SLR-ZF-1

Seat No.	

Set P

M.Sc. Chemistry (Semester - I) (New) (NEP CBCS) Examination: March/April - 2025
Physical Chemistry – I
(2324101/2325101/2326101/2327101/2302101/2303101/2304101/2305101)

Day & Date: Thursday, 15-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use f log table/calculator is allowed.

Q.1 A) Choose the correct alternative. (MCQ) **08**

1) The probability of selecting a card of the Queen of square from a standard deck of 52 cards is _____
a) 13/52 b) 1/52
c) 4/52 d) 2/52

2) At mechanical equilibrium _____ remains constant.
a) P b) V
c) T d) S

3) $(\delta T/\delta P)s = (- - -/\delta S)p$
a) δG b) δN
c) δV d) δH

4) $p_j = N_i p_i^0$, represents _____
a) Henry's law b) Raoult's law
c) Planck's law d) Boyle's law

5) In canonical ensemble T, V and _____ remains constant.
a) N b) T
c) μ d) E

6) According to Bohr postulate, the angular momentum of revolving electron is integral multiple of _____
a) 2n b) $h/2\pi$
c) h d) $h/4\pi$

7) The combined form of first and second law of thermodynamics is given as _____
a) dE = q – PdV b) dE = q – TdS
c) dE = TdS – PdV d) dE = TdS + PdV

8) The value of Maxwell- Boltzmann constant 'β' is given by _____

a) kT b) 1/ kT

c) 1/k d) kT^2

B) Fill in the blanks OR write true/false. **04**

1) Quantum mechanically, the kinetic energy of a photoelectron is directly proportional to the frequency of an incident radiation. [True/False]
2) The entropy and the probability are related by the expression ____
3) The entropy of perfectly pure crystalline substance at 0 K is infinity. [True/False]
4) The zero point energy for a particle in one dimensional box is zero. [True/False]

Q.2 Answer the following (Any Six) **12**

a) Give the expression for Gibbs' phase rule.
b) State Heisenberg's uncertainty principle.
c) Mention different types of ensembles.
d) Write the statement for Compton effect.
e) State Henry's law.
f) Write the expression for Laplacian operator in terms of cartesian coordinates.
g) What do you mean by most probable configuration?
h) What do you mean by microstates and configurations?

Q.3 Answer the following (Any Three) **12**

a) Write a note on excess thermodynamic functions.
b) Explain in detail micro-canonical and grand-canonical ensemble.
c) Take a review of laws of thermodynamics.
d) The mass of a particle is 9.11×10^{-31} kg and its corresponding velocity is 3×10^{-6} m/s, calculate its de Broglie wavelength. Comment on the result.

Q.4 Answer the following (Any Two) **12**

a) Derive Gibbs'-Duhem equation.
b) Derive the expression for Schrodinger wave equation for a particle in one dimensional box.
c) Derive Maxwell's relations.

Q.5 Answer the following (Any Two) **12**

a) Write on Duhem-Margules equation
b) Discuss the freezing point depression method for determination of activity coefficient.
c) Derive the expression for Maxwell-Boltzmann distribution law.

SLR-ZF-2

Seat No.	

Set P

M.Sc. Chemistry (Semester - I) (New) (NEP CBCS) Examination: March/April - 2025
Organic Chemistry– I
(2324102/2325102/2326102/2327102)(2302102/2303102/2304102/2305102)

Day & Date: Saturday, 17-May-2025 Max. Marks: 60
Time: 03:00 AM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose the correct alternative. **08**

1) In Schimidt rearrangement, _____ is used to react with carbonyl compounds to convert into acyl azide.
a) HN_3 b) NH_3
c) NH_2NH_2 d) NH_2OH

2) A stereoselective reaction produces _____.
a) Only one stereoisomer
b) More percent of one stereoisomer
c) A racemic mixture
d) A meso product

3) In an SN^2 reaction, there is _____.
a) Partial racemization b) Complete racemization
c) Complete inversion d) Complete retension

4) In neighbouring group participation reaction, neighbouring group acts as a _____.
a) Electrophile b) Nucleophile
c) both (A and B) d) neutral species

5) In Fullerene, _____ pentagons are present in their structure.
a) 8 b) 12
c) 16 d) 20

6) If the compound is planar, cyclic and contains fully delocalizable 4n electrons, then it is _____.
a) Aromatic b) anti aromatic
c) non aromatic d) Homoaromatic

7) Among the following, which carbocation is most stable?
a) Triphenyl methyl b) Benzyl
c) Allyl d) Tropylium

8) If the introduction of polar substituent(X) enhances the value of equilibrium constant, then rho(p) value is _____.

a) Positive b) Negative
c) Zero d) either positive or negative

B) Write True / False. **04**

1) Naphthalene is a nonalternant aromatic hydrocarbon.
   a) Ture b) False
2) Bicyclic crown ethers are called as Cryptands.
   a) True b) False
3) Generally, +I effect stabilises the carbanion.
   a) True b) False
4) The separation of a racemic modification into its constituent enantiomers is known as resolution.
   a) True b) False

Q.2 Answer the following. (Any Six) **12**

a) Define Hyperconjugation effect with suitable example.
b) State Huckel rule with example.
c) Define Resonance and field effect.
d) Explain anchimeric assistance.
e) Define chirality with example.
f) Define regioselectivity with suitable example.
g) Write Taft equation with statement.
h) Define ambident nucleophile with example.

Q.3 Answer the following. (Any Three) **12**

a) What are cryptands? Give two examples.
b) Discuss Benzil-benzilic acid rearrangement reaction with mechanism.
c) Explain Neighbouring group (NGP) participation byπ electrons with example.
d) Discuss the elements of symmetry.

Q.4 Answer the following. (Any Two) **12**

a) Describe the aromaticity in benzenoid and nonbenzenoid compounds.
b) Discuss in detail the formation, stability and reactivity of carbanion intermediate.
c) Write brief note on SNi mechanism.

Q.5 Answer the following. (Any Two) **12**

a) Discuss stereochemistry of the compounds containing Nitrogen, Sulphur and phosphorous.
b) Elaborate on Bonding in Fullerenes.
c) Discuss the Favorskii rearrangement reaction in detail.

SLR-ZF-3

Seat No.	

Set P

M.Sc. Chemistry (Semester - I) (New) (NEP CBCS) Examination: March/April - 2025
Inorganic Chemistry –I (2324107/2325107/2326107/2327107) (2302107/2303107/23041 07/2305107)

Day & Date: Monday, 19-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **08**

1) The CFSE value for d^5 high spin octahedral complex is _____.
a) $-4Dq + P$ b) $-20Dq + 2P$
c) $0Dq$ d) $10Dq$

2) Intense purple colour of $KMnO_4$ is due to ____.
a) LMCT b) d-d transition
c) MLCT d) Spin orbital coupling

3) The number of bridging CO ligand in $Mn_2(CO)_{10}$ is ____.
a) One b) Zero
c) Two d) Three

4) The number of skeletal electron pairs in the complex $[Os_5(CO)_{15}$ C] are _____.
a) 6 b) 7
c) 12 d) 14

5) $\mathrm{P} + \mathrm{e} \longrightarrow \mathrm{n}$, it is example of which type of reaction.
a) Beta plus decay b) Beta minus decay
c) Electron capture d) gamma decay

6) Neutron activation analysis technique is used to determine _____.
a) Carbon content b) Elemental content
c) Number of nuclei d) All of these

7) According to Walsh diagram the structure of BeH_2 is _____.
a) Linear b) Angular
c) T-shaped d) see-saw

8) The process of strengthening the direction of current in only one direction is called as _____.
a) Rectification b) Purification
c) Amplification d) Resistance

B) Write True / False. **04**

1) Permeability of ferromagnetic material is very much greater than one.
2) According to VSEPR theory the shape of XeOF2 is T-shaped.
3) β rays are most penetrating radiations than α and γ radiations.
4) $Cr(CO)_6$ is paramagnetic in nature.

Q.2 Answer the following. (Any Six) **12**

a) Define Paramagnetism and Diamagnetism and give examples.
b) Calculate the EAN of Co in $[Co_2(CO)_8]$ in solid state.
c) Define n-type and p-type semiconductors with examples.
d) Define the Atomic inversion and Berry-pseudo rotation reaction of covalently bonded molecules.
e) Define charge transfer spectra and give its type.
f) Calculate the total electron count and predict the skeletal structure of metal cluster $[H_3Ru_4(CO)_{12}]^-$ by Wade's rule.
g) Predict the geometry, shape and hybridization of BF_3 molecule with the help of VSEPR theory.
h) Define nephlauxetic effect and nephlauxetic series.

Q.3 Answer the following. (Any Three) **12**

a) Describe the splitting of d-orbitals in octahedral complexes.
b) Explain $d\pi - p\pi$ bonding with the help of suitable examples.
c) Give a short note on Radioactive decay and its types.
d) Describe in short Halide type of clusters.

Q.4 Answer the following. (Any Two) **12**

a) Discuss the semiconductor devices - rectifiers and transistors.
b) Explain the Z-out and Z-in distortion in transition metal complexes.
c) Explain Bonding in CO molecules in metal carbonyls and how it is modified by scientist Coulson.

Q.5 Answer the following. (Any Two) **12**

a) Discuss the principle, construction and working of Proportional counter.
b) Explain nephlauxetic effect and interelectronic repulsion Racah parameters.
c) Explain Bents rule and its energetics of hybridization.

SLR-ZF-6

Seat No.	

Set P

M.Sc. Chemistry (Semester - I) (New) (NEP CBCS) Examination: March/April - 2025
Research Methodology
(2324103/2325103/2326103/2327103) (2302103/2303103/2304103/2305103)

Day & Date: Saturday, 24-05-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **08**

1) A null hypothesis is _____.
a) when there is no difference between the variables
b) the same as research hypothesis
c) subjective in nature
d) when there is difference between the variables

2) Action-research is _____.
a) Applied research
b) A research carried out to solve immediate problems
c) Longitudinal research
d) All the above

3) What are the different ways to avoid plagiarism in academic writing?
a) Providing references b) Citing the original author
c) Quoting the exact phrase d) All of these

4) _____ is drawing software.
a) Chemdraw b) Origin
c) MS excel d) a & b

5) In polarography the current that flows as a result of the reduction or oxidation of the analyte is called _____.
a) Limiting current b) Capillary current
c) Residual current d) Diffusion current

6) In polarography the working electrode is typically _____.
a) gold electrode
b) Dropping mercury electrode (DME)
c) Platinum electrode
d) Glassy carbon electrode

7) _____ may be defined as a cloud of highly ionised gas, composed of electrons, ions and neutral particles.
a) XRD b) TG
c) DTA d) Plasma

8) In XRD _____ methods are used for investigation.

a) X-ray absorption b) Laue & Rotating crystal
c) TG & DTA d) X-ray fluorescence

B) Write True / False. **04**

1) Ex-post facto research method is also called as Quasi Experimental research.
2) A research design may be regarded as the blueprint of research.
3) Ithenticate software is a search engine.
4) In DTA, the sample and the reference are maintained at different temperatures throughout the analysis.

Q.2 Answer the following. (Any Six) **12**

a) What is Interval Scale in Research methodology?
b) What is Validity in Research methodology?
c) What is the significance of h- index?
d) What are the advantages of Scopus database?
e) What are the primary components of a TGA instrument?
f) What is the principle of Differential Thermal Analysis (DTA)?
g) Draw a neat labelled diagram of ICP instrumentation.
h) Explain in brief the Laue method.

Q.3 Answer the following. (Any three) **12**

a) What are the applications of amperometric titration?
b) Explain in brief a) Deductive research B) Explanatory research.
c) An organic compound of molecular formula C_7H_5ON shows the following features:
IR (KBr) : 2320cm^{-1}; 3325cm^{-1} broad
1HNMR : 5.0δ (s, 1H); 6.92 δ (dd, 2H, J=7.2 Hz); 7.02δ (dd, 2H; J=7.2Hz)
d) What is Hypothesis in Research Methodology? Explain in brief types of Hypotheses.

Q.4 Answer the following. (Any two) **12**

a) Define Sampling. Explain with examples various types of non-probability sampling method used in Research methodology.
b) What is Data collection in research? Classify data collection method in research.
c) Explain with suitable example the role of TGA in determining the Thermal Stability.

Q.5 Answer the following. (Any two) **12**

a) What is Ethics in research methodology? What are the ethical issues raised during research publication?

b) What is the meaning of research problem? What are the different measures one has to consider while selecting a research problem?

c) An organic compound of molecular formula $C_9H_{11}O_2N$ shows the following

IR(KBr) : 1680cm^{-1}; 3200 and 3400cm^{-1}

^{1}HNMR : 7.9δ (d, 2H, J=8.0 Hz); 6.6δ (d, 2H, J=8.0 Hz); 4.3δ (q, 2H, J=6.0Hz);
4.0δ (broad s, 2H, D_2O exchange); 1.4δ (t, 3H, J= 6.0Hz)

Seat No.	

Set P

M.Sc. Pharmaceutical Chemistry (Semester-I) (CBCS) Examination: March/April - 2025
Analytical Chemistry – I (MSC05108)

Day & Date: Friday, 23-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Q. Nos 1 and 2 are compulsory.
2) Attempt any three questions from Q. No 3 to Q. No 7
3) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **10**

1) _____ of the following types of errors can be traced to a defect in the measuring instrument.
a) Systematic b) Random
c) Gross d) None of above

2) Interpreter is _____.
a) An interpreter does the conversion line by line in program is run
b) An interpreter is the representation of the system being designed
c) An interpreter is a general- purpose language proving very efficient execution
d) None of above

3) _____ is the extension of files created in Ms-Word 97-2003.
a) Dot b) Doc
c) Dom d) Txt

4) _____ ICP is used to analyse samples in which of the following states.
a) Solids b) Liquids
c) Gases d) Solids and liquids

5) _____ of the following forms of electrochemistry seek to obtain condition for full polarization.
a) Potentiometry b) Voltammetry
c) Coulometery d) Electrogravimetry

6) Standard deviation of population is denoted by _____.
a) α b) Φ
c) σ d) δ

7) Measurement which is close to true value is _____.
a) accurate b) average
c) precise d) error

8) The auxiliary electrode in polarography is _____.
a) Dropping mercury b) Mercury pool
c) Graphite electrode d) Rotating platinum electrode

9) In Atomic Absorption Spectroscopy _____ of the following is the generally used radiation source.
a) Tungsten lamp
b) Xenon mercury arc lamp
c) Hydrogen or deuterium discharge lamp
d) Hollow cathode lamp

10) Text-styling feature of MS word is _____.
a) Word colour b) Word font
c) Word Art d) Word fill

B) Fill in the blanks **06**

1) Atomic absorption spectroscopy is also called as _____.
2) Systematic errors can be removed by _____.
3) Reference electrode used in polarography is _____.
4) A character that is downward and smaller down the baseline is known as _____ line.
5) In atomic absorption spectroscopy the most strongly absorbed light is called as _____ line.
6) The electrode used in amperometric titration is _____.

Q.2 Answer the following question **16**

a) Write a note on CHEM DRAW.
b) Write a note on applications of nature of titration curve in amperometry.
c) Explain the difference between AAS and FES.
d) Explain linear regression.

Q.3 Answer the following question **16**

a) Why error need to be determined and give types of error in detail.
b) What is principle of polarography and discuss instrumentation, and nature of titration curves of Polarography.

Q.4 Answer the following question **16**

a) Discuss the principles and instrumentation of ICP.
b) Discuss the principles and instrumentation of atomic absorption spectroscopy.

Q.5 Answer the following question **16**

a) What are electroanalytical techniques? Explain the Amperometry principle and working.
b) Discuss in detail of method of sampling techniques.

Q.6 Answer the following question **16**

a) Explain in details of average deviation and standard deviation.

b) Define precision and accuracy. Explain the analytical methods used for determination of the accuracy.

Q.7 Answer the following question **16**

a) Discuss the principles and instrumentation of AAS.

b) Discuss word processing, use of MSWORD in Chemistry.

SLR-ZF-8

Seat No.	

Set P

M.Sc. Chemistry (Semester - II) (New) (NEP CBCS) Examination: March/April - 2025
Physical Chemistry - II
(2326201/2325201/2324201/2302201/2304201/2305201/2303201/2327201)

Day & Date: Wednesday, 14-May-2025 Max. Marks: 60
Time: 11:00 PM To 01:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Select the correct alternative. **08**

1) In the Steady State Approximation, if 'I' is intermediate formed then ___.
   a) [I] = 0 b) d[I]/dt =0
   c) all of these d) None of the above

2) Typical lifetime for phosphorescence emission is _____.
   a) milliseconds b) microseconds
   c) nanoseconds d) picoseconds

3) Broad structureless band shifted to about 6000 cm^{-1} to red of the monomer fluorescence emission band. This is the emission characteristic of _____ species.
   a) excimer b) exciplex
   c) excited state dimer d) monomer

4) Increase in dielectric constant _____ the rate of ionic reactions in solution state.
   a) decreases b) increases
   c) does not affect d) ceases

5) Debye-Huckel - Onsager equation can be verified by plotting the graph of _____.
   a) $\wedge$ against $c^{1/2}$ b) $\wedge$ against c
   c) $\wedge$ against c^2 d) all of these

6) Which of the following system shows chemiluminescence phenomenon?
   a) anthracence b) azulene
   c) biphenyl d) luminol

7) Among the following reactions, which reaction follows fractional order kinetics?
   a) iodination of acetone
   b) thermal decomposition of acetaldehyde
   c) ethane decomposition reaction
   d) hydrolysis of an ester

8) Which of the following are the reactions in which molecules absorbing light do not themselves react but induce other molecules to react?
   a) Photosensitized reactions b) Free radical reactions
   c) Chain reactions d) Reversible reactions

B) Fill in the blanks OR Write true/false **04**

1) Nernst equation can be written as _____.
2) All photophysical pathways are radiationless transitions. [True/False]
3) Rate determining step of a chemical reaction is the fastest step in a chemical reaction. [True/False]
4) _____ is a radiative transition between two electronic states of different spin multiplicity and occurs for a longer time even after the source is cut off.

Q.2 Answer the following. (Any Six) **12**

a) What are fuel cells?
b) Differentiate between fluorescence and phosphorescence emissions.
c) What is an ionic atmosphere?
d) Which condition favours for the phosphorescence emission?
e) Why ozone layer is referred as Earth's protective umbrella?
f) State Beer's law.
g) Give any two examples of fractional order chemical reactions.
h) What do you mean by standard electrodes?

Q.3 Answer the following. (Any Three) **12**

a) Describe the method for evaluation of mean ionic activity coefficients from emf data.
b) Discuss in detail green house effect.
c) With the help of Jablonski's diagram, explain various radiative photophysical pathways.
d) Explain how ionic strength affects the rate of ionic reactions.

Q.4 Answer the following. (Any Two) **12**

a) Applying steady state approximation, discuss the kinetics of thermal decomposition of acetaldehyde.
b) Explain excitation energy transfer mechanism by giving suitable examples.
c) Using double sphere model, illustrate the influence of solvent on the rate of ionic reaction in solution state.

Q.5 Answer the following. (Any Two) **12**

a) With suitable examples write on photo-oxidation and photo-reduction reactions.
b) Discuss various electronic transitions occurring in organic molecules.
c) Describe electrical double layer and its structure with the help of Stem's model.

Seat No.	

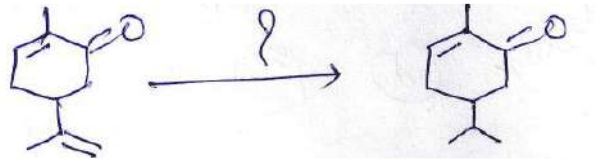
Set P

M.Sc. Chemistry (Semester - II) (New) (NEP CBCS) Examination: March/April - 2025
Organic Chemistry – II
(2326202/2325202/2324202/2302202/2304202/2305202/2303202/2327202)

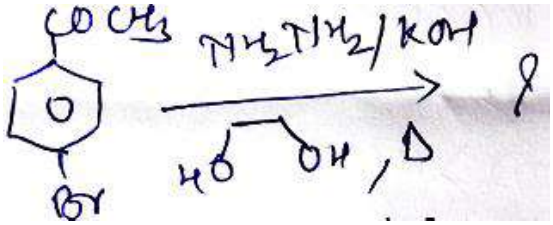
Day & Date: Friday, 16-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

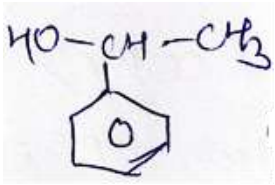
Q.1 A) Choose the correct alternative. **08**

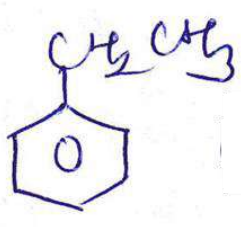
1) 

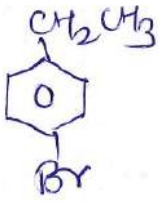
a) $H_2, (Ph_3P)_3RhCl/C_6H_6$ b) $Na/NH_3, C_2H_2OH$
c) $Al\,(O-iPr)_3/i-PrOH$ d) $NH_2NH_2, KOH, HO-CH_2CH_2OH, \Delta$

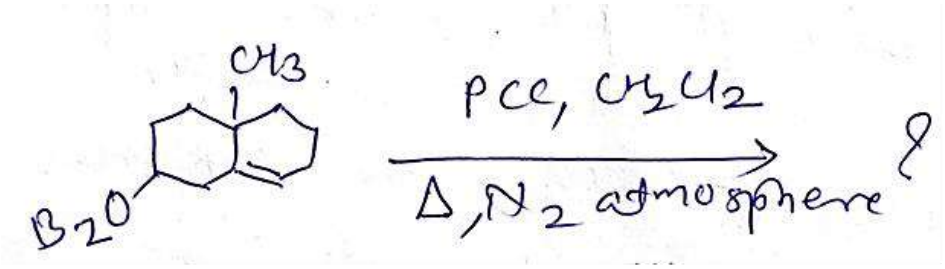
2) 

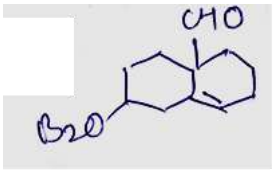
a)

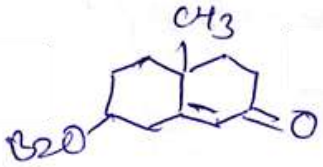
b) 

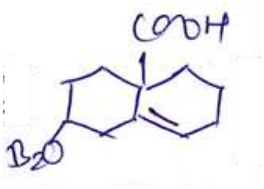
c) 

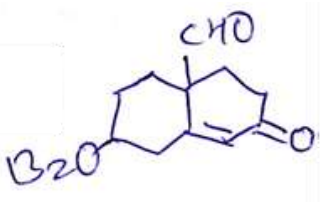
d) 

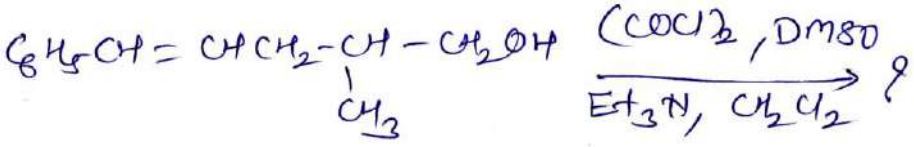
3) 
CH3
B2O
PCC, CH2Cl2
Δ, N2 atmosphere
?

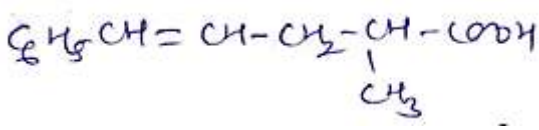
a) 
CHO
B2O

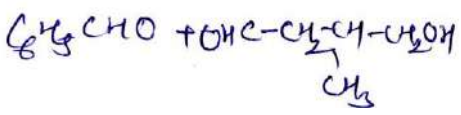
b) 
CH3
B2O
O

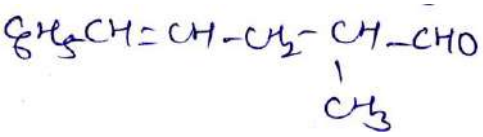
c) 
COOH
B2O

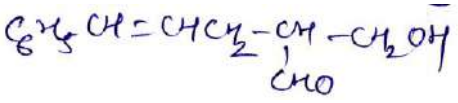
d) 
CHO
B2O
O

4) 
C6H5CH=CHCH2-CH-CH2OH
CH3
(COCl)2, DMSO
Et3N, CH2Cl2
?

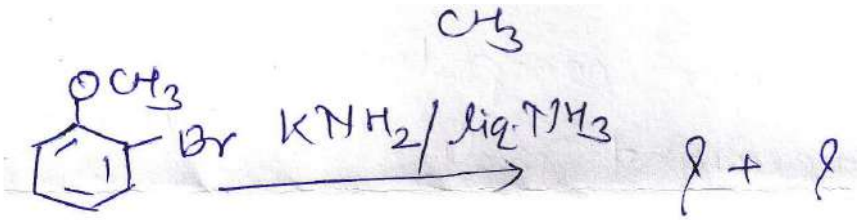
a) 
C6H5CH=CH-CH2-CH-COOH
CH3

b) 
C6H5CHO + OHC-CH2-CH-CH2OH
CH3

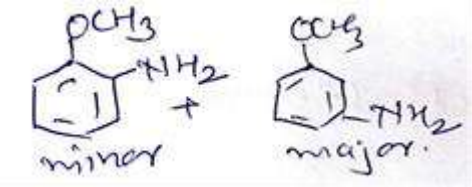
c) 
C6H5CH=CH-CH2-CH-CHO
CH3

d) 
C6H5CH=CHCH2-CH-CH2OH
CHO

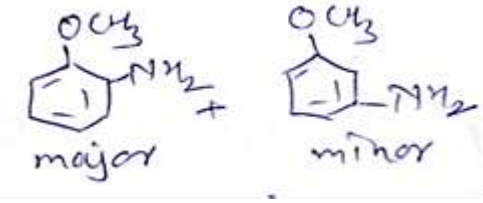
5)



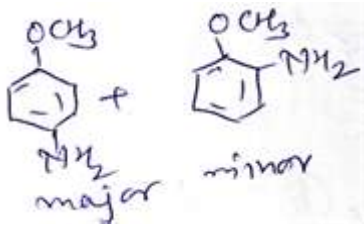
a)



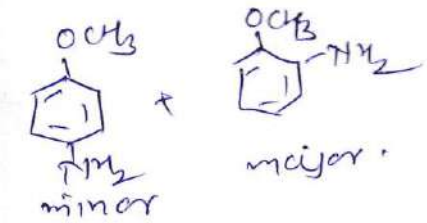
b)



c)



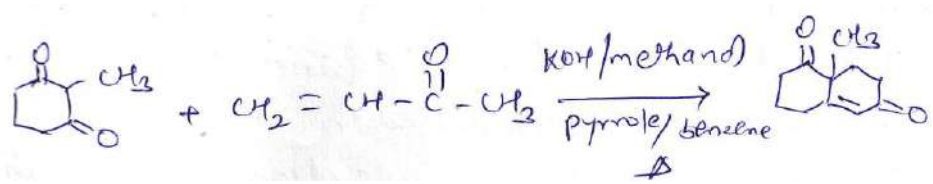
d)



6) In Friedel-Crafts acylation the reactivity order of acylanilide is ____
   a) RCOF > RCOCl > RCOBr > RCOI
   b) RCOI > RCOBr > RCOCl > RCOF
   c) RCOCl > RCOBr > RCOI > RCOF
   d) RCOCl > RCOI > RCOBr > RCOF

7) Pyrolytic elimination of esters _____
   a) is syn elimination
   b) takes place through cyclic size membered transition state
   c) requires a syn periplanar arrangement of the leaving group
   d) All three

8)



above reaaction is _____ reaction.

a) Michael addition
b) Aldos condensation
c) Michael addition followed by intramolecular alcohol condensation
d) Aldon condensation followed by Michael addition

B) Fill in the blanks. **04**

1) Conversion of Nitro group into _____ group takes place in Nef reaction.

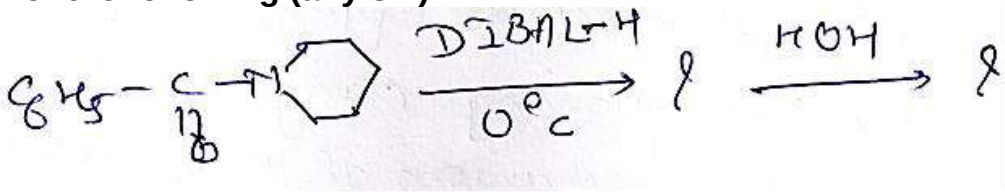
2) is_____ and deactivating group in electrophilic substitution of monosubstituted benzenes.

3) _____ regent is mainly used for the oxidation of arylmethyl ketones into the corresponding acyloins.

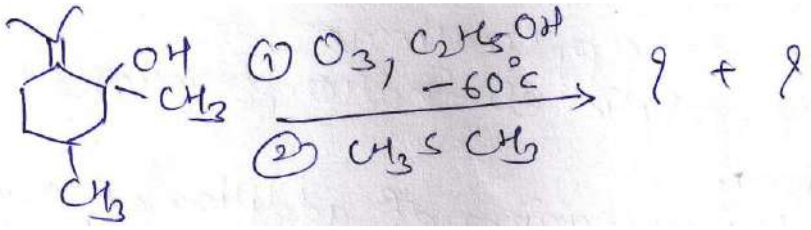
4) Acid Chloride on Rosenmund reduction gives _____ as the product.

Q.2 Answer the following (any six) **12**

a)



b)



c) Explain the mechanism of Swern oxidation

d) What is Lindar's catalyzed? Give its applications.

e) Explain Markovnikov rule with suitable example.

f) Explain Robinson annulation reaction with suitable example.

g) Explain with suitable examples o/p directing and deactivating groups.

h) Give one example of IPSO attack.

Q.3 Answer the following (any three) **12**

a) Explain with suitable example diazonium coupling reaction.

b) Give applications of Grignard reagent.

c) Explain applications of $KMnO_4$ as an oxidizing agent.

d) Give applications of $NaCNBH_3$

Q.4 Answer the following (any two) **12**

a) Explain with suitable examples benzene mechanism of aromatic nucleophile substitution.

b) Explain stereochemistry of addition reactions involving electrophilic addition.

c) Explain the mechanism of Wolff-Kishner reduction and give its applications.

Q.5 Answer the following (any two) **12**

a) Explain the mechanism of HIO_4 oxidation and give its applications.

b) Explain pyrolytic elimination reactions with mechanism.

c) Explain the mechanism of addition of organozinc & organocopper reagents to unsaturated carbonyl compounds.

Seat No.	

Set P

M.Sc. Chemistry (Semester - II) (New) (NEP CBCS) Examination: March/April - 2025
Inorganic Chemistry II (2326207/2325207/2324207/2302207/2304207/2305207/2303207/2327207)

Day & Date: Tuesday, 20-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All Questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **08**

1) The catalyst used in hydroformylation process _____.
a) $HCo(CO)_4$ b) $HCo(C1)_4$
c) $H\,Cu(CN)_4$ d) $H\,Fe(CO)_4$

2) What is maximum covalency of the nitrogen atom?
a) One b) Two
c) Three d) Four

3) Which of the following is not knows?
a) $NC1_5$ b) $NC1_3$
c) NI_3 d) $SbC1_3$

4) How are the stepwise stability constants (K) related to the overall stability constant (β)?
a) $\beta n = K1+K2+ __ +Kn$ b) $\beta n = K1x\ K2x\ __ x\ Kn$
c) $\beta n = logK1+logK2+__+logKn$ d) $\beta n = 1/ (K1+K2+ __ + Kn)$

5) How many molecules of ATP are required to fix one molecule of nitrogen?
a) 12 b) 20
c) 6 d) 16

6) Which property of actinoids cannot be explained ?
a) Radioactive a) Oxidation
c) Magnetic c) Acidic

7) Nitrogen is absorbed by the plants in the form of _____
a) Ammonium a) Nitrites
c) Nitrates c) All

8) Which is the last element of lanthanides?
a) Ytterbium b) Lutetium
c) Thulium d) Erbium

B) Fill in the blanks OR Write true/ false **04**

1) Bismuth of the group 15 elements does not exhibit allotropy.
2) The ionic radii of the lanthanides decrease from La^{3+} to Lu^{3+} in the lanthanide series.
3) Lu^{3+} lanthanide ions do not exhibit color.
4) The number of P-O-P bonds in cyclic tri metaphosphoric acid is One

Q.2 Answer the following.(Any Six) **12**

a) What is the function of ferredoxin?
b) Write the allotropes of carbon?
c) Transition elements are good catalyst. Why?
d) What is lanthanide contraction?
e) Give to examples of noble gases.
f) What is the main principal behind solvent extraction?
g) What factor affects the stability of metal complexes?
h) Give the importance uses of silver.

Q.3 Answer the following.(Any three). **12**

a) Polymorphism of Sulphur.
b) Homogeneous catalytic hydrogenation.
c) Biological nitrogen fixation
d) Structure of diborane.

Q.4 Answer the following. **12**

a) Explain in detail Oxoacids of Nitrogen w.r.t their structures and properties.
b) Explain the factors affecting stability of complexes w.r.t metal ion and ligands.
c) Describe general procedure for extraction a metal from its ore.

Q.5 Answer the following. (Any Two) **12**

a) Explain in brief structure properties of borazine.
b) Give the synthesis, mechanism and applications of Ziegler-Natta catalyst.
c) Discuss the photosynthesis PS-I and PS-II

Seat No.	

Set P

M.Sc. Chemistry (Semester - II) (CBCS)Examination: March/April - 2025
Analytical Chemistry-II (MSC05210)

Day & Date: Friday, 23-May-2025 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Q.No.1 and 2 are compulsory
2) Attempt any three questions from Q. No. 3 to Q. No. 7
3) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **10**

1) The ratio of signifying a triplet is _____
a) 1:1:1 b) 1:3:1
c) 1:2:1 d) 2:1:2

2) ^{12}C, ^{13}C and ^{1}H have nuclear spin equal to _____ respectively.
a) 0, $\frac{1}{2}$, 1 b) 0,1,0
c) 0, $\frac{1}{2}$, $\frac{1}{2}$ d) 1, 0, $\frac{1}{2}$

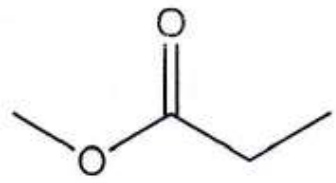
3) 2D experiments are correlation that provides information about nuclei which interact through some mechanism like _____
a) J-coupling b) through space
c) Both a and b d) None of these

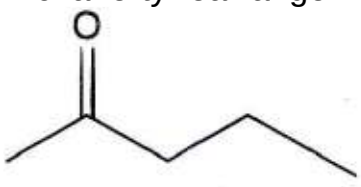
4) The PMR spectrum of _____ compound, carries more than one peak.
a) Cl-CH_2-CH_2-Cl b) CH_3-OH
c) CH_3-CO-CH_3 d) HCHO

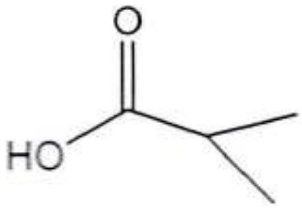
5) In DEPT-45 _____
a) Carbon bearing at least one proton shows a positive signal
b) Quaternary carbon shows a positive signal
c) Both a) and b)
d) None of these

6) In proton coupled ^{13}C NMR spectra shows signals as _____
a) -CH_2- shows triplet and -CH gives doublet
b) Quaternary carbon does not show any signal
c) All carbon shows singlet
d) None of these

7) Which of the following compound shows McLafferty rearrangement?

a) 

b) 

c) 

d) All of these

8) In mass spectrum, intensity assigned to base peak is _____

a) 50% b) 80%
c) 0% d) 100%

9) Karplus equation is for coupling constant of _____

a) geminal protons b) Long range coupling
c) Vicinal protons d) All of these

10) IR spectroscopy is mainly useful in the determination of _____

a) Conjugation b) Functional group
c) Molecular weight d) Atomic weight

B) Write true / false **06**

1) DEPT is distortion less enhancement polarisation transfer.
2) In PMR spectrum, CH_3-OH compound carries one peak.
3) Mass spectrometers are used to measure charge-to-charge ratios.
4) ^{13}C NMR spectrum has normal scale range from 0 to 100 δ.
5) In DEPT-135, CH and CH_3 gives positive peak whereas CH_2 gives negative.
6) IR spectroscopy is mainly useful in the determination of molecular weight.

Q.2 Answer the following. **16**

a) Write a short note on off-resonance technique.
b) What is metastable ion peak? For m/e values for parent ion (m_1) and daughter ion (m_2) are 150 and 122, calculate the m/e value of metastable ion (m*)?
c) Discuss the solvent used in NMR spectroscopy in detail.
d) Discuss the HETCOR spectra of n-butanoic acid.

Q.3 Answer the following. **16**

a) Discuss the chemical shift values in ppm of ^{13}C NMR for different types of compounds and factor affecting it.
b) Discuss metastable peaks with suitable examples.

Q.4 Answer the following. **16**

a) Discuss DEPT with suitable example.

b) A compound having M.F. $C_6H_{12}O_2$ gave spectral data as follows:

UV: λ_{max} 283 nm (ε=27); IR: 3300, 1705 cm^{-1}; ^{1}H NMR: δ 1.25 ppm, (s, 6H); δ 2.3 ppm, (s, 3H); δ 2.7 ppm, (s, 2H); δ 3.7 ppm. (bs, exchange with D_2O, 1H)
M.S: shows significant ions at m/z 99, 84, 58 and 43
Deduce the structure and assign the values for their confirmation.
Give fragmentation pattern of the structure.

Q.5 Answer the following. **16**

a) Two compounds with molecular formula $C_5H_{10}O$ have the following ^{1}H and ^{13}C NMR data. Both compounds have strong IR absorption bands in the 1710-1740 cm^{-1} region. Elucidate the structures of these two compounds and assign the 1H and 13C NMR values in the compounds.

1) ^{1}HNMR: δ 2.55 (septet, 1H), 2.10 (singlet, 3H), 1.05 (doublet, 6H) ^{13}C NMR: δ 212.6,41.5,27.2, 17.8
2) ^{1}H NMR: δ 2.38 (triplet, 2H), 2.10 (singlet, 3H), 1.57 (sextet., 2H), 0.88 (triplet, 3H) ^{13}C NMR: δ 209.0, 45.5, 29.5, 17.0, 13.2

b) Write a note on:

1) COSY Spectra
2) Mass fragmentation of alkanes

Q.6 Answer the following. **16**

a) 1) A compound having molecular formula $C_5H_8O_2$ shows following spectral data:
IR(cm^{-1}): 1735
^{1}H NMR data: δ 1.08 ppm (pentet, 2H); δ 1.16 ppm (pentet, 2H); δ 2.08 ppm (t, 214); δ 3.71 ppm (t, 2H).
^{13}C NMR data: δ 19.0, δ 22.2, δ 29.9, δ 68.8, δ 170.0 ppm
Predict the structure for given spectral data.

2) Propose a structure for a compound based upon the following spectral characteristics:
MS: m/z 120 [M^+]
UV:1_{max} 268 nm
IR: 3068-2910, 1608, 1470 and 800 cm^{-1}
NMR: δ 6.8 and 2.3, singlets in the ratio 1:3

b) Explain in detail the factors influencing vibrational frequencies in IR spectroscopy.

Q.7 Answer the following. **16**

a) 1) A liquid having boiling point 82 with Mol. Wt. 60 shows a characteristic IR absorption broad band at 3300 cm^{-1}. PMR shows signals (ppm) at:
δ 1.1 (d, 6H); δ 3.9 (septate,1H); δ 4.8 (bs, exchange with D_2O, 1H) Deduce the structure and assign the values of IR and PMR.

2) Three isomeric ethers with M. F. $C_4H_{10}O$, Assign the structures, name them and state how many signals will arise in their proton decoupled ^{13}C NMR spectra and also in ^{1}H NMR spectra.

b) Discuss the fragmentation pattern of following molecules:

1) Toluene
2) 2-Pentanone
3) Cyclohexanone
4) p-Cresol

Seat No.	

Set P

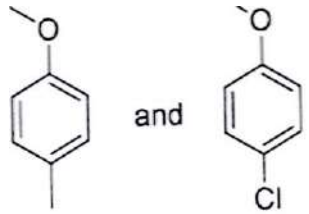
M.Sc. Organic Chemistry (Semester - III) (New) (NEP CBCS) Examination: March/April - 2025
Advanced Spectroscopic Methods (2326301)

Day & Date: Thursday, 15-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **08**

1) How many signals appears in the ^{1}H NMR spectrum of the following compounds?



a) 4, 3 b) 2, 3
c) 3, 3 d) 2, 2

2) The NMR signal of a compound is found to be 200 Hz downfield from TMS peak using spectrometer operating at 100 MHz. What is the downfield shift in Hz for same proton in the spectrometer operating at 300 MHz?

a) 300 Hz b) 900 Hz
c) 600 Hz d) 1200 Hz

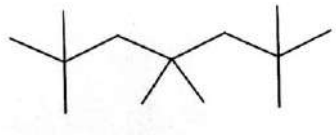
3) Which of the following halogen gives [M] and [M+2] isotopic peaks of 3:1 intensity ratio in mass spectrum?

a) Cl b) Br
c) I d) F

4) Which of the following nuclei is not NMR active?

a) ^{2}D b) ^{19}F
c) ^{32}P d) ^{33}S

5) How many peaks do you expect to see in the ^{1}H NMR spectrum for the following molecule



a) 2 b) 3
c) 4 d) 10

6) In the decoupled ^{13}C NMR spectrum the number of signals appears for catechol, resorcinol, and hydroquinone are respectively ____.
a) 6, 4 & 2 b) 6, 6 & 4
c) 3, 4 & 4 d) 3, 4 & 2

7) DEPT is ____.
a) Distortion less enhancement polarisation technique
b) Distortion less enhancement polarisation transfer
c) Different enhancement polarisation transfer
d) All above

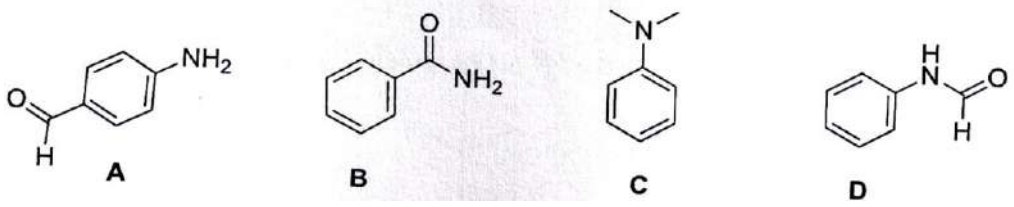
8) In mass spectroscopy, the relative abundance of fragment ion depends upon its ____.
a) Stability
b) Rate of formation
c) Rate of further decomposition
d) All of the above

B) State True or False. **04**

1) The gyromagnetic ratio of carbon-13 is larger than that of protons.
2) A proton in NOSEY experiment correlates through the space.
3) The base peak in the mass spectrum always shows molecular mass of the compound.
4) Protons that are enantiotropic will show different signals in NMR.

Q.2 Answer the following question (Any Six). **12**

a) Why does $CDCl_3$ appear as triplet in ^{13}C NMR?
b) Disuses ^{1}H NMR and ^{l3}C NMR signals of ortho, meta and para positional isomers of xylene.
c) What is nitrogen rule in mass spectroscopy?
d) Which of the following compound shows peak in the mass spectrum at m/z = 121, 105, 77, 44. Discuss all fragment ions for correct compound.



e) Why acetylene protons are shielded than olefin protons?
f) Define the term coupling constant.
g) How will you distinguish between equatorial and axial protons in cyclohexane by NMR?
h) Comment on sensitivity of ^{1}H and ^{13}C nuclei in NMR with reason.

Q.3 Answer the following question (Any Three) **12**

a) Discuss chemical and magnetical equivalence in NMR.
b) What is DEPT technique? Describe how it is useful for structure determination with examples.
c) Discuss fragmentation of benzyl alcohol and its significant peaks in Mass spectrum.
d) Find out structure of organic compound from following data
Molecular Formula: $C_8H_{14}O_3$
IR ($\bar{\nu}$ in cm^{-1}): 1100, 1755, 1820, 2990.
^{1}H NMR (200 MHz; $CDCl_3$, δ in ppm): 0.9 (t, 9 mm), 1.6 (sextet, 6 mm), 2.4 (t, 6 mm).
^{13}C NMR (50 MHz; $CDCl_3$ δ in ppm): 12, 18, 38, 180; DEPT (θ= 135): 12 (up), 18 and 38 (down); MASS: m/z = 55, 70, 71 (base peak, 100%), 158.

Q.4 Answer the following question (Any Two) **12**

a) What are the various factors affecting on coupling constant in NMR?
b) What is second order spectra? Discuss A_2B_2, A_2X_2 spin systems in NMR with examples.
c) What is 2D NMR? Discuss HETCOR NMR technique with examples.

Q.5 Answer the following question (Any Two) **12**

a) Discuss fragmentation pattern of ester, aldehydes and ethers with examples.
b) Find out structure of organic compound from following data
Molecular Formula: $C_5H_6N_2$
IR: 3450, 3300, 3190, 1620, 1600, 1500, 760 cm^{-1}; ^{1}H NMR (δ in ppm): 5.1 (broad s, 10 mm, Ex.), 6.25 (dd, *J*= 2.5 and 7 Hz, 5 mm), 6.4 (dt, *J* = 2.5 & 7 Hz, 5 mm), 7.2 (dt, *J* = *2* and 7 Hz, 5 mm), 7.9 (dd, *J*= 2 and 5 Hz, 5 mm); ^{13}C NMR (δ in ppm): 109, 118, 138, 148, 160; Mass: m/z = 94, 67, 66, 41, 39
c) Find out structure of organic compound from following data
Molecular Formula: $C_{11}H_{14}O$
IR: 2970, 1609, 1537, 1500, 1250, 1180, 1120, 1050, 755, 691 cm^{-1}
^{1}H NMR (δ in ppm): 1.3 (t, *J*= 6 Hz, 30 mm), 4.1 (q, *J* = 6 Hz, 20 mm), 3.33 (d, *J*= *6* Hz, 20 mm), 5.04 (dd, *J*= 2, 16 Hz, 10 mm), 4.79 (dd, *J*= 2, 10 Hz, 10 mm), 5.92 (m, 10 mm), 6.86 (d, *J*= 8 Hz, 20 mm), 7.14 (d, *J*= 8 Hz, 20 mm); ^{13}C NMR (δ in ppm): 15, 40, 65, 114, 116, 130, 133, 137, 156.

Seat No.	

Set P

M.Sc. Organic Chemistry (Semester - III) (New) (NEP CBCS) Examination: March/April - 2025
Photochemistry and Pericyclic Reactions (2326302)

Day & Date: Saturday, 17-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Choose the correct alternative. **08**

1) $[4+2]$ Cycloaddition reactions are _____ allowed.
a) Photo chemically b) Thermally
c) Both A and B d) All of the above

2) When symmetries of first excited state of molecular orbitals of reactants correlates with first excited state of molecular orbitals of product then reaction is _____ allowed.
a) Thermally b) Photo chemically
c) Both A and B d) All of the above

3) Claisen rearrangement is an example of _____ sigmatropic rearrangement.
a) $[1,3]$ b) $[1,5]$
c) $[3,3]$ d) $[1,7]$

4) Energies of different Molecular orbitals of conjugated acyclic polyenes can be calculated by using formula _____.
a) $E_j = a + \beta \cos\theta$ b) $E_j = a + 2\beta \cos\theta$
c) $E_j = a + \beta \cos 2\theta$ d) $E_j = a + 3\beta \cos\theta$

5) Norrish type I reaction shows _____ bond cleavage.
a) γ b) β
c) a d) None of above

6) A reaction in which bond is broken or made at the expense of cyclic shift of pi electrons is known as _____ reaction.
a) Addition b) Substitution
c) Rearrangement d) Electrocyclic

7) According to PMO theory energy of non bonding molecular orbial is _____.
a) $a + \beta$ b) $a - \beta$
c) $a + 2\beta$ d) a

8) Which of the following technique is used to detect free radicals?

a) Uv spectroscopy b) ESR
c) IR spectroscopy d) Mass spectroscopy

B) Write true or false. **04**

1) Lowest energy molecular orbital has 1 node.
2) $[1,3]$ Sigmatropic rearrangement is photochemicaly forbidden.
3) Energy of localised system is calculated by using formula $x\beta + y2a$.
4) Free radicals are detected by ESR technique.

Q.2 Answer the following. (Any Six) **12**

a) Calculate energies of different molecular orbitals of 1, 3, 5 heptatriene system.
b) Construct molecular orbital diagram for allylic system.
c) Discuss Endo selectivity in Diels Alder Reaction.
d) Explain Allylic halogenations.
e) Explain Sensitised cis-trans isomerisation of alkenes.
f) Discuss classification of Sigmatropic rearrangement reactions.
g) Explain ESR technique for free radical detection.
h) Discuss uses of NBS.

Q.3 Answer the following. (Any Three) **12**

a) Calculate delocalisation energy of cyclopropenyl cation and anion.
b) Explain mechanism of electrocyclic reactions by Huckel-Mobius aromatic and antiaromatic transition states.
c) Explain Cope rearrangement.
d) Discuss Paterno buchi reaction.

Q.4 Answer the following. (Any Two) **12**

a) Calculate energy involved in bond formation of 13+1 system.
b) With the help of correlation diagram explain thermal and photochemical electrocyclic reactions of molecules having 4n pi electrons.
c) Explain Norrish type I reaction in acyclic and cyclic ketones.

Q.5 Answer the following. (Any Two) **12**

a) Calculate energies of different molecular orbital of 1, 3, 5 heptatriene molecule.
b) Explain con and dis rotatary mode of rotation in electrocyclic ring closure and opening reaction of 4n+2 pi electron system.
c) Photochemistry of diazo compounds, nitriles and azides.

Seat No.	

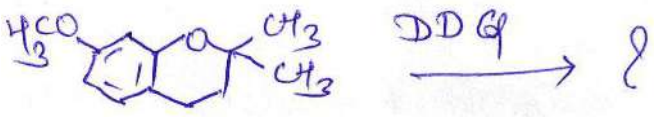
Set P

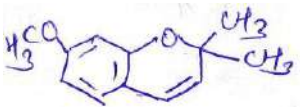
M.Sc. Organic Chemistry (Semester - III) (New) (NEP CBCS)
Examination: March/April - 2025
Advanced Organic Chemistry (2326306)

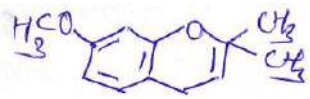
Day & Date: Monday, 19-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

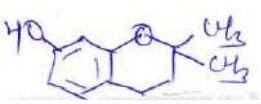
Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

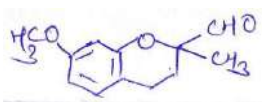
Q.1 A) Choose the correct alternative **08**

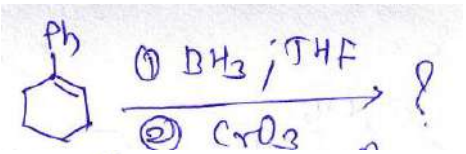
1) 

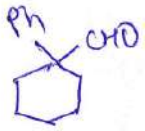
a) 

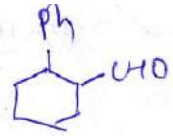
b) 

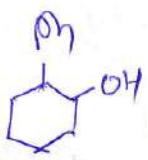
c) 

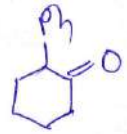
d) 

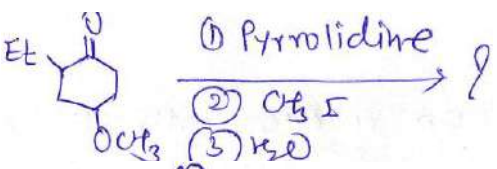
2) 

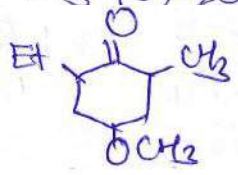
a) 

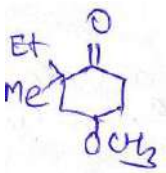
b) 

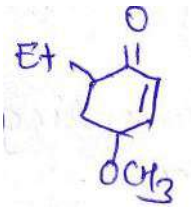
c) 

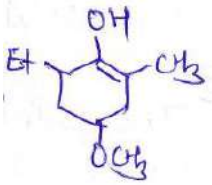
d) 

3) 

a) 

b) 

c) 

d) 

4) Preparation of substituted amines from amine, aldehyde and vinyl or arylboronic acid is known as _____

a) Amination reaction
b) Petasis reaction
c) Strecker amino acid synthesis
d) Mannich reaction.

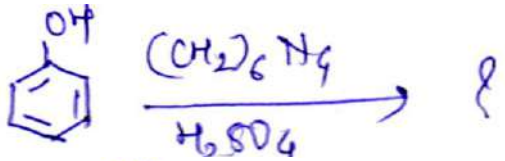
5)

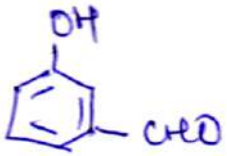
a)

b)

c)

d)

6) 

a) 

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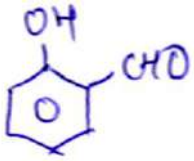
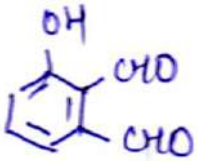
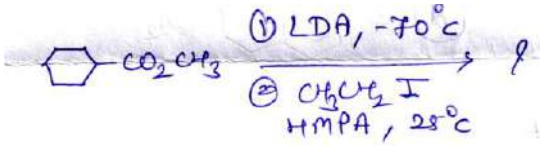
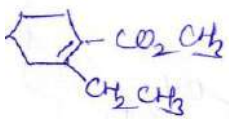
c) 

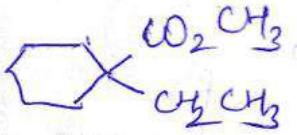
d) 

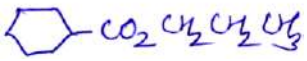
7) In the Stevens rearrangement reaction quaternary ammonium salt rearranges to a tert-amine in the presence of _____

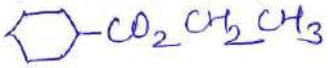
a) Weak base
b) Strong acid
b) Weak acid
d) Strong base

8) 

a) 

b) 

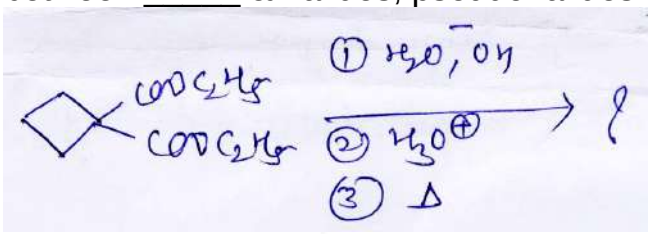
c) 

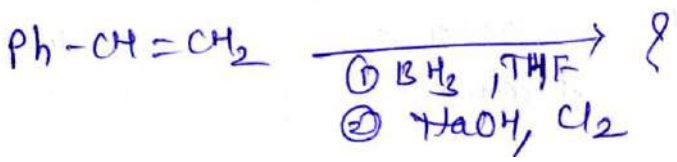
d) 

B) Fill in the blanks. **04**

1) Trimethylsilyl iodide on reaction with ether gives _____

2) The Stille coupling is a versatile c-c bond forming reaction between _____ & halides, pseudohalides.

3) 

4) 

Q.2 Answer the following. (Any Six) **12**

a) Explain the synthesis of alkane from alkene by using organoboranes.
b) Explain oxidation of alcohols by DDG.
c) Explain the effect of solvent on structure and reactivity of enolate.
d) Explain the mechanism of Hiyama reaction with suitable example.
e) Explain with suitable example the mechanism of Brook rearrangement reaction.
f) Give two uses of allylboranes.
g) Give two examples of ring closing metathesis.
h) Explain with suitable example intramolecular alkylation of enolates.

Q.3 Answer the following. (Any Three) **12**

a) Discuss the alkylation of enolates stabilized by two functional groups.
b) Discuss hydroboration mechanism and explain its uses in the synthesis of dienes and alkenes.
c) Explain the mechanism of von-Richter rearrangement reaction.
d) Explain the mechanism of Kumada reaction.

Q.4 Answer the following (Any Two) **12**

a) Discuss the synthetic application of Lithium dialkylcuprate.
b) Explain the reaction mechanism of Corey-Winter olefination reaction and give its applications.
c) Explain carbonylation of organoboranes in the presence of diglyme, water and $LiAlH(OR)_3$

Q.5 Answer the following. (Any Two) **12**

a) Explain the mechanism of Neber rearrangement reaction ad give its applications.

b) Explain generation & alkylation of dianions.

c) Explain the mechanism of Passerini reaction and give its applications.

SLR-ZF-17

Seat No.	

Set P

M.Sc. Organic Chemistry (Semester - III) (New) (NEP CBCS)
Examination: March/April - 2025
Applied Organic Chemistry (2326307)

Day & Date: Monday, 19-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and write equations wherever necessary.
3) Figures to the right indicate full marks.
4) Use of log-tables and calculator is allowed.
5) Use of Mobile is strictly prohibited.

Q.1 A) Multiple choice Questions. **08**

1) Lactose is an example of ____
   a) polysacharides b) monosaccharides
   c) disaccharides d) oligosaccharides

2) 3 carbon monosacchandes are called as _____
   a) trioses b) tetrose
   c) pentose d) hexose

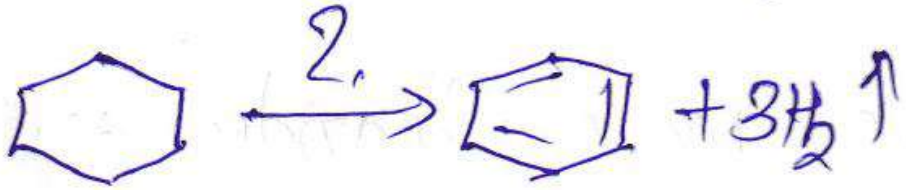
3) A ligands which helps for transformation of metal ion across the cell membrane are called_____
   a) cryptands b) Crown ethers
   c) pod ads d) Ionophores

4) A supramolecular host-guest complex formed by the inclusion of molecules of one kind in cavities_____
   a) host b) guest
   c) clathrate d) binding sites

5) ____ is father of Green Chemistry.
   a) John Warner b) Paul Anastas
   c) Albert Einstein d) Joseph Breen

6) Advantages of microwave assisted organic synthesis is/are _____
   a) Short reaction time b) Less Energy
   c) Solvent free reaction d) All of the above

7) The regent used for following transformation is



a) MnO_2 b) PCC
c) Pt-H_2 d) Se

8) Haworth synthesis is used for synthesis of ____
a) Anthracepe b) Naphthalene
c) Pheanthrene d) Fluorine

B) True or False **04**

1) Stilbite was the first discovered zeolite.
2) [12]-crown-4 forms complex with k+ion.
3) S is also used for dehydrogenation method.
4) Solvent less synthesis is called ”neat” synthesis.

Q.2 Answer the following (Any Six) **12**

a) Write any two principles of Green chemistry.
b) Give advantages of ionic liquids.
c) Give the classification of supramolecular hosts.
d) Write a note in spherands.
e) Write a note on Fisher Projection.
f) Explain the applications of
i) Benedict’s Reagent
ii) Barfoed’s Reagent.
g) Explain Elbs reaction with suitable example.
h) Give 2 examples of dehydrogenation of hydroaromatic compounds using selenium.

Q.3 Answer the following (Any Three) **12**

a) Describe various oxidation reactions of naphthalene.
b) Explain the cydic and open chain structure glucose.
c) Define the terms.
i) Host
ii) Guest
iii) Binding sites
iv) Clathrate
d) Write any 4 principles of Green Chemistry.

Q.4 Answer the following (Any Two) **12**

a) Give the basic principles of Green Chemistry.
b) What are cryptands? Give its synthesis and applications.
c) Explain the term:
i) Anomeric effect
ii) Synthesis of pyrene.

Q.5 Answer the following (Any Two) **12**

a) Explain Kiliani-fisher synthesis.

b) Give electrophilic substitution reactions of naphthalene with mechanism and suitable example.

c) i) Explain co-operativity and chelate effect.
ii) Describe the term Ionic liquids.

Seat No.	

Set P

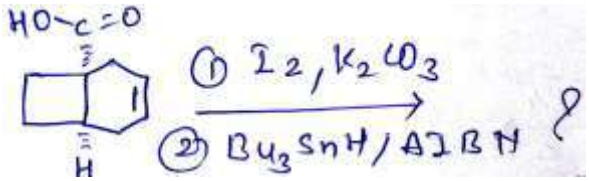
M.Sc. Organic Chemistry (Semester - III) (Old) (CBCS) Examination: March/April - 2025
Advanced Organic Chemistry - I (MSC07301)

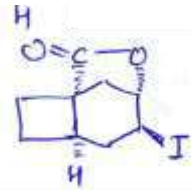
Day & Date: Thursday, 15-May-2025 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

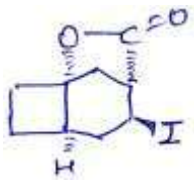
Instructions: 1) Q. Nos. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No.3 to Q. No. 7
3) Figures to the right indicate full marks.

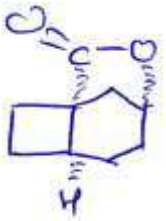
Q.1 A) Multiple choice questions. **10**

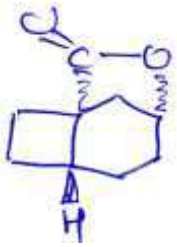
1) The Payne rearrangement reaction occurs with inversion of stereochemistry at _____.
   a) C-3 b) C-2 & C-3
   c) C-1 d) C-2

2) 

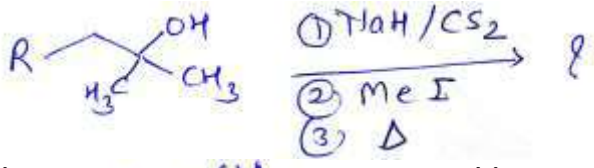
   a) 

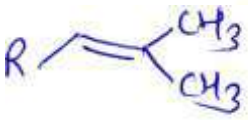
   b) 

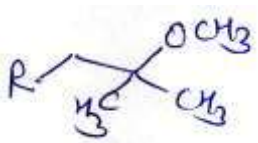
   c) 

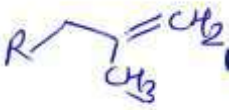
   d) 

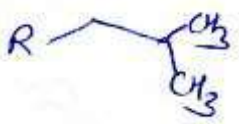
3) The Stille coupling reaction is a versatile C-C bond forming reaction between _____ and _____.
   a) stannanes & pseudo halides
   b) stannanes & halides
   c) alkene & halide
   d) Both a & b

4) 

a) 

b) 

c) 

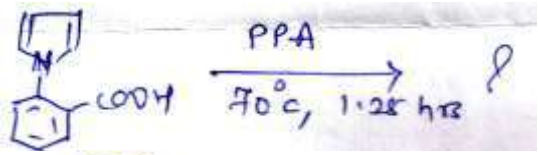
d) 

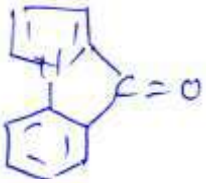
5) During SeO_2 oxidation, reactivity of $-CH_2$ group is more than $-CH_3$ group because _____ of methylene group occurs more readily than methyl group.

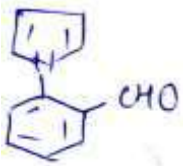
a) hydration b) protonation
c) enolization d) dehydration

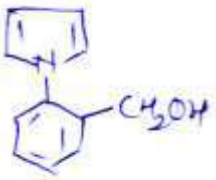
6) Ozone is a very _____ 1,3 dipolar molecule.

a) nucleophilic b) electrophilic
c) inactive d) None of these

7) 

a) 

b) 

c) 

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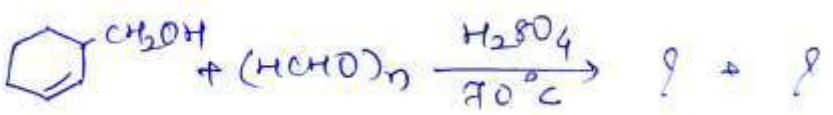
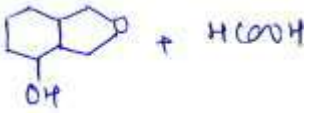
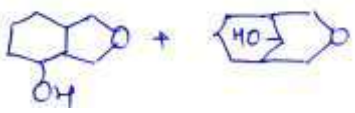
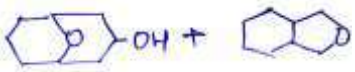
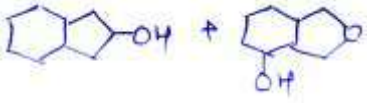
8) 

a) 

b) 

c) 

d) 

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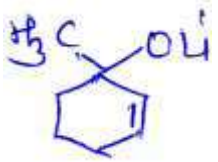
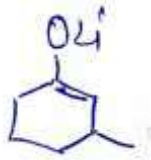
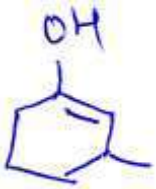
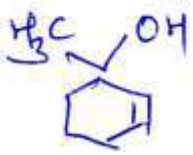
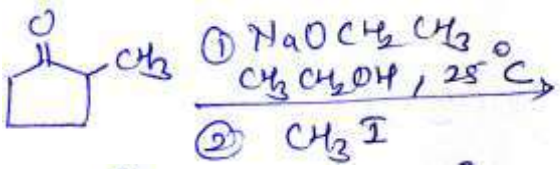
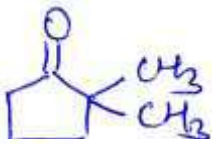
a) 

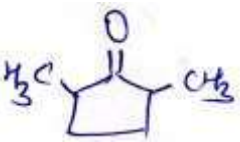
b) 

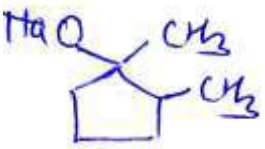
c) 

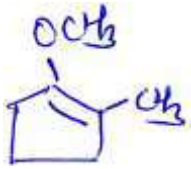
d) 

10) 

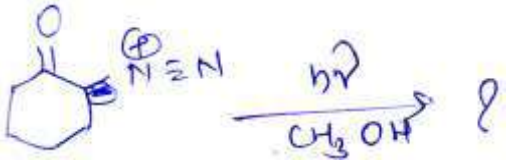
a) 

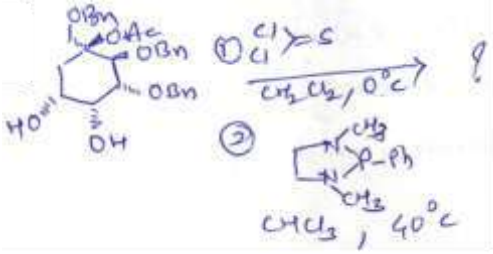
b) 

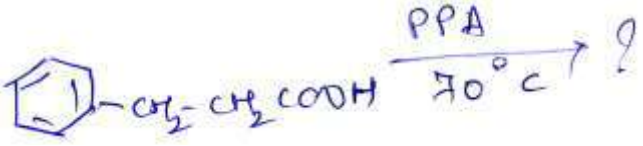
c) 

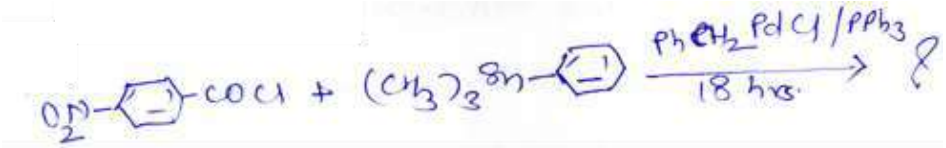
d) 

B) Fill in the blanks. **06**

1) 

2) 

3) 

4) 

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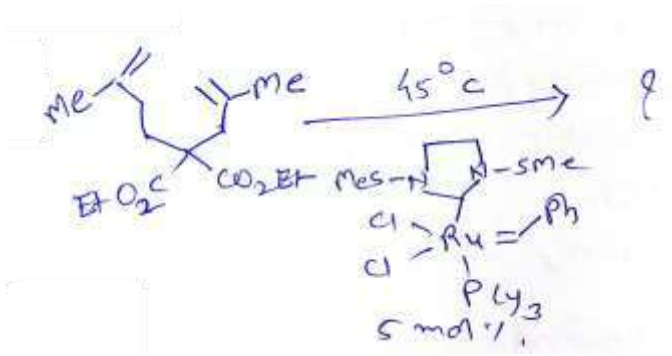

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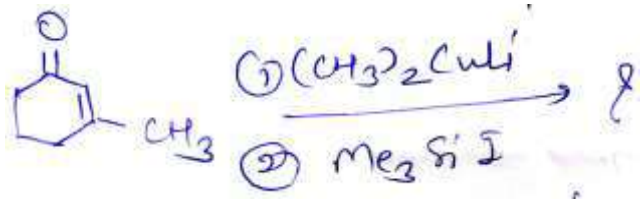


Q.2 Answer the following. **16**

a) Explain the mechanism of Corey-Fuchs reaction with suitable example.
b) Discuss the mechanism of Brook rearrangement reaction.
c) Discuss various application of selenium dioxide.
d) Discuss generation and properties of enolates.

Q.3 Answer the following.

a) Discuss reaction mechanism and applications of Julia Olefination. **08**
b) Discuss the mechanism and application of Wagner-Meerwein rearrangement reaction. **08**

Q.4 Answer the following.

a) Discuss with suitable example alkylation of highly stabilized enolates. **08**
b) Discuss reaction mechanism and application of Mitsunobu reaction. **08**

Q.5 Answer the following.

a) Discuss reaction mechanism and applications of Suzuki coupling reaction. **08**
b) Discuss reaction mechanism and applications of Tiffeneau-Demjanov rearrangement reaction. **08**

Q.6 Answer the following.

a) Discuss with suitable examples alkylation of ketones & nitriles. **08**
b) Discuss applications of DCC. **08**

Q.7 Answer the following.

a) Discuss reaction mechanism & applications of Darzen reaction. **08**
b) Discuss reaction mechanism and applications of Eschenmoser fragmentation. **08**

Seat No.	

Set **P**

M.Sc. Organic Chemistry (Semester - III) (Old) (CBCS) Examination: March/April - 2025
Chemistry of Bioactive Hetero cycles (MSC07302)

Day & Date: Saturday, 17-May-2025 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7.
3) Figures to the right indicate full marks.

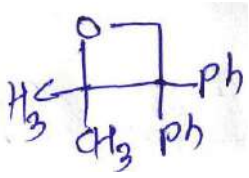
Q.1 A) Multiple choice questions. **10**

1) Which of the following prefix used for sulphur?

a) Oxa b) Thia
c) Aza d) Sila

2) The major product of the following reaction is _____.

a)



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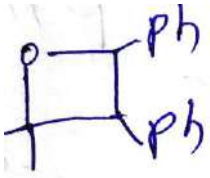

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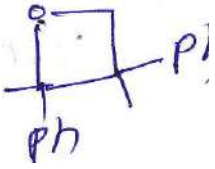

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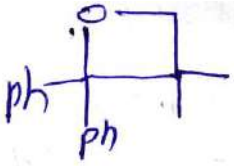
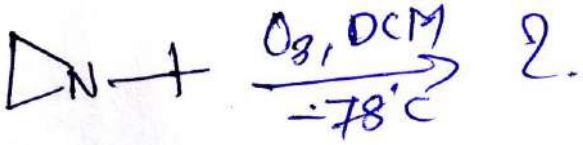
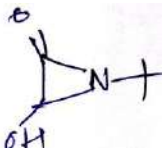


3) The major product of the following reaction is _____.



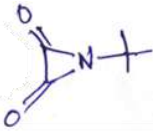
a)

b)

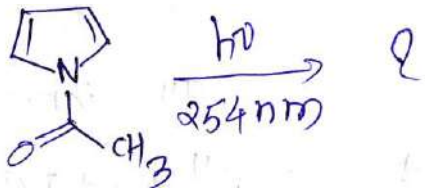


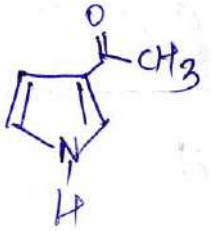
c)

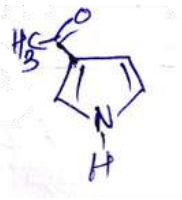
d)

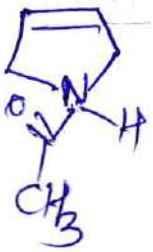


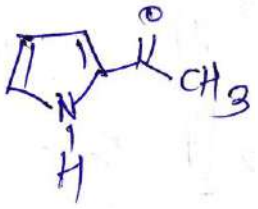
4) The major product of the following reaction is _____.



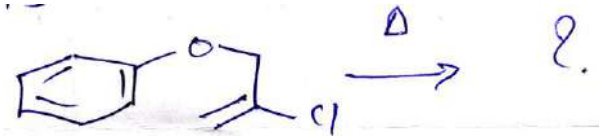
a) 

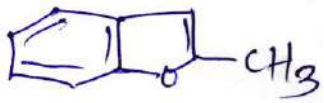
b) 

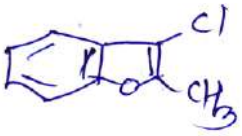
c) 

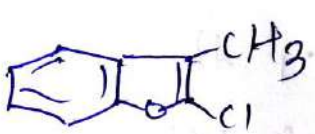
d) 

5) The major product of the following reaction is _____.



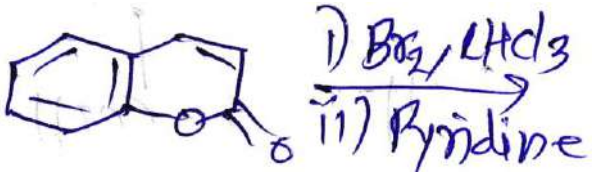
a) 

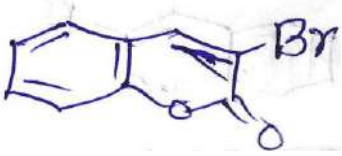
b) 

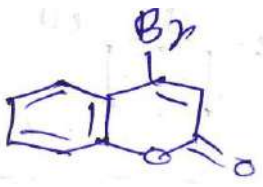
c) 

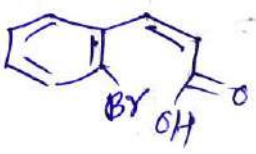
d)

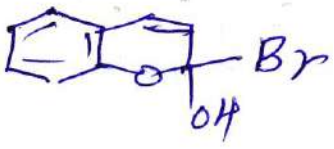
6) The major product of the following reaction is _____.



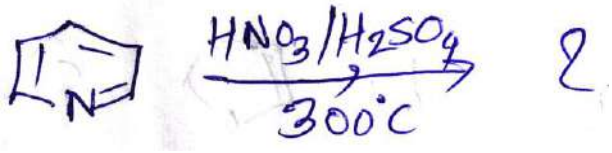
a) 

b) 

c) 

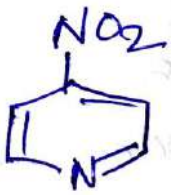
d) 

7) The major product of the following reaction is _____.



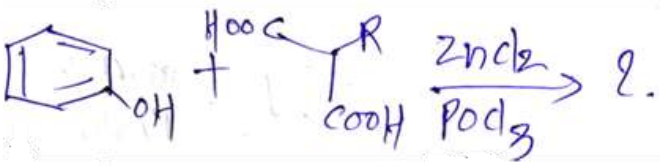
a)

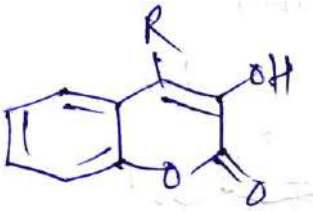
b)

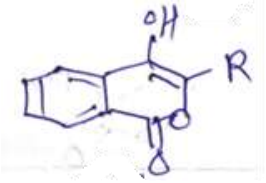
c) 

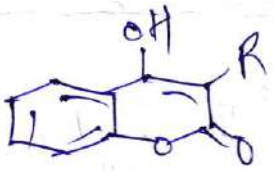
d)

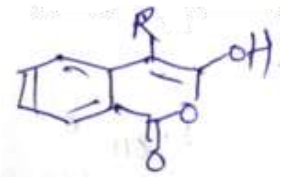
8) The major product of the following reaction is _____.



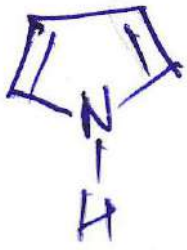
a) 

b) 

c) 

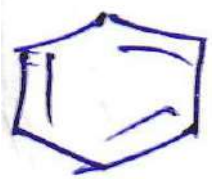
d) 

9) _____ will show more reactivity towards, electrophilic substitution reaction.

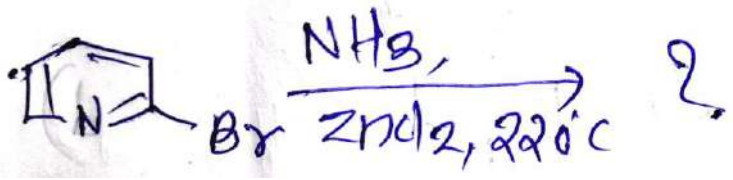
a) 

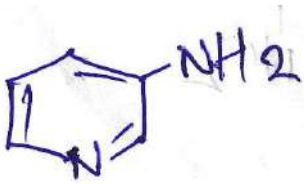
b)

c)

d) 

10) The major product of the following reaction is _____.



a) 

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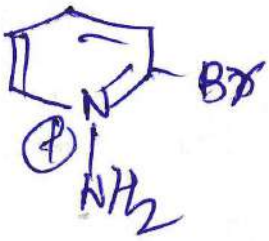
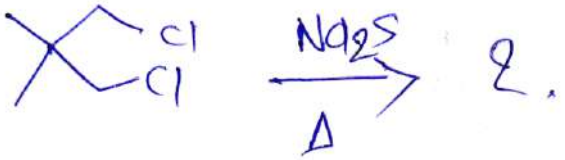
c) 

d)

B) Fill in the blanks. **06**

1) 

2) The suffix _____ is used for oxygen containing saturated compounds.

3) The electron of nitrogen participating in the resonance in indole is present in _____ orbital.

4) The Skraup synthesis method is used for synthesis of _____ Heteroaromatic compound.

5) The electrophilic substitution take place at _____ position in thiazole.

6) _____ has lowest strain energy in 3 membered heterocyclic compounds.

Q.2 Answer the following. **16**

a) Write a short not on synthesis oxetane.
b) Discuss the two methods for synthesis of Pyrrole.
c) Discuss the synthesis of pyridone with its mechanism.
d) What are the methods for synthesis of chromones? Discuss with mechanism.

Q.3 Answer the following. **16**

a) Describe electrophilic substitution reactions of pyridine.
b) Discuss the 4 methods of synthesis of Quinoline.

Q.4 Answer the following. **16**

a) Describe 2 methods of synthesis of each of Thiazole an Isothiazole.
b) Discuss the reactions of coumarin and chromone.

Q.5 Answer the following. **16**

a) Describe Baldwin rule in detail.

b) Write two methods of each for synthesis of thiophene and furan.

Q.6 Answer the following. **16**

a) Describe electrophilic substitution reactions of indole and benzothiophene.

b) Discuss 2 methods of each for synthesis of pyridazines and pyrazines.

Q.7 Answer the following. **16**

a) What are synthesis methods for oxirane and Thiirane?

b) What is the regioselectivity of brominating and nitration reactions in pyrrole with examples.

Seat No.	

Set P

M.Sc. Organic Chemistry (Semester - III) (Old) (CBCS) Examination: March/April - 2025
Photo chemistry and Pericyclic Reactions (MSC07306)

Day & Date: Monday, 19-May-2025 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Q.1 and 2 are compulsory.
2) Attempt any three questions from Q. 3 to Q. 7.
3) Figures to the right indicate full marks.

Q.1 A) Select the correct alternative. **10**

1) A reaction in which two or more pi electron system react to form a ring at the expense of one pi bond in each of reacting parteners is called _____ reaction.
   a) Sigmatropic rearrangement
   b) Electrocyclic
   c) Cycloaddition
   d) Group transfer

2) Molecular orbital Ψ_3 of 1,3,5 hexatriene will have _____ nodes.
   a) 0 b) 1
   c) 4 d) 2

3) Cope rearrangement is example of _____ sigmatropic reaction.
   a) [1,3] b) [1,5]
   c) [3,3] d) [1,7]

4) In Diels Alder reaction diene must be in _____ conformation.
   a) S-trans b) S-cis
   c) Both a and b d) None of above

5) _____ is used as catalyst in Sandmeyer reaction.
   a) Cuprous chloride b) Palladium chloride
   c) Aluminum dichloride d) Iron trichloride

6) In photocycloaddition reaction electron rich alkenes will give _____ product with α,β unsaturated carbonyl compounds.
   a) Head to head b) Head to tail
   c) Both a and b d) None of above

7) According to PMO theory energy of non bonding molecular orbital is _____.
   a) $\alpha+\beta$ b) $\alpha-\beta$
   c) $\alpha+2\beta$ d) α

8) Energies of different Molecular orbitals of conjugated acyclic polyenes can be calculated by using formula _____.
   a) $E_j = \alpha + \beta \cos\theta$ b) $E_j = \alpha + 2\beta \cos\theta$
   c) $E_j = \alpha + \beta \cos 2\theta$ d) $E_j = \alpha + 3\beta \cos\theta$

9) The diagram that shows correspondence in energy and symmetry between relevant reactants and product orbitals is called _____ diagram.
   a) Energy level b) Molecular Orbital
   c) Correlation d) None of above

10) [1, 3] sigmatropic rearrangements are _____allowed.
   a) Photochemically b) Thermally
   c) Both a and b d) None of above

B) State whether true or false. **06**

1) Pericyclic reactions are concerted.
2) Con rotatory mode of orbital motion is observed when orbitals have mirror symmetry.
3) Cyclic dienes on Diels Alder reaction give endo product as a major product.
4) Claisen rearrangement is an example of [1, 3] simatropic rearrangement.
5) Energy of molecular orbital of cyclic system can be calculated by formula $E_j = \alpha + \beta \cos 2 \times 180\mathrm{X}k/N$
6) Dienes separated by sp^3 hybridized carbon atom give Di-pi methane rearrangement.

Q.2 Write short notes on. **16**

a) Construct molecular orbital diagram of 1, 3 butadiene.
b) Explain [2+2] Cycloaddition reaction.
c) Discuss Cope rearrangement.
d) Explain Paterno Buchi reaction.

Q.3 Answer the following. **16**

a) Explain mechanism of cyclobutane ring opening to 1, 3 butadiene by correlation diagram.
b) Define Sigmatropic rearrangement reaction with suitable example and explain classification of sigmatropic rearrangements.

Q.4 Answer the following. **16**

a) Calculate energies of molecular orbitals of benzene.
b) Explain in detail Norish type I reaction in cyclic and acyclic ketones.

Q.5 Answer the following. **16**

a) With the help of Woodward-Hoffman rule explain mechanism of electrocyclic reactions.
b) Explain in detail orientation rules in Diels Alder reaction.

Q.6 Answer the following. **16**

a) Explain photochemistry of

1) Nitrites
2) Azides

b) Calculate bond formation energy in 9+1 system.

Q.7 Answer the following. **16**

a) Explain in detail types of free radical reactions and comment on free radical substitution reaction.

b) Write notes on

1) Photodimerisation of alkenes
2) Aromatic photosubstitution

Seat No.	

Set P

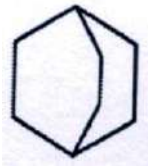
M.Sc. Organic Chemistry (Semester - IV) (New) (NEP CBCS) Examination: March/April - 2025
Modern Organic Chemistry (2326401)

Day & Date: Wednesday, 14-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

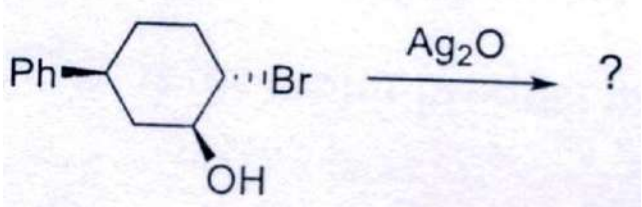
Q.1 A) Choose the correct alternative. **08**

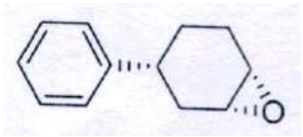
1) What is the IUPAC name of the following compound?

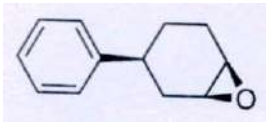


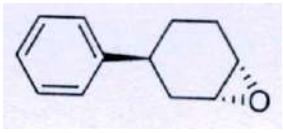
a) bicyclo[4.1.0]heptane
b) bicyclo[2.2.1]heptane
c) bicyclo[3.2.1]octane
d) bicyclo[2.2.2]octane

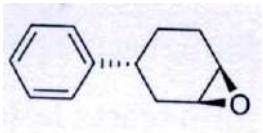
2) Predict the correct option of a major product.



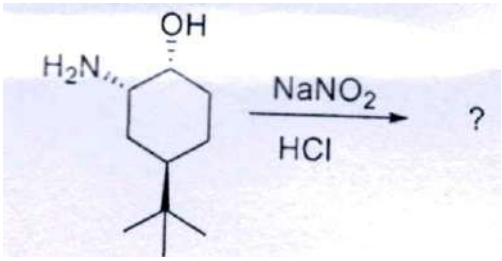
a) 

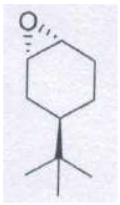
b) 

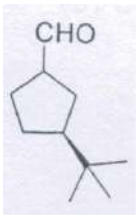
c) 

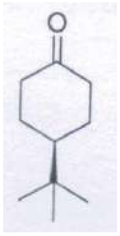
d) 

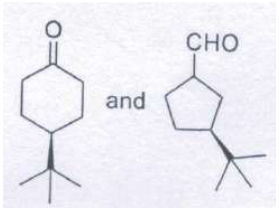
3) Choose the correct alternative for the following reaction transformation.



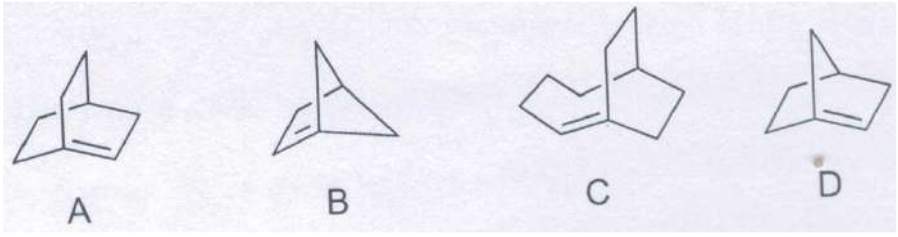
a) 

b) 

c) 

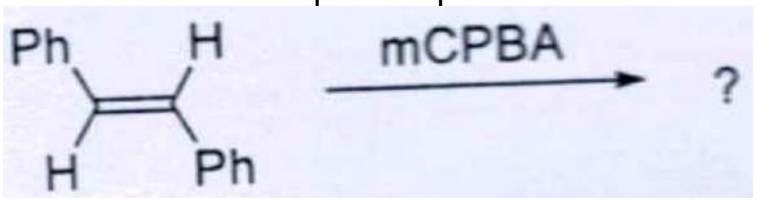
d) 

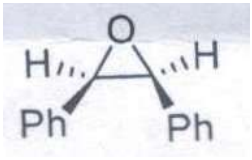
4) Based on Bredt's rule, which of these bicyclo alkenes is the most stable?

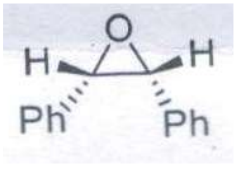


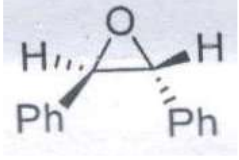
a) A
b) B
c) C
d) D

5) Predict the correct option of product.



a) 

b) 

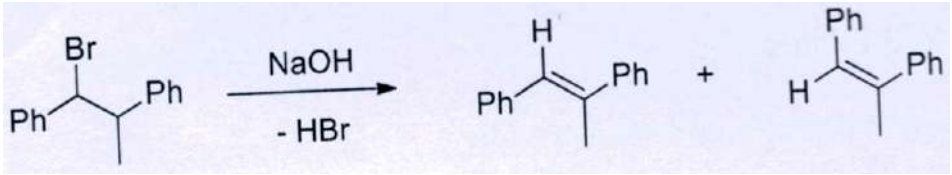
c) 

d) Both a & b

6) The point group of trans-9-methydecalin is _____.

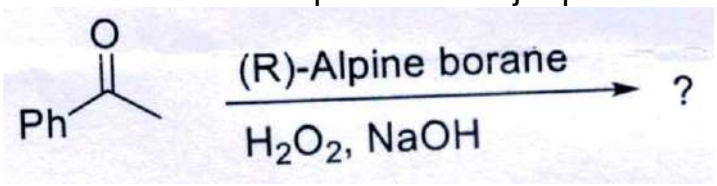
a) C_1 b) C_2
c) Cs d) C_2h

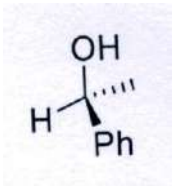
7) For the transformation given below, which statement is most correct?

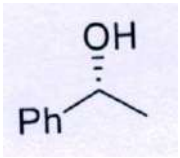


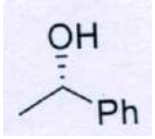
a) Threo form reacts faster & gives trans product
b) Threo form reacts faster & gives cis product
c) Erythro form reacts faster & gives trans product
d) Erythro form reacts faster & gives cis product

8) Predict the correct option of a major product.



a) 

b) 

c) 

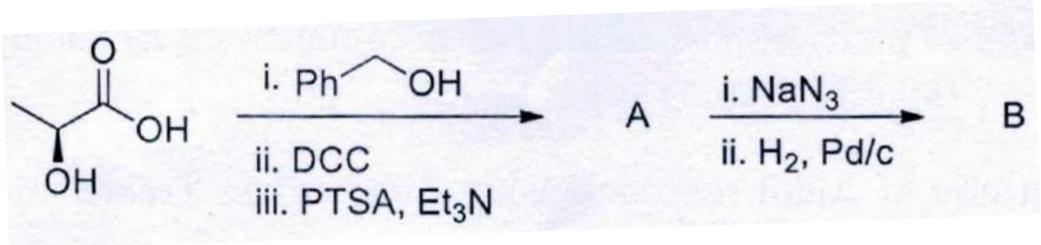
d) Both a & c

B) Write True or False: **04**

1) In Shi epoxidation, the catalyst is derived from sucrose.
2) The chiral reagent approach for asymmetric synthesis always gives product with 100% ee.
3) The point group of trans-decalin is D_2h.
4) The most stable isomer of perhydrophenanthrene is trans-c-trans.

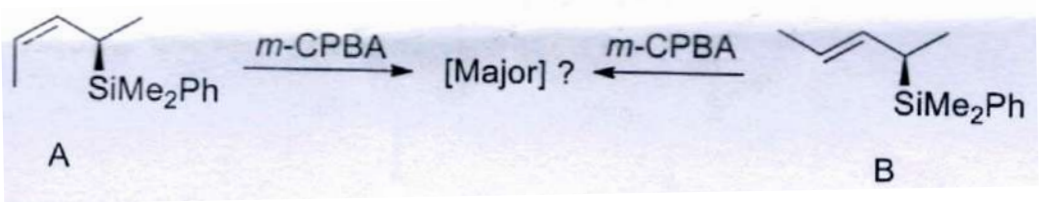
Q.2 Answer the following. (Any Six) **12**

a) What will be the product A and B in following transformation?



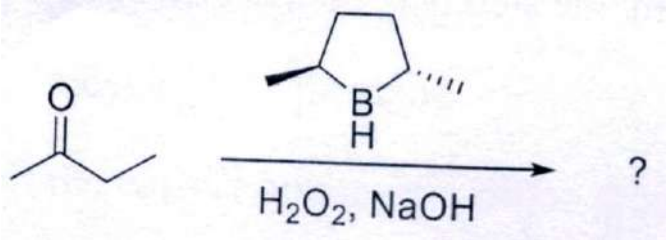
b) Discuss the reactivity in diastereomers of stilbene dichloride in presence of pyridine at 200 °C reaction temperature.

c) What will be the major product in following transformation?

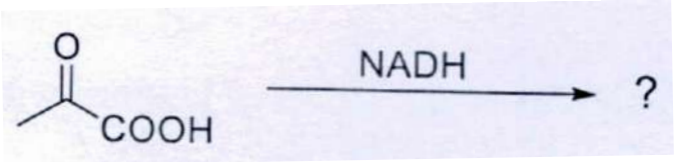


d) What is mean by Re Face and Si face?

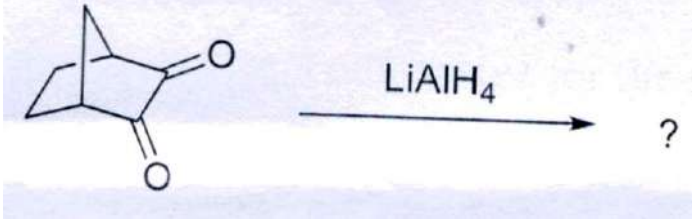
e) What is the major product in following reaction with stereochemistry?



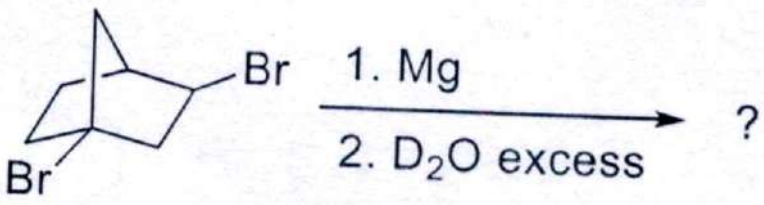
f) What is the major product in following reaction with stereochemistry?



g) What is the major product in following reaction with stereochemistry?



h) What is the major product in following reaction with stereochemistry?



Q.3 Answer the following. (Any Three) **12**

a) Discuss differences in the stability of diastereomers of stilbene dibromide and tartaric acid.

b) Discuss the iodide induced elimination of bromine from 2,3-dibromobutane.

c) Write a short note on cis-decalin and trans-decalin.

d) What is Sharpless asymmetric epoxidation? Discuss in details with examples.

Q.4 Answer the following. (Any Two) **12**

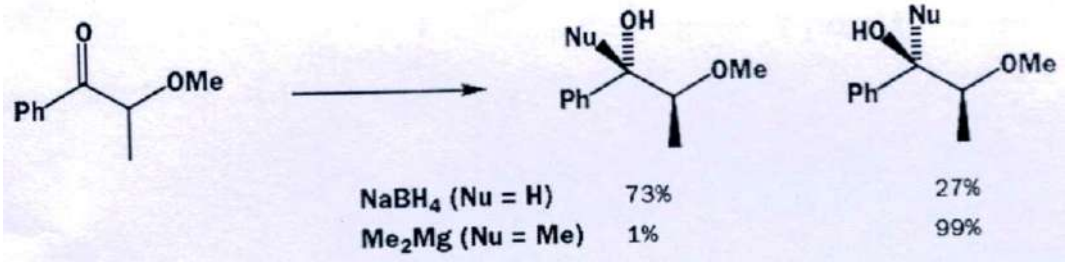
a) Explain different isomers of perhydrophenanthrene and comment on its stability and chirality?

b) Explain diastereoselectivity of Aldol reactions using Zimmerman Traxler transition state model with examples.

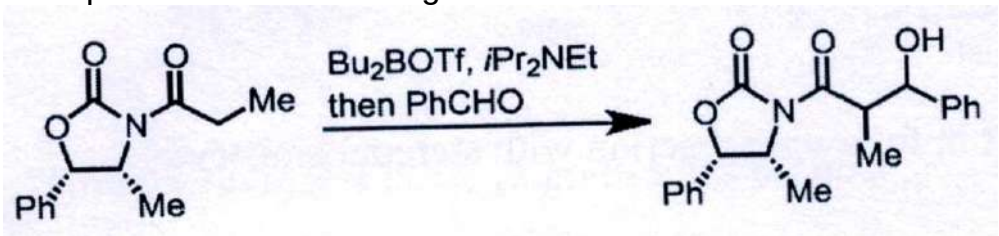
c) Discuss relative reactivity of diastereomers in NGP?

Q.5 Answer the following. (Any Two) **12**

a) Rationalize the stereochemical outcome in the following reaction.



b) Predict, with a clear transition state diagram, the stereochemistry of the aldol product in the following reaction.



c) Discuss SAMP/RAMP chiral auxiliary approach for α-alkylation of ketones with stereochemistry.

SLR-ZF-23

Seat No.	

Set P

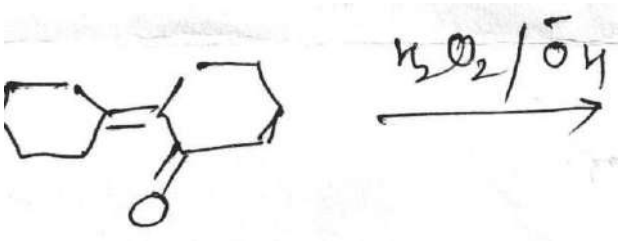
M.Sc. Organic Chemistry (Semester - IV) (New) (NEP CBCS) Examination: March/April - 2025
Chemistry of Bioactive Heterocycles (2326402)

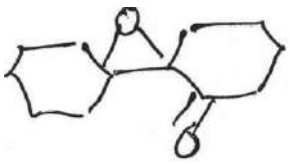
Day & Date: Friday, 16-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

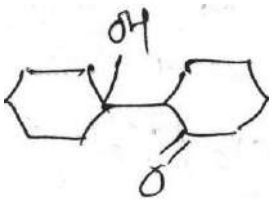
Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

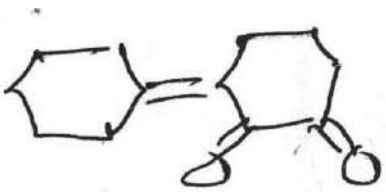
Q.1 A) Choose the correct alternative. **08**

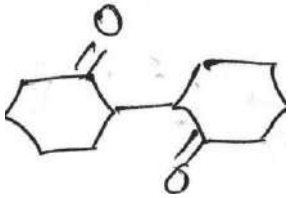
1)



a) 

b) 

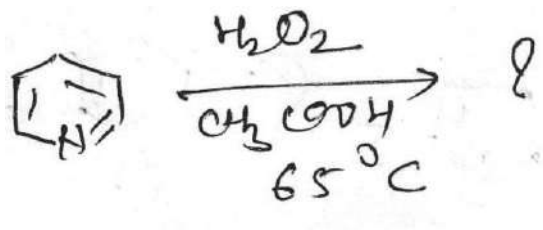
c) 

d) 

2) Completely saturated four membered nitrogen containing ring is known as ____

a) Oxitane b) Azetidine
c) Azericline d) None of the above

3)



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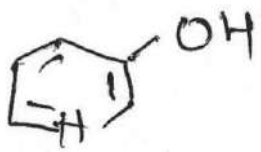


b)

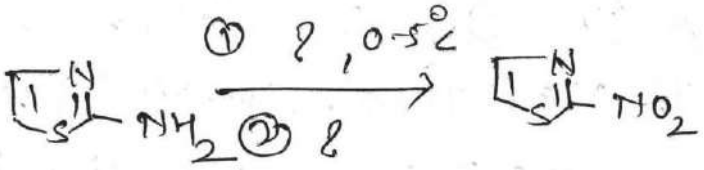
c)

d)

4) Pyridazine is ____

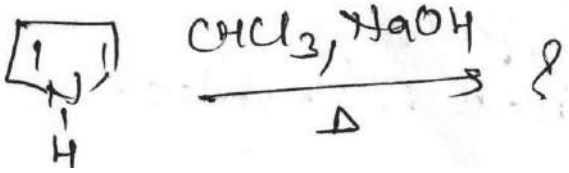
a) 1,2 - diazine
b) 1,3 - diazine
c) 1,4 - diazine
d) 1,2,3,4 - tetrazine

5)



a) HNO_2, $NaNO_2$
b) HCl, $NaNO_2$
c) H_2SO_4, $NaNO_2$
d) $HNO_3 + H_2SO_4$, $NaNO_2$

6)



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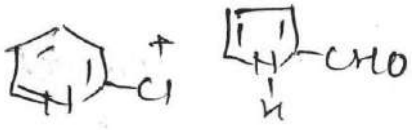

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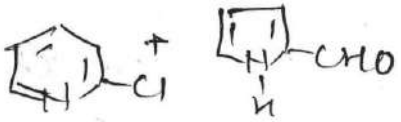

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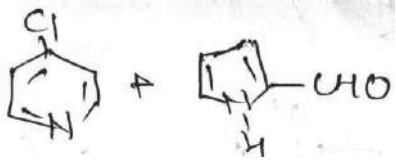

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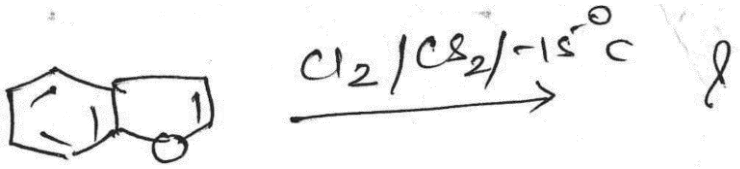

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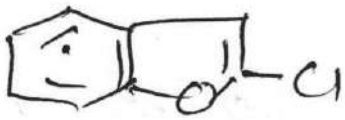

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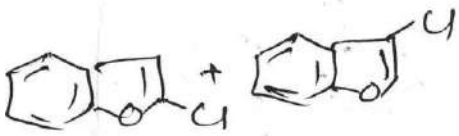

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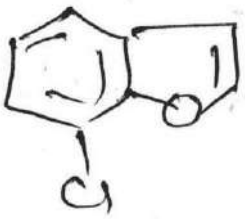

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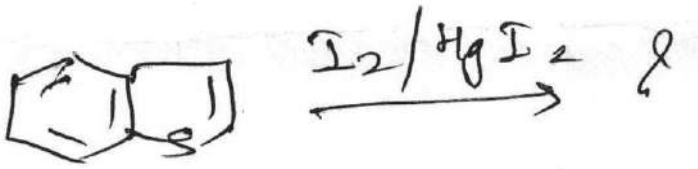

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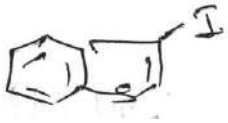

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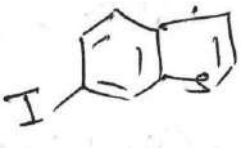


B) Write true or false: **04**

a) The unsubstituted diazines are much more resistant to electrophilic attack than pyridine.
b) Thiazole forms stable crystalline salts with strong acids.
c) Due to ring strain oxirane ring is highly labile to ring opening by acid.
d) Benzothiopnene readily polymerizes in presence of acid.

Q.2 Write short answers. (Any Four) **12**

1) Give two electrophilic substitution reactions of indole.
2) Explain the mercuriation reaction of quinoline.
3) Explain synthesis of aziridine by ring closure method.
4) Give one example of ring opening reaction of oxetane.
5) Explain reaction of thiazole with oxidizing agents.
6) Explain nitration reaction of isothiazole.
7) Draw different canonical forms of pyrimidine.
8) Explain with suitable example reaction of pyridine with acid.

Q.3 Answer the following: (Any Three) **12**

1) Discuss the synthesis of pyridazine from maleic anhydride.
2) Discuss the synthesis of furan.
3) Discuss the synthesis of azetidine.
4) Discuss the synthesis of Benzofuran.

Q.4 Answer the following: (Any Two) **12**

1) Discuss the chemical reactions of benzothiophene.
2) Discuss the synthesis and chemical reactions of pyrrole.
3) Discuss chemical reaction of pyrimidine.

Q.5 Answer the following: (Any Two) **12**

1) Discuss synthesis and chemical reactions of isoxazole.
2) Discuss synthesis and chemical reactions of isoquinoline.
3) Discuss synthesis and chemical reactions of pyrazine.

Seat No.	

Set P

M.Sc. (Organic Chemistry) (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2025
Retrosynthesis and Disconnection Approach (2326405)

Day & Date: Tuesday, 20-May-2025 Max. Marks: 60
Time: 03:00 AM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagram wherever necessary.

Q.1 A) Choose correct alternative. **08**

1) A real chemical compound equivalent carrying out function of synthon is known as _____.
a) Catalyst b) Activating agent
c) Synthetic equivalent d) All of the above

2) Condensation reaction within same molecule is known as_____
a) Self condensation b) Cross condensation
c) Intramolecular Condensation d) None of above

3) Sulphonium ylide on reaction with α, β carbonyl compounds give_____.
a) Cyclopropane b) Epoxide
c) Carbene d) Thio ether

4) In Disconnection approach molecule to be synthesised is called_____ molecule.
a) Reference b) Standard
c) Target d) Intermediate

5) Michel addition followed by Aldol condensation is known as_____.
a) Michael Condensation b) Mannich Reaction
c) Robinson annelation d) None of above

6) Esters can be used as protecting groups for _____.
a) Amines b) Carboxylic acids
c) Both A and B d) None of above

7) Process of converting one functional group into another is called_____.
a) Retrosynthesis
b) Disconnection approach
c) Functional group interconversion
d) All of the above

8) A group use of which makes possible to react a less reactive functional group in presence of a more reactive group is known as _____ Group

a) Activating
b) Resonating
c) Deactivating
d) Protecting

B) Fill in the blanks. **04**

1) Alcohols can be protected as carbamates.
2) Synthons are non idealised fragments resulting from disconnection.
3) Acetylene can act as synthetic equivalent for acyloin.
4) 1,4 difunctional compounds on disconnection gives synthons of unnatural polarity.

Q.2 Answer the following.(Any Six) **12**

a) Explain principal of protecting alcohols.
b) Define the terms target molecule and functional group interconversion.
c) Explain use of carbenes insynthesis.
d) Explain different acyl ion equivalents.
e) Explain protection of alcohols as ether.
f) Discuss stereochemistry in Diles Alder reaction.
g) Explain use of Cyclopropanation of enolates.
h) Give statement and example of Michael Addition reaction.

Q.3 Answer the following.(Any three). **12**

a) Explain use of Manganese and co-carbonyls in hydroformylation..
b) Explain Regioselectivity in retrosynthesis.
c) Explain sigmatropic rearrangements in synthesis.
d) Explain C-C disconnection in 1,6-di carbonyl compounds.

Q.4 Answer the following. (Any Two) **12**

a) Explain Protection of carbonyl compounds.
b) Write note on guidelines for choosing disconnection.
c) Explain two group C-C disconnections with suitable examples.

Q.5 Answer the following. (Any Two) **12**

a) Explain with suitable examples synthesis of saturated heterocycles.
b) Explain protection of carboxylic acids in detail.
c) Explain in detail one and two group C-X disconnections.

Seat No.	

Set **P**

M.Sc. Organic Chemistry (Semester - IV) (New) (NEP CBCS) Examination: March/April - 2025
Medicinal Chemistry (2326406)

Day & Date: Tuesday, 20-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All Questions are compulsory
2) Draw neat labelled diagrams wherever necessary.
3) Figures to right indicate full marks.
4) Use of log table and calculators is allowed.

Q.1 A) Choose correct alternatives. **08**

1) The drugs used to treat cancer are called _____.
   a) Antiarrhythmic agents b) Antimicrobials
   c) Antineoplatic agents d) Anticonvulsants

2) Chloroquine is a _____.
   a) Oralamoebicide b) Mixedamoebicide
   c) Luminal amoebicide d) Systemic amoebicide

3) "2-Bromo-2-chloro-1,1,1-trifluoroethane" is the IUPAC nomenclature of which drug?
   a) Chlorpromazine b) Halothane
   c) Dutasteride d) Fulvestrant

4) _____ is the firstly discovered antibiotic.
   a) Amoxycillin b) Penicillin
   c) Ampiillin d) Cephalosporin

5) Which of the following is the primary mechanism of action for acyclovir?
   a) Inhibiting viral DNA synthesis
   b) Blocking viral entry into cells
   c) Strengthening the immune system
   d) Directly destroying the virus

6) Number of chiral carbons in the structure of Ibuprofen is?
   a) 0 b) 1
   c) 2 d) 3

7) Insulin is an essential hormone produced by the _____.
   a) kidney b) lungs
   c) pancreas d) liver

8) Mechanism of action of nitrates is to _____.
   a) Inhibit phosphodiesterase b) Stimulates guanylatecyclase
   c) Block calcium channel d) β-blockers

B) Write True/False **04**

1) Verapamil is an example of antiamalarial drug.
2) Thiopental is a derivative of thiobarbituric acid.
3) Diazepam is a barbiturate.
4) Metformin is an antidiabetic drug.

Q.2 Answer the following. (Any Six) **12**

a) Define antianginal drug with suitable example.
b) Draw the structure of Isosorbide dinitrate.
c) Give any two uses of phenobarbital.
d) Draw the structure of phenelzine.
e) Write the names of any two antihistamine drugs.
f) Draw the structure of halothane.
g) Define antibiotic with suitable example.
h) Give any two uses of Itraconazole.

Q.3 Answer the following. (Any Three) **12**

a) Define and classify antihypertensive drugs.
b) Give synthesis and mechanism of action of aspirin.
c) Give the method of preparation of lidocaine.
d) Give the synthesis and SAR of sulfapyrifdine.

Q.4 Answer the following. (Any Two) **12**

a) Explain the synthesis and SAR of captopril.
b) Explain the synthesis and mechanism of action of alprazolum.
c) Explain the synthesis and SAR of sulfacetamide.

Q.5 Answer the following. (Any two) **12**

a) Explain the antidiabetic activity of insulin and glipizide.
b) Explain the synthesis and mechanism of action of alprazolam.
c) Explain the synthesis and SAR of remdesivir.

Seat No.	

Set P

M.Sc. Organic Chemistry (Semester - IV) (New/Old) (CBCS) Examination: March/April - 2025
Advanced Organic Chemistry - II (MSC07401)

Day & Date: Wednesday, 14-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Q.Nos.1 and 2 are compulsory.
2) Attempt any three questions from Q. No.3 to Q.No.7
3) Figures to the right indicate full marks.

Q.1 A) Multiple choice Questions: **10**

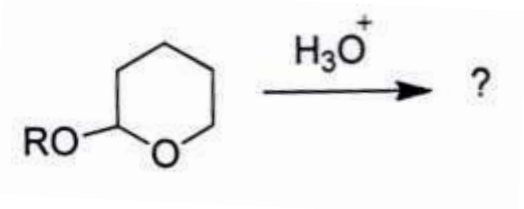
1) Coupling reaction between aryl or vinyl halides and alkynes in the presence of Pd(0) complex is known as _____
a) Heck reaction b) Wacker oxidation
c) Sonogashira coupling d) Suzuki coupling

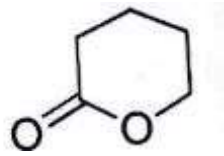
2) Palladium catalyzed Coupling reaction between aryl or vinyl halides and Boronic acid or ester is known as _____
a) Heck reaction b) Wacker oxidation
c) Sonogashira coupling d) Suzuki coupling

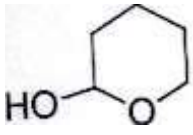
3) In Wacker oxidation of ethene, the product formed is _____
a) Ethanoic acid b) Ethanal
c) Ethanol d) Ethanedial

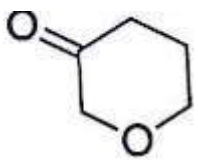
4) _____ reaction is a cross-coupling reaction in which the organometallic component is organostannane compound.
a) Suzuki coupling b) Sonogashira coupling
c) Stille coupling d) Suzuki coupling

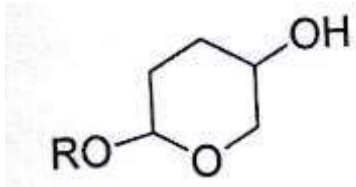
5) Predict product of the following reaction.



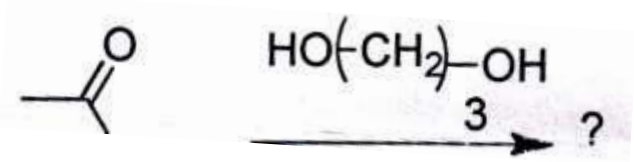
a) 

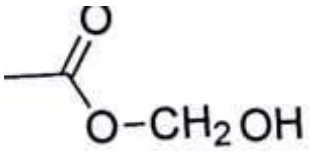
b) 

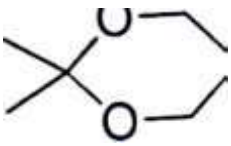
c) 

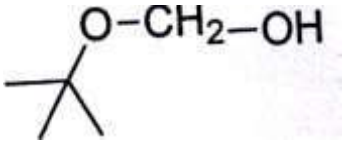
d) 

6) Predict product of following reaction.



a) 

b) 

c) 

d) None of above

7) A logical approach for designing organic synthesis which involve breaking down of target molecule into available starting material is known as _____

a) Retrosynthesis
b) Disconnection Approach
c) Retrosynthetic analysis
d) All of above

8) Process of converting one functional group into another during retrosynthesis is called _____

a) Chemoselectivity
b) Regioselectivity
c) Functional group interconversion
d) None of above

9) A reaction in which one functional group in the molecule reacts leaving another group unaltered is called _____ reaction.

a) Chemoselective
b) Regioselective
c) Both a and b
d) None of above

10) An idealised fragment resulting from disconnection is called _____

a) Synthetic equivalent
b) Synthon
c) Disconnection
d) All of above

B) Write true or false: **06**

1) Cross coupling reaction between aryl or vinyl halide and alkene in presence of palladium is known as Heck coupling reaction.
2) Ferrocene is antiaromatic compound.
3) $Na_2[Fe(CO)_4]$ complex is known as Collmans reagent.
4) Triphenyl methyl group cannot be used for protection of alcohols.
5) A real chemical compound equivalent carrying out function of synthons is called synthetic equivalent.

6) A reaction which predominantly produces one of several possible structures is called regioselective reaction.

Q.2 Answer the following. **16**

a) Explain protection of hydroxyl group.
b) Explain one and two group C-X disconnections.
c) Discuss the reaction of Ferrocene.
d) Discuss the role of Co in hydroformylation reaction.

Q.3 Answer the following.

a) Explain protection and deprotection of carbonyls in aldehydes and ketones. **08**
b) Discuss importance of order of events in organic synthesis. **08**

Q.4 Answer the following.

a) Describe Pauson Khand Reaction with mechanism and suitable example. **08**
b) Describe the role of Colman's reagent. **08**

Q.5 Answer the following.

a) Explain protection and deprotection of amines and carboxylic acids. **08**
b) Explain in detail one group C-C disconnection. **08**

Q.6 Answer the following.

a) Discuss Stille coupling reaction in detail. **08**
b) Discuss Sonogashira coupling reaction in detail. **08**

Q.7 Answer the following.

a) Write notes on **08**
1. Functional group interconversion
2. Reversal of polarity

b) Discuss Heck coupling reaction in detail. **08**

Seat No.	

Set P

M.Sc. Organic Chemistry (Semester - IV) (New/Old) (CBCS) Examination: March/April - 2025
Modern Organic Chemistry (MSC07402)

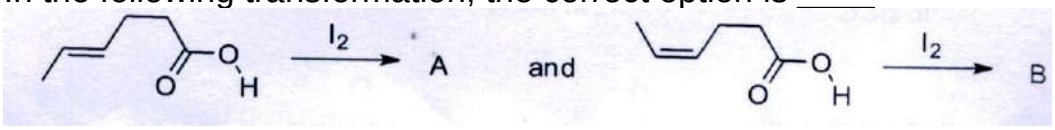
Day & Date: Friday, 16-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

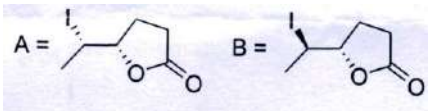
Instructions: 1) Q.Nos.1 and 2 are compulsory.
2) Attempt any three questions from Q.No.3 to Q.No.7.
3) Figure to right indicate full marks.

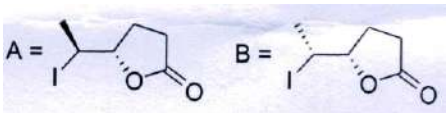
Q.1 A) Choose correct alternative. **10**

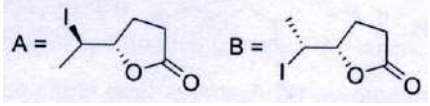
1) What is meant by a reaction going in 94% ee?
a) The product contains 94% of one enantiomer and 6% of another enantiomer.
b) The product contains 94% of one enantiomer and 6% of other product.
c) The product contains an enantiomer which is 94% pure.
d) The product contains 97% of one enantiomer and 3% of another enantiomer.

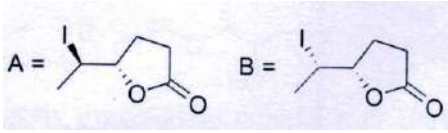
2) In the following transformation, the correct option is _____



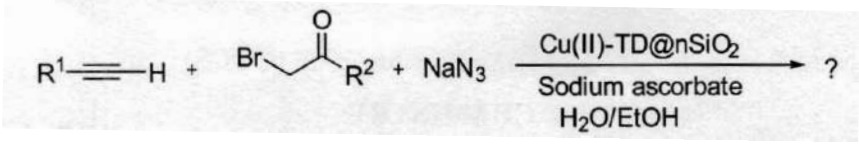
a) 

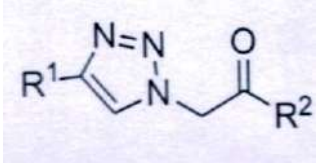
b) 

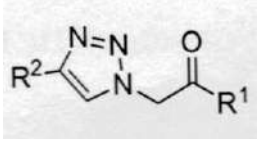
c) 

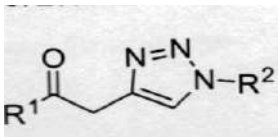
d) 

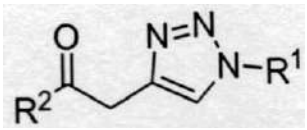
3) Predict the product of the following reaction



a) 

b) 

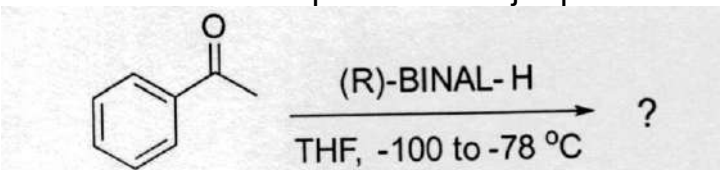
c) 

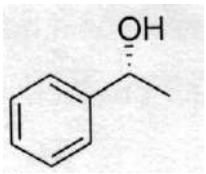
d) 

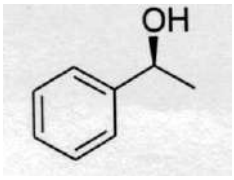
4) The regioselectivity and stereospecificity in the hydroboration-oxidation of an alkene is best described as ____

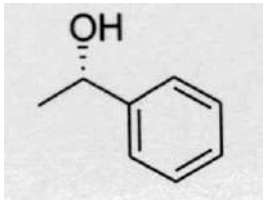
a) Markovnikov orientation with syn- addition
b) Markovnikov orientation with anti-addition
c) Anti-Markovnikov orientation with syn-addition
d) Anti-Markovnikov orientation with anti-addition

5) Predict the correct option of a major product.



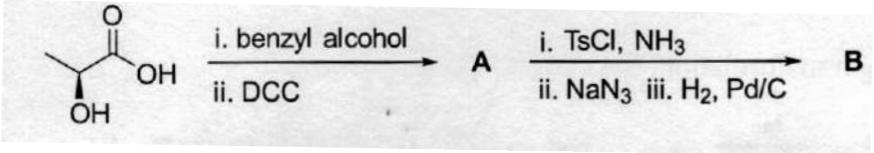
a) 

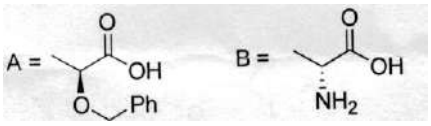
b) 

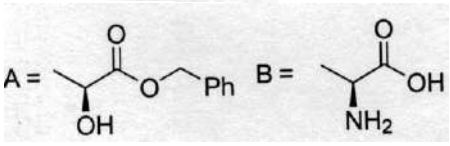
c) 

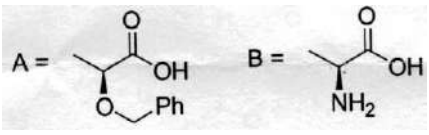
d) Both (a) and (c)

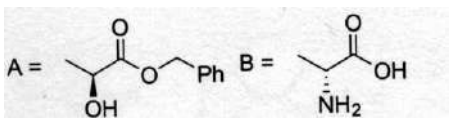
6) In the following transformation, the correct option is ____



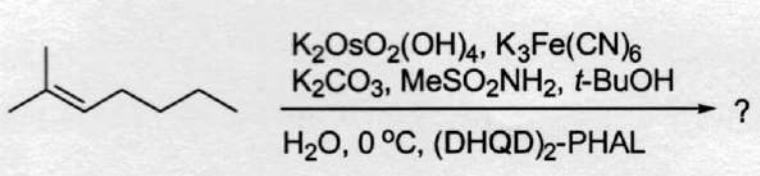
a) 

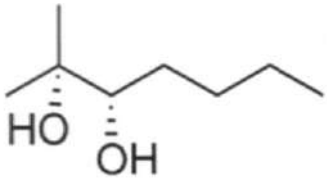
b) 

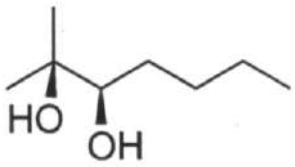
c) 

d) 

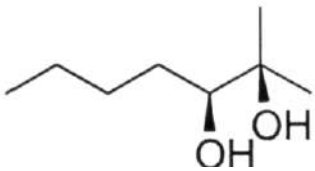
7) Predict the correct option of a major product.



a) 

b) 

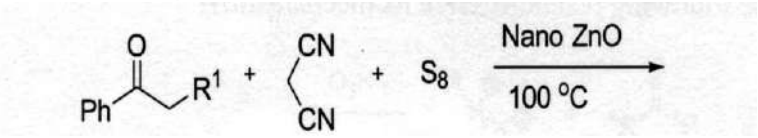
d) Both (a) and (c)

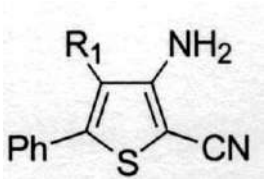
c) 

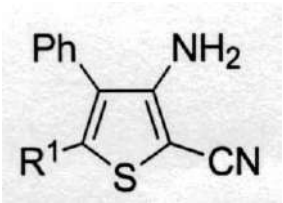
8) The hydrogen storage by MOFs is based on ____

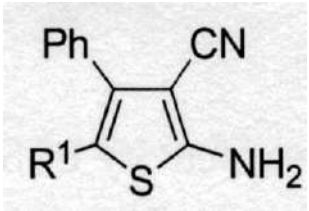
a) Chemisorption
b) Physisorption
c) Absorption
d) Desorption

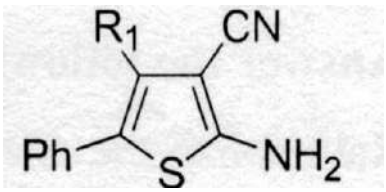
9) Predict the product of the following reaction



a) 

b) 

c) 

d) 

10) A mass production of MOFs could be achieved by ____ method.

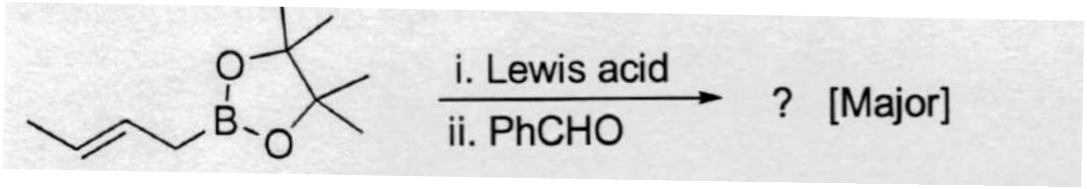
a) Ultrasound
b) Solvo-thermal
c) Crystal transformation
d) Electro-chemical

B) True or false: **06**

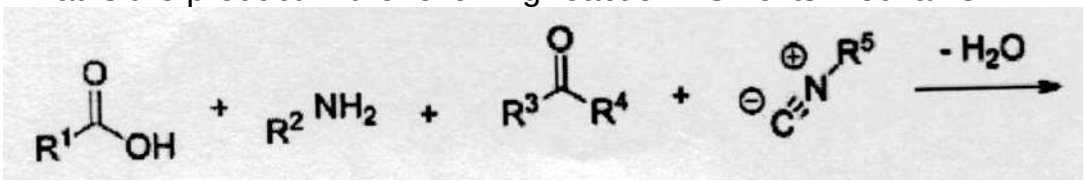
a) The Shi epoxidation proceeds *via* ketene intermediate.
b) The chiral pool approach for asymmetric synthesis always gives product with 100% ee.
c) Solid-state synthesis yields highly porous MOFs.
d) The synthesis involves reactions that include multiple chemical conversions between, substrates, reagents and catalysts which are performed in a single vessel are called one-pot reactions.
e) The Gewald reaction is isocyanide-based multicomponent reactions.
f) Diffuse Reflectance Infrared Fourier Transform Spectroscopy (DRIFTS) can show the interaction of the framework with guest molecules in MOF.

Q.2 Answer the following: **16**

a) What is Felkin Ahn Model? Discuss in details and give justification for the major product toward nucleophilic additions to chiral aldehydes and ketones.
b) Write a note on secondary building unit (SBUs).
c) Give the major product of following reaction with justification for diastereoselectivity.



d) What is the product in the following reaction? Give its mechanism?



Q.3 Answer the following: **16**

a) Rationalize the enantioselectivity of SAMP/RAMP chiral auxiliary and discuss their applications.
b) Explain Evans chiral auxiliary and its application in enantioselective and diastereoselective asymmetric synthesis.

Q.4 Answer the following **16**

a) How MCRs are useful for synthesis of heterocycles using Aldol reaction?
b) Discuss diastereoselectivity of Aldol reactions by using Zimmerman Traxler model. Give its applications.

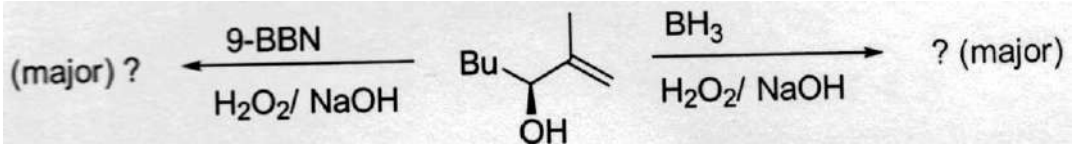
Q.5 Answer the following **16**

a) What is the mechanism of Passerini and Gewald reaction? Write different examples of each.

b) What is chiral reagent? What is stereoselective Sharpless epoxidation and its applications?

Q.6 Answer the following **16**

a) Rationalize the major product with mechanism and diastereoselectivity in following reaction

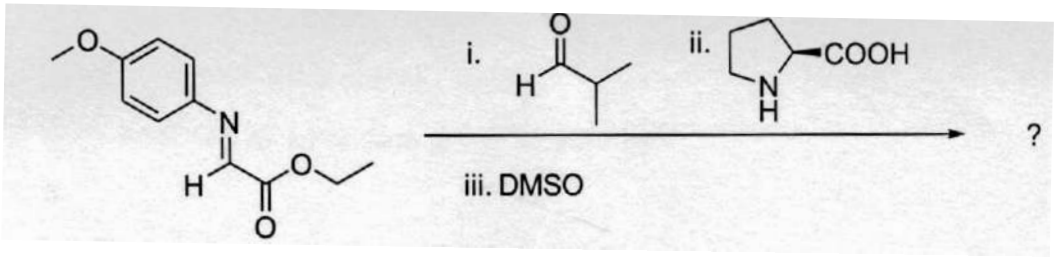


b) What are the synthetic routes to metal organic frameworks? Explain Electrochemical and microwave/ultrasound methods of MOF synthesis with suitable diagrams.

Q.7 Answer the following **16**

a) How to confirm the structure of synthesized MOF? Explain the ways for MOF analysis in detail.

b) Rationalize the major product with mechanism and diastereoselectivity in following reaction.



Seat No.	

Set **P**

M.Sc. Organic Chemistry (Semester - IV) (New/Old) (CBCS) Examination: March/April - 2025
Chemistry of Natural Products (MSC07403)

Day & Date: Tuesday, 20-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7.
3) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **10**

1) _____ on Clemmensen's reduction gives deoxy pyro acid.
a) Pyrolithobillianic acid b) Allolithobillianic acid
c) Bile acid d) Bilianic acid

2) Hardwickiic acid is a _____.
a) Monoterpenoid b) Diterpenoid
c) Sesquiterpenoid d) Triterpenoid

3) ____ is used primarily as a pesticide.
a) Taxol b) Resrpine
c) Hardwickiic acid d) strychnine

4) ____ is believed to be the precursor of the Indole alkaloid group.
a) Ornithine b) Tryptophan
c) Methionine d) Lysine

5) _____ is supplied from food as well as intestinal bacteria.
a) Vit B_2 b) Vit B_6
c) Vit B_9 d) Vit H

6) All _____ when dehydrogenated with selenium at 420^0c produce mainly chrysene.
a) proteins b) alkaloids
c) steroids d) vitamins

7) Torsion angles around all C-C bonds including the common bond of the rings of cis-decalin are approximately _____.
a) $60 - 62^0$ b) $50 - 52^0$
c) $52 - 53^0$ d) $55 - 56^0$

8) Pyridoxal phosphate participates as a coenzyme in the _____ reaction/s of amino acid metabolism.
a) transamination b) racemization
c) decarboxylation d) all three

9) Prostaglandins are biosynthesized from _____.

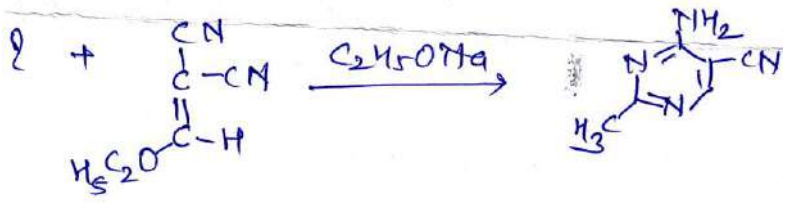
a) fatty acids
b) polyunsaturated fatty acids
c) polyunsaturated fatty acids
d) carboxylic acid

10) Progesterone has been isolated from _____

a) corpus luteum
b) testes
c) placenta
d) all three

B) Complete the following reaction **06**

1)



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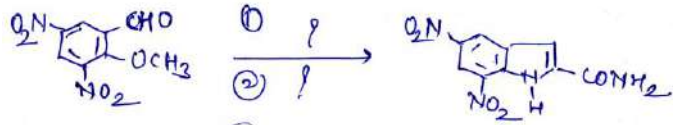

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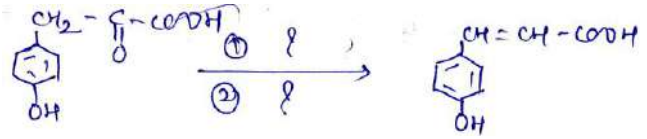

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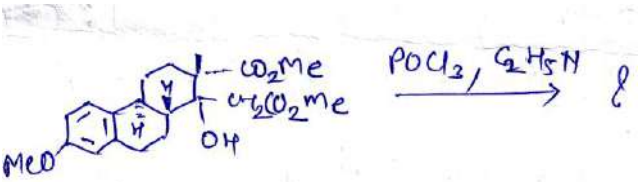

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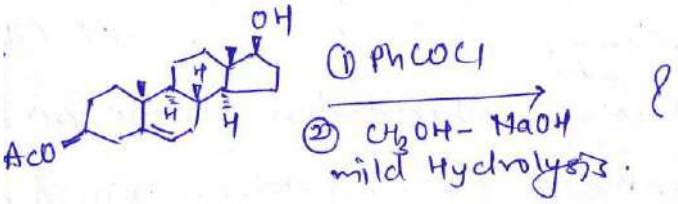

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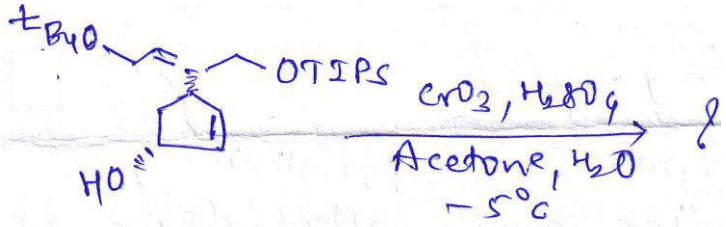


Q.2 Answer the following. **16**

a) Discuss the synthesis of folic acid.
b) Discuss the nature of nitrogen atoms and oxygen atoms in the strychnine.
c) Discuss biosynthesis of tryptophan.
d) Discuss the synthesis of 5-α cholanic acid & 5-β cholanic acid from cholesterol.

Q.3 Answer the following. **16**

a) Draw the conformers of cis and trans decalin, cis and trans g-methyl decalin and discuss their stabilities.

b) Discuss the structure elucidation and synthesis of progesterone.

Q.4 Answer the following. **16**

a) Explain the synthesis of biotin and discuss its biochemical role.

b) Discuss the synthesis of prostaglandins.

Q.5 Answer the following. **16**

a) Discuss the biosynthesis of di, tri, & tetra terpenoids.

b) Discuss the structure elucidation of reserpic acid.

Q.6 Answer the following. **16**

a) Discuss the structure elucidation of bile acid.

b) Discuss the synthesis of Fredericamycin A.

Q.7 Answer the following. **16**

a) Discuss the biosynthesis of pyrrolidine, piperidine and pyridine group alkaloids.

b) Discuss the synthesis of ring A & B of taxol.

SLR-ZF-29

Seat No.

Set P

M.Sc. Organic Chemistry (Semester - IV) (New/Old) (CBCS) Examination: March/April - 2025
Medicinal Chemistry (MSC07408)

Day & Date: Thursday, 22-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Q.No. 1 and 2 are compulsory.
2) attempt any three from Q. No. 3 to Q. No. 7.
3) Figure to the right indicates full marks.

Q.1 A) Choose correct alternative (MCQ) **10**

1) Which of the following is easily blocked by antivirals?
a) Virus penetration
b) Nucleic acid replication
c) Virus absorption
d) Removal of the virus from the cell

2) The only antifungal drug which has some activity against moulds like Mucor and Aspergillus is ____.
a) Itraconazole b) Miconazole
c) Fluconazole d) None of the above

3) Tetracycline inhibits protein synthesis by binding on ____.
a) 30s ribosomal subunit b) 60s ribosomal subunit
c) Topoisomerase III d) None of the above

4) The aminoglycoside antibiotics contain one or more amino sugars linked to aminocyclitol ring by ____.
a) Ionic bonding b) Glycosidic bond
c) Covalent bond d) Deoxy glycosidic bond

5) Sulphonamides are bacteriostatic antibiotics found to be metabolic product of _____.
a) Protonsil b) PABA
c) Sulphanilamide d) Both a & b

6) Which of the following belongs to dihydropyridine category?
a) Amiloride b) Nifedipine
c) Propranolol d) All of the above

7) A compound among the following that can be used as an anti-histamine is ____.
a) Diphenylhydramine b) Norethindrone
c) Omeprazole d) Chloramphenicol

8) The most serious adverse effect of insulin is ____.

a) Hypoglycemia b) Nephrotoxicity
c) Fever d) Sweating

9) Phenytoin belongs to the class ____.

a) Hydantoin b) Barbiturates
c) Benzodiazepine d) Succinimides

10) Which of the following histamine receptor increases the release of gastric acid?

a) H1 receptor b) H2 receptor
c) H3 receptor d) All of the above

B) State true or false: **06**

1) Adenine and Guanine nucleotides are the building blocks of DNA and RNA.
2) The peptidoglycan chains are made up of amino sugars like N-acety1 glucosamine and N-acety1muamic acid.
3) The antibacterial activity of Sulphonamides depends upon direct linkage of Sulphur from sulphonic acid with benzene ring.
4) The chemical name of a Paracetamol is 2-Acetoxybenzoic acid.
5) Ketoconazole is available in oral form, a shampoo and a cream.
6) Hepatitis is a viral infection that inflames the liver.

Q.2 Answer the following: **16**

a) What is antibiotic? Give the MOA of Ampicillin.
b) Give the synthesis of Thiopental.
c) Give classification and uses of antihistamines.
d) Discuss the SAR of Anti-hypertensive drugs.

Q.3 Answer the following: **16**

a) Describe in detail mode of action and structure activity relationship of Tetracyclines.
b) Discuss synthesis of Chloramphenicol and give its SAR.

Q.4 Answer the following: **16**

a) Discuss synthesis of Phenytoin and give its SAR.
b) Discuss synthesis of Diazepam and give its SAR.

Q.5 Answer the following: **16**

a) Explain in detail the pharmacology of Captopril.
b) Explain in detail the pharmacology of Propranolol.

Q.6 Answer the following: **16**

a) Write a detail note on synthesis and SAR of Iboprofen.
b) Explain in detail the pharmacology of Aspirin.

Q.7 Answer the following: **16**

a) Explain the following.

a) Mode of action and SAR of Metformin.

b) Describe the synthesis of chloroquine.

b) Describe the MOA and SAR of Diphenhydramine.

Seat No.	

Set P

M.Sc. Industrial Chemistry (Semester - III) (New) (NEP CBCS)
Examination: March/April - 2025
Unit Operations of Chemical Engineering (2325301)

Day & Date: Thursday, 15-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary.
3) Figures to the right indicate full marks.

Q.1 A) Choose the correct alternative. **08**

1) Weight percent=mass of the solute/mass of the solutionx100
So, if m is the mass of Solute and M is the mass of solvent, then Weight percent formula will be
Weight percent = m / m+M×100
Example: A solution is prepared by adding 3 g of a substance A to 17 g of water. Calculate the mass per cent of the solute.
a) 10 b) 20
c) 15 d) 40

2) What is residue in filtration?
a) Solid portion after filtration.
b) Solid portion before filtration
c) Liquid portion after filtration
d) Liquid portion before filtration

3) Solution contains 15% A by Mass (XA = 0.15 and 20 mole % B (yB = 0.20) calculate the total solution now file that corresponds to molar how rate of 25 kg of moles/
a) 100 b) 200
c) 125 d) 300

4) In the evaporator of refrigerator system, the refrigerant changes from _____
a) Vapour to liquid b) Liquid to vapour
c) Remains in liquid form d) None of these

5) What is the media used in chemical filtration?
a) Soap b) Detergents
c) Salt d) Activated carbons

6) Mass transfer rate between two fluid phases does not necessarily depend on the _____ of the two phases.
   a) Chemical properties b) Physical properties
   c) Degree of turbulence d) Interfacial area

7) The boiling point of chloroform is _____
   a) 334 k b) 286 K
   c) 350 K d) 298 K

8) If the amount of water vapour in the air is high, then the rate of evaporation is _____
   a) will decrease b) will be zero
   c) will remain the same d) will increases

B) Write True/False. **04**

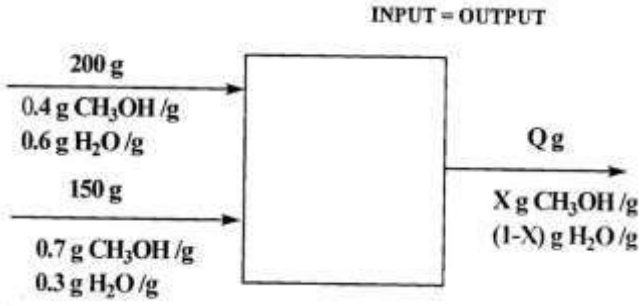
1) Distillation is the best method to separate liquids having sufficient difference in their boiling point
2) Darcy's law is the law behind filtration.
3) The pressure drop across the bed is directly proportional to Rate of flow.
4) For the given overall heat transfer coefficient and temperature difference, if the area of evaporator surface increases, then the capacity of evaporator can increase.

Q.2 Answer the following. (Any Six) **12**

a) Write down batch and continuous process.
b) What is Steam distillation?
c) What is vacuum crystallization draw diagram?
d) What is Extraction detail about section of solvent.
e) Write down Fundamentals of Material Balance and explain their classes of system.
f) With neat diagram explain cyclone separator.
g) Explain vapour liquid equilibrium.
h) What is leaching? Write in detail Bollman's extractor and continue leaching.

Q.3 Answer the following (Any Three) **12**

a) Two methanol-water mixtures are contained in separate flasks. The first mixture is 40.0 wt % methanol, and the second is 70.0 wt % methanol. If 200 g of the first mixture is combined with 150 g of the second, what will be the mass and composition of the resulting mixture



b) Explain Kettle type Heat Exchanger /Utube Heat Exchanger.

c) Example: Each year 50,000 people move into a city, 75,000 people move out, 22,000 are born, and 19,000 die. Write a balance on the population of the city.

d) A stream contains 20 g of oxygen gas, 70 g of nitrogen, 5 g of helium, and 5 g of hydrogen. Find the mass and mole fractions, mass and mole percent compositions.

Q.4 Answer the following (Any Two) **12**

a) Calculate the mole fraction of HCl and H_2O in a solution of HCl acid in water, containing 20% HCl by weight. Solution The solution contains 20 grams of HCl acid and 80 grams of water. Also, Molar mass of HCl is 36.5 grams.

b) What is Filtration? Give in details.

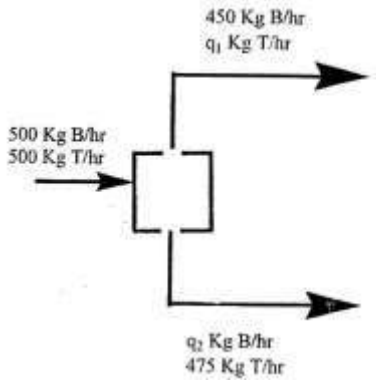
c) How to design crystallization and types of crystallization?

Q.5 Answer the following (Any Two) **12**

a) What is leaching write in detail Bollman's extractor and continue leaching.

b) Overall Analysis for a Continuous Distillation Column:
A binary mixture consists of 35 % benzene and 65 % toluene are continuously fed to the distillation column at a rate of 1000 kg/hr. Whereas, the distillate flow rate was 10% from the feed flow rate. The distillate (top product) contains 85% benzene. Calculate quantity and compositions of the waste stream.

c) One thousand kilograms per hour of a mixture of benzene (B) & toluene (T) containing 50% benzene by mass is separated by distillation into two fractions. The mass flow rate of benzene in top stream is 450 kg B/h & that of toluene in bottom stream is 475 kg T/h. The operation is at steady state. Write balances on benzene & toluene to calculate unknown component flow rates in output streams.



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Seat No.	

Set P

M.Sc. Industrial Chemistry (Semester - III) (New) (NEP CBCS)
Examination: March/April - 2025
Unit process in Chemical Industries (2325302)

Day & Date: Saturday, 17-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **08**

1) Why is the bromination of the paraffin hydrocarbons is slower than chlorination?
a) Because it's milder b) It reacts faster
c) Highly reactive d) None of the mentioned

2) Which is safer Batch process or Continuous process equipment?
a) Batch process b) Continuous process
c) Both are equally safe d) Both are unsafe

3) Which one of the following is the most important halogen in terms of preparations?
a) Bromine b) Chlorine
c) Iodine d) Fluorine

4) Which of the following is not a classification of glass?
a) Soda-lime glass b) Potash-lead glass
c) Potash-lime glass d) Soda-bromine glass

5) Which of the following is an active center in initiating systems?
a) Free radicals b) Carbonium ions
c) Carbanions d) All of the mentioned

6) Anticorrosive paint is ____ in colour
a) Blue b) White
c) Black d) Yellow

7) When a large volume is there, what type of reactor is used?
a) Tubular reactor b) Simple batch reactor
c) Semi batch reactor d) Tower reactor

8) what kind of Agent is Selenium Dioxide?
a) Reducing agent b) Oxidizing agent
c) None d) Both a & b

B) Write True or False / Fill in the blanks: **04**

1) A mixture of amyl nitrite and ethyl alcohol produces Ethyl nitrite
   a) True b) False
2) Lime is the most dominant constituent of cement.
   a) True b) False
3) ____ process is used to produce desired isomer in Naphthalene series.
4) Porcelain is a type of ____ ceramic.

Q.2 Answer the following (Any Six). **12**

a) Describe in brief the stability of nitrator charge.
b) Discuss in brief esterification by carboxylic acid derivatives.
c) Explain the epoxy resins with example.
d) Explain the sulfonates.
e) What are applications of titanium oxide.
f) What are the constituents of emulsion paints?
g) Write Application of wood ward reagent.
h) What is importance of urea and melamine polymers?

Q.3 Answer the following (Any Three). **12**

a) How is zinc oxide prepared?
b) Describe in detail the manufacturing process of monoclorobenzene.
c) Write a note on varnishes.
d) Describe in brief the Selenium Dioxide.

Q.4 Answer the following (Any Two). **12**

a) Explain the manufacturing process of lime.
b) Write the Synthesis and examples of osmium tetraoxide.
c) Write the synthesis of Michael reaction with its application.

Q.5 Answer the following (Any Two). **12**

a) Explain with the diagram the manufacturing process of glass.
b) Discuss with labeled diagram manufacture of nitrobenzene.
c) Explain the setting and hardening process.

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Set **P**

M.Sc. Industrial Chemistry (Semester - III) (New) (NEP CBCS)
Examination: March/April - 2025
Industrial Analytical Chemistry - I (2325306)

Day & Date: Monday, 19-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **08**

1) What does the shape of a cyclic voltammogram indicate about the electrochemical reaction?
   a) The reaction is reversible
   b) The reaction is irreversible
   c) The reaction is quasi-reversible
   d) The reaction is diffusion-controlled

2) What is a limitation of using a DME?
   a) Limited potential range b) High cost
   c) Difficulty in handling d) Toxicity of mercury

3) What is the purpose of calibrating a pH sensor?
   a) To adjust the sensor's sensitivity
   b) To adjust the sensor's selectivity
   c) To ensure accurate pH readings
   d) To extend the sensor's lifespan

4) What is the purpose of the magnet in an ESR spectrometer?
   a) To generate electromagnetic radiation
   b) To detect the absorption of electromagnetic radiation
   c) To provide a homogeneous magnetic field
   d) To modulate the magnetic field

5) What is the purpose of the sensing layer in a gas sensor?
   a) To provide a stable reference point
   b) To amplify the signal
   c) To detect changes in the gas composition
   d) To filter out interference

6) Which of the following moulding processes is widely used for the manufacturing of plastic bottles?
   a) Compression moulding b) Injection moulding
   c) Jet moulding d) Blow moulding

7) Which of the following materials is mostly used for making of thermoforming moulds?
   a) Steel
   b) Grey cast iron
   c) Aluminum
   d) White cast iron

8) Which of the following are not used as stationary phases in a GC column?
   a) Polysiloxanes
   b) Silica
   c) Cyclodextrins
   d) None are used as stationary phases

B) Write True or False. **04**

1) ESR spectroscopy is used to study the properties of atomic nuclei.
2) Ionic conductors are materials that allow ions to flow through them.
3) Tin oxide is a crystalline material.
4) Blow moulding is a very slow process, however economical for producing products with better quality.

Q.2 Answer the following. (Any Six) **12**

a) Explain factors affecting G values.
b) Write application of voltammeter.
c) Define ionic conductors.
d) Explain hyperfine splitting in simple system.
e) Discuss development of new voltammetry techniques.
f) What are the applications of Gas chromatography
g) Write application of polarography.
h) What is meant by Retention time in Gas chromatography?

Q.3 Answer the following. (Any Three) **12**

a) Explain in details polymer being processed by Compression moulding.
b) Write a note on factors affecting G values.
c) Discuss the crystalline membrane electrode.
d) Distinguish between GC-MS and LC-MS.

Q.4 Answer the following. (Any Two) **12**

a) Explain The Principle of ESR And its Instrumentation.
b) Explain Crystalline membrane Electrode and its Application.
c) Describe in detail with neat labelled diagram the principle and instrumentation with respect to Mobile phase being used in Gas chromatography.

Q.5 Answer the following. (Any Two) **12**

a) Describe Gas sensing electrode with a neat diagram and give its application.
b) Explain in detail programmed temperature gas chromatography.
c) Explain Cyclic Voltammetry and its Application.

Seat No.	

Set **P**

M.Sc. Industrial Chemistry (Semester - III) (Old) (CBCS) Examination: March/April - 2025
Unit Operations of Chemical Engineering (MSC06301)

Day & Date: Thursday, 15-May-2025 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No.3 to Q. No. 7
3) Figures to the right indicate full marks.

Q.1 A) Multiple choice questions. **10**

1) Distillation is the best method to separate liquids having sufficient difference in their _____.
   a) Solubility b) Melting point
   c) Boiling point d) None of the above

2) Distillation operation involves one of the following steps _____.
   a) Vaporization
   b) Vaporization and condensation
   c) Vaporization, condensation and crystallization
   d) Vaporization, condensation, crystallization and drying

3) The separation of liquid by distillation is based on one of the following principles.
   a) Boiling point b) Miscibility
   d) Vapor pressure d) Viscosity

4) What is residue in filtration?
   a) Solid portion after filtration.
   b) Solid portion before filtration
   c) Liquid portion after filtration
   d) Liquid portion before filtration

5) What is the media used in chemical filtration?
   a) Soap b) Detergents
   c) Salt d) Activated carbons.

6) For the given overall heat transfer coefficient and temperature difference, if the area of evaporator surface increases, then the capacity of evaporator:
   a) Can increase or decrease b) remain constant
   c) Increases d) Decreases

7) Latent heat of _____ is the heat energy required to change 1 kg of liquid to gas atmospheric pressure at its boiling point.
   a) Vaporization b) Fusion
   c) Fission d) Electron beam

8) In the evaporator of refrigerator system, the refrigerant changes from _____.
   a) Vapour to liquid b) Liquid to Vapour
   c) Remains in liquid form d) None of these

9) Mass transfer rate between two fluid phases does not necessarily depend on the _____ of the two phases.
   a) Chemical properties b) Physical properties
   c) Degree of turbulence d) Interfacial area

10) The boiling point of chloroform is _____.
   a) 334 k b) 286 K
   c) 350 K d) 298 K

B) Answers the following as True or False. **06**

1) Darcy's law is the law behind filtration.
2) Which type of mixer, the trough is stationary is Ribbon.
3) Heat exchanger consist of 3 parts convection conduction and Radiations.
4) The pressure drop across the bed is directly proportional to Rate of flow.
5) For the given overall heat transfer coefficient and temperature difference, if the area of evaporator surface increases, then the capacity of evaporator: Can increase
6) Distillation is the best method to separate liquids having sufficient difference in their boiling point.

Q.2 Answer the following. **16**

a) Explain Steam Distillation.
b) Write about Multiple effect evaporators.
c) What is Fixed tube sheet 1-2 heat Exchanger?
d) Describe Continuous and Batch Distillation.

Q.3 Answer the following.

a) Explain in detail about Kettle type Heat Exchanger. **08**
b) Discuss in detail about U tube heat Exchanger. **08**

Q.4 Answer the following.

a) Fractionation column **08**
   1) Bubble
   2) sieve, and
   3) Valve explain briefly

b) Explain type of heat Exchanger, in detail with diagram. **08**

Q.5 Answer the following.

a) Horizontal tube Evaporator give Advantage and Disadvantage. **08**

b) Explain in detail leaching write in detail Bollman's extractor and continue leaching. **08**

Q.6 Answer the following.

a) Explain in brief about Crystallization. **08**

b) What is Evaporator? Explain Open pan evaporator/ Jacketed pan evaporator. **08**

Q.7 Answer the following.

a) Discuss in detail about Cyclone Separator. **08**

b) Discuss in detail about Filtration and their types. **08**

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Set P

M.Sc. Industrial Chemistry (Semester - III) (Old) (CBCS) Examination: March/April - 2025
Unit processes in Chemical technology (MSC06302)

Day & Date: Saturday, 17-May-2025 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory.
2) attempt any three questions from Q. No.3 to Q. No. 7.
3) Figure to right indicates full marks.

Q.1 A) Choose the Correct alternative: **10**

1) How is sodium or potassium xanthate purified?
a) Distillation b) Recrystallization
c) Evaporation d) All of the mentioned

2) Substance which are introduced in a polymerization reaction to slow down or stop the reaction ____
a) Inhibators b) Initiators
c) Catalyst d) Accelerators

3) Sulfation involves placement of which group on carbon atom?
a) $-OSO_2OH$ b) $-SO_2-OH$
c) $-C1SO_3H$ d) $- SO_2Cl$

4) Which is the most important Nitrating medium?
a) Nitric acid and H_2SO_3
b) Nitric acid and Sulphuric acid
c) Nitrogentetraoxide and $-H_2SO4$
d) All of the mentioned

5) $C_2H_2 + 2Cl_2$ ___
a) C1CH - CHC1 b) $C1_2CH - CHC1_2$
c) $C1_3CH-CHC1$ d) C1CH=CHC1

6) In which position does the nitro group enters?
a) Ortho b) Para
c) Meta d) All of the mentioned

7) What happens to the rate of reaction as reflux ratio increases?
a) Increases b) Decreases
c) No change d) None of the mentioned

8) Dimethyl terephthalate is obtained by esterification of what?
a) Benzene b) Ethanol
c) Terephthalic acid d) phthalic acid

9) What type of reaction is a dehydrogenation reaction?
a) Exothermic b) Endothermic
c) Neutral d) None of the mentioned

10) What Kind of reagent is Osmium Tetraoxide?
a) Reducing agent b) Oxidizing agent
c) none of the above d) Both a and b

Q.1 B) Write True or False / Fill in the blanks: **06**

1) Polymerization at the double bond is a typical addition reaction.
a) True b) False
2) Cellulose acetate is used in manufacturing of photographic films.
a) True b) False
3) Vanadium oxide acts as a catalyst in vapour phase oxidation of olefins.
a) True b) False
4) While decreasing the D.V.S value the stability also decreases.
a. True b. False
5) The formation of acetic acid through oxidation is done in ____ phase.
6) The nitrating agent is a ____ reactant.

Q.2 Answer the following. **16**

a) Describe in brief the desulphonation.
b) Describe in brief the oxynitration.
c) Describe the Schmid nitrator.
d) Give the relationship between D.V.S. and Stability of Nitrator Charge.

Q.3 Answer the following.

a) Discuss the vapour phase oxidation of methanol? **08**
b) Describe in detail the manufacturing process of cellulose acetate. **08**

Q.4 Attempt the following: **16**

a) Explain in brief the Gilman Reagent.
b) Discuss the Synthesis and Application of Shapiro Reaction.

Q.5 Attempt the following:

a) Explain with the diagram the manufacturing process of mono sulfonation of benzene. **08**
b) What is nitration? Discuss in brief nitrating agents? **08**

Q.6 Answer the following:

a) Discuss the Liquid phase oxidation with oxygen of acetaldehyde to acetic acid. **10**
b) Explain with the diagram the manufacturing process of nitrobenzene? **06**

Q.7 Answer the following:

a) Describe in detail the manufacturing process of monochlorobenzene. **08**

b) Explain in details various types of chemical reactor. **08**

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Seat No.	

Set P

M.Sc. Industrial Chemistry (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2025
Pollution Monitoring and Control (2325401)

Day & Date: Wednesday, 14-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **08**

1) Smog is _____
a) A natural phenomenon
b) A combination of smoke and fog
c) Is colourless
d) All of the above

2) In reverse osmosis, the water flows from _____ concentration to ____ concentration.
a) Low, high b) High, low
c) High, moderate d) Moderate, low

3) The sources of hexavalent chromium [Cr (VI)] in the environment are _____ industries.
a) Plating b) Paint and pigment
c) Leather d) All of the above

4) Excess fluoride in drinking water is likely to cause _____
a) Blue baby syndrome b) Fluorosis
c) Change in taste and odour d) Intestinal irritation

5) These polymers cannot be recycled _____
a) Thermoplasts b) Thermosets
c) Elastomers d) All of above

6) What does it mean to recycle?
a) Make something into something new
b) Use something over and over again
c) Use less of something, creating smaller amounts of waster
d) Make something that can clean your room

7) Which gas is mainly produced due to incomplete burning of wood?
a) CO b) SO_2
c) NO_2 d) NO_3

8) Which of the following is a biological method of treatment?

a) Coagulation b) Sedimentation
c) Trickling filter d) Filtration

B) State True or False: **04**

a) Central Government appoints chairman of the Central Pollution Control Board.
b) The process of removing grit and sand is called as sedimentation.
c) Activated sludge process is used in primary treatment of effluent.
d) MINAS stands for maximum National Standards.

Q.2 Answer the following. (Any Six) **12**

a) What is photoinduced degradation method in polymer recycling?
b) What is according to IS:2296-1963, the tolerance limit for disposal of Phenolic residue and cyanide in effluent to be discharged into water for public supply and Bathing Ghat?
c) What is phenosolvan?
d) What is Lime Coagulation method?
e) What is Reverse osmosis in water treatment process.
f) What is soil pollution?
g) Explain Soil pH determination process by pH paper method.
h) Define Air pollution.

Q.3 Answer the following questions. (Any Three) **12**

a) State the Indian standard for disposal of Industrial effluent into Inland surface water, IS:2490-1974.
b) Explain Sedimentation treatment process for removal of sludge.
c) Explain the procedure for the determination of moisture content in the soil.
d) What are important end use of recycled polymer?

Q.4 Answer the following questions. (Any Two) **12**

a) Discuss the Water (prevention and control of pollution) Act, 1974.
b) Explain Reduction Precipitation method for removal of mercury.
c) Explain Analysis of Carbon Monoxide (CO) in the gaseous effluents.

Q.5 Answer the following questions. (Any Two) **12**

a) Explain MINAS and plan of action for sugar Industries.
b) Explain in detail the Stream gas Stripping process for removal of phenolic residue.
c) Explain the Tricking filters process performed on effluent.

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Seat No.	

Set P

M.Sc. Industrial Chemistry (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2025
Industrial Management and Nonconventional Energy Sources (2325402)

Day & Date: Friday, 16-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose the correct alternative. **08**

1) Which of the following converts chemical energy directly into electrical energy without combustion?
a) Dynamo b) Fuel cell
c) Ni-Cd d) Electrolytic cell

2) The Mossbauer effect is based on ____.
a) Beer-Lamberts law b) Doppler effect
c) Mossier effect d) Spin effect

3) What is a battery that stores chemical energy and converts it into electrical energy commonly known as?
a) Electrochemical cell b) Thermal cell
c) Solar cell d) Fuel cell

4) Which plant requires the largest space?
a) Commercial plant b) Pilot plant
c) Semi-commercial plant d) None of the above

5) SSI generally set up in ____
a) Rural Area b) City
c) Metro d) None

6) Which of the following is not a type of Research and Development (R&D)?
a) Financial Research b) Basic Research
c) Applied Research d) Developmental Research

7) Which of the following is unstable Mossbauer Nuclei?
a) ^{57}Fe b) ^{57} Co
c) ^{129}I d) ^{121}Sb

8) The Mossbauer Spectroscopy uses ____.
a) γ radiation b) β Radiation
c) ΘRadiation d) € Radiation

B) Fill in the Blanks / True/False **04**

1) Biomass is considered a renewable source of energy. True/False.
2) ____ is process to identify purity of product (API).
3) The Mössbauer spectroscopy is used to study the nuclear structure with the absorption and remission of gammy. True /False.
4) To magnify and focus the emitted electrons onto a detector What is the role of an electron lens in photoelectron microscopy. True/False

Q.2 Answer the following. (Any Six) **12**

a) What are rules and regulation for export and import?
b) Explain hazardous waste? give their types?
c) What is meant by Mössbauer Effect?
d) What is pyrophoric Chemical?
e) What is safety concept in industry?
f) What is Biodiesel?
g) What is pp operation and define concept of Quality Control?
h) Explain SSI?

Q.3 Answer the following. (Any Three) **12**

a) Explain in Detail primary and secondary batteries. Define Batteries.
b) What is incineration give advantages and disadvantages?
c) What is fuel cells describe in detail construction and working?
d) What is Isomer shift in Mössbauer spectroscopy?

Q.4 Answer the following. (Any Two) **12**

a) Write down importance of research and developments, scope of research and Development?
b) Explain Ignite coal, Bituminous coal and Anthracite coal?
c) What is convectional and non-convectional energy sources? Write Advantages and Disadvantages?

Q.5 Answer the following (Any Two). **12**

a) What are non-financial intensive?
b) What is biofuel describing generation I, II, III, IV in detail?
c) Explain in detail management and hazardous waste and transportation and their types.

Seat No.	

Set P

M.Sc. (Industrial Chemistry) (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2025
Nano material and its Characterization (2325405)

Day & Date: Tuesday, 20-May-2025 Max. Marks: 60
Time: 03:00 AM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **08**

1) What is chemical bath deposition (CBD) primarily used for?
a) Growing thin films b) Etching semiconductor surfaces
c) Doping materials d) Creating nanostructures

2) Which of the following is a limitation of DTA?
a) Cannot detect small transitions.
b) Not suitable for quantitative analysis.
c) Requires large sample sizes.
d) Sensitive to atmospheric conditions

3) What is the primary application of TGA?
a) Material identification b) Thermal stability study
c) Phase transition analysis d) Compositional analysis

4) What can XPS be used to determine?
a) Elemental composition b) Chemical state
c) Surface contamination d) All of the above

5) How does XPS work?
a) By measuring the energy of emitted electrons
b) By detecting the scattered X-rays
c) By analyzing the material composition
d) By determining the crystal structure

6) How does AFM work?
a) By scanning a sharp probe over the surface
b) By measuring the electrical conductivity
c) By analyzing the material composition
d) By detecting thermal properties

7) What is the role of catalysts in the sol-gel process?
a) To control the hydrolysis rate
b) To initiate condensation reactions
c) To enhance gelation
d) All of the above

8) Which of the following nanomaterials is commonly used in sunscreens?
a) Carbon nanotubes
b) Titanium dioxide nanoparticles
c) Silver nanoparticles
d) Gold nanoparticles

B) Fill in the blanks. **04**

1) Nanomaterials have limited applications.
2) Thermal analysis techniques are only used for material characterization.
3) Number of atoms in BCC are____
4) TEM can provide atomic-level resolution

Q.2 Answer the following. (Any Six) **12**

a) **Write** the application of plasma assisted CVD.
b) Explain the method Electrodeposition.
c) Write the application of the photo assisted CVD.
d) Explain different methods for synthesis of nano materials.
e) what are the merits of TGA .
f) Explain in brief DSC.
g) What are the merit and demerits of TEM.
h) What is the main purpose of XPS.

Q.3 Answer the following. (Any three). **12**

a) Explain in detail the production of X-ray by Coolidge tube
b) Describe the magnetron sputtering .
c) Explain in brief the concept of nanotechnology
d) Explain the preparation and purification of Silicon.

Q.4 Answer the following. (Any Two) **12**

a) Discuss AFM with its application.
b) Write a note on DSC and writes its merits.
c) Explain the Czochralski method and its merits.

Q.5 Answer the following. (Any Two) **12**

a) Explain Destructive Interference and Derive Bragg Law.
b) Write the Instrumentation of XPS. With its application.
c) What are thermal method? Explain DTA with graph.

Seat No.	

Set P

M.Sc. Industrial Chemistry (Semester - IV) (New/Old) (CBCS)
Examination: March/April - 2025
Chemical Industries (MSC06401)

Day & Date: Wednesday, 14-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Q.Nos.1 and 2 are compulsory.
2) Attempt any three questions from Q. No.3 to Q.No.7
3) Figures to the right indicate full marks.

Q.1 A) Choose the correct alternative. **10**

1) What is the primary raw material used in glass manufacturing?
a) Silica sand b) Limestone
c) Soda ash d) Feldspar

2) Which process is used to produce steel from pig iron?
a) Bessemer process b) Open hearth furnace
c) Electric arc furnace d) Basic oxygen furnace

3) What is the primary source of petrochemicals?
a) Crude oil b) Natural gas
c) Coal d) Biomass

4) What is the primary use of Zineb?
a) Herbicide b) Insecticide
c) Fungicide d) Bactericide

5) The temperature at which a non-crystalline material transforms from a supercooled liquid to rigid glass is _____.
a) Melting point b) Glass transition temperature
c) Boiling point d) Crystalline temperature

6) What is whiteware?
a) Type of ceramic material b) Electronic appliance
c) Glass product d) Metal alloy

7) What is cullet?
a) Raw material b) Byproduct
c) Recycled glass d) Glass scrap

8) What is the primary purpose of varnishes?
a) To provide color b) To protect surfaces
c) To enhance texture d) To improve durability

9) What is the purpose of limestone in glass manufacturing?
a) To reduce melting temperature
b) To increase durability
c) To remove impurities
d) To provide calcium oxide

10) Which type of crude oil is considered "sweet"?
a) High-sulfur crude b) Low-sulfur crude
c) Heavy crude d) Light crude

B) Write True or False: **06**

a) Steel is an alloy of iron and carbon.
b) All paints contain pigments.
c) Agrochemicals are unregulated.
d) Polyethylene is a type of petrochemical.
e) Glass is made from 100% silica.
f) Ceramics are resistant to high temperatures.

Q.2 Answer the following. **16**

a) What are the basics Raw Material used for manufacture of paints.
b) Write a note on cracking and reforming.
c) Write a note on steel.
d) Write note on synthesis and application on Endosulphan.

Q.3 Answer the following. **16**

a) Give a brief explanation on varnishes, give the account on constituents of emulsion Paints.
b) What are petrochemical? Explain petroleum Refining.

Q.4 Answer the following. **16**

a) What are agrochemicals? Discuss manufacturing process properties and application of Endosulphan.
b) What are the Chemical reaction that take place during the setting and hardening of cement?

Q.5 Answer the following. **16**

a) Give an outline of chemical derived from benzene.
b) Give the manufacturing, properties and applications of stainless steel.

Q.6 Answer the following. **16**

a) Explain the manufacturing processes of titanium oxide, properties, and application.
b) Describe the grey cast iron with its properties.

Q.7 Answer the following. **16**

a) Give the synthesis of any two Organo chlorine Pesticides.
b) How are ceramics classified? What are the basic raw materials using ceramics.

Seat No.	

Set P

M.Sc. Industrial Chemistry (Semester - IV) (New/Old) (CBCS)
Examination: March/April – 2025
Pollution Monitoring and Control (MSC06402)

Day & Date: Friday, 16-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7.
3) Figure to right indicate full marks.

Q.1 A) Choose correct options. **10**

1) Phosphorus in acidic soil can be determined by _____ method.
a) Hudson b) Newton
c) Bray d) Stanley

2) The Air (Prevention and Control of Pollution) Act is passed in the year of _____.
a) 1972 b) 1974
c) 1981 d) 1983

3) Section 16 of Water act 1974 provides _____.
a) Functions of Central Board
b) State Water Laboratory
c) Cognizance of offences
d) None of these

4) Minamata disease is due to _____ metal ion.
a) gold b) lead
c) selenium d) mercury

5) The dissolved oxygen in water is determined by _____ method.
a) Arrhenius b) Winkler
c) Briton d) Ongera

6) _____ is most recent pronouncement of the government's commitment to improve environmental conditions.
a) Education policy b) Sports council
c) Water management d) National Environmental Policy

7) _____ causes asthma to human beings.
a) Water pollution b) Soil pollution
c) Air pollution d) None of these

8) In ion exchange water treatment method, _____ are used.
a) resins b) salts
c) acids d) bases

9) The pH of potable water should be _____.
   a) acidic b) neutral
   c) basic d) all of these

10) _____ are responsible for air pollution.
   a) H_2S b) Particulate matter
   c) CO d) All of these

B) Write True/False. **06**

1) The CPCB was established in the year of 1974.
2) CO is determined by non-dispersive infra-red technique.
3) The limit for zinc as per MINAS for synthetic fiber industries is 1 mg/L.
4) Activated siudge process is primary water treatment process.
5) Tiny particles in the air that are two and one half microns or less in width are PM_{10}.
6) Phenolic compounds can be removed by solvent extraction.

Q.2 Answer the following. **16**

a) Explain the reverse osmosis process for waste water treatment.
b) Explain the different Indian standards for water quality management.
c) Give an account on reduction method of chromium removal.
d) Explain soil pollutants briefly.

Q.3 Answer the following. **16**

a) Explain in detail Water (Prevention and Control of Pollution) Act 1974, its implication and application in industrial pollution control.
b) Describe in detail with necessary diagrams the solvent extraction and oxidation methods for removal of phenolic residues.

Q.4 Answer the following. **16**

a) Discuss any two primary treatment methods for waste water treatment with diagrams.
b) What is particulate matter? Explain how CO and H_2S are analyzed in the air sample?

Q.5 Answer the following. **16**

a) Discuss in detail removal of chromium by precipitation and lime coagulation method.
b) Explain in detail toxic effects of mercury and its removal from gaseous and liquid streams.

Q.6 Answer the following. **16**

a) Define soil pollution and explain analysis of soil for the factors such as pH and phosphorous by Olsen method.
b) Explain water pollution and describe analysis of water for the factors of chloride and free acid.

Q.7 Answer the following. **16**

a) Discuss the methods used for the recycling of plastic polymers. What are the important products obtained from recycled plastic polymeric materials?

b) Explain water management in India. Discuss briefly IS-2490, IS-3360 and IS-3307.

Seat No.	

Set P

M.Sc. (Industrial Chemistry) (Semester - IV) (New/Old) (CBCS)
Examination: March/April - 2025
Nanomaterial and its Characterization (MSC06403)

Day & Date: Tuesday, 20-May-2025 Max. Marks: 80
Time: 03:00 AM To 06:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7.
3) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **10**

1) _____ method is used to prepare ultra-pure elements.
a) Kassinos b) Suzuki
c) Czochralski d) Miezo

2) Industrial nano-catalysts have _____ surface area.
a) low b) high
c) optimum d) minute

3) Photo -assisted CVD is based on the utilization of _____ light for the synthesis.
a) infra-red b) cosmic
c) visible d) ultraviolet

4) _____ are the materials also used as sensors in military operations.
a) nanosensors b) beam sensors
c) infra-red sensors d) none of these

5) Typical precursors used in sol-gel method are _____.
a) metal iodides b) metal alkoxides
c) metal bromides d) metal xanthates

6) _____ helps us in getting a surface information and topography of the specimen.
a) SEM b) UV
c) NMR d) GC-MS

7) The energy required to maintain zero temperature difference between the sample and the reference is measured by _____ technique
a) DTA b) DSC
c) TGA d) TMA

8) In TGA analysis a compressed sample will decompose at _____ temperature than a loose sample.

a) Lower b) higher
c) equal d) zero

9) A Miller index of a plane making intercept 2a, 2/3b, and 2c.

a) (1 3 1) b) (2 3 1)
c) (2 2 1) d) (1 1 3)

10) For destructive interference to take place, the path difference between the two waves should be

a) (2n+1) $\lambda/2$ b) (2n+1)$\pi/2$
c) (2n+1) λ d) (2n-1) $\pi/2$

B) Write true and false. **06**

1) Nebulizer is used to inject small droplets of precursor in electrodeposition method.
2) Nanoparticles are also used in cosmetic industries.
3) In SEM, the secondary electrons radiated back in scanning microscope is collected by electron gun.
4) In TEM, a beam of electrons is transmitted through the specimen to form an image.
5) In DSC technique rate of flow of heat property of a material is measured.
6) X-ray diffractometers are not used to identify the physical properties of solid.

Q.2 Answer the following. **16**

a) Discuss general applications of nanomaterials.
b) What are zero-, one-, two-, and three-dimensional nanomaterials?
c) Describe the variation in temperature of the same material due to furnace atmosphere by TGA.
d) The distance between the (111) plane in the BCC structure is 3 A^o Find the size of the unit cell.

Q.3 Answer the following. **16**

a) Describe in detail the sol-gel and hydrothermal methods with neat labeled diagram for the synthesis of materials.
b) Explain the chemical bath deposition and magnetron sputtering methods for the synthesis of nanomaterials.

Q.4 Answer the following. **16**

a) Explain in detail the principle, construction, working, and applications of scanning electron microscopy (SEM).
b) Explain the principles with labeled diagrams of X-ray photoelectron microscopy (XPS) and transmission electron microscopy (TEM).

Q.5 Answer the following. **16**

a) Describe in detail nanosensors, their types, characteristics, and general applications.

b) Explain in brief Czochralski method for the preparation of germanium and indium.

Q.6 Answer the following. **16**

a) Discuss in detail X-ray production by the Coolidge tube method.

b) Describe the basic principle of DTA and give the applications of the DTA technique.

Q.7 Answer the following. **16**

a) Derive an equation for the interplanar distance between two parallel planes in an orthogonal system and hence find out the interplanar distance for the tetragonal system.

b) Describe the basic principle of TGA technique, Give the details about the instrumentation of TGA.

Seat No.		Set	P

M.Sc. Industrial Chemistry (Semester - IV) (New/Old) (CBCS) Examination: March/April – 2025
Industrial Management and Material Balance (MSC06408)

Day & Date: Thursday, 22-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Q.No.1 and 2 are compulsory
2) Attempt any three questions from Q.No. 3 to Q. No. 7
3) Figures to the right indicate full marks.

Q.1 A) Multiple Choice Questions **10**

1) Feed stock containing less than 4% free fatty acid is Trans esterified with _____
a) 4% KOH b) Sulphuric acid
c) Hydrochloric acid d) Both b) and c)

2) Following is not an example of renewable source of energy is _____
a) Coal b) Solar Energy
c) Wind energy d) Ocean tides.

3) A gas mixture has the composition- of 16% oxygen, 17% carbon dioxide, 4% carbon monoxide, and 63% Nitrogen. What are the moles of carbon monoxide in the overall composition?
a) 0.06 mols b) 0.60 mols
c) 0.07 mols d) 0.70 mols

4) Researchers use the _____ method to choose the sample members of a population at regular intervals. It requires the selection of a starting point for the sample and sample size that can be repeated at regular intervals. This type of sampling method has a predefined range, and hence techniques is the least time-consuming.
a) Simple random sampling b) Cluster sampling
c) Systematic sampling d) Stratified random sampling

5) Semi- Batch process falls into the category of _____
a) Open system b) Closed system
c) Isolated system d) Both b) and a)

6) Which of the following is not an advantage of Incinerators?
   a) Waste are converted to harmless waste
   b) There is no commitment to long term containment of hazardous waste
   c) Ash from a hazardous waste incinerator must be disposed of in a secure landfill
   d) Incinerators handle most reactive wastes prohibited from landfills.

7) Define Incompatible chemicals
   a) Incompatible chemicals refers to chemicals that can react with each other randomly with evolution of heat or to produce flammable products or toxic products
   b) Incompatible chemicals refers to reactants that can react with each other violently with evolution of water or to produce flammable products or toxic products
   c) Incompatible chemicals refers to chemicals that can react with each other violently with evolution of heat or to produce flammable products or toxic products
   d) Incompatible chemicals refers to chemicals that can react with each other violently with evolution of heat or to produce flammable products or non-toxic product

8) SISI stands for _____
   a) Small industries standard institutes
   b) Small industries services institutes
   c) Sound industries services institutes
   d) Standards for industries services institutes

9) Following is not the example of potentially explosive combination of chemicals _____
   a) Chlorine and an alcohol
   b) Ethanol and silver nitrate
   c) Ethanol and water
   d) Acetone and Chloroform

10) A solution of Magnesium chloride in water is prepared by adding 10 kg of salt to 90 kg of water, to make a liquid of density 1323 kg m^{-3} Calculate the concentration of salt in this solution as a weight fraction, and % weight/weight
   a) 0.1 and 10%
   b) 0.1 and 20%
   c) 0.2 and 20%
   d) 0.05 and 5%

B) Fill in the blanks / Write True or False **06**

1) The research and development is having vast scope in various fields
   a) True b) False

2) Researchers use the systematic sampling method to choose the sample members of a population at regular intervals.
   a) True b) False

3) Organic peroxide is a chemical which is easy to handle
   a) True b) False

4) Input + generation - output -consumption =accumulation is not a general energy balance equation
   a) True b) False

5) A pilot plant is a collection of equipment designed and constructed to investigate some critical aspects of a process operation or perform basic research.
   a) True b) False

6) Applied research is aimed at a fuller, more complete understanding of the fundamental aspects of a concept or phenomenon
   a) True b) False

Q.2 Answer the following. **16**

a) Explain Hydropower as a renewable source of energy
b) What is the unsteady and steady-state process? Write the material balance Equation
c) Define a Small-scale unit. How it differs from an Ancillary unit?
d) How is technology transferred?

Q.3 Answer the following.

a) Explain the term **08**
   1) Fermentation process during the manufacturing process of Bioethanol
   2) Hydrogen as a renewable source of energy

b) Define the term export and import. What is the exact procedure involved to export a commodities **08**

Q.4 Answer the following.

a) Explain the term **08**
1) Differential Balance
2) Flow work and Shaft Work
3) Bypass stream and Recycle stream
4) Integral Balance

b) A mixture consisting of 45 % Isooctane and 65 % Toluene is continuously fed to the distillation column at a rate of 1000 kg/hr. whereas, the distillate flow rate was 10% from the feed flow rate. The distillate (top product) contains 90 % Isooctane. Calculate the quantity and compositions of the waste stream **08**

Q.5 Answer the following.

a) What is the difference between process and product Patent? What are the steps involved to obtain a Patent? **08**

b) Explain the following **08**
1) P chart for quality determination.
2) Indian factory act-1948

Q.6 Answer the following.

a) Discuss Balances on multiple unit processes for solving the Material balance problem **08**

b) Explain the following **08**
1) Control chart and their advantages
2) Role of Small-scale Industry
3) University-Industry Interface

Q.7 Answer the following.

a) What is Fuel Cell? Explain in Detail the working of Hydrogen - Oxygen Fuel Cell **08**

b) What are the steps involved in research program to minimize the risk associated with a new product? **08**

Seat No.	

Set **P**

M.Sc. Polymer Chemistry (Semester - III) (New) (NEP CBCS)
Examination: March/April - 2025
Fundamentals of Polymer Science (2324301)

Day & Date: Thursday, 15-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose the correct alternative. **08**

1) What is the main advantage of Continuous Process?
a) Easier operation and low cost
b) Maintaining batch to batch uniformity
c) Usually an induction period
d) None of these

2) Which letters are used in denoting Absolute Configuration?
a) D and L b) E and Z
c) R and S d) P and Q

3) What is the role of chain transfer agent in polymerization?
a) To initiate the polymerization
b) To increase the molecular weight
c) To increase polymerization rate
d) To control the molecular weight

4) Melt polycondensation reaction is carried out under inert atmosphere to avoid which of the following side reactions?
a) Oxidation b) Decarboxylation
c) Degradation d) All of these

5) Knocking characteristics of fuel used in petrol engine are expressed in terms of what?
a) Octane rating b) Butane rating
c) Cetane rating d) Pentane rating

6) In terms of the nomenclature used for stereoregular polymers, amylose has which structure?
a) Threodiisotactic b) Threodisyndiotactic
c) Erythrodiisotactic d) Erythrodisyndiotactic

7) Which of the following chemicals obtained by Cumene process?
a) Toluene & Butanol b) Phenol & Acetone
c) Cresol & Propanol d) All of these

8) What is the trade name of phenol formaldehyde polymer synthesized by using base catalyst?

a) Resol b) Ryton
c) Novolac d) Lexan

B) Fill in the blanks and write true/false **04**

A) Fill in the blanks.

1) Poly(1-phenylethylene) is IUPAC name of _____ commercial polymer.
2) Nylon 6,6 is synthesized by using Hexamethylenediamine with _____ monomer.

B) Write True/False

1) Polymers having more than four terminals are known as Single strand polymers.
2) In the Nylon 6, 12 the second number added on to nylon indicates number of carbon atoms in diacid.

Q.2 Answer the following question (Any Six) **12**

a) What is the requirement of monomer to get stereoregular polymers by step and Ring opening polymerization?
b) Write about the kinetic chain length.
c) Why refining of crude oil is necessary?
d) What is the “CMC” in emulsion polymerization?
e) What is elastomer? Give two examples of commercially important elastomers.
f) Define the optically activity and optical isomerism.
g) Give the order of knocking among different types of hydrocarbons.
h) Define the flash point of fuel.

Q.3 Answer the following question (Any Three) **12**

a) What are different types stereoregular polymers derived from polypropylene?
b) Use of xylene towards chemicals and polymers.
c) Explain the solution polymerization method in detail.
d) Discuss the theories associated with origin of petroleum.

Q.4 Answer the following question (Any Two) **12**

a) What is Cracking? Why it is necessary? Discuss the catalytic cracking process.
b) Discuss the use of ethylene as building block towards polymer industries.
c) Compare the chain growth and step growth polymerization with suitable examples.

Q.5 Answer the following question (Any Two) **12**

a) Discuss the IUPAC nomenclature system used for polymers in details.

b) Explain the emulsion polymerization technique in detail.

c) Explain the stereoisomerism involved in polymers derived from 1 -substituted -1,3-butadiene.

Seat No.	

Set **P**

M.Sc. Polymer Chemistry (Semester - III) (New) (NEP CBCS) Examination: March/April - 2025
Chain Polymerization Mechanism and Kinetics (2324302)

Day & Date: Saturday, 17-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **08**

1) Due to lack of chain entanglement, dendrimers usually have low ____
a) Solubility b) Boiling point
c) Conductivity d) Viscosity

2) The stereoregular polymer is synthesized by using ____ catalyst.
a) Rhodium b) Ruthenium
c) Ziegler-Natta d) all of the above

3) In Transfer Radical Polymerization ____ metal used.
a) alkali metals b) alkaline earth metals
c) transition metals d) all of the above

4) ROP product of Lactam is used in ____.
a) biological, medical and pharmaceutical applications
b) Automobile tyres
c) PVC pipe
d) Bottles

5) Free- radical chain polymerization generated by ____.
a) Homolytic decomposition of an initiators
b) Heterolytic decomposition of an initiators
c) Homolytic decomposition of the monomer
d) Heterolytic decomposition of the monomer

6) ____ is widely used for the determination of the chain transfer constant for solvents.
a) Kinetic chain length equation b) Mayo equation
c) Ceiling temperature d) All of the above

7) Function of Inhibiter is to ____.
a) Propagate reaction b) Initiate reaction
c) Increase reaction rate d) Terminate reaction

8) The Q-e scheme is using ____ monomer as a standard.

a) Ethylene b) Styrene
c) Acrylonitrile d) Methyl methacrylate

B) write true/false: **04**

a) ATRP is a not well-established technique for controlling radical polymerization.
b) ATRP can be used to synthesize inorganic-organic hybrid materials and bioconjugates.
c) Ziegler-Natta catalysts are used to polymerize terminal alkenes.
d) A polymer blend is a mixture of two or more polymers.

Q.2 Answer the following (Any Six). **12**

a) Explain propagation modes head to tail and head-to-head polymerization.
b) Write a note on chain transfer.
c) Discuss the copolymer composition.
d) Explain in short commercial importance of cationic and anionic polymerization.
e) Write the ATRP Mechanism.
f) Explain the application of Dendrimers.
g) Explain the Advantages of ATRP over conventional free radical polymerization.
h) Write the Chemical nature of Propagating Species.

Q.3 Answer the following (Any Three). **12**

a) Discuss the Advantage of RAFT over ATRP.
b) Explain the Mechanism of Syndioselective Propagation.
c) Explain with an example of A-B diblocks copolymer.
d) Write a note on Functional Polymers.

Q.4 Answer the following (Any Two). **12**

a) Explain the Group transfer polymerization
b) Discuss the thermal initiation polymerization.
c) Derive the Kinetics of anionic polymerization.

Q.5 Answer the following (Any Two). **12**

a) Explain the Ring opening polymerization mechanism of cyclosiloxanes.
b) Explain with an example of Stereospecific polymerization of polar vinyl monomers.
c) Discuss in detail Ring opening metathesis polymerization.

Seat No.	

Set **P**

M.Sc. Polymer Chemistry (Semester - III) (New) (NEP CBCS) Examination: March/April - 2025
Polymer Analysis and Characterization techniques (2324306)

Day & Date: Monday, 19-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **08**

1) The solvent used in UV-Visible spectroscopy is _____.
   a) Hexane b) Chloroform
   c) Ethanol d) All of the above

2) _____ type of molecular vibrations are detected by IR spectroscopy.
   a) Electronic transitions b) Vibrational and rotational motions
   c) Nuclear spin transitions d) Intermolecular vibrations

3) Raman spectroscopy is based on _____ phenomenon.
   a) Absorption of UV light b) Scattering of Visible light
   c) Fluorescence emission d) Thermal emission

4) X-ray diffraction is primarily used to _____.
   a) Measure particle size
   b) Determine crystal structure
   c) Analyze surface roughness
   d) Identify amorphous materials

5) The Time-of-Flight analyzer measures ions based on their _____.
   a) Energy level
   b) Time taken to travel a fixed distance
   c) Wavelength
   d) Charge distribution

6) TGA is commonly used to study _____ of a material.
   a) Electrical properties b) Optical clarity
   c) Surface roughness d) Thermal stability

7) The DTA curve is a plot of _____.
   a) Temperature vs. weight change
   b) Heat flow vs. Time
   c) Temperature difference vs. Temperature
   d) Intensity vs. Wavelength

8) The natural abundance of ^{13}C isotope is _____.
   a) 0.01% b) 1.1%
   c) 10% d) 99.9%

B) Fill in the blank. **04**

1) The elastomers are primarily composed of _____.
2) The stress is defined as _____.
3) SEM is primarily used to study _____ of a sample.
4) The _____ spectroscopy is mainly used to determine unsaturation in a sample.

Q.2 Answer the following. (Any Six) **12**

a) Explain any one of bending vibrations with example.
b) What is chemical shift in ^{1}H NMR spectroscopy?
c) Why inert atmosphere is used during TGA analysis?
d) What is the term moisture content with respect to polymer?
e) Give the mathematical term of Bragg's Law.
f) What is (n+1) rule for ^{1}H NMR spectroscopy.
g) Define Melt flow index.

Q.3 Answer the following. (Any Three) **12**

a) Explain the general method of generation of X-rays.
b) Give in details about Scanning electron microscopic technique.
c) Describe any one polymer application of IR spectroscopy.
d) What is Pyrolysis? Give the types of pyrolysis.

Q.4 Answer the following. (Any Two) **12**

a) Differentiate between Raman and IR spectroscopy.
b) What is Acid value? Give the details with suitable example of polymer.
c) With suitable diagrammatic representation describe SEM technique.

Q.5 Answer the following. (Any Two) **12**

a) Give in details about softening point of polymer with its applications.
b) Derive Bragg's Law.
c) Describe in details the TGA technique.

Seat No.	

Set **P**

M.Sc. Polymer Chemistry (Semester - III) (Old) (CBCS) Examination: March/April - 2025
Fundamentals of Feeds tocks and Polymers (MSC05301)

Day & Date: Thursday, 15-May-2025 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No.3 to Q. No. 7
3) Figures to the right indicate full marks.

Q.1 A) Multiple choice questions. **10**

1) Among the following which is IUPAC name of Nylon 6,6?
a) Poly(iminohexamethyleneiminosebasoyl)
b) Poly(hexamethylene adipamide)
c) Poly(iminohexamethyleneiminoadipoyl)
d) Poly(hexamethylenesebasamide)

2) Which monomers are used for synthesis of PET polymer?
a) Ethylene glycol and terephthalic acid
b) Ethylene glycol and adipic acid
c) Ethylene glycol and sebacic acid
d) Ethylene glycol and benzoic acid

3) Which of the following metal oxide used as a catalyst for the synthesis of HDPE by Philips process?
a) Molybdenum oxide b) Calcium oxide
c) Titanium oxide d) Chromium oxide

4) Why polymer obtained with very high molecular weight in Interfacial Polymerization?
a) Diffusion control process
b) Monomers having less reactive functional groups
c) Two phases are immiscible
d) All of these

5) Among the following, size of monomer droplets in suspension polymerization will depends upon?
a) Type and speed of stirring
b) Type and concentration of initiator
c) Monomer to initiator ratio
d) All of these

6) Polymers of aldehyde are commonly termed as?
a) Polyacetals b) Polyketals
c) Polyols d) All of these

7) Polymer containing uninterrupted series of rings connected by links around which rotation cannot occur, except bond breaking are known as?

a) Branched polymers
b) Semiladder polymers
c) Ladder polymers
d) Single strand polymers

8) Why melt polycondensation is carried out under inert atmosphere of nitrogen or carbon dioxide?

a) To avoid crosslinking
b) To control the molecular weight
c) To make polymer more flexible
d) To avoid the side reactions

9) Temperature at which vapours of oil is sufficient to maintain the flame when oil is heated in standard apparatus, is known as?

a) Fire Point
b) Flash Point
c) Smoke Point
d) Spontaneous ignition temperature

10) Why, thermal activation is difficult in Solid chase polymerization?

a) Polymerization is restricted to low
b) Monomer may undergo melting, temperature.
c) Photo or radiation activation is used
d) All of these

B) Fill in the blanks and True/False **06**

1) Write True/False:

a) In Step Growth Polymerization only reactive center can monomer molecule one at a time.
b) Polymers vulcanized into rubber product exhibit good strength and elongation are termed as elastomers.
c) Knocking characteristics of diesel oil are expressed in terms of Octane number.

2) Fill in the blanks:

a) The trade name of phenol formaldehyde polymer synthesized by using acid catalyst is _____.
b) When there is chain transfer to polymer _____ type of polymer will form.
c) In solution polycondensation solvent may be act as____ for byproduct and hence removal of byproduct is easy.

Q.2 Answer the following. **16**

a) Discuss the theories associated with origin of petroleum.
b) Explain the manufacturing of PMMA by bulk polymerization.
c) Discuss the solution polymerisation technique with example.
d) Describe nomenclature of polymers based on trade names.

Q.3 Answer the following.

a) Discuss in detail on classification of polymers with suitable examples. **10**

b) Give an account on any one renewable resource as building blocks towards polymer industries. **06**

Q.4 Answer the following.

a) Describe the use of benzene as a building block towards polymer industries. **10**

b) Explain the ladder and semiladder polymers with suitable examples. **06**

Q.5 Answer the following.

a) Describe the use of C4 stream as a feedstock for polymer industry. **08**

b) In detail describe suspension polymerisation. **08**

Q.6 Answer the following.

a) Describe the preparation process of poly(vinyl chloride) with their properties and application. **08**

b) Discuss the use of Xylene as a building block towards polymer synthesis. **08**

Q.7 Answer the following.

a) Compare step growth and chain growth polymerisation with suitable example. **08**

b) Explain the batch, semi batch and continuous processes used for synthesis of commercial polymers. What are the limitations of these processes? **08**

SLR-ZF-53

Seat No.

Set P

M.Sc. Polymer Chemistry (Semester - III) (Old) (CBCS) Examination: March/April - 2025
Morphology and Physical Chemistry of Polymers(MSC05302)

Day & Date: Saturday, 17-May-2025 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No.3 to Q. No. 7.
3) Figure to right indicates full marks.

Q.1 A) Choose the Correct alternative: **10**

1) Polydispersity index is calculated by ____
a) Mw/Mn b) Mv/Mn
c) Mn/Mw d) Mz/Mn

2) Weight average molecular weight is denoted as ____
a) Mw b) Mn;
c) Mz; d) none of above

3) In GPC analysis method molecules eluted first in column are ____
a) Monomer
b) high molar mass polymer
c) low molar mass polymer
d) Mixture

4) TMA analysis of polymer is used to estimate change in ____ of material against temperature.
a) Dimensions b) molecular weight
c) Viscosity d) Mobility

5) Spherulites are composed of highly ordered ____
a) Lamellae b) Electrons
c) Protons d) Neutrons

6) X-ray spectra of polymer give information about ____
a) melt transition temperature b) Crystallinity
c) glass transition temperature d) all of above

7) ____ is the principle of centrifugation.
a) Sedimentation b) Filtration
c) Evaporation d) Size reduction

8) Which polymer is biodegradable polymer?

a) Synthetic polymer
b) Semisynthetic polymer
c) both A and B
d) Natural polymer

9) LVDT is a type of electrical transformer used for measuring ____

a) mechanical strength
b) linear displacement
c) chemical changes
d) None of these

10) The viscosity of liquid ____.

a) Increase with increase in temperature
b) Decrease with increase in temperature
c) Decrease with decrease in temperature
d) Remain constant regardless of any change in the temperature

Q.1 B) Fill in the blanks. **06**

a) The average functionality of polymer is calculated by ____ method.
b) Ultracentrifugation analysis of polymer gives information about ____.
c) The penetration probe in TMA used for the measurement of ____ the polymer.
d) In a Crystal the atoms or molecules are arranged in ____ manner.
e) The glass transition temperature of polymers shows transition from ____ to ___ state.
f) The value of Ebullioscopic constant depends on ____.

Q.2 Answer the following. **16**

a) With suitable example write down the factors affecting on Tg.
b) Write a note on intrinsic viscosity of polymers.
c) Describe the polymer membranes for gas separation.
d) Describe the power compensation DSC.

Q.3 Answer the following. **16**

a) Describe in detail role of antioxidants in polymers.
b) Describe the principle and instrumentation of X-Ray diffractometer.

Q.4 Attempt the following: **16**

a) Give the instrumentation of gel permeation chromatography (GPC) with neat labelled diagram.
b) With the help of suitable example explain biodegradation of polymers using micro-organisms.

Q.5 Attempt the following: **16**

a) Describe the principle of membrane osmometry.
b) Describe the different transition curves obtained in DSC.

Q.6 Answer the following: **16**

a) Describe in details the mechanisms of degradation by ionizing radiations.

b) Give the instrumentation of thermo mechanical analysis (TMA) in detail.

Q.7 Answer the following: **16**

a) Explain the light scattering phenomena with suitable example.

b) Write a note on ultracentrifugation method.

Seat No.	

Set P

M.Sc. Polymer Chemistry (Semester - III) (Old) (CBCS) Examination: March/April - 2025
Basic Concepts of Polymerization (MSC05306)

Day & Date: Monday, 19-May-2025 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Q.Nos.1 and 2 are compulsory.
2) Attempt any three questions from Q. 3 to Q.7
3) Figures to the right indicate full marks.

Q.1 A) Select the correct alternative. **10**

1) Protonic acid is used as a catalyst for _____ polymerization.
   a) Cationic b) Radical
   c) Anonic d) None of the above

2) _____ Polymer is used as drug delivery agent.
   a) Block co-polymer b) Dendrimeric polymers
   c) Radical chain polymers d) Condensation polymers

3) Heck reaction of unsaturated halide or alkyl halide with an olefin or substituted olefin takes place in the presence of _____.
   a) Base and Pd catalyst
   b) Acid and Pd catalyst
   c) Base and Ru catalyst
   d) Base and transition metal catalyst

4) Pd catalyst is used as a coupling agent as it has various _____.
   a) reduction state b) oxidation state
   c) both a and b d) None of the above

5) _____ are the photochemical initiators.
   a) Thermal / Heat b) Ultra violet and visible light
   c) Photosensitive initiators d) All of the above

6) The polyestrification reaction using diol and diacids is _____.
   a) self catalyzed polymerization
   b) polycondensation reaction
   c) taking place in absence of external added catalyst reaction
   d) all of the above

7) _____ is computed or calculated for reactivity ratio of various monomer.
   a) $Q - e$ b) $1/r_1 = k_{12}/k_{11}$
   c) Both a) and b) d) None of the above

8) The temperature at which rate of propagation as well as depropagation are equal is called as _____.
   a) Propagation temperature b) DE propagation temperature
   c) Ceiling temperature d) All of the above

9) Two molecules joined together leaving small molecule is called as _____.
   a) Condensation polymerization
   b) Addition polymerization
   c) Substitution polymerization
   d) Radical polymerization

10) _____ is the natural polymer.
   a) Polyisobutylene b) Poly (methyl methacrylate)
   c) Polytetrafluoroethylene d) Cellulose

B) Fill in the blanks. **06**

1) Benzoyl peroxide is used in _____ polymerization method.
2) Organo- silicon initiator is used for _____.
3) Highly strained, 3-membered ring epoxides are polymerized by _____ initiators.
4) Hyper branched polymer was first time synthesized by _____ in 1997-2001.
5) _____ is the redox solvent system.
6) _____ are the particulate radiations.

Q.2 Write short notes on. **16**

a) Write note on free radical polymerization
b) Discuss ADMET polymerization method with suitable examples
c) Derive rate constant of the kinetics of anionic polymerization
d) Explain in short copolymer composition.

Q.3 Answer the following. **16**

a) Give the differences between radical and ionic polymerization.
b) Explain the ionizing radiation initiation in polymerization.

Q.4 Answer the following. **16**

a) Write the Heck reaction with example.
b) Give the example and applications of commercially available copolymers.

Q.5 Answer the following. **16**

a) Write in detail the Group transfer polymerization reaction.
b) Derive rate constant for Kinetics of condensation polymerization in absence of catalyst.

Q.6 Answer the following. **16**

a) Given in brief the ring opening cyclosiloxanes polymerization.
b) Write in detail the monomer reactivity ratios in copolymerization

Q.7 Answer the following. **16**

a) Discuss in short retardation and auto acceleration.

b) Explain in the ring opening polymerization mechanism of cyclic amides.

Seat No.	

Set P

M.Sc. Polymer Chemistry (Semester - IV) (New) (NEP CBCS) Examination: March/April - 2025
Industrial Polymer Science (2324401)

Day & Date: Wednesday, 14-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose the correct alternative. **08**

1) _____ is highly conducting material used for making conducting films.
a) Polysulphone b) Polyphenylene
c) PEEK d) Polypropylene

2) Polybenzimidazoles are formed by reaction between _____.
a) diacid & diamine b) diacid & tetramine
c) tetraacid & diamine d) tetraacid & tetramine

3) The polyether ether ketone is prepared by using _____.
a) bis phenol-A and MPD
b) bis phenol-A and OPD
c) bis phenol-A and difluoro diphenylketone
d) All of the above

4) Nomex is prepared by reaction of _____.
a) m-Phenylene diamine & isophthalyl chloride
b) m- Phenyl Phenylene diamine & tetraphthalyl chloride
c) P- Phenylene diamine & isophthalyl chloride
d) P- Phenylene diamine & Terephthalic acid

5) Epichlorohydrine can be prepared from _____ & _____.
a) Alkyl halide & H_2O b) Alkyl halide & CO_2
c) Propylene gas & Br_2 d) Propylene gas & Cl_2

6) _____ is also called as the 3GT polymer.
a) PTT b) PEN
c) PET d) PEEK

7) The Phenol is produced by which of the following method?
a) Hock's Process b) Raschig Process
c) Cumene process d) All of these

8) During formation of Resole, Formaldehyde to Phenol molar ratio is _____.
a) Greater than one b) Equal to zero
c) Less than one d) Equal to one

B) Fill in the blanks. **04**

1) The polysulfone resin obtained from bisphenol-A have a trade name _____.
2) The physical mixture of two or more polymers is known as _____.
3) Silicones are also called as _____ polymers.
4) ω- amino undecanoic acid gives _____.

Q.2 Answer the following question (Any Six) **12**

a) Give the synthesis of DMT by direct process.
b) Give the structure of polyvinyl chloride.
c) Define polyether with an example.
d) Give the structure of polysiloxane.
e) What is the meaning of ionic polymers.
f) Define Hydrogel.
g) What is aromatic polyamide?
h) What is elastomer? Give an example.

Q.3 Answer the following question (Any Three). **12**

a) Give the kinetic equation for polyesterification.
b) Explain the synthesis of propylenediol by any two processes.
c) Write a note on silicone resin.
d) Give the synthesis of PBT by DMT process and give its properties.

Q.4 Answer the following question (Any Two) **12**

a) Write a note on Polybenzimidazole.
b) Give the synthesis and applications of polysulfones.
c) Explain in detail polymer composites and give its applications.

Q.5 Answer the following. (Any Two) **12**

a) What is conducting polymer? Explain the doped conducting polymers.
b) Describe in details the lithium-ion batteries.
c) Give the synthesis of nylon-11 with its applications.

SLR-ZF-57

Seat No.	

Set P

M.Sc. Polymer Chemistry (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2025
Paints and Coatings Technology (2324402)

Day & Date: Friday, 16-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose the correct alternative. (MCQ) **08**

1) Which of the following is a drying oil used in paints?
a) Castor oil b) Linseed oil
c) Olive oil d) Coconut oil

2) Which equipment is commonly used for pigment dispersion in paints?
a) Triple roll mill b) Rotary evaporator
c) Soxhlet extractor d) Column chromatography

3) What is the primary function of extenders in paint formulation?
a) Improve gloss b) Act as binder
c) Reduce cost d) Enhance adhesion

4) What is the primary function of resins in paint formulations?
a) To provide colour b) To increase drying time
c) To reduce viscosity d) To act as a binder forming a film

5) Which of the following is a characteristic of an ideal paint?
a) Quick drying b) Low covering power
c) Long-lasting colour retention d) Thin consistency

6) The purpose of adding a drier to paint is to ____
a) Accelerate drying time b) Improve adhesion
c) Add colour d) Reduce cost

7) The purpose of thinners in a paint formulation is to ____
a) Add colour
b) Increase capacity
c) Improve flow and application properties
d) Harden the paint film

8) Which of the following paints is commonly used in marine environments to prevent biofouling?
a) Cement paint b) Anti-fouling coating
c) UV-curable coating d) Oil-based distemper

B) Fill in the blanks and write true / false: **04**

a) **Fill in the blanks**

1) Loss of decorative appearance in paints due to environmental factors is known as ____
2) ____ is the process of applying paint using an electric field to deposit it on a conductive surface.

b) **Write true / false**

1) Epoxy resins used in coatings are water-soluble and do not require curing agents. (True /False)
2) Drying oils in paint formulations undergo chemical reactions with oxygen to form a solid film. (True / False)

Q.2 Answer the following. (Any Six) **12**

1) Define the term "enamel paint" and mention one of its key characteristics.
2) Name any two types of white pigments used in paint formulation.
3) Write two differences between drying and non-drying oils.
4) Define hiding power of a pigment.
5) Write the differentiate between organic and inorganic pigments.
6) State the Classification of paints.
7) Name two important properties of pigments that affect their performance in coatings.
8) Explain the purpose and composition of varnish?

Q.3 Answer the following: (Any Three) **12**

1) What are the major constituents of paint? Briefly explain the function of each.
2) Describe the manufacturing process of varnishes including equipment involved.
3) Write various production strategies of paints.
4) What is distemper? Describe its types and applications in the paint industry.

Q.4 Answer the following: (Any Two) **12**

1) Compare different types of paints (e.g., emulsion, enamel, distemper, cement paint) in terms of composition, application, and usage.
2) Discuss the concept of powder coating with its key advantages and disadvantages.
3) Explain in brief with flow chart of seven tank process.

Q.5 Answer the following: (Any Two) **12**

1) Discuss the method of synthesis of alkyd resin with proper steps.
2) Write in detail Different filtration techniques in Details?
3) Explain the role of epoxy resins in paint formulations. Discuss the types of epoxy resins, their curing agents, and their applications in various coatings, highlighting their advantages and limitations.

Seat No.	

Set **P**

M.Sc. Polymer Chemistry (Semester - IV) (New) (NEP CBCS) Examination: March/April - 2025
Processing Technology and Polymer Properties (2324405)

Day & Date: Tuesday, 20-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All Questions are compulsory
2) Figures to right indicate full marks.

Q.1 A) Choose correct alternatives. **08**

1) Turbulent flow is _____.
   a) steet line flow
   b) vibrating line flow
   c) overlapping and random flow
   d) one of these

2) The stress, strain and time relationship is expressed mathematically by _____.
   a) Newton's equation b) Both a and c
   c) Rheological equation d) Maxwell equation

3) _____ is Ideal fluid.
   a) Water b) Kerosene
   c) Methanol d) Both a and b

4) _____ are the more crystalline polymers.
   a) The isotactic polymer
   b) The isotactic and syndiotactic polymer
   c) The syndiotactic polymer
   d) The atactic polymer

5) Wool and silk are example of _____.
   a) Plant fibres b) Semisynthetic fibres
   c) Animal fibres d) Synthetic fibres

6) Polymer processing leads to more efficient packing of polymer chains and thus there is reduction in _____?
   a) volume b) colour
   c) polymer chain d) all of these

7) _____ chemical methods is/are use for Nanocomposites.
   a) Sol-gel processing b) Melt mixing
   c) Chemical reduction d) All of these

8) _____ is the manual processing methods for reinforced thermoplastics and thermosets.
   a) Pultrusion b) Thermoforming
   c) Hand Lay-up d) Compression molding

B) Fill in the blanks. **04**

1) Male and Female mold parts are used in _____.
2) Adding additives like fillers, plasticizers, or stabilizers can modify the _____ and _____ of polymers.
3) _____ is the primary medium to treat and modify fibbers and fabrics in wet processing of textile manufacturing.
4) _____ is an extremely popular and well used process for producing hollow products.

Q.2 Answer the following. (Any Six) **12**

a) Write a note on stress-relaxation.
b) Describe in short reaction injection molding.
c) Discuss the analysis of flow in extruder.
d) Write the advantages and disadvantages of Transfer Molding.
e) Discuss in brief dry processing fibers.
f) Explain in short general behaviors of polymer melts.
g) Write a note on spray coating.
h) Explain the viscoelastic behavior in polymer.

Q.3 Answer the following. (Any Three) **12**

a) Explain the measurement of flow properties of polymer.
b) Explain various types of calendars? Which material used in calendaring?
c) Describe is short semi-automatic processing method is for Thermoplastics.
d) Discuss in detail Rotational Molding.

Q.4 Answer the following. (Any Two) **12**

a) Explain the features of twin screw extruders and other techniques based on extruder.
b) Describe in detail Injection Molding.
c) Explain the Mechanical spectra and effect of different factors on mechanical spectra.

Q.5 Answer the following. (Any two) **12**

a) Explain the detail thermoforming molding.
b) Discuss the general approaches of making nanocomposites.
c) Explain in detail Compression Molding.

Seat No.	

Set P

M.Sc. Polymer Chemistry (Semester - IV) (New/Old) (CBCS)
Examination: March/April - 2025
Step-growth Polymers (MSC05401)

Day & Date: Wednesday, 14-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Q.Nos.1. and 2. Are compulsory.
2) Attempt any three questions from Q.No.3 to Q.No.7
3) Figures to the right indicate full marks.

Q.1 A) Choose the correct alternative. **10**

1) Novolac after cross-linking gives _____ resin.
a) Polyamide b) Backelite
c) Resorcinol d) None of these

2) _____ resin is also called as the aminoplast.
a) Melamine formaldehyde
b) Urea formaldehyde
c) Phenol formaldehyde
d) Both a) & b)

3) _____ is the cross-linking agent used for the preparation of backelite resin.
a) Hexanol b) Pentanol
c) Hexa d) All of these

4) The Polyimide film formed by reaction between PMDA & ODA is called as _____
a) Lexan b) Sarona
c) Dacron d) Kapton

5) _____ is formed by reaction of diisocynate group with diol.
a) Polyamide b) Polyurethane
c) PEEK d) Polysulphone

6) The reaction between HMDA & Phthalic acid gives the semi aromatic nylon which is named as _____
a) Nylon 6T b) Nylon 7T
c) Nylon 6A d) Nylon 7A

7) _____ Oils are oils containing low percentage of conjugated fatty acid easters.
a) Semi drying oils b) Drying oils
c) Non-drying oils d) both a) and b)

8) Alternative source for phosgene gas in the synthesis of polycarbonate is _____
   a) Phenyl calcium carbonate
   b) Phenyl carbonate
   c) Diphenyl carbonate
   d) Diphenyl potassium carbonate

9) Thinners are used to _____ of the paint.
   a) reduce viscosity b) dissolve vehicle
   c) suspend the pigments d) All of these

10) _____ is the trade name of PBT.
   a) Sarona b) Cortora
   c) Dacron d) Celanex

B) Fill in the blanks. (Each question carries one mark) **06**

1) Glyptal resin is also called as _____
2) The trade name Dacron, Mylar, Terylene is used for _____ Polymer.
3) The homogeneous colloidal dispersion solution of natural or synthetic resins in oil or thinners or both is known as _____
4) Kevlar has strong hydrogen bonding due to _____
5) Paint is a mechanical dispersion mixture of one or more pigments in a _____
6) While formation of Novolac, the formaldehyde to Phenol ratio is _____

Q.2 Answer the following. (Each question carries four marks) **16**

a) Give the synthesis of PET by trans esterification method.
b) Explain the different constituents of paint.
c) Give the drawbacks of acid process for synthesis of PBT.
d) Define polyamide and give the nomenclature system of it.

Q.3 Answer the following. (Each question carries eight marks) **16**

a) Explain the various types of defects of paint.
b) Explain the synthesis of polycarbonate by non-phosgenation reaction and give the properties and applications of polycarbonate.

Q.4 Answer the following. (Each question carries eight marks) **16**

a) Define Polycarbonates. Describe the synthesis of polycarbonate by Interfacial polymerization method and give its advantages and disadvantages.
b) Describe the synthesis of PEN by trans-esterification reaction with the synthesis of monomers.

Q.5 Answer the following. (Each question carries eight marks) **16**

a) Describe the synthesis of PEEK with its mechanism.

b) Explain the principle, construction, working of Triple Roller Mill for paint with its applications.

Q.6 Answer the following. (Each question carries eight marks) **16**

a) Discuss the synthesis of Kevlar and give its applications.

b) Give the synthesis of Urea Formaldehyde resin.

Q.7 Answer the following.(Each question carries eight marks) **16**

a) Give the manufacture of halogen based flame-retardant epoxy resin.

b) Describe the synthesis of Melamine Formaldehyde resin by different processes.

Seat No.	

Set P

M.Sc. Polymer Chemistry (Semester - IV) (New/Old) (CBCS)
Examination: March/April – 2025
Stereo regular Polymers and Modern Polymerisation Methods
(MSC05402)

Day & Date: Friday, 16-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Question number 1 and 2 are compulsory.
2) Attempt any three questions from Q.No.3 to Q.No.7
3) Figures to the right indicate full marks.

Q.1 A) Choose the correct alternative. **10**

1) Viscosity average molecular weight of SBR block copolymers can be determine by which of the following method?
a) Light Scattering b) Viscometry.
c) Ultracentrifugation d) Membrane Osmometry

2) How many stereoregular structures will obtain on polymerization of 1,1-diphenyl ethylene?
a) Zero b) One
c) Two d) Three

3) Which is most commonly used catalyst in Atom Transfer Radical Polymerization?
a) Si b) Ti
c) Cu d) V

4) Polyacetaldehyde, poly(ethylene oxide), and poly(vinyl alcohol) are what type of isomers ?
a) Optical Isomers b) Constitutional Isomers.
c) Geometrical isomers d) All of these.

5) Among the following which approaches will yield well defined styrene-diene ABA structure?
a) Difunctional initiator process
b) Coupling process.
c) Tapered block process
d) All of these.

6) The isomerism displayed by unsaturated compounds or by ring compounds, where rotation about a carbon bond is restricted is called as?
   a) Conformational isomerism
   b) Geometric isomerism
   c) Optical Isomerism
   d) Enantiomers.

7) What is the type of insertion when the unsubstituted end of the double bond carries the partial negative charge and is attached to the counterion G?
   a) Primary insertion b) Secondary Insertion
   c) Tertiary insertion d) Quaternary insertion

8) What is full form of RAFT polymerization?
   a) Reserve Addition-Fragmentation chain Transfer Polymerization
   b) Reversible Addition-Fragmentation chain Transfer Polymerization
   c) Reversible Atom -Fragmentation chain Transfer Polymerization.
   d) None of above.

9) In terms of the nomenclature used for stereoregular polymers, amylose has which of the following structure?
   a) Erythrodiisotactic
   b) Threodiisotactic
   c) Threodisyndiotactic
   d) Erythrodisyndiotactic

10) Among the following which polymer has true chiral center?
   a) Polypropylene b) Poly(propylene oxide).
   c) Poly(Vinyl chloride) d) Poly(acrylamide).

B) Write true / false and fill in the blanks. **06**

1) Write True / false
   i) NMR is the most powerful spectroscopic technique for analysis of stereoregularity in polymers?
   ii) From the practical viewpoint, there is only one disyndiotactic polymer.
   iii) β-$TiCl_3$ has relativehigh stereoselectivity in Ziegler-Natta polymerizations.

2) Fill in the blanks.
   i) In the Ziegler - Natta polymerization mechanism _____ of addition to the carbon-carbon double bond is implied.
   ii) _____ types of polymers will be obtained when Kr/Km = 1.
   iii) A branch of chemistry that deals with the study of the three-

dimensional structure of molecules is known as _____.

Q.2 Answer the following. **16**

a) Write about stereochemical difference in cellulose and amylose.

b) What is the requirement of monomer to get stereoregular polymers by step growth and Ring opening polymerization?

c) Why co-ordination polymerization is also called as an insertion polymerization?

d) Compare the metal oxide supported initiators with Ziegler Natta initiators.

Q.3 Answer the following.

a) Discuss the monometallic mechanism proposed by Arlman and Cossee in Z - N polymerization. **10**

b) Describe the stereoselection and stereoelection in chiral monomer such as 3-methy- 1-pentene. **06**

Q.4 Answer the following.

a) Explain the various stereoregular structures obtained on polymerisation of 1-substituted and 1,4-disubstituted 1,3-butadiene monomers. **10**

b) Explain the evidences towards propagation at carbon - transition metal bond. **06**

Q.5 Answer the following.

a) Discuss in detail about the Co-ordination polymerisation of olefins and dienes. **08**

b) Discuss the styrene-butadiene A-B diblock copolymer. **08**

Q.6 Answer the following

a) Discuss the synthesis of (A-B-A)n triblock copolymer. **08**

b) What is living / controlled radical polymerisation? Explain RAFT Polymerisation. **08**

Q.7 Answer the following.

a) Describe the stereoisomerism in polymers from acetaldehyde and propylene oxide. **08**

b) Give an account on Atom Transfer Radical Polymerisation. (ATRP) **08**

Seat No.	

Set **P**

M.Sc. Polymer Chemistry (Semester - IV) (New/Old) (CBCS) Examination: March/April - 2025
Selected Topics in Polymers (MSC05403)

Day & Date: Tuesday, 20-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Q.Nos.1 and 2 are compulsory.
2) Attempt any three questions from Q.No.3 to Q.No.7
3) Figures to the right indicate full marks.

Q.1 A) Select the correct alternative. **10**

1) _____ is the primary source of natural rubber.
a) Latex from rubber trees b) Cotton fibre
c) Juit fibre d) Latex from banyan tree

2) The Cellulose contains _____ unit in it.
a) Glucose b) Propene
c) Lactose d) Ethene

3) Cellulose acetate is widely used in the production of _____.
a) Synthetic fibre b) Film coatings
c) Biodegradable plastics d) All of these

4) _____type of liquid crystal phase is commonly observed in liquid crystal polymers.
a) Nematic b) Smectic
c) Cholesteric d) All of these

5) _____ polymer blend has two glass transition temperatures.
a) Miscible b) Soluble
c) Immiscible d) Insoluble

6) _____ is the primary characteristic of optoelectronic polymers.
a) High electrical conductivity
b) Electrical insulation properties
c) Conductivity and light interaction
d) Magnetic properties

7) The ability of hydrogels to release drugs over time is an example of ____.
a) Osmotic pressure b) Controlled drug delivery
c) Hydrolysis d) Adsorption

8) _____is a key component of tissue engineering.
a) Cells b) Scaffold materials
c) Signaling molecules d) All of these

9) _____is the primary method used for polymer waste management.
a) Landfilling b) Recycling
c) Incineration d) Composting

10) Butyl rubber is prepared by _____ polymerization technique.
a) solution b) emulsion
c) suspension d) all of these

B) Fill in the blanks. **06**

1) Cellulose acetate is _____ derivative of cellulose.
2) The polymers that decompose naturally by microorganisms are called as _____.
3) In Natural rubber, the primary chemical component is _____.
4) Polymer like _____is employed in artificial kidney.
5) The water absorbance capacity of hydrogel is due to the presence of _____ groups.
6) The physical mixture of two or more polymers is known as _____.

Q.2 Write short notes on. **16**

a) Conducting polymers.
b) Silicone resins.
c) Blowing agents and lubricants with an example.
d) Waste management system of polymers.

Q.3 Answer the following. **16**

a) Define Hydrogel and describe the stimuli sensitive hydrogel.
b) What is Cellulose modification? Give in detail about the esterification mechanism of cellulose.

Q.4 Answer the following. **16**

a) Explain in detail polymer composites and give its applications.
b) Explain various reactions involved in the modification of Polystyrene.

Q.5 Answer the following. **16**

a) Describe the importance of polymer nano-particles and processing.
b) Explain solid phase synthesis of polypeptides.

Q.6 Answer the following. **16**

a) Define Liquid crystal polymers. Give its types and applications.
b) Give the various types of additives used in rubber and explain their role.

Q.7 Answer the following. **16**

a) Describe the modification of Natural rubber by chlorination and epoxidation process.

b) What is additive? Explain the flame retardant polymers.

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Seat No.	

Set P

M.Sc. Polymer Chemistry (Semester - IV) (New/Old) (CBCS) Examination: March/April - 2025
Processing Technology and Polymer Properties (MSC05408)

Day & Date: Thursday, 22-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Questions 1 and 2 are compulsory.
2) attempt any three from Q. No. 3 to Q. No. 7.
3) Figure to the right indicates full marks.

Q.1 A) Multiple choice questions: **10**

1) Polymers are normally electrical insulators because it posses _____.
a) Completely filled valance bonds and empty conduction bonds
b) Incompletely filled valance bonds and full field conduction bonds
c) Completely filled valance bonds and full field conduction bonds
d) All of the above

2) Polymers have photo elastic properties due to _____.
a) Insulation b) Optical activity
c) Elasticity d) Polarization

3) The yellowness index is measure of colour change _____.
a) White to yellow b) White to white
c) White to Brown d) White to Black

4) Conducting and Optical polymers are used in _____.
a) Biosensor b) Batteries
c) Photovoltaic cell d) All of the above

5) The Chlorine smell, pungent smell occurs during burning test for _____.
a) PVC b) PP
c) ABS d) PE

6) Lubricating oil's smell occurs during burning test for _____.
a) PVC b) PP
c) ABS d) PE

7) The laminated products are used for _____.
a) aerospace b) building
c) automotive d) All of the above

8) Parison is used in _____.

a) Blow molding b) Thermoforming
c) Twin screw extrusion d) Calendaring molding

9) Spinning is the process of converting textile fibers and filaments into _____.

a) Yarn b) Polyester cloth
c) Cloth d) Silk cloth

10) _____ is Ideal fluid.

a) Water b) Kerosene
c) Methanol d) Both a and b

B) State true/false OR Fill in the blanks. **06**

1) Bottles are the _____ molding products.
2) _____ molding is used to manufacture products like drain pipes, waste pipes, vent pipes etc.
3) Male and Female mold parts are used in _____.
4) Maxwell model gives information about visco-elasticity
5) Ideal fluid obeys Newton's Law so it is called Newtonian fluid or Ideal fluid
6) The isotactic and syndiotactic polymer are the less crystalline polymers

Q.2 Answer the following: **16**

a) Explain water absorption in brief
b) Explain the testing procedure for container and pipes
c) Explain transfer molding process with neat labeled diagram
d) Define and explain the Acid value and Softening point

Q.3 Answer the following:

a) Enlist and describe the factors affecting on mechanical spectra of polymers **08**
b) Describe the structural relationship of elastomers, fiber and plastics **08**

Q.4 Answer the following:

a) Write a detailed note on the Non Newtonian fluid **08**
b) Explain in detail the process of thermo forming with the help of suitable diagram **08**

Q.5 Answer the following:

a) Explain various rheological aspects in polymer Processing **08**
b) What is mean by stress-relaxation in viscoelastic polymer? Describe in detail. **08**

Q.6 Answer the following:

a)	Discuss in detail the general behaviors of polymer melts	**08**
b)	Explain in depth the compression molding process with suitable diagram	**08**

Q.7 Answer the following:

a)	Explain dielectric strength and dielectric loss factor of polymers	**08**
b)	Draw net labeled diagram and explain in detail injection mold process	**08**

Seat No.	

Set P

M.Sc. Physical Chemistry (Semester - III) (New) (NEP CBCS)
Examination: March/April - 2025
Quantum Chemistry (2302301)

Day & Date: Thursday, 15-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of log table/calculator is allowed.

Q.1 A) Choose the correct alternative. **08**

1) Hamiltonian operator for simple harmonic oscillator, H=_____
a) $p^2/2m$ b) $1/2\ kx^2$
c) $p^2/2m + 1/2\ kx^2$ d) $1/2\ kx$

2) The characteristics properties of waves are _____
a) Reflection b) Refraction
c) Interference d) All of these

3) $\int \Psi i \Psi j = 1$,if ___
a) i = j b) $i \neq j$
c) i = 0 d) j = 0

4) The splitting of the atomic orbitals in a magnetic field. This effect is referred as _____
a) Stark effect b) Zeeman effect
c) Compton effect d) Photoelectric effect

5) The zero point energy of a particle in three-dimensional box is _____
a) $1h^2/8mL^2$ b) $2h^2/8mL^2$
c) $3h^2/8mL^2$ d) $½\ h^2/8mL^2$

6) In photoelectric effect, electrons should be removed from the _____
a) inner shells b) surface
c) from core d) the nucleus

7) The energy levels of butadiene are $\alpha + 2\beta$ and $\alpha + \beta$. The delocalization energy in butadiene is _____
a) 0 b) $1.12\ \beta$
c) $4.47\ \beta$ d) $0.47\ \beta$

8) The degeneracy of an excited state of a particle in three-dimensional cubical box with energy 2 times its ground slate is ___

a) 3 b) 2
c) 1 d) 4

B) Fill in the blanks OR Write true/false. **04**

1) The Rayleigh Jean's equation obeys at higher wavelength only. [True / False]
2) The overlap integrals in Huckel molecular orbital theory is always taken as unity. [True / False]
3) According to Stefan-Boltzmann law, the total energy emitted by the black body is proportional to _____
4) The condition for orthogonality is _____

Q.2 Answer the following question (Any Six) **12**

a) Sketch Ψ and Ψ^2 for the states n=3 of a particle in one dimensional box.
b) Evaluate the commutator [x, d/dx],
c) State Heisenberg's uncertainty principle.
d) Give basic assumptions of Bohr's atomic theory.
e) Show that the function, $\Psi = \sin 2x$, is an eigen function of d^2/dx^2 operator?
f) What is ultraviolet catastrophe?
g) Write on basic postulates of quantum mechanics.
h) Represent Laplacian operator in terms of spherical coordinates.

Q.3 Answer the following question (Any Three) **12**

a) Using Huckel Molecular Orbital approach, evaluate the molecular orbital coefficients for wave functions of ethylene molecule.
b) Show that a trial function that depends linearly on the variational parameters leads to a secular determinant
c) Find out the normalization constant, N, for a wave function, $\Psi = N \sin (n\pi/a)\, x$, if $0 < x < a$
d) Estimate the wavelength of a particle having mass 160 g moving with 150 km/hr, compare this with the wavelength of an electron having mass 9.11×10^{-31} kg and velocity 3×10^6 m/s.

Q.4 Answer the following question (Any Two) **12**

a) What is Compton effect? Derive the expression for Compton shift.
b) Estimate the average values for $< x >$ and $< x^2 >$ for a particle in one dimensional box.
c) Derive the expression for momentum (p) and total energy operator (H).

Q.5 Answer the following question (Any Two) **12**

a) Describe quantum mechanical approach of photoelectric effect.

b) Solve the radial part of the Schrodinger equation for hydrogen atom. Give its solution

c) Discuss probability functions and plots for hydrogenic atoms.

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Seat No.

Set P

M.Sc. Physical Chemistry (Semester - III) (New) (NEP CBCS) Examination: March/April - 2025
Electrochemistry and Chemical Kinetics (2302302)

Day & Date: Saturday, 17-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of log table/calculator is allowed.

Q.1 A) Choose the correct alternatives from the given alternatives. 08

1) An increase in equivalent conductance of an electrolyte using high voltage was observed by the scientist ____
a) Debye b) Falkenhagen
c) Wien d) Onsager

2) The role of catalyst in a chemical reaction is to change the ____
a) equilibrium constant b) activation energy
c) Arrhenius factor d) all of these

3) Conductance of an electrolytic solution is proportional to ____
a) Dilution b) current density
c) mobility of ions d) volume of the solution

4) Arrhenius equation may be written as ____
a) $d \ln k / dt = E_a / RT$ b) $d \ln k / dt = E_a / RT^2$
c) $d \ln k/dt = -E_a / RT$ d) $d \ln k/dt = - E_a / RT^2$

5) ____ electrolyte is used in natural gas and CO-Air fuel cell.
a) molten nitrate with Mg b) molten sulphate with Mg
c) molten carbonate with Mg d) both (a) and (b)

6) In the Lindeman mechanism of unimolecular reaction, the observed order at low concentration is ____
a) 0.5 b) 1
c) 1.5 d) 2

7) The thickness of ionic atmosphere ____with increase of concentration and valency of ion.
a) Decreases b) Increases
c) remains constant d) both (b) and (c)

8) According to transition state theory one of the vibrations in the activated complex is a loose vibration. The partition function for this loose vibration is equal to (k_B Boltzmann's constant & h plank's constant) ____

a) k_B T/h
b) $h\nu / k_B T$
c) $k_B T$
d) $k_B T / h\nu$

B) Fill in the blanks OR write true/false: **04**

a) The relation between over voltage and current density ($\omega = a + b \log I$) was derived by the scientist ____
b) The order and molecularity of a chemical reaction are always equal. [True/False]
c) The mobility of an ion decreases due to electrophoretic force. (True or False)
d) Pourbaix diagram is the plot of ____

Q.2 Answer the following: (Any Six) **12**

a) State Faraday's second law of electrolysis.
b) Mention different methods of determination of heats of hydration.
c) What is autocatalysis? Give one example.
d) Define activated complex involved in chemical reaction.
e) State Debye-Falkenhagen effect?
f) What is electrical double layer?
g) Mention different activation parameters of a chemical reaction.
h) Mention any two limitations of collision theory.

Q.3 Answer the following: (Any Three) **12**

a) Explain the factors which affects corrosion.
b) Write a note on time of relaxation and electrophoretic effect.
c) Discuss characteristics of enzyme catalyzed reaction.
d) Calculate the thickness of ionic atmosphere for 1:1 electrolyte in water (D = 78.6) at 0.001 moles at 25°C and comment on the result.

Q.4 Answer the following (Any Two). **12**

a) Describe relaxation techniques used in study of fast reaction kinetics.
b) Discuss any one theory of electrical double layer.
c) Mention different methods of determination of heats of hydration. Discuss Van Arkel method in detail.

Q.5 Answer the following (Any Two). **12**

a) Illustrate Lindemann's mechanism for unimolecular reactions.
b) Derive Debye-Huckel-Onsager equation.
c) Discuss general acid-base catalysis.

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Set P

M.Sc. Physical Chemistry (Semester - III) (New) (NEP CBCS) Examination: March/April - 2025
Solid State Chemistry (2302306)

Day & Date: Monday, 19-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. 08

1) For which property of solid materials, BET instrument is used _____.
   a) density b) surface area
   c) absorbance d) conductivity

2) As per the principle of zone refining, in which state the impurities of ore in metal are more soluble.
   a) the melt b) Impurities
   c) solid state d) All of these

3) Glass is a _____.
   a) Microcrystalline solid b) Supercooled liquid
   c) Gel type material d) Polymeric mixture

4) The axial relationship of a tetragonal crystal system is given as _____.
   a) $a = b = c$ b) $a = b \neq c$
   c) $a \neq b = c$ d) $a \neq b \neq c$

5) The purpose of seed to use in single crystal growth is _____.
   a) nucleation centre b) catalyst
   c) promotes growth d) none

6) From the theory of solid-state reactions, it is assumed that the mobility of the _____ ions is less.
   a) cationic b) anionic
   c) both d) none of them

7) Which of the following exists as covalent crystal in the solid state?
   a) Sulphur b) Phosphorous
   c) Iodine d) Silicon

8) As the temperature increases, conductivity of metal _____.
   a) increases
   b) decreases
   c) no change
   d) first increases and decreases afterwards

B) State True or False. **04**

1) As the size of semiconductor nanoparticles increases bandgap decreases. [True/False]
2) Zone refining method is used to purify the liquids. [True/False]
3) Silicon has the resistivity in the range of 10^{J} Ohm.m [True/False]
4) Reduced pollution, low costs, and simplicity in process and handling are applicable lor sold slate reactions. [True/False]

Q.2 Answer the following. (Any Six) **12**

a) Give the typical wavelength range of X-ray.
b) Represent Bragg's X-ray diffraction equation.
c) What is Kirkendall effect?
d) What is sol-gel process for the preparation of nanomaterials
e) Define miller indices.
f) What is structure sensitive reactions?
g) Mention the factors affecting the reactivity of solid-state reactions
h) Represent suitable phase transition solid state reaction.

Q.3 Answer the following. (Any Three) **12**

a) Give the comparison between bulk and nanomaterial properties like surface area, bandgap, and electrical conductivity.
b) Give the classification of crystalline solids and discuss each type with suitable example.
c) Discuss crystal structure and Bravais lattices of respective systems.
d) What is arrested precipitation? Describe the method in details with a suitable example.

Q.4 Answer the following. (Any Two) **12**

a) Give a brief account on solid state decomposition reactions.
b) Discuss the reactions with reference to material transport and kinetics of solid-state reactions.
c) Draw and discuss the schematic of Transmission Electron Microscopy used for the determination of size of nanoparticles.

Q.5 Answer the following. (Any Two) **12**

a) Discuss the purification methods of crystallization and zone refining for semiconductor.
b) Draw the schematic used for single crystals from melt and discuss with a suitable example.
c) Discuss the hydrothermal method to prepare the semiconductor nanomaterial with its advantages and disadvantages.

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Set | P

M.Sc. Physical Chemistry (Semester - III) (New) (NEP CBCS) Examination: March/April - 2025
Biophysical Chemistry (2302307)

Day & Date: Monday, 19-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **08**

1) Which of the following types of molecules are the major structural components of the cell membrane?
a) nucleic acids and proteins b) phospholipids and proteins
c) starch and glycoproteins d) sterols and cellulose

2) Which of the following is an aromatic amino acid?
a) Glutamate b) Phenylalanine
c) Aspartate d) Leucine

3) The double helix structure of DNA was proposed by _____.
a) Watson and Crick b) Fredrick Sanger
c) Carl Newberg d) Richard Fynmann

4) Polyelectrolytes that bear both cationic and anionic repeat groups are called _____.
a) polyacryls b) polyzwitterions
c) neuralytes d) polyampholytes

5) The muscle contraction is regulated by the concentration of _____ ions.
a) calcium b) magnesium
c) chlorine d) sodium

6) There is an increase in _____ due to the hydrophobic hydration effect.
a) density b) volume
c) heat capacity d) mass

7) The _____ cells are responsible for the vision of color and bright light.
a) rod b) sphere
c) cone d) prism

8) The light dependent reactions of photosynthesis occur in the _____ of chloroplast.
   a) Thalakoids b) Grana
   c) Outer membrane d) Stroma

B) Write True or False. **04**

1) The site of transmission of nerve impulse is known as synapse.
2) Amino acids have two pKa values.
3) Photosystem II can absorb the light wavelength of 700 nm during photosynthesis.
4) During osmosis, the water molecules move from high to low concentration of solute.

Q.2 Answer the following. (Any Six) **12**

a) What is the biological role of elastic proteins?
b) What is biological importance of electrolytes?
c) What is a mechanochemical system. Give an example.
d) Give two examples of biopolymers.
e) Explain the concept of magnetic optical activity.
f) Give two examples of biochemical processes.
g) What are structural properties of proteins?
h) How the equilibrium is maintained across biological membranes?

Q.3 Answer the following. (Any Three) **12**

a) Explain the concept chirality of biomolecules.
b) Explain the properties of amino acids.
c) Differentiate between hydrophobic hydration and interaction.
d) Write a note on biomechanics.

Q.4 Answer the following. (Any Two) **12**

a) Describe the mechanism of muscle contraction and relaxation.
b) Write an account on photobiological mechanism of vision.
c) Write an account on conduction of a nerve impulse.

Q.5 Answer the following. (Any Two) **12**

a) Write an account on luminescence spectroscopy.
b) Describe X ray diffraction technique for study of biopolymers.
c) Write an account on biopolymers and their applications.

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Set P

M.Sc. Physical Chemistry (Semester - III) (New) (NEP CBCS) Examination: March/April - 2025
Radiation and Photochemistry (2302308)

Day & Date: Monday, 19-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **08**

1) Which type of light is most commonly used in photochemistry?
   a) Ultraviolet (UV) light b) Microwave
   c) Infrared (IR) light d) X-rays

2) Which laser characteristic is responsible for its high intensity?
   a) Monochromaticity b) Coherence
   c) High power output d) Directionality

3) What is the role of photosensitizers in photochemistry?
   a) To absorb light energy and initiate reactions
   b) To stabilize excited states and prevent reactions
   c) To catalyze reactions and increase efficiency
   d) To inhibit reactions and reduce yields

4) _____ laser is commonly used in CD and DVD players.
   a) Semiconductor b) Carbon dioxide
   c) Nd:YAG d) Helium-neon

5) Which type of radiation is most commonly used for cancer treatment?
   a) Alpha particles b) Beta particles
   c) Gamma rays d) X-rays

6) What is the primary process that occurs during photochemical reactions?
   a) Ionization b) Excitation
   c) Free radical formation d) Molecular fragmentation

7) What is the difference between radiolysis and radiation-induced polymerization?
   a) Radiolysis involves bond breakage, radiation-induced polymerization involves bond formation
   b) Radiolysis involves bond formation, radiation-induced polymerization involves bond breakage
   c) Radiolysis involves ionization, radiation-induced polymerization involves excitation
   d) Radiolysis involves excitation, radiation-induced polymerization involves ionization

8) _____ is the principle behind laser operation according to quantum mechanics.
   a) Spontaneous emission b) Absorption
   c) Reflection d) Stimulated emission

B) Fill in the blank OR Write true/false **04**

1) X-ray irradiation can cause photochemical changes. [True/False]
2) The full form of laser is _____.
3) The typical lifetime for phosphorescence is _____.
4) Radiofrequency radiations are the most energetic radiations. [True/False]

Q.2 Answer the following. (Any Six) **12**

a) Describe the radiation spectrum, including types and energy ranges.
b) What is the difference between type I and type II photochemical reactions?
c) Give the relationship between frequency and wavelength of radiation.
d) Define quantum yield and its significance in photochemistry.
e) Represent Barton reaction.
f) Mention different possible radiative transitions occurred after photoexcitation.
g) What is the difference between fluorescence and phosphorescence?
h) What is laser? Name any two common industrial lasers.

Q.3 Answer the following. (Any Three) **12**

a) Describe the Jablonski diagram and its significance in photochemistry.
b) With the help of energy level diagram, explain helium-neon laser. Mention its applications.
c) Write a note on flash photolysis.
d) Discuss the phenomenon, photochemical formation of smog.

Q.4 Answer the following. (Any Two) **12**

a) Explain how luminescence phenomena can be used for sensors and switches.
b) Explain the principles of fluorescence resonance energy transfer (FRET) and its applications.
c) Discuss characteristics of laser light.

Q.5 Answer the following. (Any Two) **12**

a) By taking a suitable case study, explain laser as a photochemical tool.

b) Explain Photo-Fries reaction of anilides.

c) Discuss various properties of excited states.

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Set P

M.Sc. Physical Chemistry (Semester - III) (Old) (CBCS) Examination: March/April - 2025
Quantum Chemistry (MSC11301)

Day & Date: Thursday, 15-May-2025 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No.3 to Q. No. 7
3) Figures to right indicate full marks.

Q.1 A) Multiple choice questions. **10**

1) Which of these physicists assigned a wave function to all quantum objects?
a) Planck b) de Broglie
c) Einstein d) Schrodinger

2) The uncertainty principle applies to _____.
a) energy and momentum b) velocity and position
c) momentum and position d) energy and position

3) The zero point energy of simple harmonic oscillator is _____.
a) 0 hν b) ∞ hν
c) $1/2$ hν d) hν

4) Quantum mechanics describes the motion of objects _____.
a) moving at high speed b) everyday objects
c) of macroscopic sizes d) in strong gravitational fields

5) When two waves strengthen each other, we are talking about _____.
a) destructive interference b) destructive diffraction
c) constructive interference d) constructive diffraction

6) _____ is the eigen function of d^2/dx^2 operator.
a) $\sin x$ b) $\cos x$
c) e^x d) all of these

7) The atomic orbital not allowed in quantum theory is _____.
a) 4p b) 5g
c) 3f d) 4d

8) Which of the following wave function is an eigen function of an operator d/dx?
a) $\Psi = x$ b) $\Psi = e^{-x}$
c) $\Psi = \sin x$ d) $\Psi =$ all of these

9) The limits for Cartesian coordinates are _____.
a) $-\infty$ to $+\infty$ b) 0 to ∞
c) 0 to r d) $-r$ to r

10) $\hat{A}\Psi = \lambda\Psi$, In this expression λ represents, _____.
a) eigen function b) eigen value
c) arbitrary constant d) all of the above

B) Fill in the blanks OR write true/false **06**

1) One can use Newtons laws of motion to the subatomic particles. [True / False]
2) The wavelength of an electromagnetic radiation is related with its frequency by the relation _____.
3) The del (∇) operator is expressed as _____.
4) Wein's displacement law is mathematically expressed as _____.
5) The overlap integrals in Hückel molecular orbital theory is always taken as zero. [True / False]
6) The Bohr atomic model can explain Zeeman and Stark effect. [True / False]

Q.2 Answer the following. **16**

a) Write down the expression for $[x.d/dx]^2$ and $[d/dx.\ x]^2$
b) Give the physical interpretation of Ψ and Ψ^2 for quantum mechanical harmonic oscillator.
c) For a particle in a three-dimensional box having dimensions, $a_x = 3 \times 10^{-15}\ m$, $a_y = 4 \times 10^{-15}\ m$ and $a_z = 5 \times 10^{-15} m$, calculate its ground state energy.
d) X-ray having wavelength 0.85 nm is scattered by block of carbon. The wavelength of scattered radiation is 0.9 nm. Estimate the angle of scattering.

Q.3 Answer the following.

a) Using Hükel Molecular Orbital Theory, evaluate the MO coefficients for wave functions of allyl molecule. **08**
b) Derive the expressions for momentum (p) and total energy operator (H). **08**

Q.4 Answer the following.

a) Describe the variation method for the calculation average energy of molecules. **08**
b) Construct secular determinant for cyclobutadiene and solve for its polynomial equation. Using its roots, list the different energy levels. **08**

Q.5 Answer the following.

a) Derive for Schrodinger equation for particle in three-dimensional cubical box. **08**
b) Describe quantum mechanical approach of photoelectric effect. **08**

Q.6 Answer the following.

a) Discuss Slater and Gaussian type of orbitals. **08**

b) Discuss in detail the radial plots for hydrogen atom. **08**

Q.7 Answer the following.

a) Using method of separation of variables break up the Schrodinger wave equation for rigid rotator into ordinary angular equations. **08**

b) Discuss Planck's quantum mechanical treatment for black body radiation distribution. **08**

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Seat No.

Set P

M.Sc. Physical Chemistry (Semester - III) (Old) (CBCS) Examination: March/April - 2025
Electrochemistry (MSC11302)

Day & Date: Saturday, 17-May-2025 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory.
2) attempt any three questions from Q. No.3 to Q. No. 7.
3) Figure to right indicates full marks.

Q.1 A) Choose the Correct alternative: **10**

1) Streaming potential method is used to measure the ____
a) zeta potential b) single electrode potential
c) discharge potential d) both (b) and (c)

2) A compact source of power is called ____.
a) fuel cell b) electrolytic cell
c) photo cell d) Barierlayer cell

3) Which of the following electrolytes will give same value of molar conductance and equivalent conductance?
a) NaCl b) Na_2SO_4
c) H_2SO_4 d) $MgCl_2$

4) According to coulombs law forces acting between positive and negative ions present in solutions is by the equation F= ____
a) $\in_{1.} \in_2 / D.r^2$ b) $\in_{1.} + \in_2 / D.r^2$
c) $\in_{1.} - \in_2 / D.r^2$ d) $D.r^2 / \in_{1.} . \in_2$

5) Abnormal ionic conductance of hydroxyl ion in hydroxylic solvents particularly in water is abnormally high. This can be explained by ____ conduction theory.
a) Kohlrausch b) Grotthus
c) Lambert's d) Onsager

6) The concept of association of ions to form ion pairs was introduced by the scientist ____
a) Bjerrum b) Grotthus
c) Falkenhagen d) Onsager

7) The difference between the observed decomposition potential and theoretical decomposition potential is ____
a) Electrolysis b) Electroforming
c) Polarization d) Oxidation

8) The ideal efficiency of fuel cell is given by ____

a) ΔG/ Δ H b) ΔH / Δ G

c) Δ S / Δ H d) ΔG / Δ S

9) The equation used for estimating the electrostatic component of Gibbs free energy Of salvation of an ion is ____

a) Gibbs free energy equation b) Born equation

c) Arrhenius equation d) All of these

10) The thickness of ionic atmosphere ____ with increase of concentration and valancy of ion.

a) decreases b) increases

c) remains constant d) both (b) and (c)

B) Fill in the blanks OR write true/false: **06**

1) The electrocapillary curve is a plot of ____Vs ____.
2) The basis of electroplating process is electrolysis. [True/False]
3) The dispersion of conductance at high frequency is called as ____ effect.
4) The activity of a pure gas is always taken as infinity. [True/False]
5) Hydration energy of an ion ____ on the size of the ion. [increases/decreases]
6) The movement of liquid through the pores of a diaphragm under the influence of an applied E.M.F. The phenomenon is known as ____

Q.2 Answer the following. **16**

a) Explain the construction and working of Lippmann capillary electrometer.

b) Calculate the thickness of ionic atmosphere for 1:1 electrolyte in water (D = 78.6) at 0.001 moles at 25°C and comment on the result.

c) What is heats of hydration? Mention different methods of its determination. Explain any one method.

d) What are fuel cells? Describe the functioning of hydrocarbon-oxygen fuel cell.

Q.3 Answer the following. **16**

a) Write a note on Derive Debye- Huckel - Onsager equation.

b) What are the experimental proofs for Debye- Huckel theory? Explain how they support the ionic atmosphere formation.

Q.4 Attempt the following: **16**

a) Derive Debye-Huckel limiting law.

b) Explain the mechanism of abnormal ionic conductance's of H^+ and OH^- ions.

Q.5 Attempt the following: **16**

a) Derive Butler-Volmer equation for an electrode reaction. Give its applications

b) What are electro-kinetic effects? Explain Electro-osmosis.

Q.6 Answer the following: **16**

a) Describe the role of electrolysis in electrometallurgy.

b) Discuss the importance's of diffusion overpotential.

Q.7 Answer the following: **16**

a) Discuss the application of overvoltage in electrodeposition and corrosion of metals.

b) Calculate reversible decomposition potential of 0.5 n $AgNo_3$ {Given a (AgΔ) =
0.396, $E°(Ag / Ag^{+}) = 0.799$ V and $E° (OH / O^{2}) = - 0.403$ V }

SLR-ZF-72

Seat No.		Set	P

M.Sc. Physical Chemistry (Semester - III) (Old) (CBCS) Examination: March/April – 2025
Molecular Structure - I (MSC11306)

Day & Date: Monday, 19-May-2025 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to 7.
3) Figures to the right indicate full marks.

Q.1 A) Select the correct alternative. **10**

1) Which of the following molecules is an example of C_s point group?
   a) HCl b) CO_2
   c) CH_2BrCl d) $CHCl_3$

2) Phosphorus pentachloride, PCI5 is a trigonal bipyramidal molecule. To what point group does it belong?
   a) D_{3v} b) D_{3h}
   c) C_{3h} d) C_3

3) Which of the following transitions mainly occur in IR?
   a) Electronic transitions only
   b) Rotational and vibrational transitions
   c) Rotational transitions only
   d) All the electronic, rotational, vibrational transitions

4) The different types of energies associated with a molecule are _____.
   a) vibrational energy b) electronic energy
   c) rotational energy d) All of these

5) Beer Lambert's law gives the relation between which of the following?
   a) Reflected radiation and concentration
   b) scattered radiation and concentration
   c) Energy absorption and reflected radiation
   d) Energy absorption and concentration

6) Raman frequencies are generally identical with _____ vibrational frequencies.
   a) Ultra violet b) Infrared
   c) Visible d) Microwave

7) Birge-Sponer extrapolation is used to determine _____ energy of molecule.
   a) Predissociation b) Dissociation
   c) Transition d) infinite

8) Which of the following is an application of electronic spectroscopy?
   a) Detection of impurities
   b) Control of purification
   c) Study of kinetics of the chemical reaction
   d) All of the above

9) Which of the following transitions mainly occur in IR?
   a) Electronic transitions only
   b) Rotational and vibrational transitions
   c) Rotational transitions only
   d) All the electronic, rotational, vibrational transitions

10) The correct order of different types of energies is _____.
   a) Eel>>Evib>>Erot>>Etr b) Eel>>Erot>>Evib>>Etr
   c) Eel>>Evib>>Etr>>Erot d) Etr>>Evib>>Erot>>Eel

B) Fill in the blanks State or whether true or false. **06**

1) Write down the point group for the following molecules.
   i) PCl_5
   ii) PCl_3
2) NH_3 can be considered as _____Rotor.
3) The energy of the lowest vibrational level of oscillator is called as _____ Energy.
4) In Fortrat diagram, the band head is at the _____ of parabola.
5) Birge-Sponer extrapolation is used to determine _____ energy of molecule.
6) According to Franck-Condon principle vibrating molecule does not change its _____ during electronic transition.

Q.2 Answer the following. **16**

a) What is point groups? Illustrate with examples.
b) Write note on: The effect of isotopic substitution on rotational spectra.
c) Write note on: Overtone and combination frequencies.
d) Write note on: term symbols

Q.3 Answer the following.

a) Explain the terms: **06**
   1) Axis of rotation
   2) Plane of symmetry
   3) Centre of symmetry

b) Define electromagnetic spectrum? Explain the characteristics of electromagnetic radiation. **10**

Q.4 Answer the following.

a) Describe rotational fine structure of Raman spectra in general. **06**
b) Write notes on: **10**
   1) Birje-Sponer extrapolation
   2) The Fortrat diagram

Q.5 Answer the following. **16**

a) What is the significance of zero-point energy? Obtain an expression for zero point energy of an anharmonic oscillator.

b) Describe in brief rotational fine structure of electronic-vibration transitions.

Q.6 Answer the following.

a) Give an account of microwave spectra of linear molecules. **06**

b) Discuss the theory of pure rotational Raman spectra of linear molecule. Sketch the energy levels and the spectrum arising from transition between them. **10**

Q.7 Answer the following.

a) Describe the effect of breakdown of Born-Oppenheimer approximation on P and R branches of the IR spectrum of a diatomic molecule. **06**

b) Explain the constructions of character table for point groups from Great Orthogonality Theorem. **10**

Seat No.	

Set P

M.Sc. Physical Chemistry (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2025
Statistical Mechanics and Irreversible Thermodynamics (2302401)

Day & Date: Wednesday, 14-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Select the correct alternative. **08**

1) For an atom, the term is $^3P_1$, the Q_{ele} will be _____.
a) 1 b) 3
c) 4 d) 6

2) Which of the following element has lowest specific heat?
a) Si b) Au
c) Cu d) C

3) What is entropy generation?
a) increase in the entropy of a system due to internal irreversibility
b) decrease in the entropy of a system due to internal irreversibility
c) no change in entropy of a system
d) All of the above

4) The degeneracy of translational energy levels is _____.
a) 1 b) 2
c) 3 d) 6

5) The unit of partition function is _____.
a) cm b) cm^{-1}
c) cm^2 d) unitless

6) At 0 K, the number of microstates possible are _____.
a) 0 b) 1
c) 6 d) ∞

7) The magnitude of the vibrational partition function is of the order of _____.
a) 10^2 to 10^4 b) 10 to 10^2
c) 1 to 10 d) 10^{30} to 10^{32}

8) In an open system, the transfer of ____ quantity is possible
a) mass b) energy
c) entropy d) all of the mentioned

B) Fill in the blanks OR Write True/False. **04**

1) All phase transformation processes are the constant pressure processes. [True/False]
2) As temperatures tends to zero, the heat capacity tends to _____.
3) N, V and T parameters remains the same in the grand canonical ensemble. [True/False]
4) The symmetry number of heteronuclear diatomic molecules is ____.

Q.2 Answer the following (Any Six) **12**

a) Give the names of any two Boson particles.
b) What is Euler's condition for exactness?
c) What is most probable configuration?
d) Define the electronic partition function.
e) Mention any two inexact differentials.
f) Give the features of micro-canonical ensembles.
g) State second law of thermodynamics. (any two statements)
h) Mention any two electrokinetic effects.

Q.3 Answer the following (Any Three) **12**

a) Discuss entropy production in an open and closed system.
b) Relate the partition function (Q) with thermodynamic properties, Gibbs and Helmholtz free energy.
c) Write on entropy change during various phase transformations.
d) Discuss in brief Debye theory for heat capacity of solids.

Q.4 Answer the following (Any Two) **12**

a) Deduce the expression for Fermi-Dirac statistics.
b) Derive the expression for rotational partition function. Estimate Q_{rot} for N_2 molecule. (Given $r_{N-N} = 1.09 \times 10^{-10}$ m)
c) If H= f(T,P) and dH is an exact differential then show that $(dH/dP)_T = V - T(dV/dT)_P$
[Given: dq = dH - VdP and 1/T is an integrating factor]

Q.5 Answer the following (Any Two) **12**

a) Write on entropy production in chemical reactions.
b) Name various electrokinetic effects? Write on Saxen's relations.
c) Show that $Q_{trans} = (2\pi mKT)^{3/2} / h^3.V$. Write down the equation for S_{trans}.

Seat No.		Set	P

M.Sc. Physical Chemistry (Semester - IV) (New) (NEP CBCS
Examination: March/April - 2025
Molecular Structure (2302402)

Day & Date: Friday, 16-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose the correct alternative. **08**

1) The main purpose of use of TMS (Tetramethylsilane) in NMR spectroscopy is _____.
a) To calibrate the chemical shift scale
b) To enhance the sensitivity of the NMR signal
c) To reduce the noise in the NMR signal
d) To increase the resolution of the NMR signal

2) The major difference between Stokes and anti-Stokes Raman scattering is _____.
a) Stokes scattering occurs at higher frequencies than anti-Stokes scattering
b) Stokes scattering occurs at lower frequencies than anti-Stokes scattering
c) Stokes scattering is more intense than anti-Stokes scattering
d) Anti-Stokes scattering is more intense than Stokes scattering

3) _____ is the prerequisite condition to exhibit a rotational spectrum.
a) A molecule with a permanent electric dipole moment
b) A molecule without a permanent electric dipole moment
c) A molecule with a large molecular weight
d) A molecule with a small molecular weight

4) What Is the order of a point group?
a) The number of symmetry operations in the group
b) The number of symmetry elements in the group
c) The number of atoms in the molecule
d) The number of bonds in the molecule

5) _____ is the purpose of the magnetic field in NMR spectroscopy.
a) To align the nuclear spins
b) To randomize the nuclear spins
c) To detect the signal
d) To amplify the signal

6) Which of the following species can be studied using ESR spectroscopy?
a) Free radicals
b) Transition metal ions
c) Molecules with unpaired electrons
d) All of the above

7) What is the definition of a group in group theory?
a) A set of elements with a single operation
b) A set of elements with multiple operations
c) A set of elements with a binary operation that satisfies certain properties
d) A set of elements without any operation

8) A vibrational mode is _____.
a) A specific way in which a molecule rotates
b) A specific way in which a molecule vibrates
c) A specific way in which a molecule translates
d) A specific way in which a molecule reacts

B) Fill in the blanks OR true/false. **04**

1) The fingerprint region (In terms of wave number) of an Infrared spectrum, which is characteristic for each individual compound is between _____.
2) The point group for methane molecule is _____.
3) The 'g' value for free electron is _____.
4) The number of peaks for methyl free radical in ESR spectrum will be _____.

Q.2 Answer the following. (Any six). **12**

a) What is the rigid rotor model in rotational spectroscopy?
b) What is Rayleigh scattering?
c) Mention various symmetry elements present in water molecule.
d) State Born-Oppenheimer approximation.
e) State the Beer-Lambert law.
f) State the rule of mutual exclusion.
g) Mention the factors which contribute to the intensity of the spectral lines.
h) What is point group? Mention it for NH_3 molecule.

Q.3 Answer the following. (Any Three) **12**

a) What are σ_v, σ_d and σ_h symmetry operations?
b) The ESR spectrum of methyl radical occurs at 330 mT in a spectrometer operating at 9250 MHz. Calculate the value of g. ($\beta = 9.2732 \times 10^{-24}\ JT^{-1}, h = 6.626 \times 10^{-34}\ Js$).
c) Illustrate the concept of Shielding and de-shielding in NMR spectra.
d) Write a note on isotope effect in rotational spectroscopy.

Q.4 Answer the following. (Any Two) **12**

a) Derive the expression for rotational energy of a diatomic rigid rotator.

b) Explain the classical theory of Raman effect.

c) Discuss Reducible and irreducible representations used in group theory.

Q.5 Answer the following. (Any Two) **12**

a) What are overtone and hot bands? What is the distance between atoms in a $^{1}H^{35}Cl$ molecule if the lines in rotation-vibration bands are separated by 2060 m^{-1}?

b) Draw the energy level diagram and find out allowed transitions of an electron coupled to a nucleus of spin I = 1
(by neglecting magnetic field-nuclear spin interaction).

c) Illustrate the spectrum of hydrogen atom.

Seat No.	

Set **P**

M.Sc. Physical Chemistry (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2025
Surface Chemistry (2302405)

Day & Date: Tuesday, 20-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Select the correct alternative. **08**

1) What is characteristic of Type I adsorption isotherms?
a) Multilayer formation b) Monolayer formation
c) No hysteresis d) Irreversible adsorption

2) Which of the following model describes contact angle behavior?
a) Young's equation b) Laplace's equation
c) Gibbs' equation d) Fick's law

3) What is the BET adsorption isotherm based on?
a) Multilayer adsorption b) Monolayer adsorption
c) Electrostatic interactions d) Hydrophobic interactions

4) Interfacial tension is the _____.
a) Force acting along the interface between two phases
b) Force acting perpendicular to the interface between two phases
c) Energy per unit area of an interface
d) Viscosity of an interface

5) The common application of emulsions in the pharmaceutical industry is _____.
a) Tablets b) Capsules
c) Topical creams d) Injectables

6) Reverse micelle can be defined as _____.
a) Aggregate of surfactant molecules in non-polar solvent
b) Aggregate of surfactant molecules in polar solvent
c) Colloidal particle
d) Emulsion droplet

7) Capillary rise experiments are preferred with _____ contact angle.
a) 0 b) single
c) double d) finite

8) What is the sign of the Gibbs free energy change (ΔG) for positive adsorption?

a) Positive b) Negative
c) Zero d) Depends on the system

B) State whether true or false OR Fill in the blanks. **04**

1) If volume ratio of water to oil is three or more an oil/water emulsion is more probable than water/oil emulsion", state whether this statement is true or false.
2) Rain drops are spherical in shape because of _____.
3) The work done in blowing a soap bubble of radius R is W_1 and that to a radius 3R is W2.The ratio of work done is the ratio of work done is _____.
4) The temperature at which micellization starts is called as _____.

Q.2 Answer the following (Any Six) **12**

a) What is gaseous monomolecular film.
b) State Herkins-Jura Equation.
c) State and explain Trube's rule.
d) Define cohesion and adhesion energy of the liquids interms of the surfacetension.
e) What is negative catalysis?
f) Point out the effect of temperature on detergent efficiency
g) Mercury on flat solid surface takes spherical shape, why?
h) What is the difference between surface tension and interfacial tension?

Q.3 Answer the following. (Any Three) **12**

a) Give a brief comment on the factors affecting adsorption.
b) Derive BET equation and explain its significance in determination of surface area of solids.
c) Discuss the tilting plate method of determination of contact angle
d) What are the factors affecting adsorption isotherm

Q.4 Answer the following. (Any Two) **12**

a) Deduce two dimensional ideal equation to describe physical states of monomolecular films of surfactant on liquid surfaces.
At 20°C and a surface pressure of 0.10 dynes per cm, lauric acid occupies an area of 3100 A^2 per molecule on a water surface. Assuming the film to be a two dimensional ideal gas, calculate the gas constant in ergs per degree per mole.
b) Describe Bartell method of determination of contact angle made by the liquid with the solid surface.
c) Derive BET equation and explain its significance in determination surface area of solids.

Q.5 Answer the following. (Any Two) **12**

a) Discuss theory and energetic of micellization.

b) Explain the term contact angle and its relation with the wetting of solid surface by the given liquid. Describe capillary rise method of determination of contact angle made by the liquid with the solid surface.

c) Derive Gibbs adsorption equation with usual notations

Seat No.		Set	P

M.Sc. Physical Chemistry (Semester - IV) (New/Old) (CBCS) Examination: March/April - 2025
Statistical Mechanics and Irreversible Thermodynamics (MSC11401)

Day & Date: Wednesday, 14-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Q.Nos.1 and 2 are compulsory.
2) Attempt any three questions from Q. No.3 to Q.No.7
3) Figures to the right indicate full marks.

Q.1 A) Multiple choice Questions: **10**

1) For an atom, the term is $^3S_0$, the Q_{ele} will be ____.
a) 1 b) 2
c) 6 d) 4

2) Which of the following element has lowest specific heat?
a) Si b) Au
c) Cu d) C

3) Among the following energy levels, which levels are very closely spaced?
a) Translational b) Rotational
c) Vibrational d) Electronic

4) In an open system, for maximum work, the process must be entirely
a) Irreversible b) Isothermal
c) Adiabatic d) Reversible

5) The unit of partition function is ____.
a) cm b) cm^{-1}
c) cm^2 d) unitless

6) Specific heat capacity of a substance is equal to ____
a) the amount of heat required to raise the temperature of 1 kg of substance by 1 K
b) the amount of heat required to raise the temperature of substance by 1 K
c) the amount of heat required to change the phase of substance from solid to liquid without any change in temperature
d) the amount of heat required to change the phase of substance from liquid to gas without any change in temperature

7) What is the ratio of para to ortho hydrogen at room temperature?
a) 25:75 b) 75:25
c) 50:50 d) 0:100

8) In an open system, there is a transfer of which of the following quantity?
a) Mass b) Energy
c) Entropy d) all of the mentioned

9) What is entropy generation?
a) increase in the entropy of a system due to internal irreversibility
b) decrease in the entropy of a system due to internal irreversibility
c) no change in entropy of a system
d) All of the above

10) Which of the following is a phenomenological law?
a) Snell's law b) Planck's law
c) Fourier's laW d) Stefan-Boltzmann law

B) Fill in the blanks OR Write True/False: **06**
a) All phase transformation processes are the constant pressure processes. [True/False]
b) The specific heat is highest for soft elements. [True/False]
c) As temperatures tends to zero, the heat capacity tends to ____.
d) The Debye characteristic temperature is expressed as ____.
e) μ, T and V parameters remain same in the grand canonical ensemble. [True/False]
f) The symmetry number of homo nuclear diatomic molecules is ____.

Q.2 Answer the following. **16**
a) Illustrate the concept of electron gas in metal.
b) What are exact and inexact differentials? Give examples of each.
c) Write on predominant configuration.
d) Give an account of an electronic partition function.

Q.3 Answer the following. **16**
a) Discuss entropy production in an open and closed system.
b) Define molecular partition function. Relate partition function with thermodynamic properties, entropy and Helmholtz free energy.

Q.4 Answer the following. **16**
a) Deduce the expression, $n_i/g_i = \exp(-\alpha + \beta\varepsilon_i) + 1$
b) Derive the expression for rotational partition function. Calculate Q_{rot} for N_2 molecule. (Given N-N = 1.09 x 10^{-10} m)

Q.5 Answer the following. **16**
a) Write on entropy production in chemical reactions.
b) Name various electrokinetic effects? Write on Saxen's relations.

Q.6 Answer the following. **16**

a) If H= f(T,P) and dH is an exact differential then show that $(dH/dP)_T = V - T(dV/dT)_P$.
[Given: dq = dH - VdP and 1/T is an integrating factor]

b) State second law of thermodynamics. Write on change in entropy during phase transformation.

Q.7 Answer the following. **16**

a) Show that $Q_{trans} = (2\pi mKT)^{3/2} / h^3.V$. Write down the equation for S_{trans}.

b) Discuss in brief Debye theory for heat capacity of solid.

Seat No.	

Set **P**

M.Sc. Physical Chemistry (Semester - IV) (New/Old) (CBCS)
Examination: March/April - 2025
Chemical Kinetics (MSC11402)

Day & Date: Friday, 16-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Q.Nos.1 and 2 are compulsory
2) Attempt any three questions from Q.No.3 to Q.No.7
3) Figures to the right indicate full marks.

Q.1 A) Choose the correct alternative. **10**

1) What is an optimum pH in an enzyme catalysed reaction?
   a) pH at which rate is maximum
   b) pH at which rate is minimum
   c) pH at which rate is zero
   d) pH at which rate is infinity

2) The role of catalyst in a chemical reaction is to change the ____.
   a) equilibrium constant
   b) activation energy
   c) Arrhenius factor
   d) all of these

3) What is the assumption of Transition State Theory regarding reactants?
   a) They are in equilibrium with the transition state
   b) They are not in equilibrium with the transition state
   c) They have zero kinetic energy
   d) They have infinite kinetic energy

4) How does collision cross-section affect reaction rate?
   a) Increases reaction rate
   b) Decreases reaction rate
   c) No effect on reaction rate
   d) Reverses reaction

5) What is the stopped-flow technique?
   a) Mixing reactants rapidly and measuring reaction rate
   b) Separating products rapidly after reaction
   c) Measuring reaction rate using spectroscopy
   d) Studying reaction equilibrium

6) Which theory describes enzyme-catalyzed reactions?
   a) Michaelis-Menten theory
   b) Collision theory
   c) Transition state theory
   d) Marcus theory

7) What is the transition state in a chemical reaction?
   a) The reactants
   b) The products
   c) The highest energy state
   d) The lowest energy state

8) What is the role of the transition state in reaction rate?
   a) It increases reaction rate
   b) It has no effect on reaction rate
   c) It determines the reaction rate
   d) It decreases reaction rate

9) _____ is the main assumption of collision theory?
   a) Molecules are stationary
   b) Molecules collide with each other
   c) Molecules have zero kinetic energy
   d) Reactions occur spontaneously

10) In the SSA, if 'I' is intermediate formed then.
   a) [I] = 0 b) d[I]/dt = 0
   c) All of these d) None of these

B) Fill in the blanks OR true/false. **06**

1) Order of a chemical reaction may be zero, half integral and integral. [True/False]
2) In a consecutive reaction the concentration _____ reaches, maximum and decreases during the reaction.
3) Activation energy of a catalyzed reaction is generally less than the uncatalyzed reaction. [True or false]
4) The collision number between two reactants _____ with the temperature.
5) The Lineweaver-Burk plot is _____ versus _____.
6) Acid catalyzed hydrolysis of an ester is an example of _____ order reaction.

Q.2 Answer the following. **16**

a) Comment on branched chain reactions.
b) Write on general characteristics of catalytic reactions.
c) Illustrate the effect of temperature on the rate of the chemical reactions.
d) Discuss in brief various factors determining effectiveness of collision.

Q.3 Answer the following.

a) Describe Lindemann theory of unimolecular reactions. **08**

b) What is meant by activation energy? Explain how this can be estimated with the help of Arrhenius equation. **08**

Q.4 Answer the following.

a) Explain in detail how activated complex theory helps in calculating $\Delta S^{\#}$ & $\Delta H^{\#}$. **08**

b) Illustrate the rate expression for second order reaction with equal initial concentration of reactants. Express $t_{1/2}$ for a reaction. **08**

Q.5 Answer the following.

a) Using steady state approximation, explain the kinetics of thermal decomposition of acetaldehyde. **08**

b) Explain how the maximum concentration of reaction intermediate can be determined in a sequential reaction. **08**

Q.6 Answer the following.

a) Explain the kinetics of parallel reactions. **08**

b) Using the plot of potential energy against bond distance and angle, describe the variation of potential energy with the bond distance and bond angle. **08**

Q.7 Answer the following.

a) Explain the effect of pH and temperature on enzyme catalyzed reactions. **08**

b) Illustrate potential energy surfaces. **08**

Seat No.	

Set P

M.Sc. Physical Chemistry (Semester - IV) (New/Old) (CBCS) Examination: March/April - 2025
Molecular Structure-II (MSC11403)

Day & Date: Tuesday, 20-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Q. No.1 and 2 are Compulsory.
2) Attempt any three questions from Q.No.3 to Q.No.7.
3) Figures to the right indicates full marks.

Q.1 A) Choose correct alternatives. **10**

1) Magnetic lines of force are attracted towards _____ substance.
   a) Diamagnetic b) Paramagnetic
   c) Gaseous d) Pure

2) The magnetic moment of material can be determined by knowing number of _____.
   a) Paired electrons b) Protons
   c) Unpaired electrons d) Neutrons

3) Compound A has greater shielding constant than compound B. Which of them will have more chemical shift?
   a) Compound A
   b) Compound B
   c) Both will have equal chemical shifts
   d) Chemical shift has no relation with shielding constants

4) The HCl molecules possesses _____ ionic character.
   a) 50% b) 27%
   c) 20% d) 17%

5) Which of the following is true?
   a) Diamagnetism is temperature dependent
   b) Paramagnetism is temperature dependent
   c) Paramagnetism is temperature independent
   d) None of these.

6) When a moving body emits radiation a stationary observer sees a shifted frequency; this is called _____.
   a) Compton effect b) The Doppler effect
   c) Zeeman effect d) Isomer effect

7) Chemical shifts originate from _____.
   a) Magnetic momentum b) Electron shielding
   c) Free induction decay d) Scalar coupling (J -coupling)

8) ESR spectroscopy is the study of interaction between _____.
   a) An external magnetic field and the unpaired electrons
   b) An external magnetic field and the nuclei
   c) An unpaired electron and the proton
   d) An electron and the proton

9) Which of the following solvent is not used in NMR?
   a) CCl4 b) D_2O
   c) $CHCl_3$ d) $CDCl_3$

10) Generally, the isomer shifts decreases with the _____.
   a) decrease in s-orbital electron density
   b) increase in s-orbital electron density
   c) decrease in p-orbital electron density
   d) increase in p-orbital electron density

B) Fill in the blanks. **06**

1) The temperature at which paramagnetic substance is converted in to ferromagnetic substance is called as _____ temperature.
2) The Mossbauer Spectroscopy uses _____ radiation.
3) ESR Spectroscopy uses _____ radiation.
4) If the relative permeability is less than one, then the substance is _____.
5) The splitting for $-CH_2$ group in proton NMR of CH_3CH_2OH will be observed as _____.
6) Langevin's theory for paramagnetism mainly focus on orientation of _____.

Q.2 Answer the following. **16**

a) Spin -spin relaxation.in NMR spectroscopy.
b) Zero field splitting in ESR.
c) Nuclear Overhauser effect.
d) Write note on Van Vleck general equation of magnetic susceptibility.

Q.3 Answer the following. **16**

a) Explain the terms magnetic permeability and magnetic susceptibility.
b) Distinguish between ^{1}H and ^{13}C NMR spectroscopy.

Q.4 Answer the following. **16**

a) Define diploe moment. Discuss vapour- temperature method for the determination of dipole moment.
b) Write note on
   i) Nuclear- Overhauser Effect.
   ii) double resonance in NMR.

Q.5 Answer the following. **16**

a) Describe Langevin's classical theory of diamagnetism and paramagnetism.

b) Discuss the various components of ESR spectrometer with schematic diagram.

Q.6 Answer the following. **16**

a) What is polar and non-polar molecules? Derive Clausius -Mossotti equation of molar polarization.

b) What are the advantages of TMS as internal standard reference in NMR study? A compound show PMR peak at 240 HZ downfield from TMS peak operating at 60 MH_Z. What is value of τ ?

Q.7 Answer the following. **16**

a) Describe polarizability of molecules by Clausius-Mossotti equation.

b) Discuss factors affecting chemical shift in NMR.

SLR-ZF-82

Seat No.	

Set P

M.Sc. Physical Chemistry (Semester - IV) (New/Old) (CBCS) Examination: March/April - 2025
Surface Chemistry (MSC11408)

Day & Date: Thursday, 22-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Questions 1 and 2 are compulsory.
2) attempt any three from Q. No. 3 to Q. No. 7.
3) Figure to the right indicates full marks.

Q.1 A) Multiple choice questions: **10**

1) What is characteristic of Type I adsorption isotherms?
a) Multilayer formation
b) Monolayer formation
c) No hysteresis
d) Irreversible adsorption

2) Which of the following model-describes contact angle behavior?
a) Young's equation b) Laplace's equation
c) Gibbs' equation d) Fick's law

3) What is the main difference between positive and negative adsorption?
a) Direction of adsorbate movement
b) Type of adsorbent used
c) Concentration of adsorbate
d) Temperature of adsorption

4) What is the BET adsorption isotherm based on?
a) Multilayer adsorption b) Monolayer adsorption
c) Electrostatic interactions d) Hydrophobic interactions

5) The common application of emulsions in the pharmaceutical industry is _____.
a) Tablets b) Capsules
c) Topical creams d) Injectables

6) Reverse micelle can be defined as _____.
a) Aggregate of surfactant molecules in non-polar solvent
b) Aggregate of surfactant molecules in polar solvent
c) Colloidal particle
d) Emulsion droplet

7) Capillary rise experiments are preferred with _____ contact angle.
a) 0 b) single
c) double d) finite

8) What is the sign of the Gibbs free energy change (AG) for positive adsorption?
a) Positive b) Negative
c) Zero d) Depends on the system

9) Interfacial tension is the _____.
a) Force acting along the interface between two phases
b) Force acting perpendicular to the interface between two phases
c) Energy per unit area of an interface
d) Viscosity of an interface

10) What is the difference between surface tension and interfacial tension?
a) Surface tension occurs at liquid-gas interface, while interfacial tension occurs at liquid-liquid interface
b) Surface tension occurs at solid-liquid interface, while interfacial tension occurs at liquid-gas interface
c) Surface tension is higher than interfacial tension
d) Interfacial tension is higher than surface tension

Q.1 B) Write true/false OR Fill in the blanks. **06**

1) If volume ratio of water to oil is three or more an oil/water emulsion is more probable than water/oil emulsion", state whether this statement is true or false.
2) The nanoparticles are _____ dimensional.
3) Ram drops are spherical in shape because of _____.
4) The work done in blowing a soap bubble of radius R is W1 and that to a radius 3R is W2. the ratio of work done is_____
5) According to Freundlich isotherm, $x/m = k P^z$, where z= _____.
6) The temperature at which micellization starts is called as _____.

Q.2 Answer the following: **16**

a) Explain gaseous monomolecular film.
b) Derive Herkins-Jura Equation.
c) State and explain Trube's rule.
d) Explain the terms cohesion and adhesion energy of the liquids in terms of the surface tension.

Q.3 Answer the following: **16**

a) Give a brief comment on the factors affecting adsorption.
b) Derive BET equation and explain its significance in determination surface area of solids.

Q.4 Answer the following: **16**

a) A) Deduce two dimensional ideal equation to describe physical states of monomolecular films of surfactant on liquid surfaces.

At 20°C and a surface pressure of 0.10 dynes per cm, lauric acid occupies an area of 3100 A^2 per molecule on a water surface. Assuming the film to be a two dimensional ideal gas. calculate the gas constant in ergs per degree per mole.

b) Describe Bartell method of determination of contact angle made by the liquid with the solid surface.

Q.5 Answer the following: **16**

a) Discuss theory and energetic of micellization.

b) Explain the term contact angle and its relation with the wetting of solid surface by the given liquid. Describe capillary rise method of determination of contact angle made by the liquid with the solid surface.

Q.6 Answer the following: **16**

a) Give an account of volumetric method of measuring gas adsorption.

b) Discuss reprecipitation method of preparation of aqueous suspension of organic nanoparticles.

Q.7 Answer the following: **16**

a) Derive an equation for Langmuir adsorption isotherm. Discuss experimental verification this equation for the given system of adsorbate and adsorbent.

b) Mention emulsion types and methods of identification of emulsion types.

Seat No.	

Set **P**

M.Sc. Analytical Chemistry (Semester - III) (New) (NEP CBCS)
Examination: March/April - 2025
Advance Separation Techniques (2304301)

Day & Date: Thursday, 15-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All Questions are compulsory.
2) Figures to right indicate full marks.

Q.1 A) Multiple choice questions. **08**

1) Gel filtration is technique that fractionates substances largely according to their _____ size.
a) ionic b) molecular
c) atomic d) all of these

2) The movements of substances relatives to the solvent is expressed in terms of _____ value.
a) R_f b) R_x
c) R_a d) R_s

3) In solvent extraction two phases are namely aqueous and _____ phase.
a) inorganic b) physical
c) organic d) equilibrium

4) Ether is the most common _____ used for the extraction process.
a) solute b) solvent
c) salt d) solution

5) In excretion, ultrafiltration retains the _____.
a) blood plasma b) large molecule
c) water d) small molecules

6) In electrophoresis cell, the pressure is about _____.
a) 2 Kg/m^2 b) 3 Kg/m^2
c) 5-6 Kg/m^2 d) 10 Kg/m^2

7) The use of insulin hormone to purify its receptor is an example of _____.
a) ion exchange b) gel filtration
c) paper d) affinity

8) Electrophoresis was developed by the scientist _____.
a) Tswett b) Tsvedberg
c) Tiselius d) Sanger

B) Fill in the blanks. **04**

1) Blood pressure required for ultra-filtration is provided through _____.
2) Electrophoresis is not suitable for the separation of _____.
3) _____ does not influence on electrophoretic mobility.
4) In solvent extraction, _____ phases are observed.

Q.2 Answer the following. (Any Six) **12**

a) Give the principle of high performance liquid chromatography.
b) Define synergic extraction.
c) Give the applications of electrodialysis.
d) Explain in brief the techniques of solvent extraction.
e) Give steps involved in chromatographic methods.
f) Give the principle of exclusion chromatography.
g) What is solid phase extraction.
h) Write a short note on zone electrophoresis

Q.3 Answer the following (Any Three). **12**

a) Explain the factors affecting on solvent extraction.
b) Explain technique of ultrafiltration
c) Explain Micellar electro kinetics capillary chromatography.
d) Give the applications of high performance liquid chromatography.

Q.4 Answer the following (Any Two). **12**

a) Explain capillary electrophoresis.
b) What is the principle of zone refining? Explain the process of zone refining.
c) Give applications of electrophoresis in inorganic and organic separations.

Q.5 Answer the following (Any Two). **12**

a) Which gels are commonly used in gel permission chromatography? What are the roles of ligand and spacer arms in gel permission chromatography?
b) Give the principle and classification of extractors.
c) Explain in brief sedimentation equilibrium of ultra-centrifugation.

Seat No.	

Set P

M.Sc. Analytical Chemistry (Semester - III) (New) (NEP CBCS)
Examination: March/April - 2025
Instrumental Methods of Chemical Analysis - I (2304302)

Day & Date: Saturday, 17-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **08**

1) The heat versus temperature plot of DSC of a polymer cannot detect _____.
a) gradual slope b) Hump
c) Glass transition d) All of these

2) _____ thermal procedure is not destructive in nature.
a) TGA b) DTA
c) DSC d) none of the above

3) Radioactive disintegration follows _____ order kinetics.
a) Third b) Second
c) Zero d) First

4) Helium nucleus is also called as _____.
a) Gamma particle b) Beta particle
c) Alpha particle d) Positron particle

5) _____ is used for quantitative determination of ions in solutions.
a) Voltammetry b) Amperometiy
c) Conductometry d) Potentiometry

6) A controlled-current coulometric method is also called as _____.
a) Potentiometric titration b) Coulometric titration
c) Electrogravimetric titration d) Redox titration

7) Electrogravimetry is similar to _____.
a) Electroplating b) Dopping
c) Gravimetry d) Potentiometry

8) In amperometric titrations _____ is kept constant.
a) Current b) Conductance
c) Resistant d) Voltage

B) Fill in the blanks OR Write True /False. **04**

1) _____ current is observed when the electroactive substance acts as a current carrier.
2) In solid state membranes, the body of the electrodes are made of _____.
3) _____ electrode is used as a reference electrode in amperometric titrations.
4) In thermogravimetric analysis (TGA) _____ parameter is measured as a function of time or temperature.

Q.2 Answer the following. (Any Six) **12**

a) What is difference between β and γ radiations?
b) What do you mean by radiochromatography?
c) Define thermometric titrations.
d) Give the factors affecting DTA curve.
e) Give the principle of cyclic voltammetry.
f) Define ion selective electrode and give one example.
g) Give any two advantages of amperometric titration.
h) Give any two disadvantages of electrogravimetric titration.

Q.3 Answer the following. (Any Three) **12**

a) Describe the stripping voltametry technique.
b) Explain liquid-liquid membrane electrodes.
c) Explain Typical DSC cell.
d) Explain the radioimmuno assay method.

Q.4 Answer the following. (Any Two) **12**

a) What are radioactive tracers? Discuss the applications of it in physico-chemical investigations.
b) Describe the cells used in high frequency titrations.
c) Explain in detail Electrogravimetric titration.

Q.5 Answer the following. (Any Two) **12**

a) Discuss the amperometric titration of lead with dichromate.
b) Explain isotopic dilution analysis with principle.
c) Explain the applications of coulometric titrations.

Seat No.	

Set **P**

M.Sc. Analytical Chemistry (Semester - III) (New) (NEP CBCS)
Examination: March/April - 2025
Analytical Spectroscopy (2304306)

Day & Date: Monday, 19-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **08**

1) Electron spin resonance (ESR) is used to study substance that contains _____.
   a) protons b) unpaired electrons
   c) neutrons d) entire molecule

2) In ESR, the typical radiation frequency used is in the range of _____.
   a) X-rays b) visible light
   c) microwave d) infra-red

3) What is the source of imaging in SEM?
   a) X-rays b) Visible light
   c) Electrons d) Infra-red

4) Which component of AFM interacts directly with sample surface?
   a) Cantilever b) Photodiode
   c) Laser detector d) Piezoelectric scanner

5) Mossbauer effect is related to _____.
   a) resonance fluorescence of γ rays
   b) intranuclear rather than electronic energy levels
   c) both a and b
   d) stark effect

6) The Mossbauer spectroscopy is due to the absorption of _____ radiations.
   a) beta b) gamma
   c) X-rays d) cosmic

7) Raman spectrum is often hampered by _____.
   a) fluorescence b) phosphorescence
   c) infra-red d) all

8) SEM belongs to the family of _____ spectroscopies.
   a) photo-emission b) electron
   c) photo-absorption d) none of these

B) Write True or False. **04**

1) SEM provides information about the sample's surface and composition.
2) ESR can only detects paired electrons in molecule.
3) In photoelectron spectroscopy, photons are used to eject electrons from atoms or molecules.
4) Nuclear recoil velocity is the order of 10^{-3} ms^{-1}.

Q.2 Answer the following. (Any Six) **12**

a) Write the applications of STM.
b) Write the principle of photoacoustic spectroscopy.
c) Define Raman scattering?
d) Give any two essential characteristics which a nuclide have for exhibiting Mossbauer effect?
e) What is tunnelling?
f) Define Auger effect.
g) Draw the labelled instrumentation setup of AFM.
h) Compare between ESCA and UPS.

Q.3 Answer the following. (Any Three) **12**

a) Explain the use of Mossbauer spectroscopy in the investigation of tin compounds.
b) Explain quantum theory of Raman effect.
c) Calculate the number of hyperfine ESR lines of the following:
1) Naphthalene radical
2) Anthracene radical
3) CCl_3
4) CD_3

(Given: Nuclear spins for H = 1/2, Cl = 3/2, D = 1).
d) Discuss the chemical applications of photoacoustic spectroscopy.

Q.4 Answer the following. (Any Two) **12**

a) Explain the principle and working of scanning electron microscopy (SEM).
b) Illustrate the quantum mechanics approach of Raman spectroscopy.
c) Discuss the isomer shift in Mossbauer spectra with examples.

Q.5 Answer the following. (Any Two) **12**

a) Write the theory of XPES and UPES.
b) Discuss pure rotational Raman spectrum.
c) What is mean by $qxx = qyy = qzz$ in NQR?

Seat No.	

Set **P**

M.Sc. Analytical Chemistry (Semester - III) (New) (NEP CBCS)
Examination: March/April - 2025
Applied Analytical Chemistry (2304307)

Day & Date: Monday, 19-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.
4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. **08**

1) Micro nutrients of plants are _____.
   a) Cu, Fe, Mn b) C, H, (O)
   c) N, P, K d) B, C, O

2) Alloy is _____ mixture of 2 or more metals.
   a) liquid b) solid
   c) heterogenous d) homogenous

3) For estimation of chloride from sample, sample is titrated with _____.
   a) KNO_3 b) $NaNO_3$
   c) $AgNO_3$ d) $NaNO_2$

4) Phenol on bromination gives _____ tribromophenol.
   a) 5, 4, 6 b) 3, 4, 5
   c) 2, 3, 4 d) 2, 4, 6

5) pH of acidic soil is _____.
   a) 7 b) 6.5 - 7
   c) 7.5 – 8.5 d) 10 - 12

6) _____ is an example of alloy.
   a) Steel b) Lead
   c) Zn d) Copper

7) Creams are _____.
   a) solid b) suspensions
   c) liquid d) semisolid

8) _____ indicator is used during estimation of Ca & Mg when sample is titrated with EDTA.
   a) Methyl orange b) Methyl red
   c) EBT d) Phph

B) Fill in the blank. **04**

1) Instrument that gives quantity of element based on colour comparison is _____.
2) _____ is determined by ashing method.
3) Oxidation state of Fe in $Fe(OH)_3$ is _____.
4) _____ indicator is used in acid base titration.

Q.2 Answer the following. (Any Six) **12**

a) Name the biotic constituent of soil.
b) Name factors affecting soil temperature.
c) Explain soil pH.
d) Define fertilizer. Give its example.
e) Which constituents are present in bronze alloy.
f) How will you determine propylene glycol from cream.
g) Write principle used to determine zinc by gravimetric method.
h) Write constituents of milk.

Q.3 Answer the following. (Any Three) **12**

a) Write general idea about soil.
b) Explain estimation of ziram from pesticides.
c) How will you estimate lead from brass.
d) How will you estimate barium gravimetrically.

Q.4 Answer the following. (Any Two) **12**

a) How will you estimate 'N' by Kjeldahl's method?
b) How will you estimate phosphorus by alkalimetric ammonium molybdate phosphate method?
c) How will you estimate nickel from its alloy?

Q.5 Answer the following. (Any Two) **12**

a) Explain estimation of thiram.
b) Explain estimation of tin from brass.
c) Explain estimation of Mg volumetrically from face powder.

Seat No.	

Set **P**

M.Sc. Analytical Chemistry (Semester - III) (Old) (CBCS) Examination: March/April - 2025
Advance Separation Techniques (MSC013301)

Day & Date: Thursday, 15-May-2025 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No.3 to Q. No. 7
3) Figure to right indicate full marks.

Q.1 A) Multiple choice questions. **10**

1) Solvent extraction is governed by _____.
a) Boyle's law b) Beer's law
c) Nernst's distribution law d) Ostwald's law

2) Proteins can be visualized directly in the gels by _____.
a) staining with dye
b) using electron microscope
c) measuring their molecular weight
d) using microscope

3) The electrodes in electro-dialysis are neither oxidized nor reduced because _____.
a) they are chemically inert
b) they act as catalyst
c) no acid is present
d) there is no acid-base reaction involved in the process

4) In a chromatographic separation, _____ is most appropriate for the qualitative analysis of substance.
a) tacking factor b) retention time
c) capacity factor d) resolution

5) Removal of waste from our body is the process of _____.
a) excretion b) respiration
c) exhalation d) double circulation

6) 0.1-0.01 μm _____ used in ultrafiltration membrane
a) concentration b) solution
c) pore size d) frequency

7) In normal phase HPLC, the mobile phase is _____ in nature.
a) polar b) non-polar
c) isolated d) carbonated

8) Electrophoresis is not suitable for the separation of _____
a) proteins b) amino acids
c) lipids d) nucleic acids

9) The most common type of gel used for DNA separation is _____.
a) agarose b) agar
c) polyacrylamide d) silica

10) In SDS electrophoresis, proteins are separated on basis of ____.
a) charge b) mass
c) structure d) stereochemistry

B) Fill in the blanks. **06**

1) In paper chromatography, usually stationary phase is _____.
2) _____ is the basis of solvent extraction.
3) In solvent extraction, _____ phases are observed.
4) _____ is the simple and the oldest technique for solvent extraction.
5) In electrophoresis cell, the pressure is about _____ Kg/m^2.
6) Blood pressure required for ultra-filtration is provided through.

Q.2 Answer the following. **16**

a) Give the principle and classification of extractors.
b) Explain in brief electro osmotic flow.
c) Give an account on principle and applications of zone refining.
d) Explain the applications of high performance liquid chromatography.

Q.3 Answer the following. **16**

a) Describe in detail the ultra-filtration technique.
b) Give the applications of electrophoresis in inorganic and organic separations

Q.4 Answer the following. **16**

a) Explain in detail the principle and process of zone refining.
b) Discuss electrophoresis process with its theory and applications.

Q.5 Answer the following. **16**

a) Explain in detail the theory and techniques of solvent extraction.
b) Discuss solid phase extraction (SPE) and applications of solvent extraction.

Q.6 Answer the following. **16**

a) Which gels are commonly used in gel permeation chromatography? What are the roles of ligand and spacer arms in gel permeation chromatography.
b) Explain the principle, theory and technique of high performance liquid chromatography.

Q.7 Answer the following. **16**

a) Discuss the principle of affinity chromatography. Describe the components involved in affinity medium.

b) 1) Write a short note on solvent extraction by using crown ethers.

2) Give the applications of dialysis.

Seat No.	

Set **P**

M.Sc. Analytical Chemistry (Semester - III) (Old) (CBCS) Examination: March/April - 2025
Instrumental Methods of Analysis-I (MSC013302)

Day & Date: Saturday, 17-May-2025 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7.
3) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **10**

1) In the standard notation for a voltaic cell, the single vertical line " | " represents _____.
a) a wire (metal) connection b) gas electrode
c) phase boundary d) a salt bridge

2) High frequency technique was introduced by _____.
a) Mecurdy b) Hall
c) Adams d) Jensen and Parrack

3) Radioactive disintegration follows _____ order kinetics.
a) Third b) First
c) Zero d) Second

4) The dropping mercury electrode is mainly used in _____ titration.
a) Potentiometric b) Conductometric
c) Amperometric d) None of these

5) The heat versus temperature plot of DSC of a polymer cannot detect _____.
a) Glass transition b) Hump
c) gradual slope d) Intercept

6) Ion selective electrodes have _____ linear range detection limit than PH electrode.
a) Lower & Lower b) Lower & Higher
c) Higher & Higher d) Higher & Lower

7) Electrogravimetry is similar to _____.
a) Dopping b) Electroplating
c) Gravimetry d) Potentiometry

8) The change in current with the varying voltage gives the plot is known as _____.
a) Voltagram b) Chromatogram
c) Both a & b d) None of these

9) _____ is the most sensitive electroanalytical method.

a) Conductometry b) Potentiometry
c) Coulometry d) None of these

10) On studying the reversible process during DTA which of the following is observed on both heating and cooling?

a) Esterification b) Carboxylation
c) Methylation d) Hysteresis

B) Fill in the blanks. **06**

1) Amperometric sensor was developed in 1956 by L.C.Clark to measure dissolved _____ in blood.
2) Becquerel discovered radioactivity by using _____.
3) Dialatometry is also known as_____.
4) The current due to supporting electrolyte is called _____current.
5) An electrode whose potential is dependent on current flow is called as _____.
6) In solid state membranes, the body of the electrodes are made of _____.

Q.2 Answer the following. **16**

a) Explain Typical DSC cell.
b) What are the various advantages of dropping mercury electrode.
c) Discuss the applications of TGA method.
d) Give the basis of high frequency titration method.

Q.3 Answer the following. **16**

a) What are ion selective electrodes? Explain liquid-liquid membrane electrodes.
b) Explain isotopic dilution analysis with principle.

Q.4 Answer the following. **16**

a) Sketch typical DTA curve for hypothetical substance and illustrate the terms endotherm and exotherm.
b) Explain the factors that affects the shape of the TGA peaks.

Q.5 Answer the following. **16**

a) Discuss the amperometric titration of lead with dichromate.
b) Discuss the forensic applications of neutron activation analysis.

Q.6 Answer the following. **16**

a) Explain applications of High frequency titration.
b) Discuss the direct and reverse isotopic dilution analysis.

Q.7 Answer the following. **16**

a) Explain the application of voltammetry technique in determination of organic species.

b) With neat labelled diagram, explain use of glass electrode for pH measurement.

SLR-ZF-90

Seat No.	

Set P

M.Sc. Analytical Chemistry (Semester - III) (Old) (CBCS) Examination: March/April - 2025
Applied Analytical Chemistry (MSC013306)

Day & Date: Friday, 19-May-2025 Max. Marks: 80
Time: 11:00 PM To 02:00 PM

Instructions: 1) Q.Nos.1 and 2 are compulsory.
2) Attempt any three questions from Q.No.3 to Q.No.7.
3) Figure to right indicate full marks.

Q.1 A) Choose correct alternative. **10**

1) P^H of soil is greater than 7 then soil is _____.
a) neutral b) acidic
c) highly acidic d) basic

2) _____ are primary nutrients of plants
a) C, B, H b) C, H, O
c) N, P, K d) C, H, N

3) Bauxite contains _____ and _____ metals.
a) C, B b) Al, Si
c) Zn, Fe d) C, H

4) Deodorants are _____ based.
a) alcohol b) oil
c) water d) acid

5) Soil is surrounded by _____.
a) atmosphere b) biosphere
c) hydrosphere d) all

6) Ziram is digested with _____.
a) CH_3CooH b) Ox. acid
c) H_2SO_4 d) Succinic acid

7) Alloy contains _____ bonding.
a) metal-ligand b) metal-metal
c) ligand-ligand d) metal-oxygen

8) When ammonium oxalate is added to calcium solution then PPT of _____ is observed.
a) Calcium oxalate b) Mg. oxalate
c) CaO d) $Ca(OH)_2$

9) Wet digestion is carried out by _____ and _____
a) CH_3COOH, HCl b) HNO_3, HCl
c) HCl, H_2SO_4 d) HNO_3, $HClO_3$

10) 'N' from urea is estimated by _____ method.
a) colorimetric b) conductometric
c) titrimetric d) refractometric

B) Fill in the blanks. **06**

a) _____ reagent is used for preparation of Ni.
b) Cosmetic is a substance that _____.
c) _____ is used to determine potash.
d) _____ indicator used in titration of acid and base.
e) Alloy is a mixture of _____.
f) Antiperspirant contains _____ and _____ salts.

Q.2 Answer the following: **16**

a) Cation exchange method
b) Fertilizer
c) Estimation of pyrolusite
d) Estimation of propylene glycol, sulphate, chloride and Zine oxide form cosmetic

Q.3 Answer the following: **16**

a) Explain how will you prepare soil sample.
b) Explain Kjeldahl's method for estimation of 'N' from soil sample.

Q.4 Answer the following **16**

a) What is sample? Explain its types.
b) Explain sample collection of fertilizer. How will you estimate K from fertilizer?

Q.5 Answer the following **16**

a) How will you analyze bronze from its alloy?
b) Explain the process to analyze tin & lead from alloy.

Q.6 Answer the following **16**

a) How will you estimate Ca & Ba by gravimetric method form face powder.
b) Give difference between antiperspirant and deodorant.

Q.7 Answer the following **16**

a) Explain the process to estimate nickel from its alloy.
b) Explain the process to estimate Fe and Zn by gravimetric method from face powder.

SLR-ZF-92

Seat No.	

Set P

M.Sc. Analytical Chemistry (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2025
Advanced Analytical Techniques (2304401)

Day & Date: Wednesday, 14-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Select the correct alternative. **08**

1) GC-MS has been developed for _____ column systems.
   a) packed b) capillary
   c) open tubular d) porous layer

2) The general reagents used for COD determination is _____ solution.
   a) $K_2Cr_2O_7$ b) urea
   c) NH_3 d) NaOH

3) _____ particles are smaller than 44 μ but greater than 1 μ aperture.
   a) Sieve b) Sub-micron
   c) Sub-sieve d) Ultra-fine

4) The _____ test is used to measure the content of organic matter of waste water.
   a) COD b) pH
   c) color d) all of these

5) The supercritical fluid are the material which have the properties of both _____ and liquid.
   a) gas b) plasma
   c) solid d) all of these

6) The transport system in FIA is called as _____.
   a) manifold b) unbroken
   c) uniform d) all of these

7) The retention is the time between sample injection and peak ____.
   a) height b) front
   c) tail d) all

8) Which of the following is most commonly used interface?
   a) Nebulizer b) Filler
   c) Array d) Chopper

B) Write True/ False. **04**

1) Cold ray is provided for liquid N_2 or CO_2 but is used only for extremely small samples.
2) Under ideal conditions, the COD/TOC ratio for sewage containing only organic matter is 2.66.
3) A reagent blank is prepared by using external standard in FIA.
4) A supercritical fluid can be used for both solid and liquid supercritical fluid extraction.

Q.2 Answer the following (Any Six) **12**

a) Centrifugal fast scan analyzer
b) Dynamic light scattering
c) BUN analyzer
d) NMR and FTIR detection in ion chromatography
e) Write the principle of dynamic-light scattering.
f) Explain hyphenated techniques for chromatographic detection.
g) Explain non-segmented flow methods.
h) Compare super critical fluid chromatography (SFC) with other chromatography.

Q.3 Answer the following. (Any Three) **12**

a) Explain the principle of ion chromatography and its applications.
b) Explain GC-MS technique and- its merits.
c) Discuss in short the structure determination of biopolymers.
d) Explain the instrumentation of super critical fluid chromatography.

Q.4 Answer the following. (Any Two) **12**

a) Explain the structure of resins used in ion chromatography.
b) Explain the basic instrumentation of LC-MS and applications of HPLC.
c) Explain automatic glucose analyzer and how the ammonia in water is analyzed?

Q.5 Answer the following. (Any Two) **12**

a) Write the instrumentation of super critical fluid extraction (SFE) and applications of it.
b) Discuss low-angle laser light scattering instrumentation and its applications.
c) Explain in brief automatic elemental analyzer.

SLR-ZF-93

Seat No.	

Set P

M.Sc. Analytical Chemistry (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2025
Instrumental Methods of Chemical Analysis - II (2304402)

Day & Date: Friday, 16-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **08**

1) Angle of incidence at which the angle of refraction becomes 90^0 is called as ____ angle.
a) Right b) Acute
c) Interfacial d) Critical

2) Specific refractivity (Rs) of compound is given by ____.
a) RM+M b) RM x M
c) RM/M d) RM – M

3) Roentgen discovered, the ____.
a) X-ray b) Gama ray
c) cosmic ray d) alpha particle

4) ____ is based on measurement of scattered light by a solution containing fine particles.
a) Potentiometry b) Nephelometry
c) Conductometry d) Colorimetry

5) The wavelength range for X-ray region in the electromagnetic spectrum is ____.
a) 0.1-100 cm b) 200-1000 Å
c) 0.0001-0.001 Å d) 0.1-100 Å

6) Absorption of X-ray in a material is governed by _____
a) Bragg's law b) Beer's law
c) Boltzmann law d) none of these

7) ____ aromatic compounds are the most fluorescent.
a) sterically crowded b) non planar
c) Rigid d) all of these

8) ____ affect the value of refractive index.
a) Pressure b) Volume
c) Temperature d) none of these

B) Fill in the blanks. **04**

a) Colorimetric method is similar to ____.
b) For phosphorescence detection, samples are often kept at ____ temperature.
c) The temperature of acetylene-oxygen flame is ____ K.
d) The distance between two successive planes of similar type is called as ____.

Q.2 Answer the following. (Any Six) **12**

a) Draw Jablonski diagram showing various photophysical pathways.
b) State different types of excitation sources used in emission spectroscopy.
c) Explain the burners used in flame photometry.
d) Give the advantages of X-ray absorption methods.
e) State Bragg's equation.
f) Give the applications of turbidimetric method.
g) What do you mean by solid surfaces.
h) Give the statement and equation of Snell's law.

Q.3 Answer the following. (Any three) **12**

a) Describe the principle and working of interferometry.
b) Explain various types of interferences encountered in flame photometry.
c) Explain the critical angle principle.
d) Write a note on spectroscopic surface methods.

Q.4 Answer the following. (Any two) **12**

a) Give an account of X-ray fluorescence technique.
b) Discuss the phenomenon of chemiluminescence.
c) Write a note on types of emission spectra.

Q.5 Answer the following. (Any two) **12**

a) Discuss the interaction of X-rays with matter.
b) Describe the principle and working of turbidometry.
c) Explain phosphoroscope with diagram.

Seat No.	

Set **P**

M.Sc. Analytical Chemistry (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2025
Biochemical and Food Analysis (2304405)

Day & Date: Tuesday, 20-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All Questions are compulsory
2) Figures to right indicate full marks.

Q.1 A) Choose correct alternatives. **08**

1) Chemical substance that stop growth of bacteria & colourisation is known as _____ preservative.
   a) artificial b) natural
   c) chemical d) acidic

2) Anemia disease is caused due to _____ normal level.
   a) Hb below the b) Hb higher than
   c) Hb equal to d) None

3) Oil obtained from crude petroleum by distillation is called as _____ oil.
   a) essential b) mineral
   c) maize d) natural

4) Normal blood glucose in human ranges bet^{n} _____ mg.
   a) 40-70 b) 70-110
   c) 110-150 d) above 150

5) Substance used for purpose of diagnosis, prevension, relief or cure some disease in man or animal is _____.
   a) dye b) vitamin
   c) drug d) enzyme

6) Hormone produced in pancreas which regulates the amount of glucose in blood is _____.
   a) apatiser b) vitamin
   c) insulin d) none

7) Vitamin A is called as _____.
   a) β-ionone b) ascorbic acid
   c) β-carotine d) retinal

8) The disease _____ is caused due to deficiency of vitamin B-1.
   a) hypoglycemia b) diarrhea
   c) hypothyroid d) beri-beri

B) Fill in the blanks. **04**

1) Pleasant odour is given by _____ oil.
2) Hemoglobin of blood carries _____.
3) The dose of chemical or biochemical preparation that likely cause death is _____ dose.
4) _____ drug increases activity of various portions of central nervous system.

Q.2 Answer the following. (Any Six) **12**

a) Define softening point & congent point.
b) Name two properties of food coloring.
c) Write contents in Urine.
d) Give the classification of oil.
e) Give two symptoms of narcotics drug.
f) What are dangerous drug.
g) Name two types of hormones.
h) Name two poisonous metals in biochemical samples.

Q.3 Answer the following. (Any Three) **12**

a) Write note on pasteurization.
b) How will you detect nitrogen from foods.
c) Explain in brief vitamin C.
d) How will you detect iodine value of oil.

Q.4 Answer the following. (Any Two) **12**

a) How will you determine saponification value of oil.
b) How will you estimate cholesterol in blood.
c) How will you analise procane hydrochloride & phenobarbital in drug sample.

Q.5 Answer the following. (Any two) **12**

a) How will you estimate Urea & Glucose in blood.
b) Give the properties of ideal drug.
c) Explain significances of LD-50 & LC-50.

Seat No.	

Set P

M.Sc. Analytical Chemistry (Semester - IV) (New/Old) (CBCS)
Examination: March/April - 2025
Advanced Analytical Techniques (MSC013401)

Day & Date: Wednesday, 14-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory
2) Attempt any three questions from Q. No. 3 to Q. No. 7
3) Figures to the right indicate full marks.

Q.1 A) Select the correct alternative. **10**

1) An FIA curve is a plot of detector's signal as a function of _____.
   a) time b) temperature
   c) pressure d) none

2) The general reagents used for COD determination is ____ solution.
   a) $K_2Cr_2O_7$ b) urea
   c) NH_3 d) NaOH

3) _____ particles are smaller than 44 μ but greater than 1 μ aperture.
   a) Sieve b) Sub-micron
   c) Sub-sieve d) Ultra-fine

4) The _____ test is used to measure the content of organic matter of waste water.
   a) COD b) pH
   c) color d) all of these

5) The supercritical fluid are the material which have the properties of both _____ and liquid.
   a) gas b) plasma
   c) solid d) all of these

6) The transport system in FIA is called as _____.
   a) manifold b) unbroken
   c) uniform d) all of these

7) The retention is the time between sample injection and peak ____.
   a) height b) front
   c) tail d) all

8) Capillary tube is most often used in _____.
   a) NMR b) FIA
   c) GC-MS d) COD

9) _____ is the type of separator used in commercial GC-MS systems.
   a) Porous tube b) Flow type separator
   c) Teflon tube d) Jet type molecular separator

10) The particle size measurement technique based on the settling velocity of particles in stationary fluid medium is called _____ method.
   a) microscopic b) elution
   c) sedimentation d) miniscule

B) Write true/ false. **06**

1) Stoke's law establishes the relationship between the settling velocity of falling particles and particle size.
2) Under ideal conditions, the COD/TOC ratio for sewage containing only organic matter is 2.66.
3) A reagent blank is prepared by using external standard in FIA.
4) A supercritical fluid can be used for both solid and liquid supercritical fluid extraction.
5) Entry of biodegradable organics into wastewater is due to domestic waste.
6) In gas chromatography, mobile phase is liquid.

Q.2 Answer the following. **16**

a) Centrifugal fast scan analyzer
b) Dynamic light scattering
c) COD analyzer
d) NMR and FTIR detection

Q.3 Answer the following. **16**

a) Discuss the principle of ion chromatography and its applications.
b) Explain LC-MS technique and its merits.

Q.4 Answer the following. **16**

a) Describe the structure of resins used in ion chromatography.
b) Explain the basic instrumentation of GC-MS and applications of it.

Q.5 Answer the following. **16**

a) Write the instrumentation of super critical fluid extraction (SFE) and its applications.
b) Discuss low-angle laser light scattering instrumentation and its applications

Q.6 Answer the following. **16**

a) Explain in brief automatic elemental analyzer.
b) Discuss the structure determination of biopolymers.

Q.7 Answer the following. **16**

a) Discuss the instrumentation and operating variables of super critical fluid chromatography.

b) Explain automated analyzer based on multilayer film principle and its instrumentation.

Seat No.	

Set **P**

M.Sc. Analytical Chemistry (Semester - IV) (New/Old) (CBCS)
Examination: March/April - 2025
Instrumental Methods of Analysis - II (MSC013402)

Day & Date: Friday, 16-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Q.Nos.1 and 2 are compulsory
2) Attempt any three questions from Q.No.3 to Q.no.7
3) Figures to the right indicate full marks.

Q.1 A) Choose the correct alternative. **10**

1) Fluorescence emissions are mainly confined to the following transitions
a) $\pi \rightarrow \pi^*$ b) $\sigma \rightarrow \sigma^*$
c) $n \rightarrow \sigma^*$ d) $n \rightarrow n^*$

2) The wavelength range for X-rays is _____.
a) 1-10 Å b) 100-1000 Å
c) 0.001-0.1 Å d) 1000-10000 Å

3) The element used as an ionization suppressor is _____.
a) Bi b) Cs
c) Na d) Mg

4) The molecule is _____ in triplet state.
a) diamagnetic b) ferromagnetic
c) non magnetic d) paramagnetic

5) For very dilute suspensions, the most sensitive technique is ____.
a) Turbidimetry b) Nephelometry
c) Colorimetry d) Photometry

6) The good oxidants to excite metals in the flame is _____.
a) hydrogen b) cyanogens
c) butane d) oxygen

7) _____ are the non-radiative transitions.
a) Inter system crossing
b) Vibrational relaxation
c) Internal conversion
d) All of these

8) For triplet states, the spin multicity is _____.
a) 1 b) 2
c) 3 d) 3/2

9) Which of the following system shows chemiluminescence phenomenon?

a) jelly fish b) fire flies
c) luminol d) all of these

10) Due to presence of heteroatom in the molecule, fluorescence intensity _____.

a) decreases b) increases
c) doesn't affect d) none of these

B) Fill in the blanks or write true/false. **06**

1) Usually in Bragg's equation the value of 'n' is taken as 1. True/False
2) X ray's are ionizing radiations. True/False
3) Elements having atomic number less than 23 produce only _____ series.
4) The refractive index property is dimensionless. True/False
5) In the flame, everywhere temperature is same. True/False
6) All organic molecules are fluorescent. True/False

Q.2 Answer the following question **16**

a) Write on chemiluminescence phenomenon.
b) Discuss the applications of phosphorimetry.
c) Why there is a need of surface study of solids?
d) Lists various analytical applications of turbidimetry.

Q.3 Answer the following question

a) What is refractive index? Explain how it can be determined by using Abbe's refractometer. **08**
b) Discuss Bragg's X-ray powder diffraction technique. **08**

Q.4 Answer the following question

a) Illustrate various interferences in flame photometry. **08**
b) Write on qualitative and quantitative applications of flame photometry. **08**

Q.5 Answer the following question

a) Discuss in detail factors affecting fluorescence and phosphorescence. **08**
b) Describe the X-ray fluorescence method used in chemical analysis. **08**

Q.6 Answer the following question

a) Discuss essential features of Nephelometer. **08**
b) Describe the applications of fluorimetry in organic analysis. **08**

Q.7 Answer the following question

a) Give an account of general techniques used in surface spectroscopy. **08**

b) Give the principle and working of typical interferometer. **08**

Seat No.	

Set P

M.Sc. (Analytical Chemistry) (Semester – IV) (New/Old) (CBCS)
Examination: March/April - 2025
Biochemical and Food Analysis (MSC013403)

Day & Date: Tuesday, 20-May-2025 Max. Marks: 80
Time: 03:00 AM To 06:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7.
3) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **10**

1) Formation of D-gluconic acid form D-glucose is ____ process.
a) Oxidation b) reduction
c) neutralization d) hydrolysis

2) The normal blood glucose in human ranges between _____.
a) 30-80 b) 70-110
c) 120-160 d) above 160

3) _____ drug is sedative
a) biazepam b) phenytol
c) Phenobarbital d) Adrenaline

4) Drug is used for _____.
a) relief pain b) relief disease
c) prevention d) all of these

5) Hydrolysis in presence of alkali is known as _____.
a) neutralization b) reduction
c) oxidation d) saponification

6) Normal level hemoglobin per 100 ml of blood is _____.
a) 7 b) 10
c) 14 d) 20

7) The dose of chemical or biochemical preparation that likely to cause death is known as ____ dose.
a) chemical b) Lethal
c) local d) biochemical

8) The term LC stands for lethal _____.
a) concentration b) composition
c) combination d) consumption

9) Rancidity depends on _____ value.

a) acid b) base
c) normal d) COD

10) Urine contains _____.

a) uric acid b) urea
c) Ca d) All of these

B) Fill in the blanks. **06**

1) Dring which is used to treat variety of physiological responses of histamine are known as _____.
2) Lethal concentration is expressed as weight of chemical administered per _____ of body.
3) Pleasant odour is given by _____ oil.
4) Hemoglobin mainly contains _____ element.
5) Hormone produced in pancreas which regulates the amount of glucose in blood is _____.
6) _____ is used as insecticides in forensic analysis.

Q.2 Answer the following. **16**

a) How will you estimate bilirubin?
b) Give qualities of ideal drug.
c) Classification of poisons.
d) How will you determine saponification value of oil?

Q.3 Answer the following. **16**

a) What are the constitution of milk? Explain process of pasteurization.
b) How will you estimate nitrogen by Kjeldahl's method.

Q.4 Answer the following. **16**

a) How will you estimate phosphate & urea from blood.
b) Explain collection of sample & preservation of physiological fluids.

Q.5 Answer the following. **16**

a) Explain classification of drugs.
b) Write an account on narcotic drugs.

Q.6 Answer the following. **16**

a) Write the account on snake venom. Explain function of insulin.
b) How will you estimate blood glucose? Explain clinical interpretation.

Q.7 A) Answer the following. **16**

i) Write note on RM value of oil.
ii) How will you estimate sodium from blood sample?

B) Answer the following.

i) Explain analysis of diazepam.
ii) Explain estimation of lead from simple.

Seat No.	

Set **P**

M.Sc. Analytical Chemistry (Semester - IV) (New/Old) (CBCS)
Examination: March/April - 2025
Pharmaceutical Analysis (MSC013409)

Day & Date: Thursday, 22-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Questions 1 and 2 are compulsory.
2) attempt any three from Q. No. 3 to Q. No. 7.
3) Figure to the right indicates full marks.

Q.1 A) Multiple choice questions: **10**

1) In limit test, due to addition of ____, brownish colour is produced.
a) Sodium hydroxide b) Sodium sulphide
c) ammonium hydroxide d) iron sulphide

2) To enhance stability, to maintain pH and to improve drug delivery, ____ is used in drugs.
a) Coating b) Solvent
c) Catalyst d) Excipient

3) In pharmaceutical industries, the impurities are may be due ____.
a) raw material b) manufacturing process
c) chemical instability d) all of the above

4) Solutions are ____ dosage form.
a) Monophasic b) Biphasic
c) Triphasic d) Solid

5) In pharmaceutical industries, ____ indicator is used for the analysis of aspirin.
a) malachite green b) Phenolphthalein
c) Starch d) $KMnO_4$

6) In capsule, inner substance is enclosed with small shell which is generally prepared from ____.
a) silica gel b) plastic
c) starch d) gelatin

7) ____ of the following is not a route of administration.
a) Oral b) Dissolution
c) Topical d) Intravenous

8) The parent organization of FDA is ____.
a) Directorate General of Health Services ((India)
b) Department of Health & Human Services (US)
c) Ministry of Health & Family Welfare (India)
d) Department of Health & Human Science (UK)

9) Hard gelatin capsule contains ____% of moisture.
a) 5-10 b) 10-13
c) 13-16 d) 20-25

10) For storage injectable preparations, neutral glass of ____ type is used.
a) Grade-I b) Grade-II
c) Grade-Ill d) Grade-IV

B) Fill in the blanks and rewrite the sentences: **06**

1) API stands for ____.
2) ____ is remaining residue after ignition.
3) Arsenic test is also called as ____.
4) Syrup is saturated solution of ____.
5) GLP means ____.
6) To standardize Karl Fisher reagent, ____ is used.

Q.2 Answer the following: **16**

a) Discuss injections with suitable example.
b) Write a note on chemical instability of drug substances
c) What is the role of FDA in pharmaceutical industries?
d) Discuss advantages of aerosol

Q.3 a) How ointment bases are classified? Discuss uses of ointment and cream as dosage Form. **10**
b) Explain dissociation test in detail **06**

Q.4 a) Discuss role of manitol in injection and role of salicylic acid in mouth wash **10**
b) Explain labeling procedure in pharmaceutical drug synthesis **06**

Q.5 a) What is contamination of pharmaceuticals? Discuss in detail about contamination due to process error **10**
b) 0.32 gm of paracetamol [$C_8H_9NO_2$] was dissolved in 30 ml 2 N H_2SO_4. This solution was titrated with 0.1 N ceric ammonium sulphate using ferroin sulphate indicator gave a burette reading 8.1 ml. Calculate the percentage of paracetamol. [At. Wt.: C-12, H-l, O-16, N-14]. **06**

Q.6 a) What is Karl-Fisher reagent? How it prepared and standardized? **08**
b) Describe in detail chemical test for arsenic. **08**

Q.7 **a)** What is tablet? Discuss different steps involved in manufacturing of tablets **08**

b) 0.59 gm sample containing calcium lactate [$C6H_{10}06Ca5H20$] was dissolved in 100 ml of water containing 2 ml of HC1. This solution was titrated with 0.05 M EDTA using muroxide naphtha indicator gave a burette reading 24.2 ml. Calculate the % of calcium lactate in given sample. [At. Wt.: C-12, H-l, 0-16, Ca-20] **08**

Seat No.	

Set P

M.Sc. Pharmaceutical Chemistry (Semester - III) (New) (NEP CBCS)
Examination: March/April - 2025
Advanced Spectroscopic Methods (2303301)

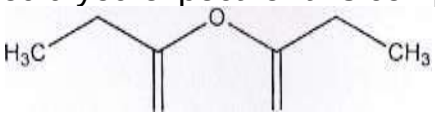
Day & Date: Thursday, 15-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Select the correct alternative. **08**

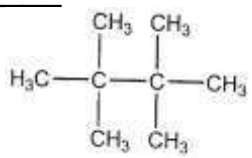
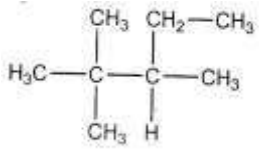
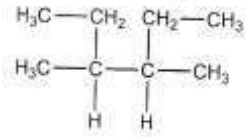
1) Karplus equation gives coupling constant value for _____ coupling.
   a) germinal b) vicinal
   c) ortho d) none of these

2) How many signals would you expect for this compound in ^{13}C NMR?



   a) 3 b) 4
   c) 5 d) 6

3) Which of the following can undergo McLafferty rearrangement?
   a) acetone b) 2-butanone
   c) propanal d) 1-butanal

4) Compound having molecular formula C_8H_{18} shows only one singlet in ^1H NMR and two signals ^{13}C NMR. The structure of compound is _____.
   a) 
   b) 
   c) 
   d) None of these

5) 2D experiments are correlation that provides information about nuclei which interact through some mechanism like _____.
   a) J-coupling b) through space
   c) both a and b d) None of these

6) The correct order for the basic features of a mass spectrometer is ____.
   a) acceleration, deflection, detection, ionisation
   b) ionisation, acceleration, deflection, detection
   c) acceleration, ionisation, deflection, detection
   d) acceleration, deflection, ionisation, detection

7) COSY spectra is used to detect coupling interaction between _____.
   a) ^{13}C-^{1}H b) ^{13}C-^{19}F
   c) ^{1}H-^{1}H d) None of the above

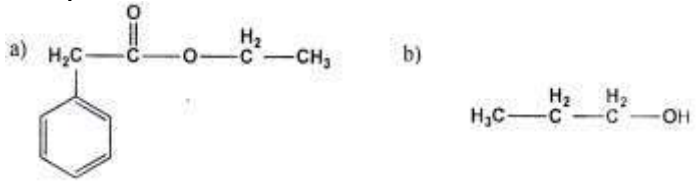
8) In ^{1}H NMR, aldehyde proton shows a peak at 9-10 ppm, due to ____.
   a) Electron withdrawing effect
   b) magnetic anisotropic effect
   c) Hydrogen bonding
   d) both a) and b)

B) Fill in the blanks OR write true false. **04**

1) DEPT stands for _____.
2) Degree of unsaturation for compound having formula $C_6H_6O_2$ is ____.
3) FAB stands for _____.
4) Metastable ion peak is observed at _____ m/e value.

Q.2 Answer the following (Any Six) **12**

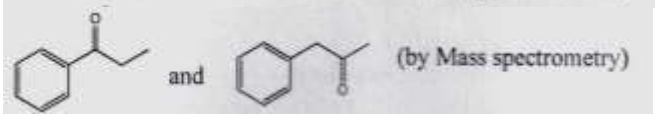
a) Explain the formation of peaks at m/e 43 and 15 in mass spectrum of acetone.
b) What the difficulties in production of ^{13}C NMR?
c) Define base peak with suitable example.
d) How you would use the proton NMR spectra to distinguish between 1-bromopropane and 2-bromopropane?
e) Define nitrogen rule with suitable examples.
f) Why TMS is used as reference standard in NMR?
g) Explain coupling constant with suitable examples.
h) How many numbers of signals would be expected in ^{13}C NMR spectra of following compounds?



Q.3 Answer the following. (Any Three) **12**

a) Differentiate following pair compounds:

1)

2) 

b) Discuss the solvent used in NMR spectroscopy in detail.
c) Discuss the HETCOR spectra of n-butanoic acid.

d) What is metastable ion peak? For m/e values for parent ion (m_1) and daughter ion (m_2) are 150 and 122, calculate the m/e value of metastable ion (m*)?

Q.4 Answer the following. (Any Two) **12**

a) Hydrogen deuterium exchange in ^{1}H NMR.

b) Discuss the instrumentation of mass spectrometry.

c) A compound having molecular formula $C_5H_8O_2$ shows following spectral data:
IR(cm^{-1}): 1735; ^{1}H NMR: δ 1.08 ppm (pentet, 2H), δ 1.16 ppm (pentet, 2H), δ 2.08 ppm (t, 2H), δ 3.71 ppm (t, 2H);
^{13}C NMR: δ 19.0, δ 22.2, δ 29.9, δ 68.8, δ 170.0 ppm
Predict the structure and draw a sketch of COSY spectrum for this molecule showing expected diagonals and off diagonal peaks

Q.5 Answer the following. (Any Two) **12**

a) Discuss the fragmentations in:
1) Alcohols
2) phenols

b) A compound with molecular mass 116 gave the following spectral information:
UV: 283 nm
IR: 3000-2500 (b), 1715 (s), 1342 cm^{-1} (w)
^{1}H NMR: d 2.12 (3H, singlet), d 2.60 (2H, triplet), d 2.25 (2H, triplet) and d 11.1(1H, singlet).
Find the structure of the compound with proper indication of spectral values.

c) Discuss the chemical shift values in ppm of ^{13}C NMR for different types of compounds and factor affecting it.

Seat No.		Set	P

M.Sc. Pharmaceutical Chemistry (Semester - III) (New) (NEP CBCS)
Examination: March/April - 2025
Modern Pharmaceutical Analytical Techniques (2303306)

Day & Date: Monday, 19-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All Questions are compulsory.
3) Figures to the right indicates full marks.

Q.1 A) Choose correct alternatives. **08**

1) The pair of light source and atomizer resulting highest sensitivity to atomic absorption spectrometric measurement is _____.
   a) Hg lamp, nitric oxide flame
   b) Hg lamp, graphite furnace
   c) Hallow cathode lamp, graphite furnace
   d) Hallow cathode lamp, acetylene-nitric oxide flame

2) Which of the following is not a carrier gas in Gas Chromatography?
   a) Helium b) Nitrogen
   c) Bromine d) Hydrogen

3) _____ elution where unvarying composition of M.P. is used.
   a) Gradient b) Isocratic
   c) Displacement d) Active

4) UV spectroscopy is mainly used for the determination of _____.
   a) Molecular weight b) Molecular formula
   c) Functional group d) Conjugation

5) In DTA, physical changes give rise to _____ peak.
   a) Positive b) Endothermic
   c) Exothermic d) Negative

6) DSC can measure directly both the temperature and the _____.
   a) Heat of reaction b) Heat of Combustion
   c) Heat of formation d) All of the above

7) Transition from triplet excited state to the doublet state is known as _____.
   a) Phosphorescence b) Spectroscence
   c) Fluorescence d) Lumiscence

8) IR absorption is accompanied by the transition _____.
   a) Nuclear spin b) Vibrational
   c) Electronic d) None of these

B) Write true/false. **04**

1) The wavelength of σ to σ^* transitions lie in the IR region.
2) The pattern on the paper in Paper chromatography is called chromatogram.
3) Elements such as Carbon, Hydrogen and Halides are detected by Flame Photometry.
4) Area of differential TGA curve is proportional mass loss.

Q.2 Answer the following.(Any Six) **12**

a) What are the advantages of paper chromatography?
b) Draw a neat labelled diagram of IR spectrometer.
c) Write principle of Flame emission spectroscopy (FES).
d) Give advantages & disadvantages of Thermogravimetric analysis.
e) Define Retention time & Retention volume.
f) Enlist applications of potentiometer.
g) Enlist applications of UV-Visible spectroscopy.
h) Write principle of Differential thermal analysis.

Q.3 Answer the following. (Any three) **12**

a) Discuss the factors affecting on vibrational frequencies in IR spectroscopy.
b) Discuss Beers & Lambert's law.
c) Give difference between TLC & HPTLC.
d) Write on instrumentation of atomic absorption spectroscopy (AAS).

Q.4 Answer the following. (Any Two) **12**

a) Explain instrumentation of double beam UV-Visible spectrophotometer.
b) Elaborate on Principle, chromatographic parameters and applications of column chromatography.
c) Write principle, stationary phases and applications of ion exchange chromatography.

Q.5 Answer the following. (Any Two) **12**

a) Discuss the pharmaceutical applications of TGA and DTA techniques.
b) Explain with suitable diagram flame Emission spectroscopy.
c) Discuss Instrumentation of Gas Chromatography.

Seat No.	

Set P

M.Sc. Pharmaceutical Chemistry (Semester - III) (New) (NEP CBCS)
Examination: March/April - 2025
Biochemistry (2303307)

Day & Date: Monday, 19-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **08**

1) An example of a saturated fatty acid is ____
a) Palmitic acid b) Oleic acid
c) Linoleic acid d) Erucic acid

2) The monosaccharide units are linked by alpha 1 $\rightarrow$ 4 glycosidic linkages in ____
a) Maltose b) Sucrose
c) Cellulose d) Cellobiose

3) Which of the following vitamin helps in blood clotting?
a) Vitamin A b) Vitamin C
c) Vitamin D d) Vitamin K

4) The primary structure of a protein refers to ____
a) The sequence of amino acids
b) The local folding of the polypeptide chain
c) The overall three-dimensional shape of the protein
d) The arrangement of multiple polypeptide chains

5) Glucosamine is an important constituent of ____
a) Homopolysaccharide b) Heteropolysaccharide
c) Mucopolysaccharide d) Dextran

6) Correct ordering of lipoprotein molecules from lowest to the greater density is ____
a) LDL, IDL, VLDL, chylomicron
b) Chylomicron, VLDL, IDL, LDL
c) VLDL, IDL, LDL, chylomicron
d) LDL, VLDL, IDL, chylomicron

7) β-Oxidation of fatty acids requires all the following coenzymes except ____
a) CoA b) FAD
c) NAD d) NADP

8) The number of base pair in a single turn of B-form DNA about the axis of the molecule is ____

a) 4 b) 8
c) 10 d) 12

B) Write whether the following statements are TRUE or FALSE **04**

a) Phenylalanine is an aromatic amino acid.
b) The molecular mechanism of synthesis of mRNA is known as transcription.
c) Vitamin D is a water-soluble vitamin.
d) One Hemoglobin molecule can bind up to six oxygen molecules at a time.

Q.2 Answer the following (Any Six). **12**

a) Explain the flow of genetic information.
b) How micelles are formed?
c) Give examples of metal binding biomolecules
d) Write biological function and deficiency of vitamin C.
e) Give ring structure of any two monosaccharides.
f) What are the main properties of amino acids?
g) What are coenzymes? give an example.
h) Give an example of saturated and unsaturated fatty acids.

Q.3 Answer the following (Any Three). **12**

a) Write a note on binding of metal ions with biomolecular active centers.
b) Write about properties and forms of DNA.
c) Describe classification of lipids based on their density.
d) Write a note on Genetic code and its importance in heredity.

Q.4 Answer the following (Any Two). **12**

a) Describe organization of protein structure at different levels of conformation.
b) Explain the double helix structure of DNA in detail.
c) Write in detail about assembly of metal containing units in biology.

Q.5 Answer the following (Any Two). **12**

a) Write an account on beta oxidation of fatty acids.
b) Describe the methods for sequencing of protein molecules.
c) Describe the source, requirements and deficiency conditions of fat-soluble vitamins.

Seat No.	

Set P

M.Sc. Pharmaceutical Chemistry (Semester - III) (CBCS) Examination: March/April - 2025
Advanced Organic Chemistry - I (MSC012301)

Day & Date: Thursday, 15-May-2025 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No.3 to Q. No. 7
3) Figures to the right indicate full marks.

Q.1 A) Multiple choice questions. **10**

1) In the reduction of halides using organotin compound the stability order of free radical is _____.
   a) 1° > 2° > 3° b) 2° > 3° > 1°
   c) 3° > 2° > 1° d) 1° > 3° > 2°

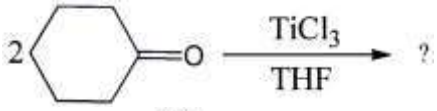
2) Oxidation of α-carbon of carbonyl group by selenium dioxide is known as _____.
   a) Riley reaction b) Oppenaur oxidation
   c) Allylic oxidation d) None of these

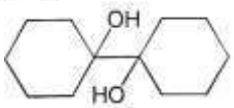
3) DCC is used as powerful _____ agent.
   a) hydrating b) dehydrating
   c) reducing d) oxidizing

4) In the Hofmann rearrangement, the intermediate formed during the reaction is _____.
   a) carbene b) carbocation
   c) isocyanate d) ketene

5) The formylation of phenol with hexamines is known as _____ reaction.
   a) Reimer-Tiemann b) Duff
   c) Vilsmeir- Hack d) Guttermann-Koch

6) Predict the product.



a) 

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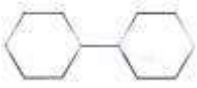
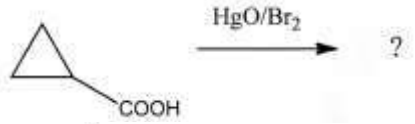
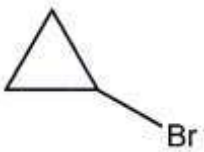
d) 

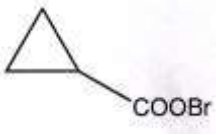
7) _____ is rate determining step in the Stille reaction.
   a) Transmetallation b) Isomerisation
   c) Oxidative addition d) Reductive elimination

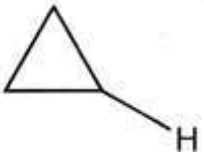
8) The interaction of a reaction centre with a lone pair of electrons in an atom or the electrons present in a pi bond contained within the parent molecule with the reaction centre is called as _____.
   a) Neighbouring group assistance
   b) Intermolecular rearrangement
   c) Intramolecular rearrangement
   d) Concerted reaction

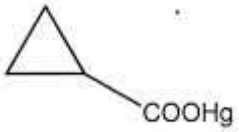
9) Predict the product.



a) 

b) 

c) 

d) 

10) During the mechanism of Neber rearrangement, formation of _____ place.
   a) oxirane b) azirine
   c) azitidine d) cyclopropane

B) Fill in the blanks. **06**

1) The reagent used for the allylic halogenation is _____.
2) The _____ is a chemical reaction used to synthesize aryl halides from aryl diazonium salts using copper salts as reagents or catalysts.
3) The _____ reaction is an organic chemical reaction that involve disproportionation of an aldehyde in the presence of an alkoxide.
4) Wagner-Meerwein rearrangements are common in many reactions involving _____ as intermediate.
5) Lithium dialkylcuprate are also known as _____ reagent.
6) DDQ is used as a powerful _____ agent.

Q.2 Answer the following. **16**

a) Give the applications of DDQ reagent.

b) Discuss the Sandmayer's reaction in detail.

c) Identify the reaction and predict the product with mechanism:

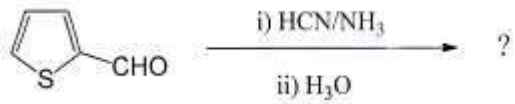
d) Write a note on Grubb's metathesis.

Q.3 Answer the following. **16**

a) Explain the following.

1) Free radical rearrangement
2) Auto-oxidation

b) Predict the product. Give its mechanism and identify the name of the reaction.



Q.4 Answer the following. **16**

a) Discuss the Wolf rearrangement in detail. Give its application.

b) Write a note on,

1) DCC reagent
2) Organotin reagent

Q.5 Answer the following. **16**

a) Explain Corey-Fuchs reaction with example.

b) Write reaction and mechanism involved in Tiffeneau-Demjanov rearrangement reaction in detail and give its application.

Q.6 Answer the following. **16**

a) Explain in detail Bamford-Steven reaction and give its applications.

b) Describe coupling of alkynes and arylation of aromatic by diazonium salts.

Q.7 Answer the following. **16**

a) Write a brief note on

1) Peracid
2) Trimethylsilyl iodide

b) Explain Hofmann-Loffler-Freytag reaction with suitable example and mechanism.

Seat No.	

Set P

M.Sc. Pharmaceutical Chemistry (Semester - III) (CBCS) Examination: March/April - 2025
Chemistry of Bioactive Hetero cycles (MSC012302)

Day & Date: Saturday, 17-May-2025 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7.
3) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **10**

1) The heteroatom present in Thietane is _____.
a) Oxygen b) Nitrogen
c) Sulphur d) Sulphur and oxygen

2) Which of the following five membered rings are most resonance stabilized?
a) Furan b) Thiophene
c) Pyrrole d) Pyridine

3) Aziridine is a _____.
a) Three membered ring b) Four membered ring
c) Five membered ring d) Six membered ring

4) Tetrazole ring structure is having _____ atoms.
a) 3 carbon and 2 nitrogen b) 4 carbon and 1 nitrogen
c) 2 carbon and 3 nitrogen d) 1 carbon and 4 nitrogen

5) Piperazine is prepared by reaction of ethanolamine with _____.
a) ammonia b) ethyl alcohol
c) water d) piperyl alcohol

6) Molecular formula of tetrazine is _____.
a) $C_4H_2N_4$ b) $C_2H_2N_4$
c) $C_4H_4N_2$ d) $C_4H_4N_4$

7) In pyridazine structure nitrogen atoms are at _____.
a) 1 and 2 positions b) 1 and 3 positions
c) 1,2 and 4 positions d) 1,2 and 3 positions

8) In coumarin one of the ring is having _____ functional group.
a) acid b) alcohol
c) ester d) phenol

9) Pteridine is an aromatic chemical compound composed by fusion of _____.

a) Pyridazine and pyrazine b) Pyrimidine and pyrazine
c) Piperazine and pyrazine d) Pyridine and pyrazine

10) Indole is prepared by fusion of benzene ring to pyrrole ring at _____.

a) 1,2 position b) 1,4 position
c) 2,3 position d) 1,3 position

B) Fill in the blanks. **06**

1) Molecular formula of isothiozole is _____.
2) Quinazoline is prepared by condensation of two rings _____ and _____.
3) Number of hydrogens present in Azetidine is _____.
4) Pyrrole is a heterocyclic ring which has _____ pi electrons.
5) Number of double bonds present in Pyranare _____.
6) Isoquinoline is a structuralisomer of _____.

Q.2 Answer the following. **16**

a) Write synthesis and medicinal importance of Benzothiophene.
b) Write synthesis and medicinal importance of Imidazole.
c) Write synthesis and aromatic character of Isoquinoline.
d) Write synthesis and aromatic character of Pyridine.

Q.3 Answer the following. **16**

a) Write synthesis, reactivity and medicinal importance of Azeridine.
b) Write synthesis, reactivity and aromatic character of Benzothiozole.

Q.4 Answer the following. **16**

a) Write synthesis, reactivity and medicinal importance of Oxirane.
b) Write synthesis, reactivity and aromatic character of Indole.

Q.5 Answer the following. **16**

a) Write synthesis, reactivity and medicinal importance of Hexahydro -1, 3, 5 - triazine.
b) Write synthesis, reactivity and medicinal importance of Piperazine.

Q.6 Answer the following. **16**

a) Write synthesis, reactivity and medicinal importance of Pyrazine.
b) Write synthesis, reactivity and medicinal importance of Pyrrolidine.

Q.7 Answer the following. **16**

a) Write synthesis, reactivity and medicinal importance of Tetrazole.
b) Write synthesis, reactivity and medicinal of Thiazole.

Seat No.	

Set **P**

M.Sc. Pharmaceutical Chemistry (Semester - III) (CBCS) Examination: March/April - 2025
Drug Development (MSC012306)

Day & Date: Monday, 19-May-2025 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) All questions are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7.
3) Figure to right indicate full marks.

Q.1 A) Choose the Correct alternative: **10**

1) Proteomics refers to the study of ____
a) Set of proteins in a specific region of the cell
b) Biomolecules
c) Set of proteins
d) The entire set of expressed proteins in the cell

2) The rate of drug absorption is not affected by ____.
a) Route of administration b) Drug Solubility
c) Sex of the person d) The environment

3) ____ is meant by a lead compound in medicinal chemistry.
a) A drug containing the element lead
b) A leading drug in a particular area of medicine
c) A compound that acts as the starting point for drug design and development
d) A drug which is normally the first to be prescribed for a particular ailment

4) Among the following, ____ is not a type of cellular receptor.
a) Tyrosine kinase receptor b) G-protein coupled receptor
c) Endocrine receptors d) Intracellular/nuclear receptor

5) ____ is meant by the therapeutic index or ratio.
a) The ratio of LD50 to ED99 b) The ratio of LD50 to ED50
c) The ratio of ED99 to ED50 d) The ratio of ED50 to LD50

6) The concentration of drug in plasma above which toxic effect is produced is known as ____
a) Maximum safe concentration
b) Minimum Effective Concentration
c) Intensity of action
d) Duration of action

7) A negative value of a for a substituent signifies that ____.
a) It is electron donating b) It is hydrophobic
c) It is hydrophilic d) It is neutral

8) Lipinski proposed a set of ____rules that would predict whether a molecule was likely to be orally bioavailable
a) 3 b) 4
c) 5 d) 10

9) ____ of the following is a protein sequence database.
a) DDBJ b) EMBL
c) GenBank d) PIR

10) ____ tells the relationship between chemical structures and biological activity.
a) QSPR b) QSRR
c) QSAR d) QSBR

Q.1 B) Fill in the blanks. **06**

a) UniProt is ____ database.
b) Margaret Dayhoff developed the first protein sequence database called ____.
c) The change in the amount of drug in plasma by half of the drug during elimination is called as ____.
d) ____ is a drug substance that is administered inactive in the intended pharmacological actions.
e) The amount of drug in the body to the concentration of drug in plasma is called as ____.
f) ____ is the study of mechanism of action of drug and pharmacological effects produced on the human body.

Q.2 Answer the following. **16**

a) Describe different sources of drugs.
b) Write a note on types of receptors.
c) Describe volume of Distribution of drug.
d) Write a note on Ligand-based drug designing.

Q.3 Answer the following. **16**

a) What is pharmacokinetics? Explain the process of drug absorption
b) Explain drug receptor interaction with factor affecting in drug receptor interaction.

Q.4 Attempt the following: **16**

a) What is a lead molecule? Discuss the various stages involved in identification of a lead molecule. **10**
b) Explain the LD50, ED50 and IC50 in detail. **6**

Q.5 Attempt the following: **16**

a) Discuss in detail physicochemical properties of drug.

b) Explain the plasma drug concentration-time profile showing pharmacokinetic as well as pharmacodynamics parameters.

Q.6 Answer the following: **16**

a) What is biotransformation of drugs? Explain in detail factors affecting biotransformation of drugs.

b) What is dose-response relationship? Explain the potency and efficacy of the drug.

Q.7 Answer the following: **16**

a) What is lipophilicity? How does lipophilicity affect drug permeability? **6**

b) What are molecular descriptors? Discuss their types, methods of selection, and significance in QSAR modeling. **10**

Seat No.	

Set P

M.Sc. Pharmaceutical Chemistry (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2025
Advanced Organic Chemistry - II (2303401)

Day & Date: Wednesday, 14-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Select the correct alternative. **08**

1) Peterson olefination reaction is such an organic reaction that synthesizes desired alkene when α-silyl carbanion is added to a carbonyl compound followed by _____.
   a) elimination b) addition
   c) substitution d) rearrangement

2) In Stevens rearrangement, formation of _____ takes place from quaternary ammonium salt.
   a) tertiary amine b) amide
   c) aldehyde d) none of these

3) The formation of alkenes by base catalysed decomposition of p-toulenesulfonylhydrazo-nes of aldehydes and ketones is known as _____.
   a) Bomford-Steven's reaction
   b) Stille reaction
   c) Heck reaction
   d) Ugi reaction

4) In Henry reaction, nitroalkanes should have _____.
   a) α-hydrogen b) β-hydrogen
   c) γ-hydrogen d) δ-hydrogen

5) Which of the following reactions involves the use of lithium dialkylcuprate?
   a) Grignard reaction
   b) Corey-House synthesis
   c) Williamson ether synthesis
   d) Wurtz coupling

6) In Hoffmann-Loffler-Freytag reaction, N-haloamines should have ____
   a) α-hydrogen b) β-hydrogen
   c) γ-hydrogen d) δ-hydrogen

7) Which of the following is act as inhibitor in free radical reactions?
   a) nitric oxide b) molecular oxygen
   c) benzoquinone d) all of these

8) Which of the following is one of the reactants in Eschenmoser rearrangement?
   a) β-hydroxy ketone b) β-amino alcohol
   c) α,β-epoxy ketone d) all of these

B) Write true or false for the followings. **04**

1) Hydroboration oxidation converts alkene to alcohol corresponding to the Anti-Markownikoff's rule.
2) DDQ is used as a powerful hydrogenating agent.
3) DCC is used as powerful dehydrating agent commonly used for the preparation of amides, esters and anhydrides.
4) The Sandmeyer reaction can directly convert aniline to an aryl halide.

Q.2 Answer the following (Any Six) **12**

a) Define free radical with examples.
b) Explain auto-oxidation.
c) Define Darzen reaction with example.
d) Define Duff reaction with example.
e) Explain Brook reaction with example.
f) Give any two applications of DDQ.
g) Explain the regioselectivity in hydroboration reaction.
h) Explain allylic hydrogenation.

Q.3 Answer the following (Any Three) **12**

a) Write a note on Julia olefination.
b) Write a note Sandmeyers reaction
c) Discuss the applications of selenium dioxide
d) Give the brief account on preparation of 9-BBN and their applications.

Q.4 Answer the following (Any Two) **12**

a) Discuss mechanism at an aromatic substrate in free radical substitution reaction.
b) Discuss the reaction, mechanism involved in Heck reaction and give its applications.
c) Explain Hoffmann-Loffler-Fretag reaction with suitable example and mechanism.

Q.5 Answer the following (Any Two) **12**

a) Discuss the hydroboration reaction with mechanism and give its applications.
b) Discuss in detail the applications of organotin reagent.
c) Write a brief note on Shapiro reaction.

Seat No.	

Set | **P**

M.Sc. Pharmaceutical Chemistry (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2025
Drugs and Hetero Cycles (2303402)

Day & Date: Friday, 16-May-2025 Max. Marks: 60
Time: 03:00 PM To 06:00 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose the correct alternative. **08**

1) Piperazine is prepared by reaction of ethanolamine with _____.
   a) ammonia b) ethyl alcohol
   c) water d) piperyl alcohol

2) Oxidation of Isoquinoline with KMnO4 gives _____ as one of the products.
   a) Benzoic acid b) Pyridine
   c) Phthalic acid d) Salicylic acid.

3) Indole is prepared by fusion of benzene ring to pyrrole ring at _____
   a) 1,2 position b) 1,4 position
   c) 2,3 position d) 1,3 position

4) Captopril drug is a _____ ACE inhibitors.
   a) Sulfhydryl containing
   b) Dicarboxylate containing
   c) Phosphonate containing
   d) None of the above

5) The most serious adverse effect of insulin is _____.
   a) Hypoglycemia b) Nephrotoxicity
   c) Fever d) Sweating

6) Tetracycline inhibits protein synthesis by binding on _____.
   a) 30s ribosomal subunit
   b) 60s ribosomal subunit
   c) Topoisomerase III
   d) None of the above

7) Phenytoin belongs to the class _____.
   a) Hydantoin b) Barbiturates
   c) Benzodiazepine d) Succinimides

8) What are the pharmacological actions of NSAID?
   a) Prevent blood clots
   b) Reduce pain
   c) Decrease fever and inflammation
   d) All of the above

B) Fill in the blanks. **04**

1) Quinazoline is prepared by condensation of two rings _____ and _____.
2) Number of double bonds present in Pyran is _____.
3) Paracetamol act as NSAID by inhibition of _____ enzyme.
4) Local anaesthetics are _____ bases.

Q.2 Answer the following. (Any Six) **12**

a) Give the synthesis of Thiopental.
b) Give the synthesis of Sulfamethoxazole.
c) Define and classify NSAIDS.
d) Define and classify antihypertensive agents.
e) Give the synthesis of Thiazole.
f) Write the chemical reactions of pyrimidines.
g) Give the synthesis of Isoquinoline.
h) Give the synthesis of Quinazoline.

Q.3 Answer the following. (Any Three) **12**

a) Write a note on alkylating agent.
b) Discuss the synthesis of Tolbutamide and their applications.
c) Discuss the synthesis of imidazole and their applications.
d) Write synthesis and aromatic character of Pyridine.

Q.4 Answer the following. (Any Two) **12**

a) Discuss synthesis of Paracetamol and give its SAR.
b) Write a note on morphine.
c) Write synthesis and medicinal importance of Quinoline.

Q.5 Answer the following. (Any Two) **12**

a) Discuss synthesis of Chloramphenicol and give its SAR.
b) Discuss synthesis of Chloroquine and give its SAR.
c) Write synthesis and medicinal importance of Benzothiophene.

Seat No.	

Set **P**

M.Sc. Pharmaceutical Chemistry (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2025
Pharmaceutical Dosage Forms (2303405)

Day & Date: Tuesday, 20-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All Questions are compulsory
2) Figures to right indicate full marks.

Q.1 A) Choose correct alternatives. **08**

1) Alzet is an example of _____ type of parenteral system.
   a) Osmotic pressure activated
   b) Vapour pressure activated
   c) Magnetically activated
   d) Hydration activated

2) An ingredient used to improve flow properties of granules into a die for compression during tablet formulation is a _____.
   a) Disintegrant b) Glidant
   c) Surfactant d) Lubricant

3) Disintegration time for sugar coated tablet is _____.
   a) 15 minutes b) 30 minutes
   c) 60 minutes d) 90 minutes

4) Depending on the nature of the product concentrate, the aerosol can be filled by _____.
   a) Cold-filling b) Pressure-filling
   c) Both of these d) None of these

5) Corneal sensations are diminished in _____.
   a) Herpes simplex b) Conjunctivitis
   c) Fungal infections d) Marginal keratitis

6) The sure diagnostic sign of corneal ulcer is _____.
   a) Ciliary injection b) Blepharospasm
   c) Miosis d) Positive fluorescein test.

7) Which of the following drugs cannot be given as transdermal administration?
   a) Drugs with very short half-lives
   b) Drugs with narrow therapeutic indices
   c) Easy removal and termination
   d) Drugs against peptic ulcer

8) Suspension is a _____.
   a) One phase system b) Two phase system
   c) 3 phase system d) None of above

B) Write True/False **04**

1) Suspensions are monophasic liquid dosage forms.
2) Occusert is a part of occular drug delivery system.
3) Cellulose is used for enteric coated tablet.
4) Emulsion is a biphasic liquid dosage form.

Q.2 Answer the following. (Any Six) **12**

a) What are excipients. Give their classifications.
b) What are the types of tablets?
c) Explain the types of dosage forms
d) What is pre-formulation? Enlist pre-formulation tests.
e) Give the classification of emulsifying agents.
f) Explain with examples:
   i) Suspensions
   ii) Emulsions
g) Write formulation of eye ointment
h) Explain Ophthalmic products

Q.3 Answer the following. (Any Three) **12**

a) Explain in detail the formulation of biphasic liquid dosage forms.
b) Write a note on powders.
c) Describe the steps involved in sugar coating.
d) Write a note on inhalation products.

Q.4 Answer the following. (Any Two) **12**

a) Write a note on semisolid dosage forms.
b) What are aerosols. Explain in detail.
c) Explain oral drug delivery system.

Q.5 Answer the following. (Any two) **12**

a) Write in detail formulation considerations of suspension.
b) Describe routes of drug administrations.
c) Write a note on transdermal drug delivery system

Seat No.	

Set P

M.Sc. Pharmaceutical Chemistry (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2025
Pharmaceutical Technology (2303406)

Day & Date: Tuesday, 20-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All Questions are compulsory.
3) Figures to the right indicates full marks.

Q.1 A) Choose correct alternative. **08**

1) Moisture and heat sensitive drug are formulated into tablets by _____.
   a) Direct compression b) Dry granulation
   c) Wet granulation d) All of these

2) The formation of acetic acid through oxidation is done in _____ phase.
   a) Vapour b) Liquid
   c) Solid d) All of the above

3) _____ is the documented evidence which provides high degree of assurance that specific process produce product meeting its predetermined specification and quality characteristics.
   a) Validation b) Qualification
   c) Revalidation d) Process validation

4) GMP guidelines provide the guidelines for maintaining _____.
   a) A clean & hygienic manufacturing area
   b) Clarity& control in manufacturing processes
   c) Records of manufacture
   d) All of these

5) _____ is the most important state in dry granulation.
   a) Mixing b) Screening
   c) Milling d) Slugging

6) The first element of validation of new facilities systems or equipment is _____.
   a) Installation qualification b) Design qualification
   c) Concurrent validation d) Process validation

7) Coating used to protect the tablet from acidic environment of stomach is _____.
   a) Film coating b) Sugar coating
   c) Enteric coated d) Encapsulation

8) Which one of these is responsible for hardness of tablet?
   a) Die filling
   b) Compression force
   c) Both a and b
   d) None of these

B) True or False **04**

1) FDA stands for Food and Drug Adulteration.
2) GLP stands for Good Laboratory Prices.
3) API stands for Active Pharmaceutical Ingredient.
4) IRB Stand for Institutional Research Board.

Q.2 Answer the following. (Any Six) **12**

a) Describe level of screening.
b) What is pilot plant? What are its objectives.
c) Write about qualification phases according to WHO.
d) Give the difference between calibration and validation.
e) Write short note on Effluent Treatment Plant
f) What is Technology transfer? Explain in short.
g) Explain the coating process of tablet in short.
h) Explain Regulatory guidelines.

Q.3 Answer the following. (Any three) **12**

a) Discuss wet granulation technique.
b) Explain unit process of vinyl chloride
c) Describe sampling techniques in cleaning validation.
d) What are the types of process validation?

Q.4 Answer the following. (Any Two) **12**

a) Discuss the typical industrial chlorination process for the preparation of monochlorobenzene.
b) Explain working of tablet compression machine with neat labelled diagram.
c) Discuss unit process of vinyl acetate

Q.5 Answer the following. (Any Two) **12**

a) Write a brief note on reactors used in API manufacturing unit.
b) Discuss the factors affecting on chemical process.
c) Explain validation of standard method in analytical method validation.

Seat No.	

Set P

M.Sc. Pharmaceutical Chemistry (Semester - IV) (New/Old) (NEP CBCS)
Examination: March/April - 2025
Photochemistry and Pericyclic Reactions (MSC012401)

Day & Date: Wednesday, 14-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

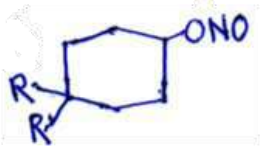
Instructions: 1) Q. Nos. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7.
3) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **10**

1) A reaction in volving photochemical reorganization of phenolic ester is known as _____.
a) Photo-Fries rearrangement
b) Perkin reaction
c) Claisen rearrangement
d) None of these

2) Alkanes show which type of transition?
a) $\sigma \rightarrow \sigma^*$ b) $\pi \rightarrow \pi^*$
c) $n \rightarrow \sigma^*$ d) none

3) Among the following compounds, how many compounds gives barton reaction.

a) 

b)

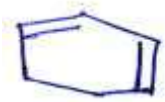
c)

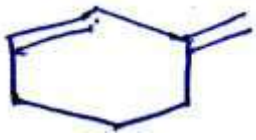
d) All of these

4) Which of the following dienes cannot undergo Diels-Alder reaction?

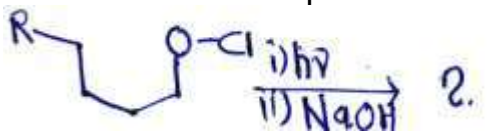
a)

b)

c) 

d) 

5) Choose the correct product.



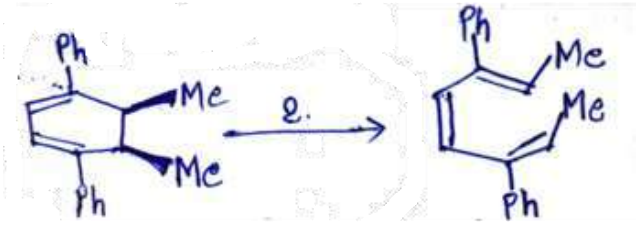
a)

b)

c)

d)

6) Which reaction condition appropriate for following transformation?



a) hγ
b) Δ
c) H^+
d) None

7) Which of the following molecular species having greatest stability?

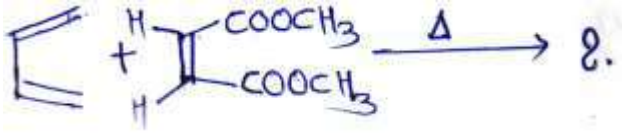
a)

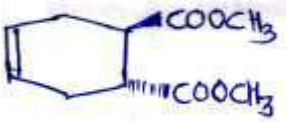
b)

c)

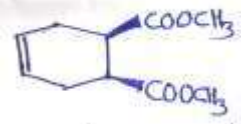
d) None of these

8) The major product formed in following reaction is _____.



a) 

b)

c) 

d) none of these

9) How many bonding interactions are present in (Ψ_1) energy orbital of 1,3-butadiene?

a) 3
b) 2
c) 0
d) 4

10) Cyclo-addition reactions are _____.

a) Chemoselective b) Stereospecific
c) Regioselective d) none of these

B) Fill in the blanks. **06**

1) Photoinduced decarboxylation reaction is known as _____.
2) N- halo amines having hydrogen on δ carbon are substrates for _____ reaction.
3) If system has node, then it is called _____.
4) If the highest occupied molecular orbital has m-symmetry, the process will be _____.
5) A pericyclic process involving the transfer of one or more groups or atoms from one molecule to another is known as _____.
6) Di-π methane rearrangement given by β,γ - unsaturated ketone is known as _____.

Q.2 Answer the following. **16**

a) Explain photo-oxidation.
b) Explain why Ψ_3 of 1,3-Butadiene has higher energy than the Ψ_2.
c) Sketch the pi molecular orbitals of 1,3,5-hexatriene.
d) Write a note on conrotatory and disrotatory motion.

Q.3 Answer the following.

a) Assign coefficient and calculate change density in following. **08**

b) Discuss photoaddition reaction with suitable examples. **08**

Q.4 Answer the following.

a) Explain Norrish type-I reaction with suitable examples. **08**
b) Calculate Huckel's delocalization energy and arrange the following molecular by decreasing order of stability. **08**

Q.5 Answer the following.

a) Explain Woodward-Hoffmann rule for cycloaddition reactions. **08**
b) Explain Di-π-methane rearrangement with suitable examples. **08**

Q.6 Answer the following.

a) Discuss stereochemistry of [3,3] sigma tropic rearrangements under thermal and photochemical conditions. **08**

b) Define group transfer reaction and give its examples. **08**

Q.7 Answer the following.

a) What is reactivity index? Explain calculation of reactivity index with suitable examples. **08**

b) With the help of FMO method, show [2+2] cycloaddition reaction is photochemically allowed process. **08**

Seat No.	

Set P

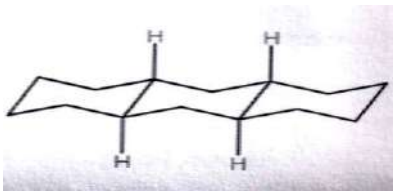
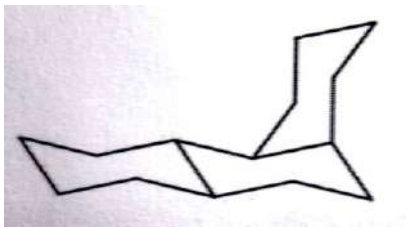
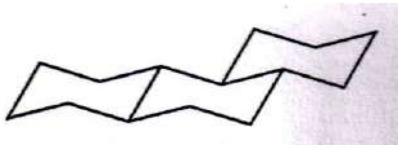
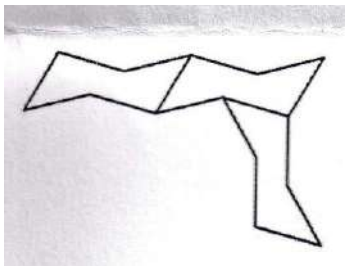
M.Sc. Pharmaceutical Chemistry (Semester - IV) (New/Old) (NEP CBCS)
Examination: March/April - 2025
Advanced Organic Chemistry - II (MSC012402)

Day & Date: Friday, 16-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7.
3) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **10**

1) Conversion of one functional group into another functional group is known as _____.
   a) Oxidation
   b) Functional group interconversion
   c) Reduction
   d) None of these

2) The stable form of perhydraphenanthrene is _____.
   a) 
   b) 
   c) 
   d) 

3) The chiral catalyst employed in the L-DOPA synthesis is/are?
   a) Tyrosinase
   b) [Rh $(CAMP)_2(COCl)$]
   c) [Rh (R_1,R)-DIAMPCOD]+ BF_4^-
   d) All of the above

4) Which of the following statements best describes a synthon?
   a) A synthetic reagent used in a reaction
   b) A key intermediate in a reaction sequence
   c) A transition state involved in a reaction mechanism
   d) A hypothetical structure that would result in a given reaction if it existed

5) When molecule containing 1°, 2°, 3° alcoholic groups react with trityl chloride in pyridine this selectively protects _____.
   a) 1° alcoholic groups b) 2° alcoholic groups
   c) 1° amino groups d) 2° amino groups

6) In Sharpless asymmetric epoxidation _____ is responsible for enantioselective product.
   a) Allylic alcohol b) (±) DET
   c) Titanium isopropoxide d) Ter. Butyl hydroperoxide

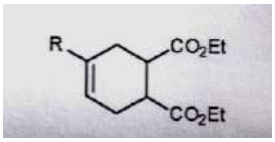
7) Cis-9-methyl decalins and trans-9-methyl decalins both are _____ of 9-methyl decalins.
   a) Geometrical isomer b) Enantiomer
   c) Distereomer d) optical isomer

8) High yielding synthetic equivalent formed in the below structure is _____.

   a) Ph-CH_2-MgBr + CH_2O b) PhMgBr +
   c) Ph-CH_2-CH_2-MgBr + OH- d) Ph-Mg-Br + Br-CH_2-CH_2-OH

9) BINAP is an example of _____.
   a) Chiral pool b) Chiral auxiliary
   c) Chiral solvent d) Chiral catalyst

10) Which of the following reactions would result a cyclohexene such as,



   a) The Friedel Crafts alkylation
   b) The Wittig reaction
   c) The Diels Alder reaction
   d) The Claisen reaction

B) Fill in the blank. **06**

1) A _____ blocks the reactivity of functional group by converting it into different group which is inert to the conditions of reactions.
2) Asymmetric synthesis involves conversion of _____ centre to chiral centre along with product selectivity.
3) The reaction of anthracene with H_2/Pt gives the formation of _____ product.
4) The site of disconnection is shown by _____ line.
5) In Felkin-Ahn addition reaction nucleophile prefer to attack on carbonyl through _____ bond angle.
6) The process of imaginary breaking of molecule into its component part is known as _____.

Q.2 Answer the following. **16**

a) Give an account on the principle of protection of amines

b) Explain Sharpless Asymmetric Epoxidation.

c) Explain Bredts rule in fused rings with suitable examples.

d) Write note on reversal of polarity.

Q.3 Answer the following. **16**

a) Explain Cis- and trans- decalins with respect to stability and reactivities.

b) Explain Cram's rule and Prelog rule with examples. Write the differences between Cram's rule and Prelog rule.

Q.4 Answer the following. **16**

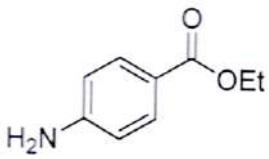
a) Discuss the principle of protection of carboxylic group with suitable examples?

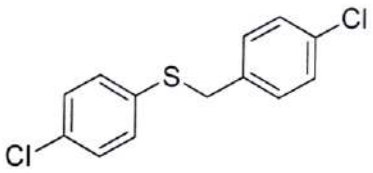
b) Explain hydroboration and write diastereoselectivity in crotyl boronate.

Q.5 Answer the following. **16**

a) How do we achieve asymmetric synthesis by use of chiral auxiliaries and chiral reagents?

b) Using disconnection approach, design a suitable synthesis for each of the following compounds.





Q.6 Answer the following. **16**

a) Explain the synthesis of alkenes using one group C-C disconnections.

b) Explain various protecting groups for carbonyl compounds?

Q.7 Answer the following. **16**

a) Draw different conformations of perhydrophenanthrene and explain its stability.

b) Explain two group C-C disconnection using Diels-Alder reactions and 1,3 difunctionalized compounds.

Seat No.		Set	P

M.Sc. Pharmaceutical Chemistry (Semester - IV) (New/Old) (CBCS)
Examination: March/April - 2025
Pharmaceutical Dosage Forms (MSC012403)

Day & Date: Tuesday, 20-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Question No. 1 and 2 are Compulsory.
2) Attempt any three questions from Q.No.3 to Q.No.7.
3) Figure to the right indicates full marks.

Q.1 A) Choose correct alternatives. **10**

1) Which of the following agent is/are used in enteric coating of the tablet _____.
   a) HPMC b) CMC
   c) CAP d) All of the above

2) What is the drawback of parental controlled release system?
   a) Injecting is a difficulty
   b) The drug cannot be easily removed once administered
   c) Can get easily precipitated in the injection site
   d) Rapid onset but fast excretion

3) Posology is a branch of pharmacy which deals with _____.
   a) Study of dosage forms b) Study of dosage
   c) Study of drug interaction d) All of these

4) Rate of sedimentation is high in _____ suspension.
   a) flocculated b) deflocculated
   c) both a) and b) d) none of these

5) Elexirs are _____.
   a) Aqueous b) Viscous
   c) Hydroalcoholic liquids d) Semisolid

6) Suspension is a _____.
   a) One phase system b) Two phase system
   c) 3 phase system d) None of above

7) _____ is most commonly used dosage form.
   a) Liquid b) Solid
   c) Semisolid d) Gaseous

8) Drug is _____.
   a) Any chemical compound
   b) Substance which alter physiological function
   c) Substance which cure disease
   d) All of these

9) Which drug delivery system has longest duration of action?
   a) Nasal preparation b) Implants
   c) Depot injection d) Transdermal patch

10) Disintegration time for sugar coated tablet is _____.
   a) 15 minutes b) 30 minutes
   c) 60 minutes d) 90 minutes

B) Write true/false. **06**

1) Cellulose is used for enteric coated tablet.
2) Nanoparticles have size range in micrometer.
3) Emulsion is a biphasic liquid dosage form.
4) The prescription is an order written by a registered medical practitioner to pharmacist.
5) Clonidine patches have been used for moderate hypertension.
6) Transdermal drug delivery system can be programmed to deliver a drug for delayed action.

Q.2 Answer the following. **16**

a) Describe the steps involved in sugar coating.
b) What are emulsifying agents? Give its classification.
c) Classify semisolid dosage forms.
d) Write a note on powders.

Q.3 Answer the following. **16**

a) Explain different types of Ophthalmic preparations. Write formulation of eye ointment.
b) Describe recently design Occular dosage form

Q.4 Answer the following. **16**

a) Write excipients used in formulation of tablets.
b) Write a detailed note on types of tablets.

Q.5 Answer the following. **16**

a) Write in detail formulation considerations of suspension.
b) Describe quality control methods and measurements of tablet properties.

Q.6 Answer the following. **16**

a) Describe routes of drug administrations.
b) Write a note on ocular drug delivery system.

Q.7 Answer the following. **16**

a) Explain stability testing protocol.

b) Explain oral drug delivery system.

Seat No.	

Set **P**

M.Sc. Pharmaceutical Chemistry (Semester - IV) (New/Old) (NEP CBCS)
Examination: March/April - 2025
Pharmaceutical Technology (MSC012408)

Day & Date: Thursday, 22-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Q.No.1 and Q.No.2 are compulsory
2) Attempt any three questions from Q.No.3 to Q.No.7
3) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **10**

1) What size of equipment is needed in continuous process when compared with batch process?
a) does not depend on size b) Larger
c) Smaller d) none of these

2) The formation of acetic acid through oxidation is done in ____ phase.
a) Vapour b) Liquid
c) Solid d) All of the above

3) _____ is the documented evidence which provides high degree of assurance that specific process produce product meeting its predetermined specification and quality characteristics.
a) Validation b) Qualification
c) Revalidation d) Process validation

4) GMP guidelines provide the guidelines for maintaining.
a) A clean & hygienic manufacturing area
b) Clarity & control in manufacturing processes
c) Records of manufacture
d) All of these

5) _____ is the most important state in dry granulation.
a) Mixing b) Screening
c) Milling d) Slugging

6) The first element of validation of new facilities systems or equipment is _____
a) Installation qualification b) Design qualification
c) Concurrent validation d) Process validation.

7) Coating used to protect the tablet from acidic environment of stomach is _____

a) Film coating b) Suger coating
c) Enteric coated d) Encapsulation

8) Moisture and heat sensitive drug are formulated into tablets by _____

a) direct compression b) dry granulation
c) Wetgranulation d) All of these

9) Which one of these is responsible for hardness of tablet?

a) Die filling b) Compression force
c) Both a and b d) None of these

10) Brine is -_____

a) Heat exchanger b) Tower
c) Coolant d) Column

B) True or False. **06**

1) FDA stands for Food and Drug Adulteration
2) GLP stands for Good Laboratory Prices
3) API stands for Active Pharmaceutical Ingredient
4) IRB Stand for Institutional Research Board
5) IP stands for Indian Pharmacopoeia
6) ICH stands for international Conference on Harmonization

Q.2 Answer the following. **16**

a) Describe level of screening.
b) What is pilot plant? What are its objectives.
c) Give details about qualification phases according to WHO.
d) Give the different between calibration and validation.

Q.3 Answer the following.

a) Explain unit process of vinyl chloride. **10**
b) Discuss wet granulation technique. **06**

Q.4 Answer the following. **16**

a) Describe sampling techniques in cleaning validation.
b) What are the types of process validation?

Q.5 Answer the following. **16**

a) Discuss the typical industrial chlorination process for the preparation of monochlorobenzene.
b) Explain working of tablet compression machine with neat labelled diagram.

Q.6 Answer the following **16**

a) Discuss unit process of vinyl acetate.

b) Explain validation of standard method in analytical method validation.

Q.7 Answer the following **16**

a) Write a brief note on reactors used in API manufacturing unit.

b) Discuss the factors affecting on chemical process

Seat No.	

Set P

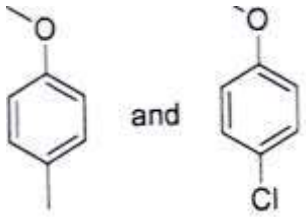
M.Sc. Medicinal Chemistry (Semester - III) (New) (NEP CBCS)
Examination: March/April - 2025
Advanced Spectroscopic Methods (2327301)

Day & Date: Thursday, 15-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **08**

1) How many signals appears in the ^{1}H NMR spectrum of the following compounds?



a) 4, 3 b) 2, 3
c) 3, 3 d) 2, 2

2) The NMR signal of a compound is found to be 200 Hz downfield from TMS peak using spectrometer operating at 100 MHz. What is the downfield shift in Hz for same proton in the spectrometer operating at 300 MHz?

a) 300 Hz b) 900 Hz
c) 600 Hz d) 1200 Hz

3) Which of the following halogen gives [M] and [M+2] isotopic peaks of 3:1 intensity ratio in mass spectrum?

a) Cl b) Br
c) I d) F

4) Which of the following nuclei is not NMR active?

a) ^{2}D b) ^{19}F
c) ^{32}P d) ^{33}S

5) How many peaks do you expect to see in the ^{1}H NMR spectrum for the following molecule

a) 2 b) 3
c) 4 d) 10

6) In the decoupled ^{13}C NMR spectrum the number of signals appears for catechol, resorcinol, and hydroquinone are respectively ____.
a) 6, 4 & 2 b) 6, 6 & 4
c) 3, 4 & 4 d) 3, 4 & 2

7) DEPT is ____.
a) Distortion less enhancement polarisation technique
b) Distortion less enhancement polarisation transfer
c) Different enhancement polarisation transfer
d) All above

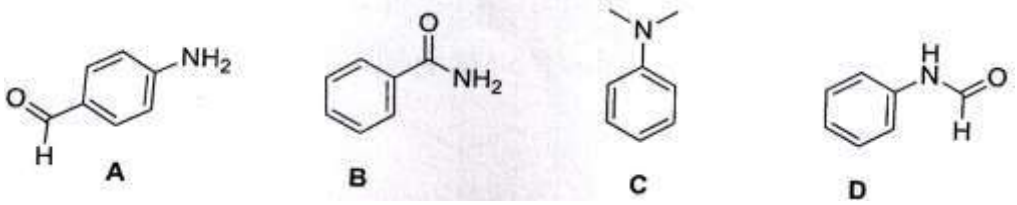
8) In mass spectroscopy, the relative abundance of fragment ion depends upon its ____.
a) Stability
b) Rate of formation
c) Rate of further decomposition
d) All of the above

B) State True or False. **04**

1) The gyromagnetic ratio of carbon-13 is larger than that of protons.
2) A proton in NOSEY experiment correlates through the space.
3) The base peak in the mass spectrum always shows molecular mass of the compound.
4) Protons that are enantiotropic will show different signals in NMR.

Q.2 Answer the following question (Any Six). **12**

a) Why does $CDCl_3$ appear as triplet in ^{13}C NMR?
b) Disuses ^{1}H NMR and ^{l3}C NMR signals of ortho, meta and para positional isomers of xylene.
c) What is nitrogen rule in mass spectroscopy?
d) Which of the following compound shows peak in the mass spectrum at m/z = 121, 105, 77, 44. Discuss all fragment ions for correct compound.



e) Why acetylene protons are shielded than olefin protons?
f) Define the term coupling constant.
g) How will you distinguish between equatorial and axial protons in cyclohexane by NMR?
h) Comment on sensitivity of ^{1}H and ^{13}C nuclei in NMR with reason.

Q.3 Answer the following question (Any Three) **12**

a) Discuss chemical and magnetical equivalence in NMR.
b) What is DEPT technique? Describe how it is useful for structure determination with examples.
c) Discuss fragmentation of benzyl alcohol and its significant peaks in Mass spectrum.
d) Find out structure of organic compound from following data
Molecular Formula: $C_8H_{14}O_3$
IR ($\bar{\nu}$ in cm^{-1}): 1100, 1755, 1820, 2990.
^{1}H NMR (200 MHz; $CDCl_3$, δ in ppm): 0.9 (t, 9 mm), 1.6 (sextet, 6 mm), 2.4 (t, 6 mm).
^{13}C NMR (50 MHz; $CDCl_3$ δ in ppm): 12, 18, 38, 180; DEPT (θ= 135): 12 (up), 18 and 38 (down); MASS: m/z = 55, 70, 71 (base peak, 100%), 158.

Q.4 Answer the following question (Any Two) **12**

a) What are the various factors affecting on coupling constant in NMR?
b) What is second order spectra? Discuss A_2B_2, A_2X_2 spin systems in NMR with examples.
c) What is 2D NMR? Discuss HETCOR NMR technique with examples.

Q.5 Answer the following question (Any Two). **12**

a) Discuss fragmentation pattern of ester, aldehydes and ethers with examples.
b) Find out structure of organic compound from following data
Molecular Formula: $C_5H_6N_2$
IR: 3450, 3300, 3190, 1620, 1600, 1500, 760 cm^{-1}; ^{1}H NMR (δ in ppm): 5.1 (broad s, 10 mm, Ex.), 6.25 (dd, *J*= 2.5 and 7 Hz, 5 mm), 6.4 (dt, *J* = 2.5 & 7 Hz, 5 mm), 7.2 (dt, *J* = *2* and 7 Hz, 5 mm), 7.9 (dd, *J*= 2 and 5 Hz, 5 mm); ^{13}C NMR (δ in ppm): 109, 118, 138, 148, 160; Mass: m/z = 94, 67, 66, 41, 39
c) Find out structure of organic compound from following data
Molecular Formula: $C_{11}H_{14}O$
IR: 2970, 1609, 1537, 1500, 1250, 1180, 1120, 1050, 755, 691 cm^{-1}
^{1}H NMR (δ in ppm): 1.3 (t, *J*= 6 Hz, 30 mm), 4.1 (q, *J* = 6 Hz, 20 mm), 3.33 (d, *J*= *6* Hz, 20 mm), 5.04 (dd, *J*= 2, 16 Hz, 10 mm), 4.79 (dd, *J*= 2, 10 Hz, 10 mm), 5.92 (m, 10 mm), 6.86 (d, *J*= 8 Hz, 20 mm), 7.14 (d, *J*= 8 Hz, 20 mm); ^{13}C NMR (δ in ppm): 15, 40, 65, 114, 116, 130, 133, 137, 156.

Seat No.	

Set P

M.Sc. MEDICINAL CHEMISTRY (Semester - III) (New) (NEP CBCS)
Examination: March/April - 2025
Drug Development (2327302)

Day & Date: Saturday, 17-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **08**

1) A preliminary requirement for any structure based drug design technique is the _____ structure of the target.
a) 2 D b) 3 D
c) 1 D d) 4 D

2) A molecule that binds to a biological target in an organism and is believed to be responsible for the native activity of the target is called _____.
a) endogenous ligand b) exogenous ligand
c) Neurons d) none of these

3) Lipinski proposed a set of _____ rules that would predict whether a molecule was likely to be orally bioavailable.
a) 3 b) 4
c) 5 d) 10

4) Addition of non-polar group _____ Partition coefficient.
a) Improves b) Reduces
c) no effect on d) none of these

5) _____ is defined as the time taken for the amount of drug in the body as well as plasma concentration to decline by one-half or 50% its initial value.
a) Elimination half-life
b) Clearance
c) Apparent volume of distribution
d) None of these

6) The term _____ is defined as the rate and extent of absorption of unchanged drug from its dosage form.
a) Bioavailability b) Availability
c) systemic availability d) none of these

7) _____ of the following term is used to describe the dose of a drug

required to produce a measurable effect in 50% of the animals tested.

a) LD_{50} b) LD_1
c) ED_{50} d) none of the above

8) Generally drugs are absorbed in their _____form.

a) ionized form b) unionized form
c) both a & b d) none of these

B) Fill in the blanks. **04**

1) Corwin Herman Hansch published a model related to ____ to show a relationship between biological activities and physicochemical properties.
2) The antimalarial quinine from cinchona bark, the cardiac stimulus from foxgloves are the examples of _____ sources of drugs.
3) _____ is the intensity of effect produced for a given drug dose.
4) The process of movement of unchanged drug from the site of administration to systemic circulation is called _____.

Q.2 Answer the following. (Any Six) **12**

a) Write a note on 2D-QSAR Techniques.
b) Write a note on Structure Activity Relationship (SAR).
c) Define the drug and comment on concept of drug.
d) Discuss on introduction of IC_{50} and MIC.
e) Write a note on Transcellular/Intracellular drug transport mechanism.
f) Write a note on Steps in Drug Distribution.
g) Write a note on pKa value and ionization of drug?
h) Write a note on term combined effect of drugs.

Q.3 Answer the following. (Any Three) **12**

a) Write about Historical Progress and Development of QSAR.
b) Explain Volume of Distribution of Drug.
c) Explain drug potency and drug efficacy. Discuss in detail dose response relationship.
d) Explain in details the bioavailability of drug and discuss on Lipinski rule of five.

Q.4 Answer the following. (Any Two) **12**

a) What is mean by Ligand-based drug design and explain in detail Molecular Similarity based search technique?
b) Explain in detail Pharmaceutical factors influencing on absorption of drug.
c) Explain in details the term partition coefficient of drug and explain lipophilicity and biological activity of drug.

Q.5 Answer the following. (Any Two) **12**

a) Explain Molecular docking and Homology modeling techniques used in Structure-based drug design.

b) Explain in detail Pharmacokinetic methods used in measurement of bioavailability of drug.

c) Discuss in detail the principles of drug action. Explain drug receptor interaction.

Seat No.	

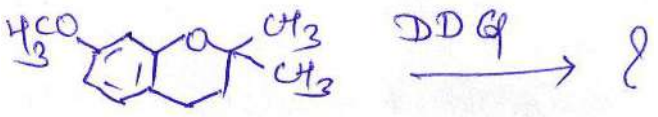
Set P

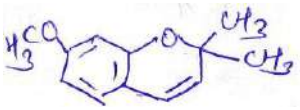
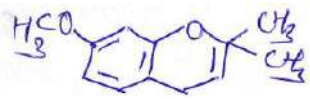
M.Sc. MEDICINAL CHEMISTRY Sem–III(New) (NEP CBCS)
Examination : March/ April- 2025
Advanced Organic Chemistry (2327306)

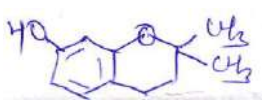
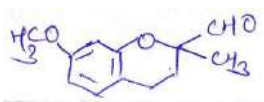
Day & Date: Monday, 19-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

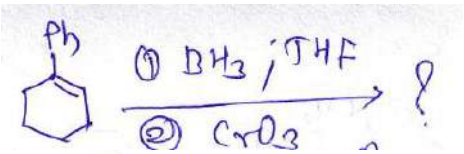
Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

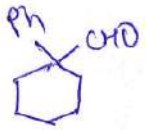
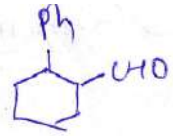
Q.1 A) Choose the correct alternative **08**

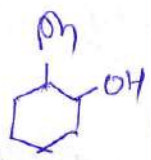
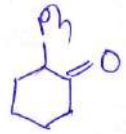
1) 

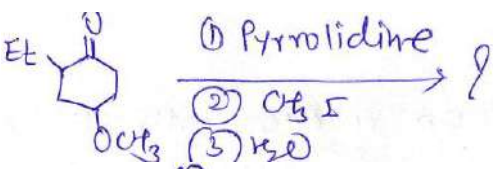
a)  b) 

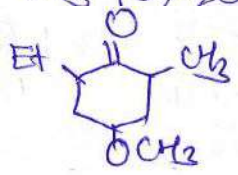
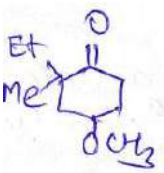
c)  d) 

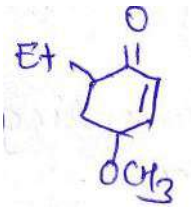
2) 

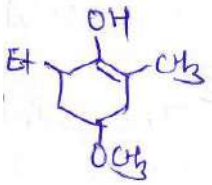
a)  b) 

c)  d) 

3) 

a)  b) 

c) 

d) 

4) Preparation of substituted amines from amine, aldehyde and vinyl or arylboronic acid is known as _____

a) Amination reaction
b) Petasis reaction
c) Strecker amino acid synthesis
d) Mannich reaction.

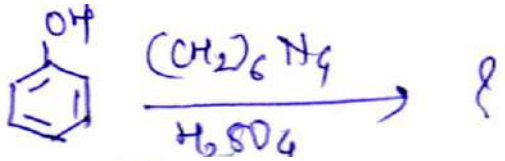
5)

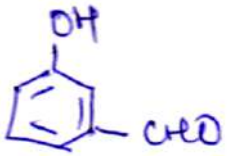
a)

b)

c)

d)

6) 

a) 

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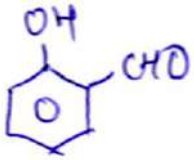
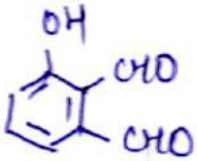
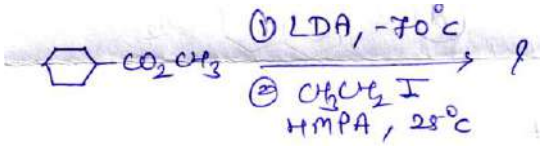
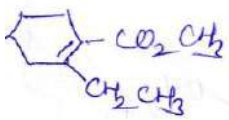
c) 

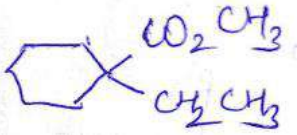
d) 

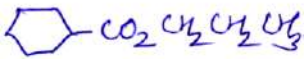
7) In the Stevens rearrangement reaction quaternary ammonium salt rearranges to a tert-amine in the presence of _____

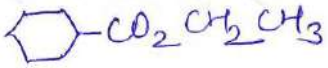
a) Weak base
b) Strong acid
b) Weak acid
d) Strong base

8) 

a) 

b) 

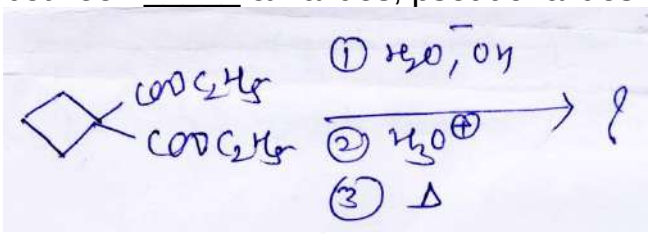
c) 

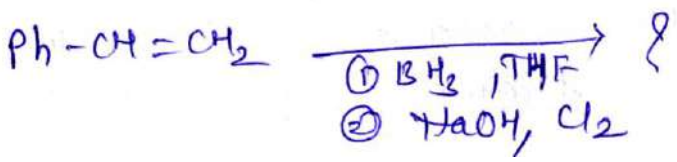
d) 

B) Fill in the blanks. **04**

1) Trimethylsilyl iodide on reaction with ether gives _____

2) The Stille coupling is a versatile c-c bond forming reaction between _____ & halides, pseudohalides.

3) 

4) 

Q.2 Answer the following. (Any Six) **12**

a) Explain the synthesis of alkane from alkene by using organoboranes.
b) Explain oxidation of alcohols by DDG.
c) Explain the effect of solvent on structure and reactivity of enolate.
d) Explain the mechanism of Hiyama reaction with suitable example.
e) Explain with suitable example the mechanism of Brook rearrangement reaction.
f) Give two uses of allylboranes.
g) Give two examples of ring closing metathesis.
h) Explain with suitable example intramolecular alkylation of enolates.

Q.3 Answer the following. (Any Three) **12**

a) Discuss the alkylation of enolates stabilized by two functional groups.
b) Discuss hydroboration mechanism and explain its uses in the synthesis of dienes and alkenes.
c) Explain the mechanism of von-Richter rearrangement reaction.
d) Explain the mechanism of Kumada reaction.

Q.4 Answer the following (Any Two) **12**

a) Discuss the synthetic application of Lithium dialkylcuprate.
b) Explain the reaction mechanism of Corey-Winter olefination reaction and give its applications.
c) Explain carbonylation of organoboranes in the presence of diglyme, water and $LiAlH(OR)_3$

Q.5 Answer the following. (Any Two) **12**

a) Explain the mechanism of Neber rearrangement reaction ad give its applications.

b) Explain generation & alkylation of dianions.

c) Explain the mechanism of Passerini reaction and give its applications.

Seat No.	

Set **P**

M.Sc. MEDICINAL CHEMISTRY (Semester - III) (New) (NEP CBCS)
Examination: March/April - 2025
Biochemistry (2327307)

Day & Date: Monday, 19-May-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All Questions are compulsory
2) Figure to right indicate full marks.

Q.1 A) Choose correct alternatives. **08**

1) Molecules having only one actual or potential sugar group are called _____.
   a) Disaccharides b) Trisaccharides
   c) Monosaccharides d) Polysaccharides

2) Polysaccharides that are composed of a single kind of monosaccharide units are called _____.
   a) Heteroglycan b) Homoglycan
   c) Both a & b d) Neither a nor b

3) The unit comprising only a sugar and a base is referred to as a _____.
   a) Nucleotide b) Nucleoside
   c) Nucleus d) Chromosome

4) Separation of protein according to size is known as _____ filtration.
   a) Micron b) Gel
   c) Resin d) Ion exchange

5) The hydrolysis of triacylglycerols by alkali to produce glycerol and soaps is known as _____.
   a) Saponification b) Hydrolysis
   c) Rancidity d) None of these

6) _____ is a water soluble vitamin.
   a) Vitamin D b) Vitamin C
   c) Vitamin K d) Vitamin A

7) Proteins consist of unbranched chains of amino acids joined by ____ bonds.
   a) Coordinate b) Covalent
   c) Peptide d) Double

8) The most prevalent side-chain ligand in histidine was _____.
   a) Thiolate b) Imidazole
   c) Phenolate d) Carboxylate

B) Fill int e blanks. **04**

1) _____ is the most predominant sugar in the human body.
2) _____ is the common Pyrimidine base present in both DNA & RNA.
3) _____ is a poor source of ascorbic acid.
4) The most prevalent side-chain ligand in cysteine was _____.

Q.2 Answer the following. (Any Six) **12**

a) Explain nomenclature of carbohydrates.
b) Explain D and L isomerism of glucose.
c) What are the physical properties of protein?
d) Write the structure of DNA.
e) Write about History and nomenclature of vitamins.
f) Write about classification of lipids.
g) Write a note on the naturally occurring amino acids.
h) Write a note on the Porphyrins.

Q.3 Answer the following. (Any Three) **12**

a) Explain in detail classification of carbohydrates.
b) Describe PI value of amino acid.
c) Write about triacylglycerols and their properties.
d) Explain in detail the enzymes involved in mercury detoxification.

Q.4 Answer the following. (Any Two) **12**

a) Explain reactions of monosaccharides.
b) Write in detail chemistry, biochemical functions, recommended dietary allowance, dietary sources and deficiency symptoms of Vitamin K.
c) Explain in detail about the Other Metal-Binding Biomolecules.

Q.5 Answer the following. (Any two) **12**

a) Explain stereoisomerism in carbohydrates.
b) Explain in detail about Chylomicrons and Low-density lipoproteins.
c) Explain in detail the enrichment strategies and intracellular chemistry of low-abundance metals.

Seat No.	

Set **P**

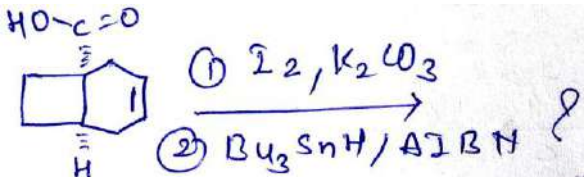
M.Sc. Medical Chemistry (Semester - III) (Old) (CBCS) Examination: March/April - 2025
Advanced Organic Chemistry - I (MSC08301)

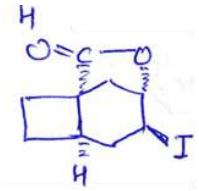
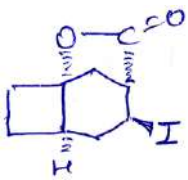
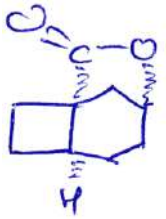
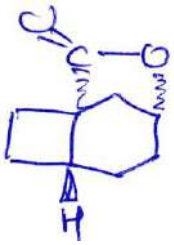
Day & Date: Thursday, 15-May-2025 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No.3 to Q. No. 7
3) Figures to the right indicate full marks.

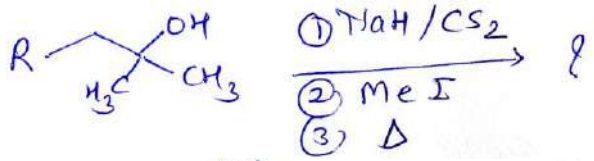
Q.1 A) Multiple choice questions. **10**

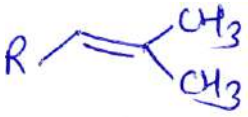
1) The Payne rearrangement reaction occurs with inversion of stereochemistry at _____.
   a) C-3 b) C-2 & C-3
   c) C-1 d) C-2

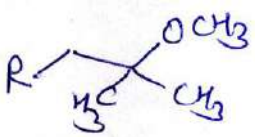
2) 

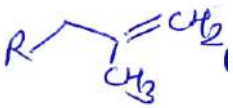
   a) 
   b) 
   c) 
   d) 

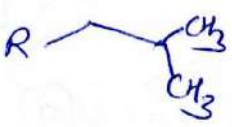
3) The Stille coupling reaction is a versatile C-C bond forming reaction between _____ and _____.
   a) stannanes & pseudo halides
   b) stannanes & halides
   c) alkene & halide
   d) Both a & b

4) 

a) 

b) 

c) 

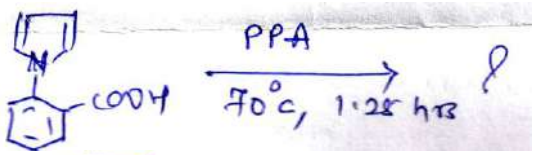
d) 

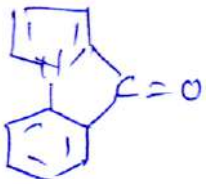
5) During SeO_2 oxidation, reactivity of $-CH_2$ group is more than $-CH_3$ group because _____ of methylene group occurs more readily than methyl group.

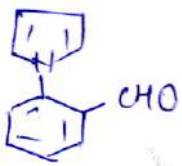
a) hydration b) protonation
c) enolization d) dehydration

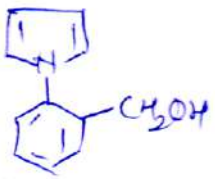
6) Ozone is a very _____ 1,3 dipolar molecule.

a) nucleophilic b) electrophilic
c) inactive d) None of these

7) 

a) 

b) 

c) 

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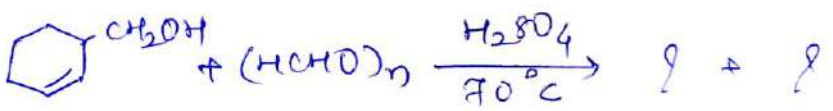
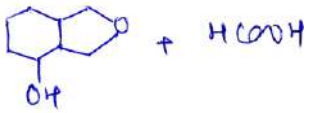
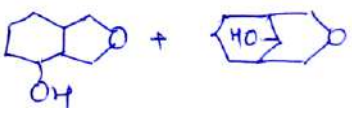
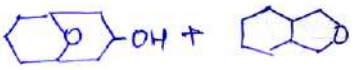
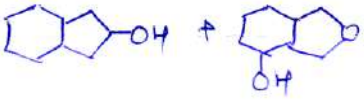
8) 

a) 

b) 

c) 

d) 

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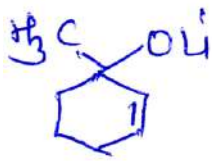
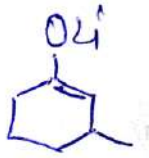
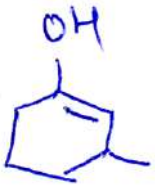
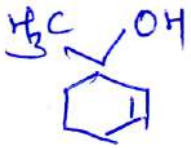
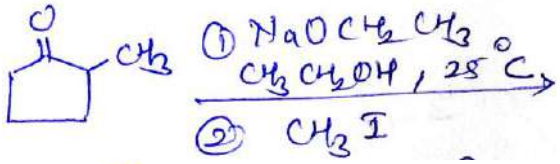
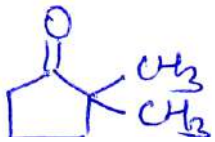
a) 

b) 

c) 

d) 

10) 

a) 

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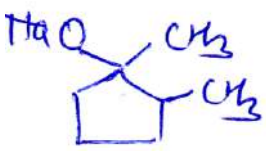
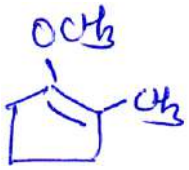
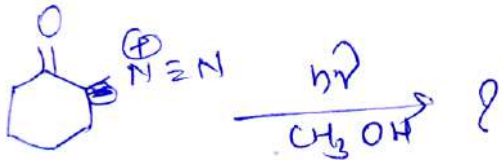
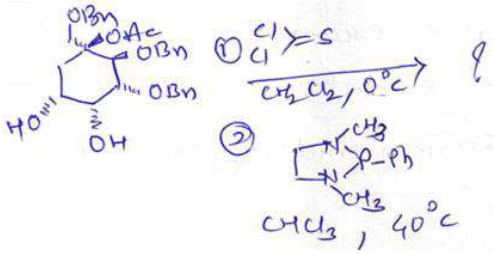
c) 

d) 

B) Fill in the blanks. **06**

1) 

2) 

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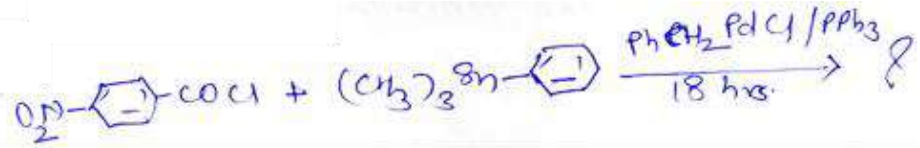
4) 

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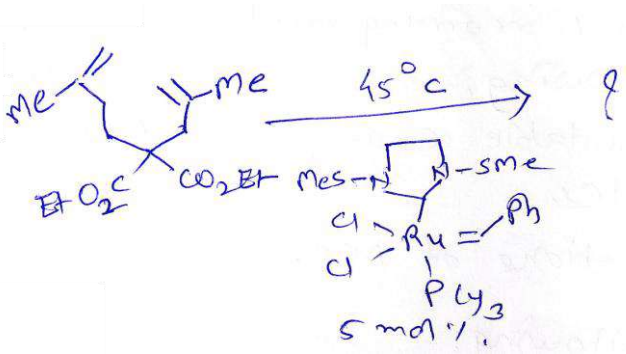

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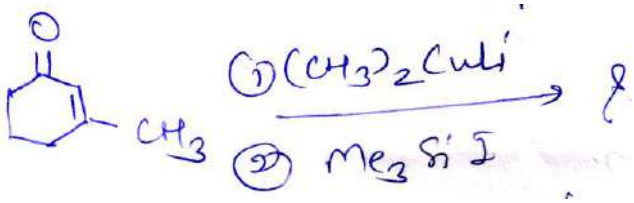


Q.2 Answer the following. **16**

a) Explain the mechanism of Corey-Fuchs reaction with suitable example.
b) Discuss the mechanism of Brook rearrangement reaction.
c) Discuss various application of selenium dioxide.
d) Discuss generation and properties of enolates.

Q.3 Answer the following.

a) Discuss reaction mechanism and applications of Julia Olefination. **08**
b) Discuss the mechanism and application of Wagner-Meerwein rearrangement reaction. **08**

Q.4 Answer the following.

a) Discuss with suitable example alkylation of highly stabilized enolates. **08**
b) Discuss reaction mechanism and application of Mitsunobu reaction. **08**

Q.5 Answer the following.

a) Discuss reaction mechanism and applications of Suzuki coupling reaction. **08**
b) Discuss reaction mechanism and applications of Tiffeneau-Demjanov rearrangement reaction. **08**

Q.6 Answer the following.

a) Discuss with suitable examples alkylation of ketones & nitriles. **08**
b) Discuss applications of DCC. **08**

Q.7 Answer the following.

a) Discuss reaction mechanism & applications of Darzen reaction. **08**
b) Discuss reaction mechanism and applications of Eschenmoser fragmentation. **08**

Seat No.	

Set **P**

M.Sc. Medicinal Chemistry (Semester - III) (Old) (CBCS) Examination: March/April - 2025
Drug Development (MSC08307)

Day & Date: Monday, 19-May-2025 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Question No. 1 and 2 are Compulsory.
2) Attempt any 3 questions from Q.No.3 to Q.No.7.
3) Figures to the right indicates full marks.

Q.1 A) Choose correct alternatives. **10**

1) QSAR, as the name suggests, is the computational technique to establish the correlation between _____ and _____.
   a) Chemical structures b) Biological activity
   c) Both a & b d) None of these

2) _____ are the main statistical methodologies conventionally executed in the linear model of the QSAR approach to elect molecular features crucial for activity.
   a) Principal component analysis
   b) Partial least square
   c) Multivariable linear regression analysis
   d) All of the above

3) The statistics of structure descriptors are based on _____ factors.
   a) The molecular representation of molecules.
   b) The geometric algorithm that is utilized for the descriptor calculation.
   c) Both a & b
   d) None of these

4) The process of movement of unchanged drug from the site of administration to systemic circulation is called _____.
   a) Drug distribution b) Drug absorption
   c) Drug metabolism d) Drug excretion

5) The function of phosphatidylcholine is to facilitate electron transfer from _____ to cytochrome P-450.
   a) NAD b) NADPH
   c) NAPD d) None of these

6) The antimalarial quinine from cinchona bark, the cardiac stimulus from foxgloves are the examples of _____ sources of drugs.
   a) Marine sources
   b) Microorganisms
   c) Animal sources
   d) Ethnopharmeceutical sources

7) _____ type of hydrogen bonding present when hydrogen bonding occurs between molecules.
   a) Intramolecular b) Intermolecular
   c) Both a & b d) None of these

8) pKa is a parameter which indicates the _____.
   a) Strength of drug as acid base reaction in water
   b) Aqueous phase in phosphate buffer
   c) Hydrophilic and lipophilic character
   d) All of the above

9) The minimum inhibitory concentration (MIC) is typically stated in ____.
   a) Milligrams/ kilogram b) Litres/ second
   c) Micrograms/milliliter d) Milligrams/ milliliter

10) _____ of the following is not used as a measure of enzyme activity.
   a) EC_{50} b) Ki
   c) IC_{50} d) Log P

B) Fill in the blanks. **06**

1) Among other approaches _____ is effective in reducing the cost, duration and attrition rate of the drug discovery process.
2) A preliminary requirement for any SBDD technique is the _____ structure of the target.
3) _____ is defined as the process whereby drugs and their metabolites are irreversibly transferred from internal to external environment.
4) Addition of polar group in drug increases its interaction with _____.
5) Addition of non-polar group _____ Partition coefficient.
6) Substances which reduce the rate of enzyme catalysed reactions are known as _____.

Q.2 Answer the following. **16**

a) Comment on Factors affecting bioactivity.
b) Explain mechanisms of drug absorption.
c) What is pKa value? Discuss on pKa value and ionization of drug.
d) Explain in brief the term LD_{50} and MIC.

Q.3 Answer the following. **16**

a) Explain Design of Prodrugs (application of the prodrug principle).
b) What is mean by Ligand-based drug design? Explain Molecular similarity-based search and Ligand-based pharmacophore techniques.

Q.4 Answer the following. **16**

a) Explain Pharmaceutical factors influencing drug absorption and bioavailability.
(Factors relating to the physicochemical properties of the drug).

b) Explain following types of Pharmacokinetic Models.
1) Compartment models.
2) Physiological models.

Q.5 Answer the following. **16**

a) Discuss on bioavailability of drug and write detailed description on sources of drug with examples.

b) Discuss in detail the solubility of drugs and factors affecting on solubility of drug. Explain relation between solubility and absorption of drug.

Q.6 Answer the following. **16**

a) What is receptor and types of receptors and Explain drug receptor interaction with factor affecting in drug receptor interaction.

b) Explain drug potency and drug efficacy. Discuss in detail the mechanism of drug action.

Q.7 Answer the following. **16**

a) Comment on Quantitative structure-activity relationship and Molecular docking.

b) Write in detail factors affecting Biotransformation of Drug.

Seat No.	

Set P

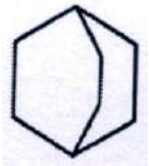
M.Sc. Medical Chemistry (Semester - IV) (New) (NEP CBCS) Examination: March/April - 2025
Modern Organic Chemistry (2327401)

Day & Date: Wednesday, 14-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

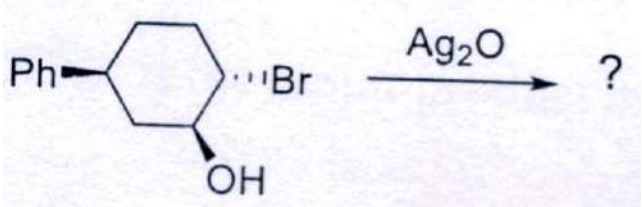
Q.1 A) Choose the correct alternative. **08**

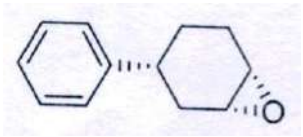
1) What is the IUPAC name of the following compound?

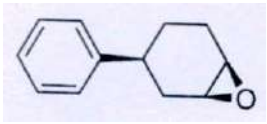


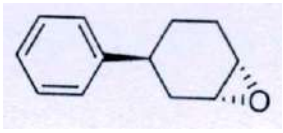
a) bicyclo[4.1.0]heptane
b) bicyclo[2.2.1]heptane
c) bicyclo[3.2.1]octane
d) bicyclo[2.2.2]octane

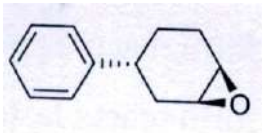
2) Predict the correct option of a major product.



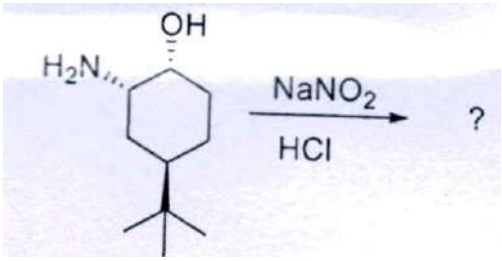
a) 

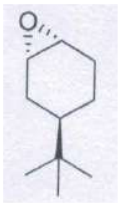
b) 

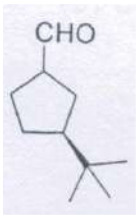
c) 

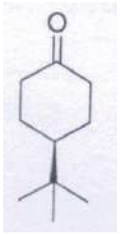
d) 

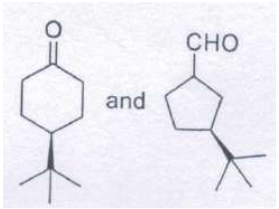
3) Choose the correct alternative for the following reaction transformation.



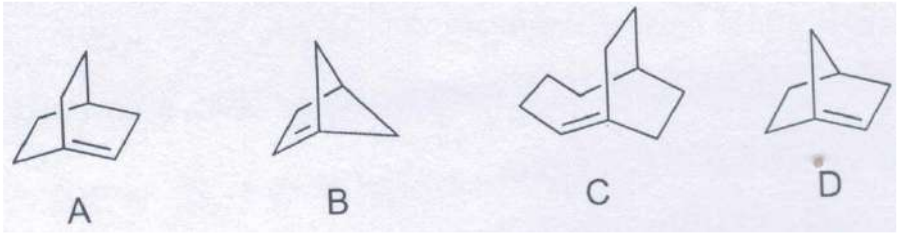
a) 

b) 

c) 

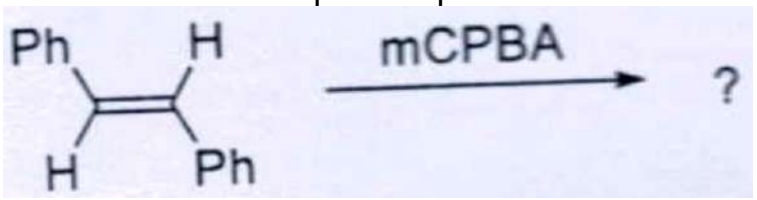
d) 

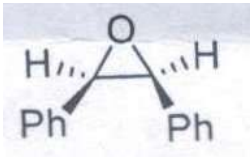
4) Based on Bredt's rule, which of these bicyclo alkenes is the most stable?

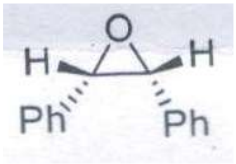


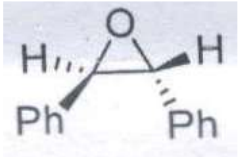
a) A
b) B
c) C
d) D

5) Predict the correct option of product.



a) 

b) 

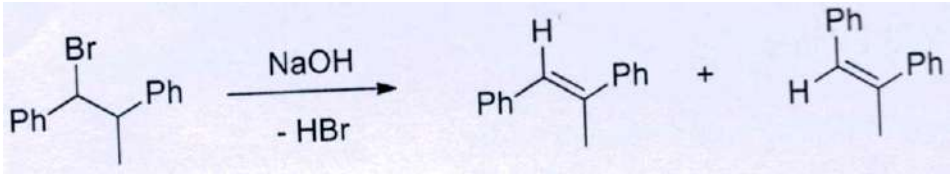
c) 

d) Both a & b

6) The point group of trans-9-methydecalin is _____.

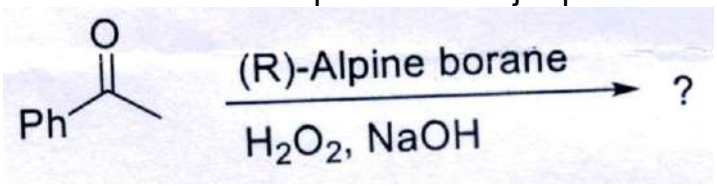
a) C_1 b) C_2
c) Cs d) C_2h

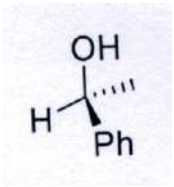
7) For the transformation given below, which statement is most correct?

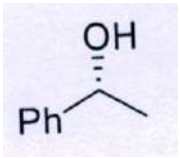


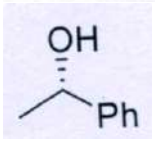
a) Threo form reacts faster & gives trans product
b) Threo form reacts faster & gives cis product
c) Erythro form reacts faster & gives trans product
d) Erythro form reacts faster & gives cis product

8) Predict the correct option of a major product.



a) 

b) 

c) 

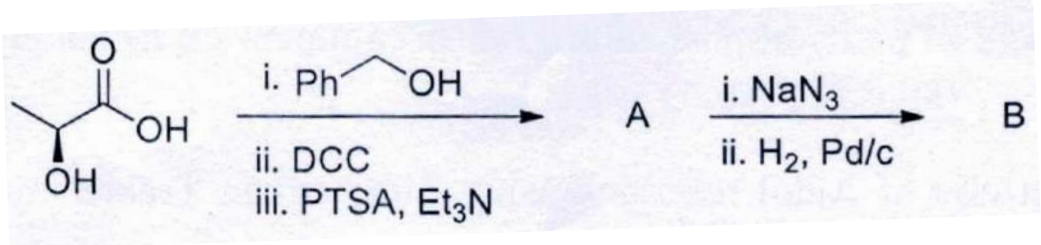
d) Both a & c

B) Write True or False: **04**

1) In Shi epoxidation, the catalyst is derived from sucrose.
2) The chiral reagent approach for asymmetric synthesis always gives product with 100% ee.
3) The point group of trans-decalin is D_2h.
4) The most stable isomer of perhydrophenanthrene is trans-c-trans.

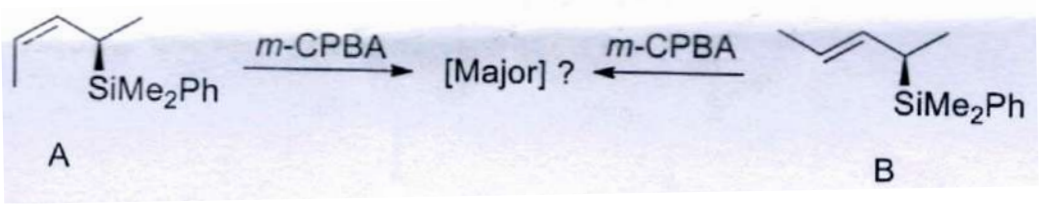
Q.2 Answer the following. (Any Six) **12**

a) What will be the product A and B in following transformation?



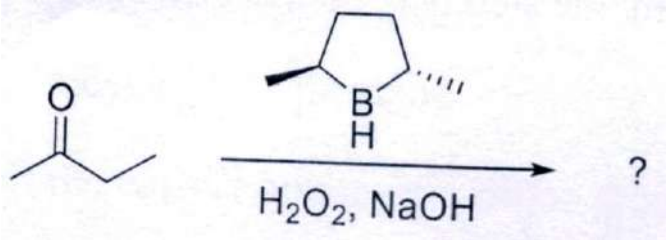
b) Discuss the reactivity in diastereomers of stilbene dichloride in presence of pyridine at 200 °C reaction temperature.

c) What will be the major product in following transformation?

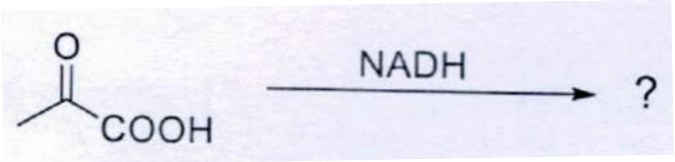


d) What is mean by Re Face and Si face?

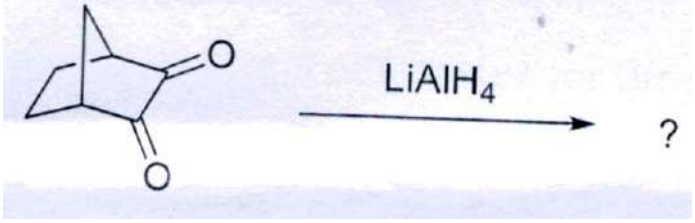
e) What is the major product in following reaction with stereochemistry?



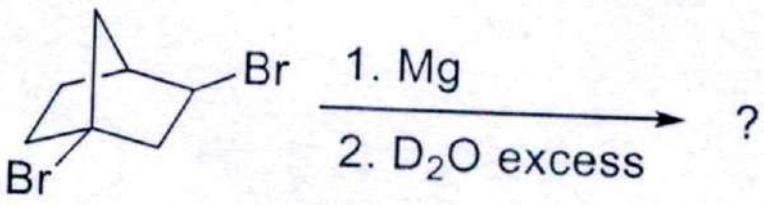
f) What is the major product in following reaction with stereochemistry?



g) What is the major product in following reaction with stereochemistry?



h) What is the major product in following reaction with stereochemistry?



Q.3 Answer the following. (Any Three) **12**

a) Discuss differences in the stability of diastereomers of stilbene dibromide and tartaric acid.

b) Discuss the iodide induced elimination of bromine from 2,3-dibromobutane.

c) Write a short note on cis-decalin and trans-decalin.

d) What is Sharpless asymmetric epoxidation? Discuss in details with examples.

Q.4 Answer the following. (Any Two) **12**

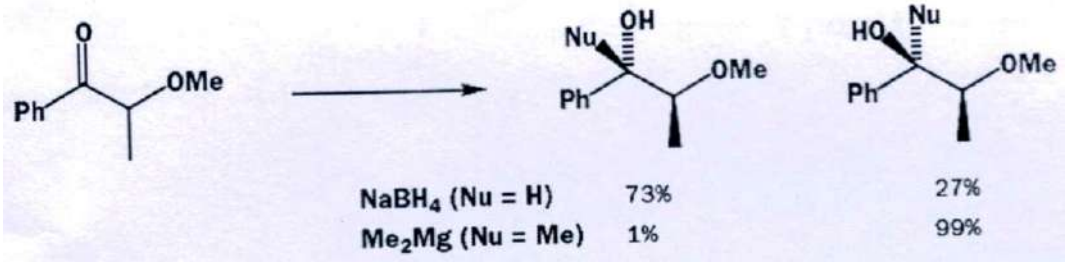
a) Explain different isomers of perhydrophenanthrene and comment on its stability and chirality?

b) Explain diastereoselectivity of Aldol reactions using Zimmerman Traxler transition state model with examples.

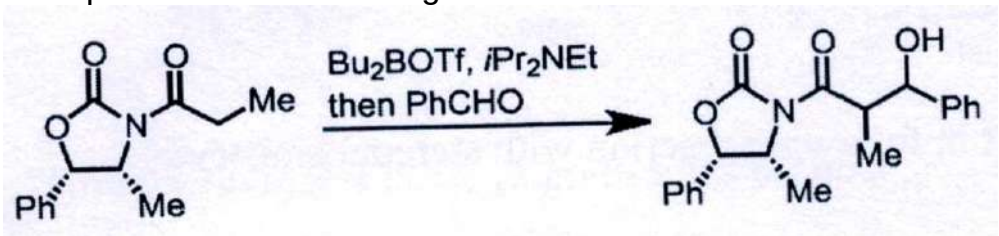
c) Discuss relative reactivity of diastereomers in NGP?

Q.5 Answer the following. (Any Two) **12**

a) Rationalize the stereochemical outcome in the following reaction.



b) Predict, with a clear transition state diagram, the stereochemistry of the aldol product in the following reaction.



c) Discuss SAMP/RAMP chiral auxiliary approach for α-alkylation of ketones with stereochemistry.

SLR-ZF-137

Seat No.	

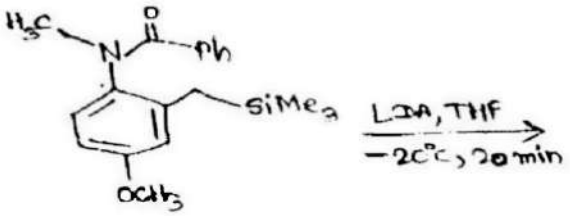
Set P

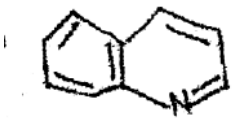
M.Sc. MEDICINAL CHEMISTRY (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2025
Drug & Heterocycles (2327402)

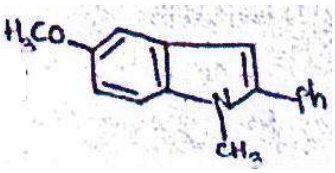
Day & Date: Friday, 16-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

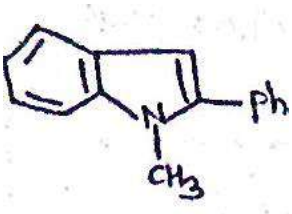
Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

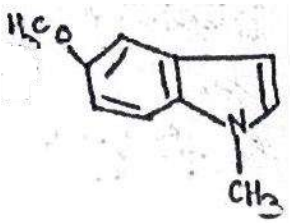
Q.1 A) Choose the correct alternative. **08**

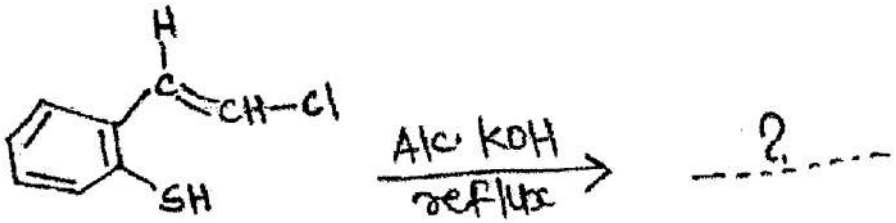
1) 

a) 

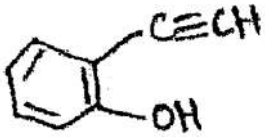
b) 

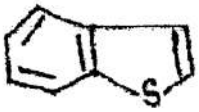
c) 

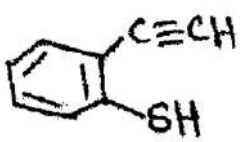
d) 

2) 

a)

b) 

c) 

d) 

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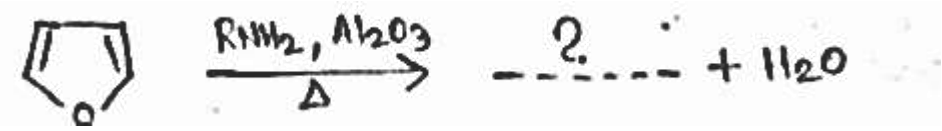
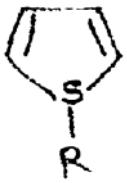


a) 

b)

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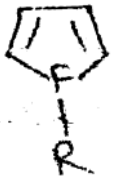
d) 

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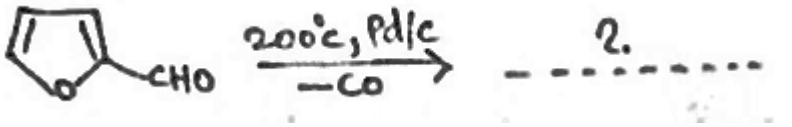


a)

b)

c)

d) None of these

5) Cephalosporines consist of β-lactam fused with a six membered ____

a) oxazolidine ring
b) pyrroline ring
c) dihydrodaidzein ring
d) thiazolidine

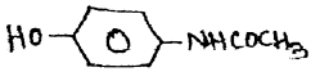
6) Ampicillin has an ____ group in its side chain.

a) Chloro
b) Amino
c) Fluro
d) Iodo

7) In the Ibuprofen drug, the aryl ring, with it's ____substituent, is crucial for binding to the COX active site and influencing the overall activity of the drug.

a) Isopropyl
b) Isobutyl
c) Ethane
d) Propane

8) _____ is the structure of Paracetamol.

a) 

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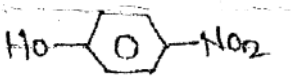
d) 

B) Write true or false: **04**

1) Quinoline ring structure is obtained by ortho-condensation of benzene ring with Furan.
2) Azoles containing two nitrogen atoms, one oxygen and one nitrogen atom, one sulfur and one nitrogen atom in the 1, 2-position are designated as pyrazole, isoxazole and isothiazole respectively.
3) The epi-tetracycline exhibit much less, activity than the corresponding natural isomers.
4) In the synthesis of Captopril, L-proline is acylated with the acid chloride to give the amide as a mixture of diastereomers.

Q.2 Answer the following. (Any Six) **12**

a) Write down with reaction the synthesis of Benzothiophene from Aryl Keto Sulfides.
b) Write down with reaction the Skraup synthesis of Quinolines.
c) Write down with reaction the Paal-Knorr synthesis of Thiophene.
d) Write down with reaction the synthesis of 2, 3-fused pyridines from cyclic ketones.
f) Write down the classification of Antimalarial drug.
g) Write down the classification of Anticonvulsant drug.
h) Write down the salient features of primary structure of insulin.
i) Write down the classification of Antineoplastic agents.

Q.3 Answer the following: (Any Three) **12**

a) Write in detail the various chemical reactions of Benzofuran.
b) Explain the chemical reactions of pyrimidines with Nucleophilic reagents and reaction with oxidizing and reducing agents.
c) Write down the structure, SAR and mechanism of action of Cefadroxil drug.
d) Write down the structure. SAR and mechanism of action of Indomethacin drug.

Q.4 Answer the following: (Any Two) **12**

a) Explain in detail the various chemical reactions of pyridines.
b) Write down the SAR, mechanism of action and synthesis of Chloroquine phosphate or Chloroquine.
c) Write down the SAR, mechanism of action and synthesis of Ibuprofen drug.

Q.5 Answer the following: (Any Two) **12**

a) Explain with reaction any six chemical reactions of Thiophenes.

b) Write down the SAR, mechanism of action and synthesis of Thiopental drug.

c) Write down the SAR, mechanism of action and synthesis of Metformin drug.

Seat No.	

Set P

M.Sc. MEDICINAL CHEMISTRY (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2025
Pharmaceutical Dosage Forms (2327405)

Day & Date: Tuesday, 20-May-2025 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **08**

1) _____ methods are used to prepare effervescent granules.
a) Heat b) Wet
c) Both a & b d) None of these

2) The _____ emulsions are mainly used externally as lotions or creams.
a) o/w b) w/o
c) w/w d) o/o

3) Generally, drug absorption into the skin occurs by _____diffusion.
a) Passive b) Carrier mediated
c) Active d) None of these

4) The volume of product dispensed from the MDI during the actuation process is _____.
a) $150 - 200\ \mu m$ b) $25 - 100\ \mu m$
c) $200 - 250\ \mu m$ d) $300 - 350\ \mu m$

5) _____ is used as an intervening agent to reduce the particle size of a powder by grinding usually in a motor.
a) Levigating agent b) Plasticizer
c) Flavorant d) Emulsifying agent

6) _____ is used to prevent drying of preparations, particularly ointments and creams.
a) Clarifying agent b) Humectant
c) Surfactant d) Chelating agent

7) _____ is the mechanism by which a dosage form is retained in the stomach, generally for the purposes of improving drug delivery.
a) Gastroretention b) Membrane controlled
c) Osmotic systems d) Hydrophilic matrix

8) Following are the advantages of transdermal patches over conventional oral dosage forms except _____.

a) Drug administration through the skin avoids the pH variations seen with gastrointestinal transit.
b) The drug reaches the systemic circulation whilst avoiding first pass hepatic metabolism.
c) Patient adherence is high.
d) Patches cannot be removed easily and quickly in cases where adverse

B) Write True/False. **04**

1) Nitroglycerin is buccal tablet.
2) Ophthalmic preparations are generally act at optic nerve which acts as the gate way for these formulations.
3) The formulation that best meets the goals for the product is selected to be its master formula.
4) For injections water is the most common vehicle used.

Q.2 Answer the following. (Any Six) **12**

a) Write a note on Compression Coating of tablet.
b) Write a note on Molded tablets.
c) Write down the Advantages and Disadvantages of Parenteral dosage form.
d) Write down the Comparison between Flocculated and Non-flocculated Suspensions.
e) Why dosage forms are needed, write reasons.
f) Define and give example of following ingredients.
   1) Acidifying agent
   2) Alkalinizing agent
g) Write the classification of control release form.
h) Write a note on Dissolution Controlled Release Systems and Matrix Dissolution Controlled Systems.

Q.3 Answer the following. (Any Three) **12**

a) Explain about
   1) Impact of manufacturing changes on solid dosage form and
   2) Packaging and storing of tablets.
b) Explain in detail about the Bulk and Divided Powders.
c) Write in detail about Sweetening and Coloring agents used in pharmaceutical preparations.
d) Explain in detail the physicochemical factors influencing design of sustained release dosage form.

Q.4 Answer the following. (Any Two) **12**

a) Explain in detail sugarcoating of tablets.

b) Explain in detail types of propellants commonly used in pharmaceutical aerosols.

c) Write in detail about Accelerated stability studies of drug product.

Q.5 Answer the following. (Any Two) **12**

a) Explain in detail Wet granulation method used for manufacture of compressed tablets.

b) Explain in detail about the evaluation tests for ophthalmic preparations.

c) Write about Intraocular implants and explain in detail about

1) Nonbiodegradable intraocular implants and
2) Biodegradable intraocular implants.

Seat No.	

Set P

M.Sc. Medicinal Chemistry (Semester - IV) (New/Old) (CBCS)
Examination: March/April - 2025
Pharmaceutical Dosage Forms (MSC08401)

Day & Date: Wednesday, 14-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Q.Nos.1 and 2 are compulsory.
2) Attempt any three questions from Q.No.3 to Q.No.7.
3) Figure to right indicate full marks.

Q.1 A) Choose correct alternative. **10**

1) _____ are the local routes of drug administration.
a) Topical b) Arterial supply
c) Deeper tissues d) All of the above

2) Following are the fillers used in wet granulation method except ____
a) Lactose b) Pharmaceutical shellac
c) Cellulose d) Starch

3) _____ coatings are employed when the drug substance is destroyed by gastric acid.
a) Enteric b) Film
c) Sugar d) None of these

4) _____ are the biphasic liquid dosage form of medicament in which the finely divided solid particles are dispersed in a liquid vehicle.
a) Emulsions b) Cream
c) Suspensions d) Powder

5) _____ is/ are a semisolid dosage forms.
a) Ointments b) Creams
c) Pastes d) All of the above

6) _____ are propellants used in pharmaceutical aerosols.
a) Chlorofluorocarbons b) Hydrofluorocarbons
c) Hydrocarbons d) All of the above

7) _____ drug is indicated for Parkinson disease.
a) Rasagiline mesylate 0.5 mg b) Nitroglycerine 0.3 mg
c) Paricalcitol 0.002 mg d) Lisinopril 5 mg

8) The energy required for a molecule of drug to escape from a crystal is much than _____ is required to escape from an amorphous powder.
a) Lower b) Greater
c) very lower d) none of these

9) ____ drug is indicated for Dementia.

a) Rasagiline mesylate 0.5 mg b) Nitroglycerine 0.3 mg
c) Paricalcitol 0.002 mg d) Rivastigmine tartrate 1.5 mg

10) Sustained release formulation follows ____ release.

a) first order b) third order
c) fourth order d) none of these

B) Fill in the blanks: **06**

a) ____ refers to administration by injection which takes the drug directly into the tissue fluid or blood without having to cross the intestinal mucosa.
b) A tablet's durability may be determined through the use of a ____
c) ____ ointments are intended to release the medicaments that pass through the skin and produce systemic effects.
d) The formulation that best meets the goals for the product is selected to be its _____ formula.
e) Aspirin combines with a water molecule and hydrolyzes into one molecule of ____ and one molecule of acetic acid.
f) Drugs having shorter and longer ____ cannot be formulated as sustained release dosage formulation.

Q.2 Answer the following: **16**

a) Write in detail any four systemic routes of drug administration.
b) Define Aerosols and write components of aerosol product with neat labeled figure.
c) Write the general considerations in dosage form design.
d) Write a note on Matrix Diffusion Controlled Systems.

Q.3 Answer the following **16**

a) Explain in detail types of tablets.
b) Write in detail Wet granulation method of tablet manufacturing.

Q.4 Answer the following **16**

a) Explain in detail following types of ophthalmic products.
1) Eye drops
2) Eye lotions
3) Eye ointments

b) Explain following types of powders.
1) Topical powders
2) Insufflated powders
3) Hygroscopic powders
4) Efflorescent powders

Q.5 Answer the following **16**

a) Explain in detail steps involved in preformulation studies.
b) Comment on Flavoring Pharmaceuticals and write a note on Sweetening Pharmaceuticals.

Q.6 Answer the following **16**

a) Describe Delayed release dosage form.

b) Explain formulation principles of Transdermal preparation.

Q.7 Answer the following **16**

a) Define the term suspension. Explain the formulation of suspensions.

b) Write down the classification of ointment based on penetration of skin and explain bases used in preparation of ointments.

Seat No.	

Set P

M.Sc. MEDICINAL CHEMISTRY (Semester - IV) (New/Old) (CBCS)
Examination: March/April - 2025
Drug Regulatory Affairs (MSC08403)

Day & Date: Tuesday, 20-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) 1) Attempt five questions.
2) Q (1) and Q (2) are compulsory.
3)Attempt any three from Q.3 to Q.7.

Q.1 A) Select the correct alternative. **10**

1) _____ with GMP is a necessary condition for the marketing authorization to sell the product.
a) Non compliance b) Confirmation
c) Practice d) Compliance

2) As per ICH guidelines residual solvent chloroform is classified as _____.
a) Class I solvent b) Class II solvent
c) Class III solvent d) Class IV solvent

3) MedDRA stands for _____.
a) Medical dictionary for regulatory affairs
b) Medical directory for regulatory activity
c) Medical dictionary for regulatory activity
d) Medical device for regulatory activity

4) Common Technical Document (CTD) is divided into _____modules.
a) 2 b) 3
c) 5 d) 4

5) A high efficiency air filter used in AHU is _____.
a) Micron filter b) HAPA filter
c) Nano filter d) HEPA filter

6) _____ is a right obtained by a person for his innovation.
a) CTD b) Patent
c) DMF d) GMP

7) Type-I DMF deals with _____.
a) Packaging materials b) Manufacturing site
c) Drug substance d) Excipients

8) Intellectual property rights (I.P.) in India covers _____.
a) Trademarks b) Copyrights
c) Patents d) All of the above

9) Functions of state licensing authorities, Deputy Drug Controller (DDC) _____.
a) Licensing of drug testing laboratories
b) Pre and post licensing inspection
c) Recall of substandard drugs
d) All of the above

10) MHRA is regulatory agency of _____.
a) UK b) Denmark
c) Brazil d) South Africa

B) State whether true or false. **06**

1) List of approved drugs and their associated IPR is available in orange book.
2) The ICH topics are divided into Quality guidelines, Safety guidelines, Efficacy and Multidisciplinary Categories.
3) The office for registration of Geographical indications for whole of India is located at Mumbai.
4) Drug Master File (DMF) is divided into seven types.
5) The TGA is described as the national medicines regulatory authority of Brazil.
6) CDSCO is the India's national drug regulatory body.

Q.2 Answer the following. **16**

a) Write definitions of following.
1) Clean room
2) Airlock
3) Contaminations
4) Critical Parameter

b) Explain in brief drug master file (DMF) & discuss about types of DMF?

c) Write the difference between Quality assurance Vs. Quality controls with respect to their responsibility.

d) What is trade mark? Explain in brief its functions.

Q.3 Answer the following. **16**

a) What is GMP? Explain the basic requirements of GMP and quality culture in pharmaceutical industry.

b) Explain in detail typical pharmaceutical HVAC system and the components of HVAC in accordance with GMP. What are the different types of airlocks?

Q.4 Answer the following. **16**

a) What is invention? Discuss in details about patentable and non-patentable inventions criteria and discuss about advantages of patenting.

b) What is compulsory licenses? Write an overview on Exclusive Market Right (EMR) with an examples.

Q.5 Answer the following. **16**

a) Write an overview on overall organization of CTD with five modules?

b) Discuss in detail about drug regulatory agencies in Australia (TGA) and guidelines for Japan.

Q.6 Answer the following. **16**

a) Discuss in details about USFDA and FDA mission. Explain what FDA regulate and does not regulate.

b) Write short note on NDA (New drug application) and ANDA.

Q.7 Answer the following. 16

a) Write an overview on ICH and steps involved in ICH process.

b) Write short notes on

1) Trade secrets
2) Industrial designs
3) Holding and distribution
4) Geographical Indications

Seat No.	

Set P

M.Sc. MEDICINL CHEMISTRY (Semester - IV) (New/Old) (CBCS)
Examination: March/April - 2025
Medicinal Chemistry (MSC08408)

Day & Date: Thursday, 22-May-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Q.Nos 1 and 2 are compulsory.
2) attempt any three from Q. No. 3 to Q. No. 7.
3) Figure to the right indicates full marks.

Q.1 A) Choose the correct alternative: **10**

1) Medicines that kill or stop growth of bacteria are called ____agents.
a) Antifungal b) Antibiotics
c) Cardiovascular d) Anaesthetics

2) Which of the following sulphonamide is used in treatment of skin infection ____.
a) Sulphisoxazole b) Nitrosulphathiazole
c) Sulphaguanidine d) Sulphapyridine

3) Nifedipine corresponds to ____ type of drug.
a) NSAID b) Antibiotics
c) Cardiovascular d) Antianginal

4) ____ is an example of anticonvulsant drug.
a) Sulphapyrine b) Phenytoin
c) Valproic acid d) Cefixime

5) Peniciline corresponds to ____ group of antibiotics.
a) $\alpha - lactum$ b) $\beta - lactum$
c) Aminoglycosides d) None of above

6) A drug that causes loss of consciousness is called ____ agent.
a) Antipyretic b) Analgesic
c) Anaesthetic d) Antibiotic

7) Chloroquine is used as____ drug.
a) Cardiovascular b) Antimalarial
c) Antihistamine d) Both b and c

8) ____ is an antidepressant agent.
a) Nifedipine b) Verapamil
c) Phenelzine d) Phenytoin

9) Insulin is released from ____ in human body to control blood sugar level.
a) Kidney b) Pancreas
c) Lungs d) Intestine

10) NSAID work by blocking ____ enzyme.
a) Amylase b) COX-II
c) Protease d) None of above

B) State true or false: **06**

1) Diazepam is used as sedative agent.
2) General anesthetics cause total unconsciousness of human body.
3) Phenelzine is used as anticonvulsant agent.
4) Malaria is caused due to four different species of Plasmodium.
5) Paracetamol is an antipyretic drug.
6) Cefazolin corresponds to first generation cephalosporine.

Q.2 Answer the following: **16**

a) Explain synthesis and mechanism of action of Diclofenac.
b) Write structure and explain mechanism of action of Diphenhydramine.
c) Explain synthesis of Phenelzine.
d) Write note on synthesis and SAR of Chloramphenicol.

Q.3 Answer the following: **16**

a) Write structure and explain mechanism of action, structure activity relationship of Thiopental.
b) Write the synthesis and SAR of antihypertensive drug Metformin.

Q.4 Answer the following: **16**

a) Write note on Anticonvulsant agents with suitable example w.r.t. synthesis and mechanism of action.
b) Write note on Classification and mechanism of action of antibiotics.

Q.5 Answer the following: **16**

a) Write structure and explain mechanism of action, structure activity relationship and therapeutic uses of Phenytoin.
b) Explain in detail sulphonamides.

Q.6 Answer the following: **16**

a) Explain mechanism of action of NSAID and give methods for synthesis of Ibuprofen and Aspirin.
b) Explain in detail Antifungal drugs.

Q.7 Answer the following: **16**

a) Write notes on:

i) Antiviral drugs

ii) Antidiabetic drugs

b) Explain in detail classification and SAR of sedative and hypnotics.