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Set **P**

**M.Sc. (Chemistry) (Semester - I) (New) (NEP CBCS) Examination:
March/April – 2026**

Physical Chemistry - I

(2324101/2325101/2326101/2327101/2302101/2303101/2304101/2305101)

Day & Date: Friday, 17-04-2026
Time: 03:00 PM To 05:30 PM

Max. Marks: 60

- 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 correct alternative. (MCQ)

08

- 1) The kinetic energy of a photoelectron changes with _____.
 - a) frequency of incident radiation
 - b) intensity of incident radiation
 - c) metal surface
 - d) All of these

- 2) All gases behave ideally as _____.

a) $P \rightarrow 1$	b) $P \rightarrow 0$
c) $P \rightarrow \infty$	d) $P \rightarrow -1$

- 3) The fugacity of a solute in dilute solution is proportional to its mole fraction. This statement belongs to _____.

a) Henry's law	b) Raoult's law
c) Planck's law	d) Boyle's law

- 4) Entropy is a measure of _____.

a) randomness	b) disorderness
c) orderness	d) Both a and b

- 5) $(\partial H/\partial T)_T = V - T(\partial V/\partial T)_P$, this equation represents _____.
 - a) first law of thermodynamics
 - b) combined form of first and second law
 - c) thermodynamic equation of state
 - d) Maxwell relation

- 6) The individual way of distribution of an energy in the particular configuration is called as _____.

a) microstate	b) configuration
c) ensemble	d) most probable configuration

- 7) On mixing of gases, the entropy _____.

a) increases	b) decreases
c) becomes infinite	d) becomes zero

Seat No.	
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Set **P**

**M.Sc. Chemistry (Semester - I) (New) (NEP CBCS) Examination:
March/April – 2026
Organic Chemistry - I
(2324102 / 2325102 / 2326102 / 2327102 / 2302102 / 2303102 / 2304102 /
2305102)**

Day & Date: Monday, 20-04-2026
Time: 03:00 PM To 05:30 PM

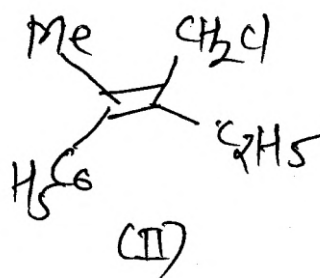
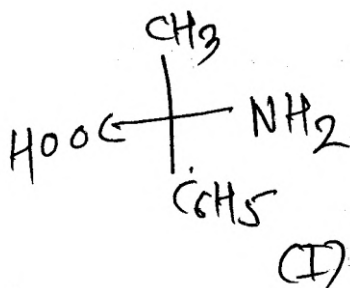
Max. Marks: 60

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

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

08

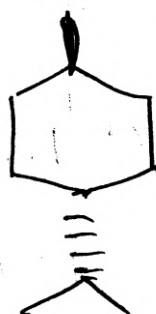
1) Consider the molecules I and II



Which one of the following represents their correct configurational notation according to CIP rule?

- | | I | II |
|----|---|----|
| a) | R | S |
| b) | S | E |
| c) | R | Z |
| d) | S | Z |

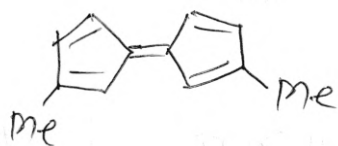
2) In the most stable conformation of the compound below, how many alkyl substituents are axial?



- | | | | |
|----|---|----|------------|
| a) | 2 | b) | 1 |
| c) | 0 | d) | Both a & b |

3) Amongst the following the rate of cis-trans isomerization is expected to be highest in: _____.

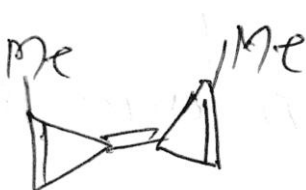
a)



b)



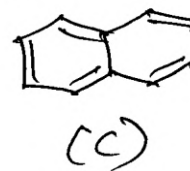
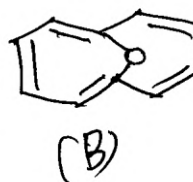
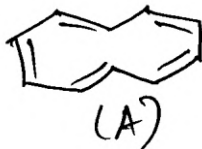
c)



d)



4) Among A-C, the aromatic compounds are _____.



a) A, B and C

b) A and B only

c) B and C only

d) A and C only

5) The reaction given below is an example of _____.



a) Benzylic and rearrangement

b) Michael addition

c) Favorskii reaction

d) Baeyer villiger reaction

6) The intermediate involved in Curtius rearrangement is _____.

a) Isocyanate

b) Acid

c) Acid chloride

d) Amine

7) The good leaving group in S_N2 mechanism is _____.

a) F^-

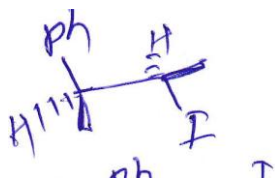
b) Cl^-

c) Br^-

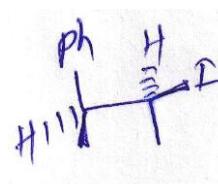
d) I^-

8) The Neighboring group participation (NGP) is involved in substrate:

a)



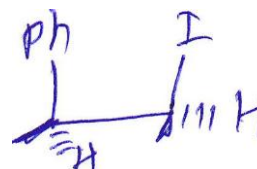
b)



b)



d)



B) Write True or False.

04

- 1) Trans Decalin is more stable than cis Decalin.
- 2) [18]-crown-6 species binds with Na^{\oplus} metal ion.
- 3) Cis-alkene on reaction with singlet carbene gives cyclopropane with cis stereochemistry as major product.
- 4) The nucleophilic substitution reaction with anchimeric assistance, gives product with inversion of configuration.

Q.2 Answer the following. (Any Six)

12

- a) Explain the migratory aptitude in Benzil-benzilic acid rearrangement.
- b) Explain aromatic nature of tropane and trapdoor.
- c) Explain resonance effect.
- d) Explain the term enantiomerism with suitable example.
- e) Describe the term axis of symmetry with suitable example.
- f) Explain stability of carbocation.
- g) Describe nucleophilic substitution at an allylic carbon with suitable example.
- h) What is non-classical carbocation? Explain with example.

Q.3 Answer the following. (Any Three)

12

- a) Explain the aromatic nature of non-benzenoid compounds with suitable examples.
- b) Give the different methods for synthesis of free radical.
- c) Explain stereospecific and stereoselective reaction with suitable example.
- d) Explain with suitable example SET mechanism.

Q.4 Answer the following. (Any Two)

12

- a) Define Prochiral relationship and explain the following term with suitable examples.
 - 1) Homotopic groups
 - 2) Enantiotropic groups
 - 3) Diastrophic groups
- b) Explain synthesis and reactions of Nitrene.
- c) Explain neighboring group participation in nucleophilic substitution reaction.

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

- a)** Explain the term with suitable examples:
- 1) Aromatic compound
 - 2) Antiaromatic compound
 - 3) Non-aromatic compound
 - 4) Homoaromatic compound
- b)** Explain Wolff rearrangement with respect to mechanism and applications.
- c)** Discuss in details, the SN' type mechanism with an example.

Set No.	
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Set **P**

**M.Sc. Chemistry (Semester - I) (New) (NEP CBCS) Examination:
March/April - 2026**

Inorganic Chemistry - I

(2324107/2325107/2326107/2327107) (2302107/2303107/2304107/2305107)

Day & Date: Wednesday, 22-04-2026

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 Tog table and calculators is allowed.

Q.1 A) Choose the correct alternative for the following.

08

- 1) The symmetry required for the ligand group orbitals (LGO) for the π - base ligands to have π - interactions with the metal d orbitals in an octahedral geometry is _____.
 - a) a_{1g}
 - b) t_{1u}
 - c) e_g
 - d) t_{2g}
- 2) According to Bent's rule, the more electronegative atom will occupy the hybrid orbital with _____.
 - a) Greater s-character
 - b) Less s-character
 - c) Equal s-character
 - d) Depends on the molecule's geometry
- 3) In a molecule with a trigonal bipyramidal geometry, where does a lone pair of electrons prefer to be located, according to Bent's rule?
 - a) Equatorial position
 - b) Axial position
 - c) Either axial or equatorial position
 - d) It depends on the electronegativity of the ligands
- 4) A NPN transistor conducts when _____.
 - a) Both collector and emitter are positive with respect to the base
 - b) Collector is positive and the emitter is negative with respect to the base
 - c) Collector is positive and the emitter is at the same potential as the base
 - d) Both collector and emitter are negative with respect to the base
- 5) Which of the following nuclear reactor components is used to slow down fast-moving neutrons without absorbing them?
 - a) Control rods
 - b) Coolant
 - c) Moderator
 - d) Fissile materials

Q.5 Attempt any TWO of the following.

12

- a) Explain preparation, properties & structures of tri nuclear carbonyl complexes.
- b) Explain in detail doping of semiconductors and conduction mechanism.
- c) Discuss the magnetic properties and color of transition elements.

Seat No.	
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Set P

**M.Sc. (Chemistry) (Semester - I) (New) (NEP CBCS) Examination:
March/April – 2026
Research Methodology
(2324103/2325103/2326103/2327103/2302103/2303103/2304103
/2305103)**

Day & Date: Friday, 24-04-2026
Time: 03:00 PM To 05:30 PM

Max. Marks: 60

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

Q.1 A) Choose the correct alternative. 08

- 1) The experimental study is based on _____.
 - a) The manipulation of variables
 - b) Conceptual parameters
 - c) Replication of research
 - d) Survey of literature
- 2) 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
- 3) Which of these situations would not result in plagiarism?
 - a) Including a generally known fact without providing a reference
 - b) Submitting your research for publication to multiple journals
 - c) Adding quotation marks and providing a citation when using words from another author's work
 - d) Both a & c
- 4) Research paper format, MLA stands for _____.
 - a) Modern Language Association
 - b) Moral Language Association
 - c) Model Language Association
 - d) Middle Language Association
- 5) Polarography is particularly useful for the analysis of _____.
 - a) Organic compounds only
 - b) Gaseous samples
 - c) Electroactive species in solution
 - d) Non-polar substances

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

- a) Define Sampling. Explain with examples various types of probability sampling method used in Research methodology.
- b) What is Data collection in research? Classify data collection method in research.
- c) An organic compound of molecular formula C_8H_8O shows the following features:

IR (KBr): 2998cm^{-1} ; 1685cm^{-1}

$^1\text{HNMR}$: 2.1δ (s, 3H); 7.43 (dd, 2H, $J=7.0$ Hz); 7.02δ (dd, 2H, $J=7.0$ Hz); 9.10δ (s, 1H)

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

- a) Why literature survey is necessary in Research methodology? Explain various sources being used.
- b) Discuss in detail layout of research paper in APA format.
- c) Describe the interpretation of different Thermogram obtained by TGA.

Seat No.	
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Set **P****M.Sc. (Chemistry) (Semester - II) (New) (NEP CBCS)****Examination: March/April - 2026****Physical Chemistry - II****(2326201/2325201/2324201/2302201/2304201/2305201/2303201/2327201)**

Day & Date: Thursday, 16-04-2026

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 & well labelled diagram wherever necessary.

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

- 1) Which of the following greenhouse gas is present in very high quantity?
 - a) Carbon dioxide
 - b) Ethane
 - c) Propane
 - d) Methane
- 2) An electronically excited dimer which dissociates immediately after relaxation is called _____.
 - a) excimer
 - b) exciplex
 - c) sensitizer
 - d) catalyst
- 3) According to steady approximation, the concentration of reactive intermediate _____.
 - a) decreases
 - b) increases
 - c) remains constant
 - d) None of these
- 4) _____ is the only colligative property that can be useful for investigating macromolecules.
 - a) osmotic pressure
 - b) vapour pressure
 - c) boiling point
 - d) melting point
- 5) Chain initiation, chain propagation and chain termination are the three steps involved in _____ polymerization.
 - a) addition
 - b) free radical
 - c) condensation
 - d) cationic
- 6) Which of the following reaction follows fractional order kinetics?
 - a) iodination of acetone
 - b) thermal decomposition of acetaldehyde
 - c) ethane decomposition reaction
 - d) hydrolysis of an ester
- 7) Which of the electrodes can be used as a reference electrode?
 - a) platinum
 - b) cadmium
 - c) calomel
 - d) silver

- 8) Debye-Huckel limiting law is valid with experimental value of activity coefficient at _____.
a) high concentration of electrolyte
b) low concentration of electrolyte
c) high temperature
d) low temperature

B) Fill in the blanks OR Write True/False.**04**

- 1) The fluorescence wavelength is often much longer than irradiation is governed by _____.
- 2) Working principle of battery involves an electrochemical reaction that converts chemical energy into electrical energy. (True/False)
- 3) In Step-growth polymerization the reaction occurs in steps, where small molecules gradually combine to form larger molecules. (True/False)
- 4) Ionic strength of 0.2 M KNO_3 solution is _____.

Q.2 Solve any Six of the following.**12**

- a) State Debye-Huckel limiting law.
- b) Write on different possible electronic transitions.
- c) Gouy-Chapman model of electrical double layer.
- d) What is meant by phosphorescence?
- e) State steady state approximation.
- f) What are conducting polymers?
- g) Define Glass transition temperature.
- h) Mathematically define ionic strength of the solution.

Q.3 Attempt any Three of the following.**12**

- a) Write a note on alkali storage battery.
- b) Discuss inter and intra molecular excitation energy transfer process with example.
- c) Describe the effect of ionic strength on the ionic reactions in solution state.
- d) What are the factors influencing Glass transition temperature?

Q.4 Attempt any Two of the following.**12**

- a) Discuss in brief the kinetics of bimolecular collisional quenching.
- b) Discuss in brief higher order kinetics.
- c) Write in brief Debye-Huckel theory.

Q.5 Attempt any Two of the following.**12**

- a) Derive Stern-Volmer equation. Give the significance of terms involved in it.
- b) Explain the method of determination of dissociation constant of monobasic acid by e.m.f. method.
- c) Give brief account on kinetics of free radical polymerization.

Seat No.	
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Set P

**M.Sc. Chemistry (Semester - II) (New) (NEP CBCS) Examination:
March/April - 2026
Organic Chemistry – II
(2326202 / 2325202 / 2324202 / 2302202 / 2304202 / 2305202 / 2303202 /
2327202)**

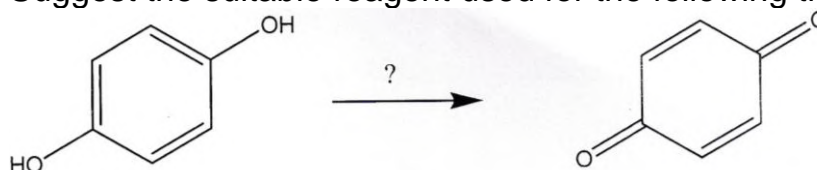
Day & Date: Saturday, 18-04-2026
Time: 11:00 AM To 01:30 PM

Max. Marks: 60

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

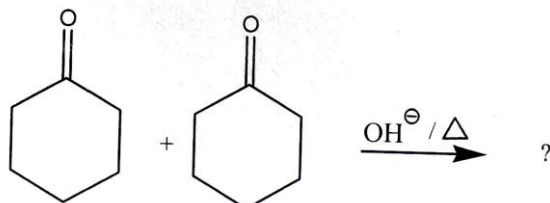
Q.1 A) Choose correct alternative. (MCQ) 08

- Which of the following statements about E1 reactions is INCORRECT?
 - The rate-determining step involves the loss of a leaving group
 - E1 reactions are unimolecular
 - E1 reactions involve a carbocation intermediate
 - E1 reactions are always second-order
- _____ is a very selective reducing agent for the reduction of aldehydes and ketones to alcohols.
 - LiAlH₄
 - Na and Liq. NH₃
 - Na in alcohol
 - NaBH₄
- The specific reagent for the oxidation of allylic and benzylic hydroxyl group is _____.
 - CrO₃
 - OsO₄
 - KMnO₄
 - MnO₂
- Lindlar's catalyst is used for the selective reduction of which functional group?
 - Alkyl halides
 - Alkynes
 - Alkenes
 - Alcohols
- The product of Wittig reaction is _____.
 - alcohol
 - aldehyde
 - ketone
 - olefin
- Suggest the suitable reagent used for the following transformation

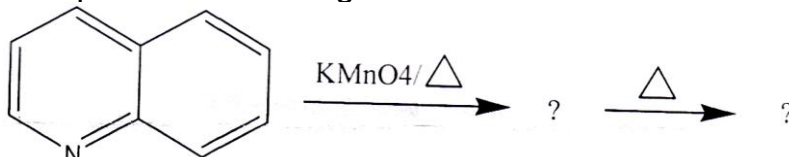


- Osmium tetroxide
- Lead tetra-acetate
- Chromium trioxide
- Manganese oxide

g) Complete the given reaction:



h) Complete the following reaction:



Q.3 Answer the following. (Any Three)

12

- Explain *IPSO* attack with suitable example.
- Discuss Robinson annulation with suitable example
- Explain the pyrolysis of Xanthate esters.
- Write any four applications of organolithium compounds.

Q.4 Answer the following. (Any Two)

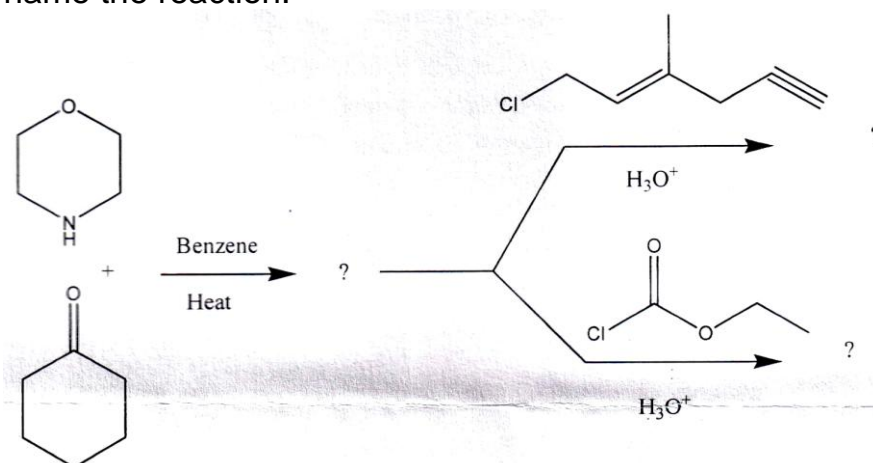
12

- Give any three uses of following oxidizing reagents in organic synthesis.
 - m*-CPBA
 - Thallium
 - Nitrate
- Discuss the Wolff-Kishner reduction reaction in detail.
- Give any three applications of following reducing reagents in organic synthesis.
 - Bu_3SnH (TBTH)
 - NaBH_4

Q.5 Answer the following. (Any Two)

12

- Give detailed mechanism and applications of Mc-Murry reaction.
- Discuss E2 reaction in detail with mechanism.
- Complete the following conversion, explain it with mechanism and name the reaction.



Seat No.	
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Set P

M.Sc. Chemistry (Semester - II) (New) (NEP CBCS)
Examination: March/April - 2026
Inorganic Chemistry-II (2326207/2325207/2324207/2302207/
2304207/2305207/2303207/2327207)

Day & Date: Tuesday, 21-04-2026
 Time: 11:00 AM To 01:30 PM

Max. Marks: 60

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

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

- 1) For separation of lanthanide _____ method is used.
 - a) ion exchange
 - b) decomposition
 - c) filtration
 - d) oxidation
- 2) Rhodium based catalysts are used in _____ process.
 - a) Synthesis gas
 - b) Wacker
 - c) Ziegler-Natta
 - d) Monsanto acetic acid
- 3) The oxidation state of iron in deoxy-hemoglobin is _____.
 - a) +1
 - b) +3
 - c) +2
 - d) 0
- 4) White phosphorus P₄ molecule has _____ shape.
 - a) linear
 - b) tetrahedral
 - c) triangular
 - d) square planar
- 5) The deoxy form of hemocyanin is _____.
 - a) blue
 - b) green
 - c) colourless
 - d) red
- 6) The _____ lanthanide ion is used as Shift reagents.
 - a) Eu(III) and Pr(III)
 - b) La(III) and Lu(III)
 - c) Ac(II) and Lu(III)
 - d) Gd(II) and Ce(III)
- 7) _____ Wijs reagent is used for estimation of iodine.
 - a) BrF₄
 - b) ICl
 - c) IBr
 - d) IF
- 8) IF₇ molecule has _____ geometry.
 - a) angular
 - b) tetrahedral
 - c) octahedral
 - d) pentagonal bipyramidal

B) Fill in the blanks: 04

- 1) _____ is the basic unit in most of the silicates.
- 2) The general electronic configuration of lanthanides is _____.
- 3) In graphite each carbon atom is _____ hybridized.
- 4) Hemerythrin is a non-heme iron protein that transports _____.

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

- a) List the factors affecting stability constant with respect to metal ion and ligand.
- b) Give an account on interhalogen compounds.
- c) What are the important ores of lanthanides?
- d) Discuss ferredoxins in brief.
- e) Define calcination and roasting.
- f) What are phosphazenes?
- g) Define isomerization with suitable example.
- h) Draw the structure of porphyrine ring.

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

- a) Explain the synthesis, structure and properties of silicates.
- b) Explain the pH metric determination of formation constant.
- c) Write a note on properties and applications of tin.
- d) Discuss in detail spectral and magnetic properties of lanthanides.

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

- a) What are organometallic compounds? Discuss in detail Hydroformylation of Alkenes.
- b) Write a note on Photosynthesis PS-I and PS-II.
- c) Discuss in detail the synthesis and properties of oxoacids of Nitrogen.

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

- a) What is Wacker process? Discuss the catalytic cycle involved in it.
- b) Write a note extraction of Gold.
- c) Discuss in detail the structures of hemoglobin and Myoglobin.

Seat No.	
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Set **P**

**M.Sc. Chemistry (Semester - II) (CBCS) Examination:
March/April – 2026
Analytical Chemistry - II (MSC05210)**

Day & Date: Thursday, 23-04-2026
Time: 11:00 AM To 02:00 PM

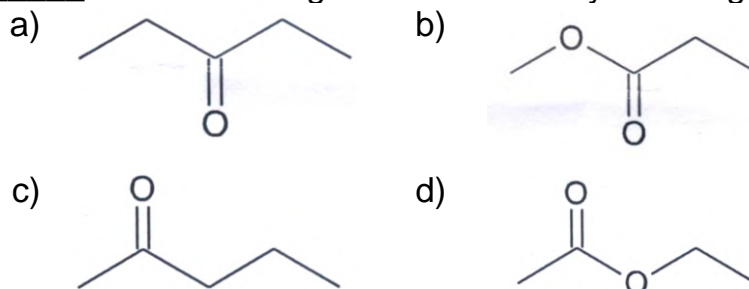
Max. Marks: 80

- Instructions:** 1) Questions no. 1 & 2 are compulsory.
2) Attempt any Three Question from Q No.3 to Q No.7
3) Figures to the right indicate full marks.

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

- 1) IR spectroscopy is mainly used to determine _____.
a) functional group b) molecular weight
c) atomic weight d) None of these
- 2) In mass spectroscopy, gaseous organic molecule is bombarded with _____ at elevated temperature and reduced pressure.
a) neutron b) electron
c) proton d) None of these
- 3) Generally, due to O-H stretching in alcohol, the IR band is observed at _____.
a) 3500 cm^{-1} b) 2250 cm^{-1}
c) 1710 cm^{-1} d) 1760 cm^{-1}
- 4) Number of sets of equivalent protons in butanal are _____.
a) 2 b) 3
c) 4 d) 5
- 5) Nuclear spin of ^{13}C and ^1H are _____ respectively.
a) 1 and 0 b) $1/2$ and 1
c) $1/2$ and 0 d) $1/2$ and $1/2$

6) _____ of the following shows McLafferty rearrangement.



- 7) _____ of the following compounds having three peaks in PMR spectra.
- a) acetaldehyde b) 1-propanol
c) 2-propanol d) acetone
- 8) In proton decoupled ^{13}C NMR spectrum, _____.
- a) all carbon shows singlet
b) -CH- shows doublet
c) -CH₃ shows quartet
d) -CH₂- shows triplet
- 9) In mass spectroscopy, intensity of base peak is assigned as _____.
a) 0% b) 50%
c) 75% d) 100%
- 10) In 2D NMR, experiment like COSY gives information about _____.
a) coupled proton b) molecular weight
c) functional group d) None of these

B) Write True or False for following statements. 06

- 1) The PMR spectrum of ethyl acetate gives three peaks.
- 2) Commonly due to carbonyl stretching, the IR band is observed at 2250 cm^{-1} .
- 3) In IR spectroscopy, vibrational excitations are observed in molecules.
- 4) ^{13}C NMR normally ranges from δ 200 to 400 ppm.
- 5) Quaternary carbons do not appear in a DEPT-45 spectrum.
- 6) Mass spectroscopy is mainly used to determine functional group of the compound.

Q.2 Answer the following. 16

- a) Write a short note on off-resonance technique.
- b) Explain solvent used in NMR spectroscopy in detail.
- c) Write a note on McLafferty rearrangement.
- d) Discuss different modes of vibrations in IR spectroscopy.

Q.3 Answer the following. 16

- a) What is first order and second order NMR spectra? Explain AB, AX and ABX spin system in ^1H NMR.
- b) Deduce the structure of the compound using following spectral data.
Molecular formula- $\text{C}_5\text{H}_{10}\text{O}$, IR - 1710 cm^{-1} ,
 ^1H NMR: δ 2.4 (multiplet, 1H), δ 2.1 (singlet, 3H), δ 1.1 (doublet, 6H)
 ^{13}C NMR: δ 212.6, δ 41.5, δ 27.2, δ 17.8

Q.4 Answer the following. 16

- a) Discuss in detail factors affecting IR group frequencies.
- b) Explain NOESY and DEPT NMR techniques in detail.

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

- a)** Determine the structure from following spectral data
Molecular formula - $C_8H_9O_2$,
IR – 2900-3000, 1725, 1620, 1600, 1100-1200 cm^{-1}
 1H NMR: δ 1.3 (t, $J = 8$ Hz, 15 mm), 4.3 (q, $J = 8$ Hz, 10 mm),
7.9 (d, $J = 7.5$ Hz, 10 mm), 8.9 (d, $J = 7.5$ Hz, 10 mm).
 ^{13}C NMR, DEPT – 135: δ in ppm 150.3, 122.9, 60.9 (up), 14.1 (down)
- b)** Discuss fragmentation of any two functional groups in mass spectroscopy.

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

- a)** What are factors affecting coupling constant? Explain in detail.
- b)** Deduce the structure of compound from following spectral data
Molecular formula- $C_6H_{14}O_2$,
IR – 3460 (br.), 3000, 1500, 1400, 1200 cm^{-1}
 1H NMR: δ 1.0 (s, 12H), 3.0 (s, 2H exchangeable with D_2O)
 ^{13}C NMR: δ 25, 75 ppm
Mass: m/e 118 (M^+), 103, 59 (100 %)

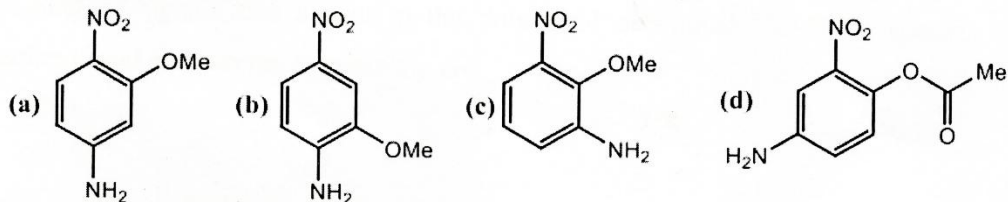
Q.7 Answer the following. **16**

- a)** Discuss metastable peaks with suitable examples.
- b)**
- i) Determine the structure from following data
Molecular formula- $C_4H_8O_2$, IR- 1745 cm^{-1} ,
 1H NMR: δ 1.2 (triplet, 3H), δ 4.1 (quartet, 2H), δ 2.1 (singlet, 3H)
 - ii) Determine the structure from following data
Molecular formula- $C_4H_8O_2$, IR - 1720 cm^{-1} ,
HNMR: δ 1.0 (triplet, 3H), δ 1.2 (sextet, 2H), δ 2.2 (quartet, 2H),
 δ 9.8 (triplet, 1H)

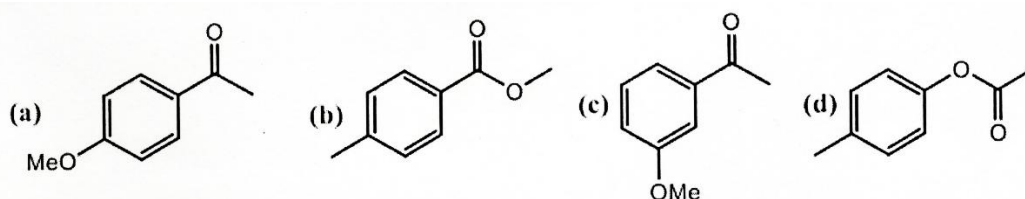
Q.3 Answer the following. (Any Three)

12

- a) Assign signals and give justification for the correct structure of the compound that matches the given ^1H NMR data: ^1H NMR (DMSO- d_6): δ 7.75 (dd, $J = 8.8, 2.4$ Hz, 1H), 7.58 (d, $J = 2.4$ Hz, 1H), 6.70 (d, $J = 8.8$ Hz, 1H), 6.50 (broad s, 2H), 3.80 (s, 3H)



- b) Write a short note on Karplus equation.
 c) Find out number of signals for the following compounds in ^1H NMR and ^{13}C NMR and explain their chemical and magnetical equivalence?



- d) Find out structure of organic compound from following data with detail justifications Molecular Formula.: $\text{C}_5\text{H}_{10}\text{O}$
 ^1H NMR (δ in ppm): 1.22 (d, $J = 6$ Hz, 12 mm), 2.0 (m, 16 mm), 3.65 (t, $J = 6$ Hz, 8 mm), 3.80 (m, 4 mm); ^{13}C NMR (δ in ppm): 21, 26, 33, 68, 77.

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

12

- a) What is 2D NMR? Discuss COSY spectra of 2-Hexanone.
 b) What is second order spectra? Discuss AB_2 , AX_2 spin systems in NMR with examples.
 c) Discuss the mode of fragmentation in aldehydes, ketones and esters.

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

12

- a) A compound has $M^+ = 96$ in its mass spectrum and exhibits the ^{13}C spectral data Broadband-decoupled ^{13}C NMR: 27.6, 29.3, 32.2, 132.4; DEPT-90: 132.4; DEPT-135: positive peak at 132.4; negative peaks at 27.6, 29.3, 32.2 ppm. Find the structure for this compound.
 b) Find out structure of organic compound from following data with justifications
 Molecular Formula: $\text{C}_9\text{H}_{11}\text{O}_2\text{N}$
 ^1H NMR (δ in ppm): 7.9 (d, $J = 8$ Hz, 2H), 6.6 (d, $J = 8$ Hz, 2H), 4.3 (q, $J = 6$ Hz, 2H), 4.0 (br s, 2H, D_2O exchangeable), 1.4 (t, $J = 6$ Hz, 3H); Mass: m/z 165, 137, 120, 92
 c) Find out structure of organic compound from following data
 Molecular Formula: $\text{C}_9\text{H}_{10}\text{O}_2$
 IR = 1690, 1100 cm^{-1} ; ^1H NMR (δ in ppm): 2.8 (s, 3H), 3.8 (s, 3H), 6.9 (d, $J = 8$ Hz, 2H), 7.8 (d, $J = 8$ Hz, 2H); ^{13}C NMR (δ in ppm): 197, 165, 130, 129, 114, 56, 26

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Set **P**

**M.Sc. (Organic Chemistry) (Semester - III) (New) (NEP CBCS)
Examination: March/April – 2026
Photochemistry and Pericyclic Reactions (2326302)**

Day & Date: Monday, 20-04-2026
Time: 11:00 AM To 01:30 PM

Max. Marks: 60

- Instructions:** 1) All questions are compulsory.
2) Draw neat labelled diagram wherever necessary.
3) Figure to the right indicates full marks.

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

- Claisen rearrangement is an example of _____ sigmatropic rearrangement.
 - [1,3]
 - [1,5]
 - [3,3]
 - [5,5]
- When symmetries of ground state of molecular orbitals of reactants correlates with ground state of molecular orbitals of products then reaction is _____ allowed.
 - Thermally
 - Photo chemically
 - Both a and b
 - All of the above
- Which of the following is example of sigmatropic rearrangement?
 - Fries rearrangement
 - Claisen rearrangement
 - Benzil-benzilic acid rearrangement
 - All of the above
- _____ is used as catalyst in Sandmeyer reaction.
 - Iron chloride
 - Palladium chloride
 - Alluminium dichloride
 - Cuprous chloride
- Which of the following will have more delocalization energy?
 - Cycloheptatrienyl cation
 - Cycloheptatrienyl anion
 - Cycloheptatrienyl free radical
 - a and b will have same energy
- A reaction in which bond is broken or made at the expense of cyclic shift of pi electrons is known as _____ reaction.
 - Substitution
 - Electrocyclic
 - Rearrangement
 - Addition
- In Diels Alder reaction diene must be in _____ conformation.
 - S-trans
 - S-cis
 - Both a and b
 - None of above

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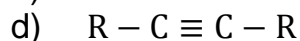
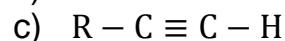
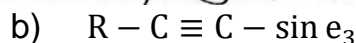
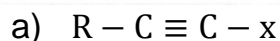
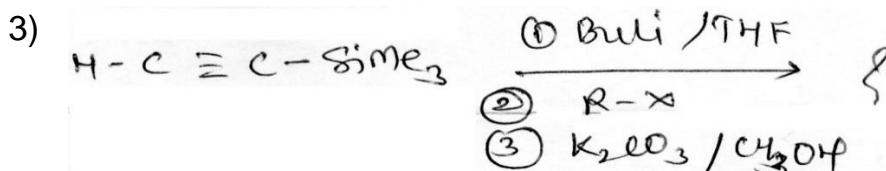
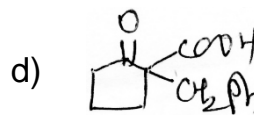
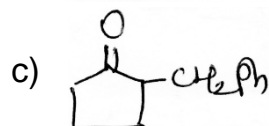
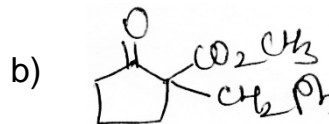
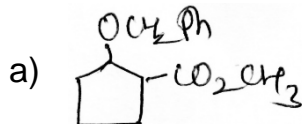
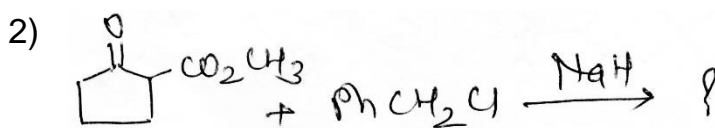
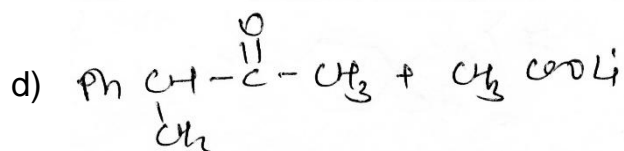
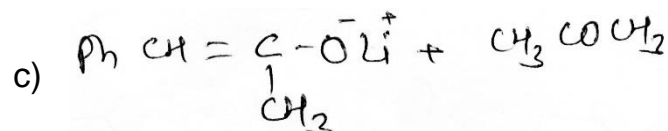
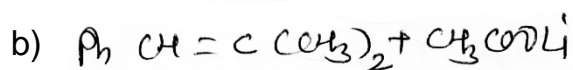
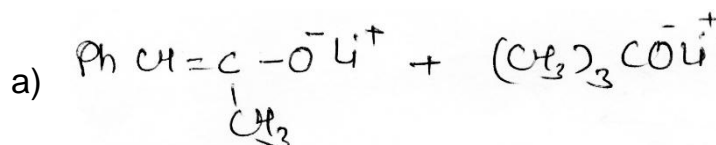
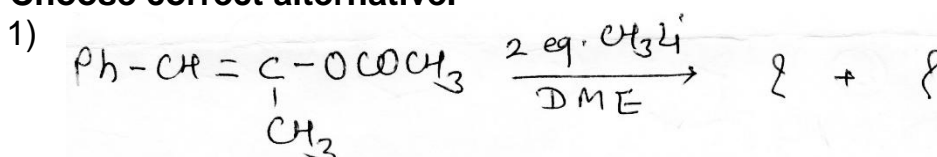
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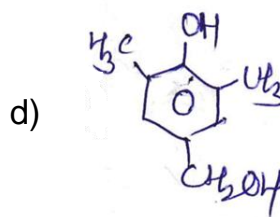
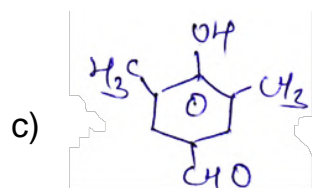
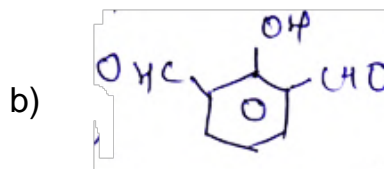
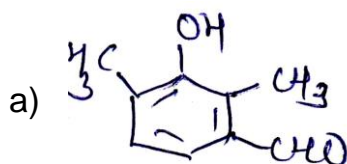
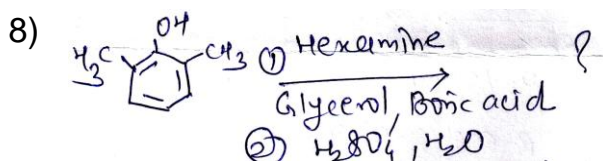
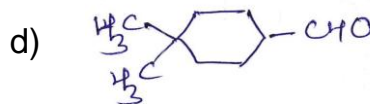
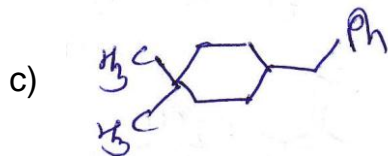
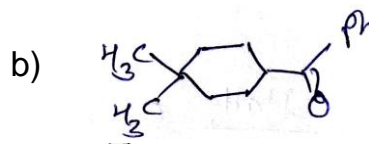
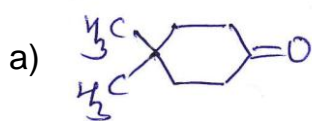
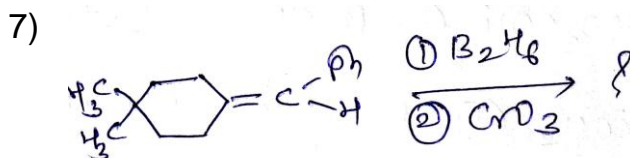
**M.Sc. (Organic Chemistry) (Semester - III) (New) (NEP CBCS)
Examination: March/April – 2026
Advanced Organic Chemistry (2326306)**

Day & Date: Wednesday, 22-04-2026
Time: 11:00 AM To 01:30 AM

Max. Marks: 60

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

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



B) Fill in the blanks.

04

- 1) The Darzen reaction is the condensation of a carbonyl compound with _____ in the presence of a base to form an α, β -epoxyester.
- 2) Lewis's acid catalyzed Mukaiyama Aldol reaction involves _____ as an enolate equivalent.
- 3) Trisubstituted alkenes with borane normally give a _____ as the product.
- 4) Reaction of enolates with alkylating agents is _____ reaction.

Q.2 Answer the following. (Any Six)

12

- a) Explain with suitable example the reaction mechanism of Corey-Winter definition.
- b) Give two examples of Mukaiyama Aldol reaction.
- c) Give two examples of generation and alkylation of dianions.
- d) Discuss the effect of solvent on reactivity of enolates.
- e) Give the synthesis of monoalkylborane.
- f) Explain hydroboration mechanism with suitable example.
- g) Give two examples of Peterson's synthesis.
- h) Give two examples of Wolff rearrangement reaction.

- Q.3 Answer the following. (Any Three) 12**
- Discuss the mechanism of Eschenmoser fragmentation and give its two applications.
 - Discuss the synthesis of Hantzsch pyridine synthesis and give its two applications.
 - Discuss the mechanism and applications of conversion of organoboranes to ketones.
 - Discuss alkylation of Carboxylic acids and nitriles.
- Q.4 Answer the following. (Any Two) 12**
- Discuss the mechanism and applications of organotin reagents.
 - Discuss the synthesis of EE and ZZ dienes from organoboranes.
 - Discuss reaction mechanism and applications of Heck reaction.
- Q.5 Answer the following. (Any Two) 12**
- Explain the mechanism of Stevens rearrangement reaction and give its application.
 - Explain the mechanism of Chugaev reaction and give its applications.
 - Discuss with suitable examples the synthesis of primary, secondary and tertiary alcohols from organoboranes.

Seat No.	
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Set **P**

M.Sc. (Organic Chemistry) (Semester - III) (New) (NEP CBCS)
Examination: March/April – 2026
Applied Organic Chemistry (2326307)

Day & Date: Wednesday, 22-04-2026
 Time: 11:00 AM To 01:30 PM

Max. Marks: 60

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

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

- 1) Which of the following is an example green solvent?
 - a) Benzene
 - b) DMF
 - c) PEG
 - d) Methyl cyanide
- 2) Microwave irradiation in organic synthesis mainly helps to _____.
 - a) Increase pollution
 - b) Reduce reaction time
 - c) Increase solvent use
 - d) Decrease yield
- 3) The D- and L- configuration of monosaccharides is based on _____.
 - a) Optical rotation
 - b) Position of -OH group on last chiral carbon
 - c) Molecular weight
 - d) Number of carbon atoms
- 4) Which structure represents the cyclic form of glucose?
 - a) Fischer projection
 - b) Haworth structure
 - c) Newman projection
 - d) Sawhorse projection
- 5) Supramolecular chemistry mainly deals with _____.
 - a) Covalent bonding
 - b) Ionic bonding
 - c) Non-covalent interactions
 - d) Metallic bonding
- 6) Which of the following is a host molecule used in supramolecular chemistry?
 - a) Alkane
 - b) Crown ether
 - c) Alkene
 - d) Alcohol
- 7) Which of the following is a polycyclic aromatic hydrocarbon?
 - a) Methane
 - b) Benzene
 - c) Naphthalene
 - d) Ethane

- 8) Which of the following is a heteropolysaccharide?
- | | |
|-------------|--------------------|
| a) Starch | b) Cellulose |
| c) Glycogen | d) Hyaluronic acid |

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

- 1) Solvent-free reactions are also known as neat reactions.
- 2) The interaction between host and guest molecules is called molecular recognition.
- 3) Gewald reaction is a method for synthesizing phenanthrene.
- 4) Crown ethers, cryptands, and calixarenes are examples of guest molecules.

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

- a) Define following terms.
 - i) Ideal synthesis.
 - ii) Neat synthesis.
- b) What do you mean by heterogeneous catalysis?
- c) What are carbohydrates? How they are classified?
- d) Define heteropolysaccharides.
- e) What is supramolecular chemistry?
- f) What are cryptands and rodents?
- g) Define polycyclic aromatic compounds.
- h) What is difference between 4C1 and 1C4 Conformation.

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

- a) Write a note on Ideal synthesis.
- b) Write a note on conformations of monosaccharides.
- c) Write a note on binding constant.
- d) Explain Ullmann diaryl synthesis.

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

- a) What are basic principles of green chemistry? What are its applications?
- b) Explain conformations of monosaccharides. What is anomeric effect?
- c) Explain principle of molecular recognition and comment on complementarity.

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

- a) Explain:
 - i) Phenanthrene synthesis by PA Schorr.
 - ii) Stobbe condensation.
- d) Discuss various oxidation and reduction reactions of D-glucose.

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Set	P
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**M.Sc. (Organic Chemistry) (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2026
Modern Organic Chemistry (2326401)**

Day & Date: Thursday, 16-04-2026
Time: 03:00 PM To 05:30 PM

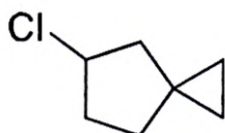
Max. Marks: 60

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

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

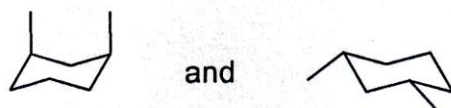
08

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



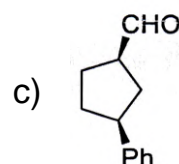
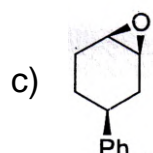
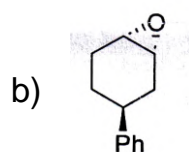
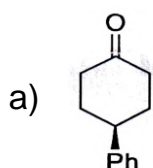
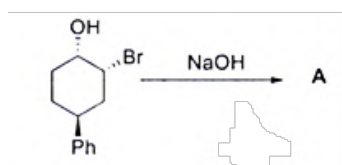
- a) 5-chlorospiro[2,4]heptane
- b) 5-chlorospiro[2,4]pentene
- c) 4-chlorospiro[3,4]heptane
- d) 4-chlorospiro[3,4]pentene

2) What relationship do the following pairs of compounds have to each other?

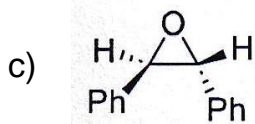
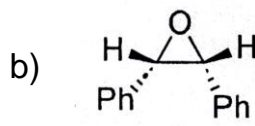
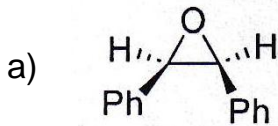
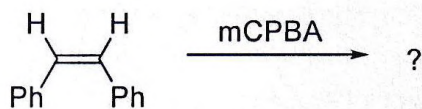


- a) Enantiomers
- b) Diastereomers
- c) Identical
- c) Epimers

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

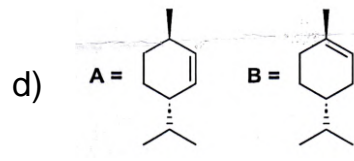
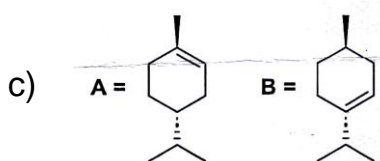
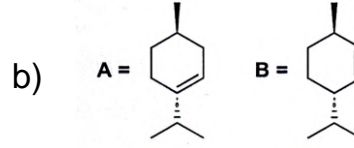
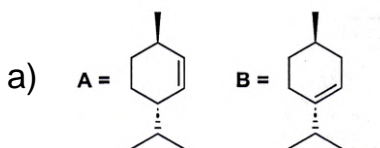
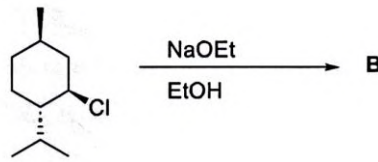
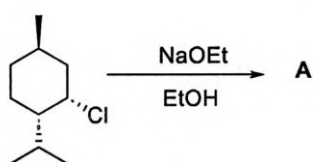


4) Predict the correct option of product.

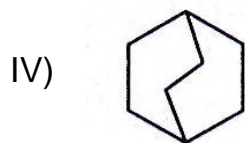
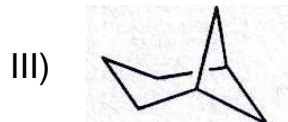
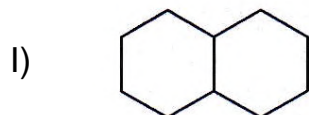


d) both (a) and (b)

5) Predict the correct option of a major product A and B _____.



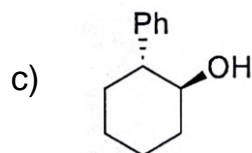
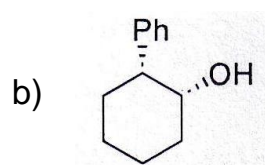
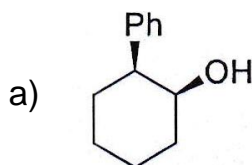
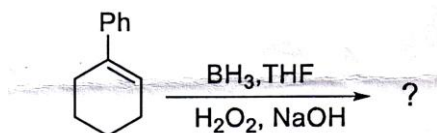
6) The fused ring system among the following is _____.



a) I
c) III

b) II
d) IV

- 7) If the molecule having 60% optical purity of S enantiomers. What should be the total % of S and R enantiomers present in the solution?
- 20% of S and 80% of R
 - 60% of S and 40% of R
 - 80% of S and 20% of R
 - 40% of S and 60% of R
- 8) Predict the correct option of a major product.



d) Both a) and b)

B) Write True/False.

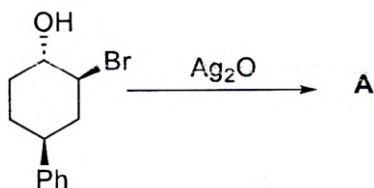
04

- The chiral catalyst approach for asymmetric synthesis always gives product with 100% ee.
- The point group of cis-decalin is D_{2h} .
- The least stable isomer of perhydrophenanthrene is trans-syn-trans.
- The dihedral angle between the axial bond and the equatorial bond on adjacent carbons is 120 degrees in cyclohexane.

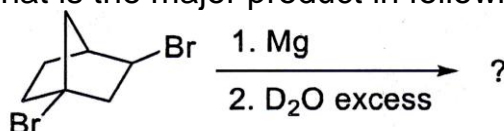
Q.2 Answer the following. (Any Six)

12

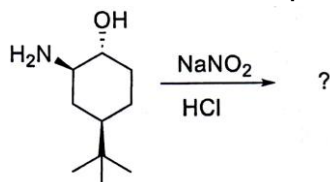
- a) Predict the correct option of a major product with mechanism.



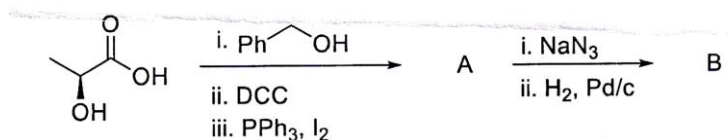
- b) What is the major product in following reaction with stereochemistry?



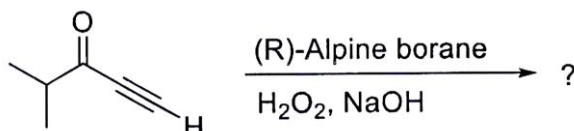
- c) Predict the correct option of a major product with mechanism.



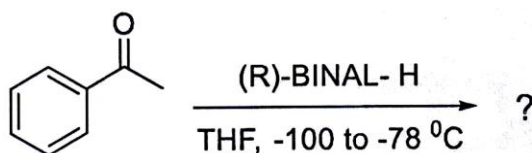
- d) Discuss the reactivity in diastereomers of stilbene dichloride in presence of pyridine at 200 °C reaction temperature.
 e) Draw Newman projection of trans-c-trans perhydroanthracene.
 f) What is the product A and B in following transformation?



- 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)

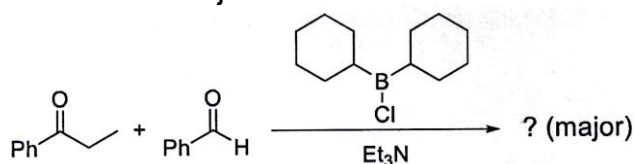
12

- a) What is the reactivity of 2,3-dibromobutane diastereomers with Br₂ in ionic elimination reaction?
 b) Write a short note on Mayers oxazolines.
 c) What is Shi asymmetric epoxidation? Discuss in details with examples.
 d) Write a short note on cis-decalin and trans-decalin.

Q.4 Answer the following. (Any Two)

12

- a) Discuss relative reactivity of diastereomers in NGP?
 b) Rationalize the Diastereoselectivity of following reaction with mechanism and justification.

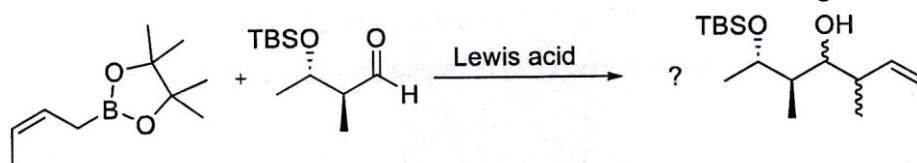


- c) Explain different isomers of perhydroanthracene and comment on its stability and chirality?

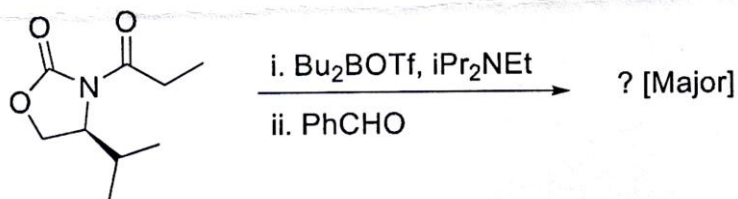
Q.5 Answer the following. (Any Two)

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) What is the product of Evans-Saksena and Evans-Tishenko diastereoselective reduction? Discuss with stereochemistry.

Seat
No.Set **P**

M.Sc. Organic Chemistry (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2026
Chemistry of Bioactive Heterocycles (2326402)

Day & Date: Saturday, 18-04-2026
 Time: 03:00 PM To 05:30 PM

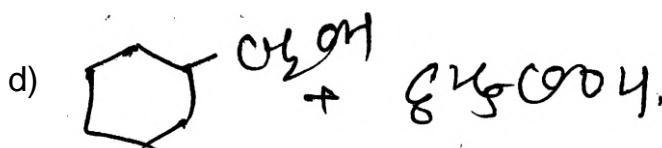
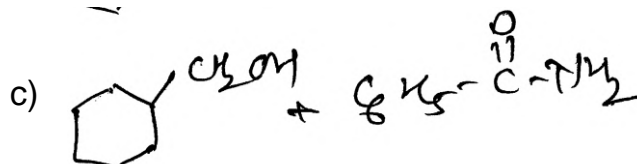
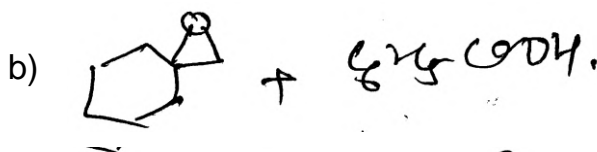
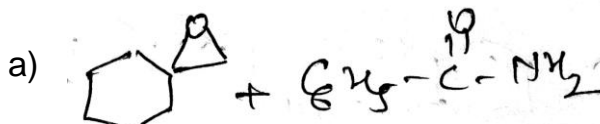
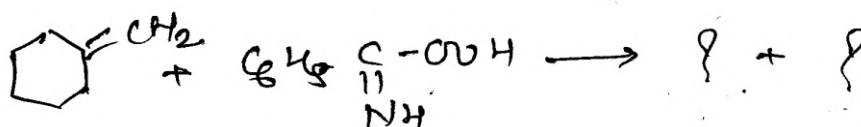
Max. Marks: 60

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

Q.1 A) Choose the correct alternative.

08

1)



2) _____ is puckered.

- | | |
|-------------|--------------------|
| a) Oxetane | b) Thietane |
| c) Pyridine | d) 2-Methyloxetane |

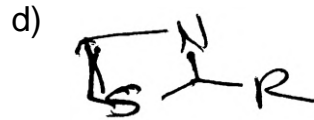
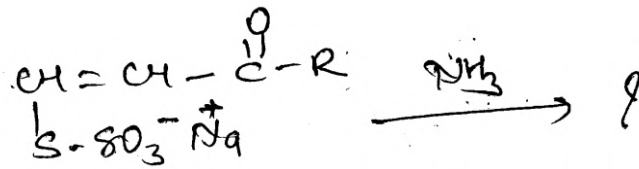
3) In pyridine electrophilic attack takes place at _____ position.

- | | |
|------|------|
| a) 2 | b) 1 |
| c) 3 | d) 4 |

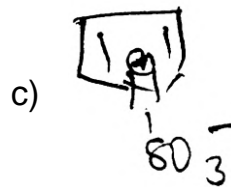
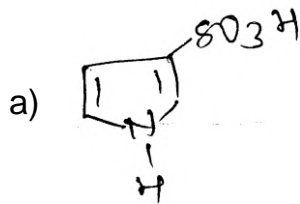
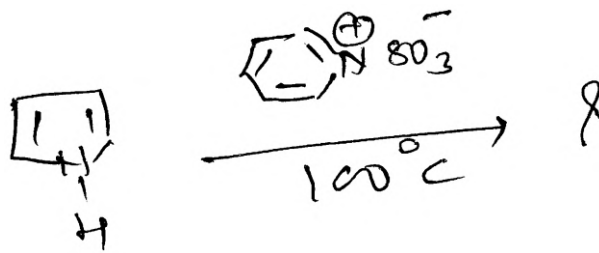
4) Pyrimidine is _____.

- | | |
|-----------------------|-------------------|
| a) 1, 2 - diazine | b) 1, 3 - diazine |
| c) 1, 2, 3 - triazine | d) None of these |

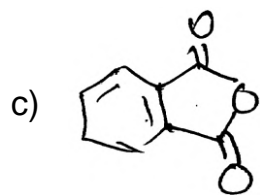
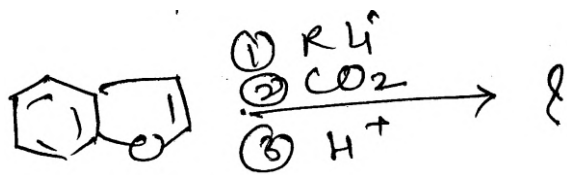
5)

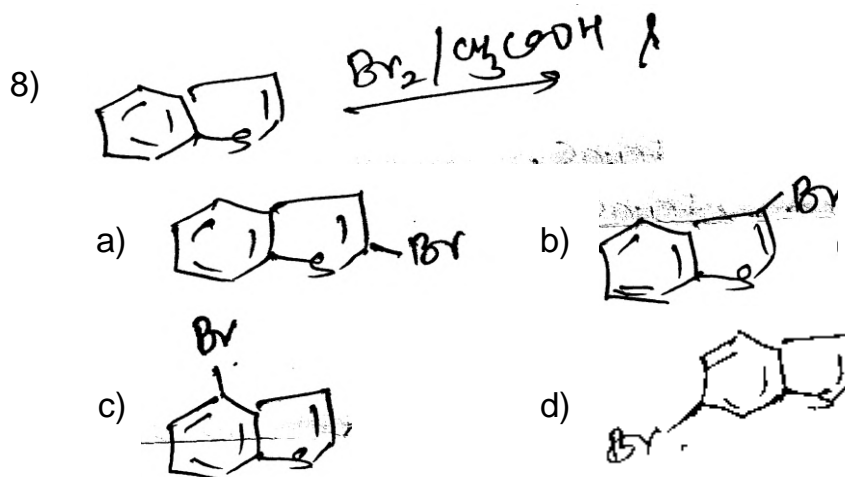


6)



7)



**B) Write True/False.**

04

- 1) Hexahydro- 1, 3, 5 – triazine is a class of heterocyclic compound with the formula $(CH_2NR)_3$.
- 2) Pyrrole is very strong base.
- 3) Aziridine ring is planar and rigid.
- 4) Indole does not react with electrophiles easily.

Q.2 Answer the following. (Any Six)

12

- a) Give an example of halogenation reaction of indole.
- b) Give the Halogenation reaction of quinoline.
- c) Give the synthesis of thiirane by ring closure method.
- d) Give the ring opening reaction of thietane.
- e) Explain the electrophilic substitution reaction of pyrrole.
- f) Explain sulfonation of pyrrole.
- g) Explain how to enhance the basicity of pyrimidine.
- h) Explain nitration reaction of pyridine.

Q.3 Answer the following. (Any Three)

12

- a) Discuss any two methods of synthesis of tetrazine.
- b) Discuss the synthesis of thiophene.
- c) Discuss ring opening reaction of oxetane.
- d) Discuss synthesis of Isoquinoline.

Q.4 Answer the following. (Any Two)

12

- a) Discuss the synthesis and chemical reaction of furan.
- b) Discuss synthesis and chemical reactions of pyridazine.
- c) Discuss the synthesis and chemical reactions of thiirane.

Q.5 Answer the following. (Any Two)

12

- a) Discuss synthesis and chemical reactions of oxazole.
- b) Discuss synthesis and chemical reactions of quinoline.
- c) Discuss synthesis and chemical reactions of imidazole.

Seat No.	
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Set **P**

**M.Sc. (Organic Chemistry) (Semester - IV) (New) (NEP CBCS)
Examination: March/April – 2026
Retrosynthesis and Disconnection Approach (2326405)**

Day & Date: Tuesday, 21-04-2026
Time: 03:00 PM To 05:30 PM

Max. Marks: 60

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

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

- 1) 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) Protecting
 - d) Deactivating
- 2) 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
- 3) Condensation reaction between two different carbonyl compounds is known as _____.
 - a) Self condensation
 - b) Cross condensation
 - c) Intramolecular Condensation
 - d) None of above
- 4) Acyl diazo alkanes on heating give _____.
 - a) Ketene
 - b) Carbene
 - c) Ylide
 - d) Cyclopropane
- 5) Disconnection must correspond to _____ reaction.
 - a) Real and workable
 - b) Irreversible
 - c) Reversible
 - d) Unreal
- 6) α, β unsaturated carbonyl compounds can be synthesised by _____.
 - a) Aldol condensation followed by decarboxylation
 - b) Aldol condensation followed by dehydration
 - c) Aldol condensation followed by cyclisation
 - d) Aldol condensation followed by reduction

Seat No.	
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Set **P**

**M.Sc. (Organic Chemistry) (Semester - IV) (New) (NEP CBCS)
Examination: March/April – 2026
Medicinal Chemistry (2326406)**

Day & Date: Tuesday, 21-04-2026
Time: 03:00 PM To 05:30 PM

Max. Marks: 60

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

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

- 1) The drugs used to treat high blood pressure are called _____ drugs.
 - a) antiarrhythmic agents
 - b) antihypertensive
 - c) antineoplastic agents
 - d) anticonvulsants

- 2) _____ is an antianxiety drug.
 - a) Diazepam
 - b) halothane
 - c) Ampicillin
 - d) Cephalosporin

- 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) Phenytoin is a _____ derivative.
 - a) Amoxicillin
 - b) Penicillin
 - c) Ampicillin
 - d) hydantoin

- 5) Carbamazepine is a _____ antidepressant.
 - a) monocyclic
 - b) bicyclic
 - c) tricyclic
 - d) tetracyclic

- 6) Cisplatin is used as an _____ drug.
 - a) Anticancer
 - b) Antidiabetic
 - c) Antiviral
 - d) Antifungal

- 7) Which of the following cephalosporins is most likely to cause allergic reactions?
 - a) Cefazolin
 - b) Ceftriaxone
 - c) Cefepime
 - d) Cefuroxime

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

- B) Write True/False.** **04**
- 1) Phenezine is an example of anticonvulsant drug.
 - 2) Phenobarbital is a derivative of barbituric acid.
 - 3) Halothane is a solid compound.
 - 4) Atenolol is used to treat high blood pressure.
- Q.2 Answer the following. (Any Six)** **12**
- a) Define anticonvulsant drug with suitable example.
 - b) Draw the general structure of penicillin.
 - c) Give any two uses of paracetamol.
 - d) Draw the structure of thiopental.
 - e) Write the names of any two antianginal drugs.
 - f) Draw the structure of valproic acid.
 - g) Define antidiabetic drugs with suitable example.
 - h) Define sedatives and hypnotics.
- Q.3 Answer the following. (Any Three)** **12**
- a) Define and classify anaesthetic drugs.
 - b) Give synthesis and mechanism of action of paracetamol.
 - c) Give the method of preparation of tolbutamide.
 - d) Give the synthesis and SAR of propranolol.
- Q.4 Answer the following. (Any Two)** **12**
- a) Explain the synthesis and SAR of verapamil.
 - b) Explain the synthesis and mechanism of action of amitriptyline.
 - c) Explain the synthesis and SAR of aspirin.
- Q.5 Answer the following. (Any Two)** **12**
- a) Explain the antidiabetic activity of insulin and metformin.
 - b) Explain the synthesis and mechanism of action of thiopental.
 - c) Explain the synthesis and SAR of ibuprofen.

- 6) The equipment used for solid-liquid leaching in continuous operation is _____.
- a) Rotary drum filter b) Dorr agitator
c) Plate heat exchanger d) Shell and tube condenser
- 7) Which of the following methods is used to separate azeotropic mixtures?
- a) Simple distillation b) Steam distillation
c) Extractive distillation d) Vacuum distillation
- 8) Which one of the following is a common crystallization method used in industries?
- a) Dry distillation b) Steam distillation
c) Cooling crystallization d) Flash evaporation

B) Fill in the blanks or Write True or False. 04

- a) Distillation is the best method to separate liquids having a sufficient difference in their boiling points. (True/False)
- b) Darcy's law is the law behind filtration. (True/False)
- c) _____ is the best method to separate liquids having sufficient difference in their boiling points.
- d) _____ law is the law behind filtration.

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

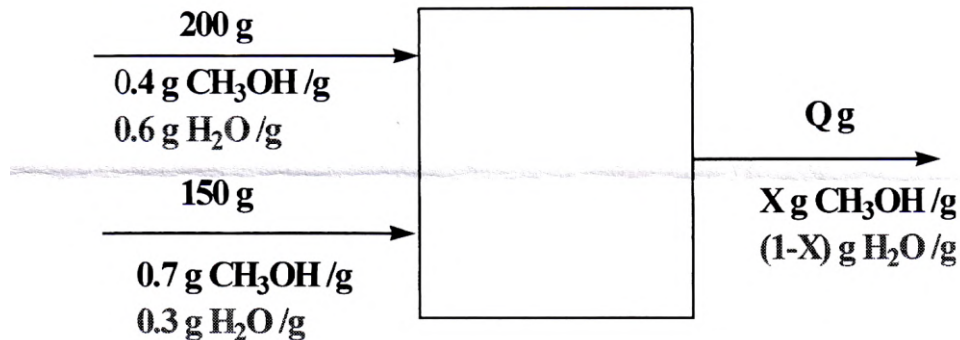
- a) What is leaching? Write in detail Bollman's extractor and continue leaching.
- b) What is a vacuum/agitated crystallization draw diagram?
- c) What is Extraction detail about the section of solvent?
- d) Write down the Fundamentals of Material Balances, and explain their classes of system.
- e) With a neat diagram, explain the cyclone separator.
- f) Explain in detail Heat and its types.
- g) Write down batch, semi-batch, continuous process.
- h) What is Steam distillation?

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

- a) 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.
- b) 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.
- c) Discuss and draw diagram of Dorr Thickener and Dorr agitator.

- d) 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?

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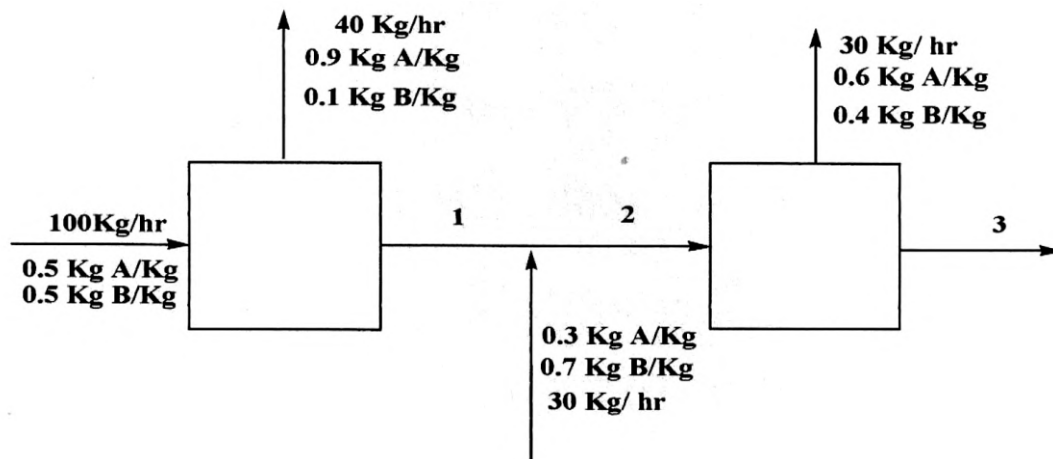


Q.4 Answer the following. (Any Two)

12

- a) A labelled flowchart of a continuous steady-state two-unit process is shown below. Each stream contains two components, A & B, in different proportions. Three streams whose flow rates &/or compositions are not known are labelled 1, 2, and 3. Calculate unknown flow rates & compositions of streams 1, 2, and 3.

The outer boundary encompasses the entire process and has as input & output streams all of the streams that enter & leave the process. Two of the interior boundaries surround individual process units, & the third encloses a stream junction point.



- b) Explain Kettle type Heat Exchanger /Utube Heat Exchanger.
- c) Material balances on a batch mixing process 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.

Q.5 Answer the following. (Any Two)

- a)** Overall Analysis for a Continuous Distillation Column:
A binary mixture consisting of 35 % benzene and 65 % toluene is continuously fed to the distillation column at a rate of 1000 kg/hr. Whereas the distillate flow rate was 10% of the feed flow rate. The distillate (top product) contains 85 % benzene. Calculate the quantity and composition of the waste.
- b)** Calculate the mole fraction of HCl and H₂O 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, the Molar mass of HCl is 36.5 grams.
- c)** Explain vapour-liquid equilibrium with a neat diagram.

Seat No.	
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Set	P
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M.Sc. (Industrial Chemistry) (Semester - III) (New) (NEP CBCS)
Examination: March/April – 2026
Unit process in Chemical Industries (2325302)

Day & Date: Monday, 20-04-2026
 Time: 11:00 AM To 01:30 PM

Max. Marks: 60

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

Q.1 A) Choose correct alternative.

08

- 1) In which position does the nitro group enters?
 - a) Ortho
 - b) Para
 - c) Meta
 - d) All of the mentioned
- 2) What is the formula of Nitrogen pentoxide?
 - a) N_3O_5
 - b) N_2O_4
 - c) N_2O_5
 - d) N_3O_4
- 3) In Sulfonating, which acid group is used?
 - a) -OH
 - b) -SO-OH
 - c) -SO₂-OH
 - d) -SO₃-OH
- 4) Which process is used to produce desired isomer in Naphthalene series?
 - a) Sulfonation
 - b) Desulfonation
 - c) Alkylation
 - d) Halogenation
- 5) Which of the following reaction is highly exothermic i.e explosive in reaction?
 - a) Chlorine
 - b) Bromine
 - c) Iodine
 - d) Fluorine
- 6) What effect does removal of water has on esterification?
 - a) Increase reaction
 - b) Decrease reacting
 - c) Completes reaction
 - d) Acts as catalyst
- 7) What are the factors of solution polymerisation?
 - a) Nature of solvent
 - b) Concentration
 - c) Temperature
 - d) All of the mentioned

Seat No.	
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Set **P**

M.Sc. (Industrial Chemistry) (Semester - III) (New) (NEP CBCS)
Examination: March/April – 2026
Industrial Analytical Chemistry - I (2325306)

Day & Date: Wednesday, 22-04-2026
 Time: 11:00 AM To 01:30 PM

Max. Marks: 60

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

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

- 1) A metal coated with its insoluble salt is in contact with a solution containing an anion of its insoluble salt is _____.
 - a) metal electrode of Ist kind
 - b) metal electrode of IInd kind
 - c) metal electrode of IIIrd kind
 - d) Redox electrode

- 2) The characteristic S-shaped curve obtained in polarography is known as a _____.
 - a) Titration curve
 - b) Polarogram
 - c) Chromatogram
 - d) Spectrum

- 3) The half-wave potential ($E_{1/2}$) in a polarogram is used for _____.
 - a) Quantitative analysis
 - b) Qualitative analysis
 - c) Determining the purity of mercury
 - d) Measuring the drop time

- 4) Unit for measurement of hyperfine splitting constant in ESR is _____.
 - a) Guass
 - b) Tesla/sec
 - c) Guass/mm
 - d) No units

- 5) Electron Spin Resonance (ESR) is applicable to _____.
 - a) Molecules
 - b) Ion
 - c) Free radical
 - d) All of the above

- 6) _____ is the time it takes for a specific compound to travel from injection to detection in a gas chromatography (GC) system.
 - a) Retention time
 - b) Retention period
 - c) Retention volume
 - d) Retention Number

- 7) _____ used as stationary phase in a GC column?
 - a) Polysiloxanes
 - b) Polyethylene glycol
 - c) Both a and b
 - d) Silica

- 8) _____ moulding processes is widely used for the manufacturing of plastic bottles.
- | | |
|----------------|--------------|
| a) Compression | b) Injection |
| c) Jet | d) Blow |

B) Write True/False. 04

- 1) The process of energy conversion is called transduction.
- 2) Interaction between electron spin and nuclear spin is called as zero spin splitting.
- 3) In liquid membrane electrode, the liquid ion exchanger is held in a porous disc of hydrophobic material.
- 4) Carrier gas used in gas chromatography should be reactive.

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

- a) Which type of Ion selective membrane electrode is used to detect HF and H₂S in analyte solution?
- b) Write a short note on Tin oxide (SnO) as ionic Conductor.
- c) What is thermoplastic polymer?
- d) What are the applications of Gas chromatography?
- e) How many lines are expected in EPR spectrum of [Cu(Phen)Cl₂]?
- f) What is the selection rule in ESR for transition?
- g) Draw a neat labelled diagram of Injection mould.
- h) What is meant by Retention volume in Gas chromatography?

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

- a) Explain the principle of ESR Spectroscopy.
- b) Discuss in details the source with respect to Klystron tube used in Instrumentation of ESR.
- c) Explain in brief:
 - i) Faradic current
 - ii) Diffusion current
- d) Explain in brief the plate theory in Gas chromatography.

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

- a) Explain in detail the Transfer Moulding process.
- b) Discuss in detail polarography: Principle, Instrumentation & Application with neat labelled diagram.
- c) Describe in detail with neat labelled diagram the principle and working of Biosensor membrane Electrode.

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

- a) Explain in detail the Compression Moulding process.
- b) Discuss in detail Cyclic Voltammetry: Principle, instrumentation & advantages with neat labelled diagram.
- c) Describe in detail with neat labelled diagram the principle and working of pH sensing membrane electrode.

Seat No.	
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Set **P**

M.Sc. (Industrial Chemistry) (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2026
Pollution Monitoring and Control (2325401)

Day & Date: Thursday, 16-04-2026
 Time: 03:00 PM To 05:30 PM

Max. Marks: 60

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

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

- 1) Who is responsible for the degradation of biodegradable organic matter present in the domestic sewage?
 - a) Animals
 - b) Humans
 - c) Plastic
 - d) Bacteria and other microbes

- 2) How is the amount of biodegradable organic matter in sewage water estimated?
 - a) Chemical Oxygen Demand
 - b) Physical Oxygen Demand
 - c) Biological Oxygen Demand
 - d) Mathematical Oxygen Demand

- 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 waste
 - d) Make something that can clean your room

- 7) SPCB stands for _____.
a) State Pollution Control Board
b) Soviet Pollution Central Board
c) Server Pollution Central Board
d) Sensitive Pollution Control Board
- 8) Which of the following is a biological method of treatment?
a) Coagulation b) Sedimentation
c) Trickling filter d) Filtration

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

- 1) Central Pollution Control Board established in 1974.
- 2) MINAS stands for minimum National Standards.
- 3) Primary treatment removes only suspended solids.
- 4) Process industries which are major sources of phenolic discharge is sugar industries.

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 Electrodialysis in water treatment process?
- f) What is soil Pollution?
- g) Explain Soil pH determination process by using universal indicator solution method.
- h) Define Air pollution.

Q.3 Answer the following. (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 is important end product from recycled polymer?

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

- a) Discuss the Air (Prevention and Control of Pollution) Act 1981.
- b) Explain Reduction Precipitation method for removal of mercury.
- c) Explain Analysis of Nitrogen Oxide (NO) in the gaseous effluents.

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

- a) Explain MINAS and plan of action for sugar Industries.
- b) Explain in detail the Oxidation process for removal of phenolic residue.
- c) Explain the Activated sludge process performed on effluent.

Seat No.	
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Set **P**

**M.Sc. (Industrial Chemistry) (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2026
Industrial Management and Nonconventional Energy Sources
(2325402)**

Day & Date: Saturday, 18-04-2026
Time: 03:00 PM To 05:30 PM

Max. Marks: 60

- 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 correct alternative.**08**

- 1) Environmental Management of Toxic and Hazardous Chemicals. Which of the following chemicals is considered pyrophoric?

a) Water	b) Sodium
c) Acetone	d) Ethanol

- 2) Potentially explosive chemicals must be stored: _____.
 - a) With all other reactive chemicals
 - b) In sealed glass jars
 - c) In isolated, controlled environments
 - d) Under high pressure

- 3) The Mossbauer Spectroscopy uses _____.

a) γ Radiation	b) β Radiation
c) θ Radiation	d) ϵ Radiation

- 4) Why are pilot plants important?
 - a) Save costs by skipping tests
 - b) Ensure process safety and viability
 - c) Reduce manpower
 - d) Avoid R&D

- 5) One key reason for scale-up studies is: _____.

a) Marketing	b) Risk management
c) Decoration	d) Licensing

- 6) SSI is generally set up in _____.

a) Rural Area	b) City
c) Metro	d) None of these

- 7) Which of the following is not a type of Research and Development (R&D)?

a) Basic Research	b) Financial Research
c) Applied Research	d) Developmental Research

- 8) The R-chart monitors: _____.
- Range or variability in a process
 - Chemical properties
 - Customer satisfaction
 - Stock levels

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

- Mössbauer spectroscopy helps in understanding nuclear structure through the absorption and emission of gamma rays. (True/False)
- In _____, the electron lens functions to focus and magnify emitted electrons onto the detector.
- The process used to determine the purity of an Active Pharmaceutical Ingredient (API) is called _____.
- Biomass energy is categorized as a renewable source of energy. (True/False)

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

- Explain the term SSI (Small Scale Industry) and its importance in industrial development.
- What is meant by the Mössbauer Effect? Mention its applications.
- Define hazardous waste. What are the different types of hazardous wastes?
- What is the safety concept in industry?
- What is Biodiesel?
- What is the pp operation, and what is quality control?
- Explain SSI.
- What is the purpose of classifying industrial chemicals?

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

- What is biofuel? Describe generations I, II, III, and IV in detail?
- Discuss the significance of pilot plant operation in process development.
- What is an Isomer shift in Mössbauer spectroscopy?
- List the advantages and limitations of fuel cells in practical applications.

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

- Write down the importance of research and developments.
- What are convectional and non-convectional energy sources? Write the Advantages and Disadvantages.
- Explain in detail primary and secondary batteries. Define Batteries.

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

- Describe the registration and licensing procedure for SSI in India.
- Explain in detail the management and hazardous waste and transportation and their types.
- Give in Detail, non-financial intensive?

Seat No.	
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Set **P**

**M.Sc. (Industrial Chemistry) (Semester - IV) (New) (NEP CBCS)
Examination: March/April – 2026
Nano Material and its Characterization (2325405)**

Day & Date: Tuesday, 21-04-2026
Time: 03:00 PM To 05:30 PM

Max. Marks: 60

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

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

08

- 1) What is the primary characteristic that defines nanomaterials?
 - a) High density
 - b) High strength
 - c) Small size (1-100 nanometers)
 - d) High conductivity
- 2) What is the primary function of a Scanning Electron Microscope (SEM)?
 - a) To produce images of the internal structure of materials
 - b) To analyze the chemical composition of materials
 - c) To produce high-resolution images of the surface of materials
 - d) To study the crystal structure of materials
- 3) What is the principle behind AFM imaging?
 - a) Transmission of electrons through the sample
 - b) Reflection of electrons from the sample
 - c) Scanning of a probe across the sample surface
 - d) Emission of electrons from the sample
- 4) Which of the following is a common application of XPS?
 - a) Materials science
 - b) Surface chemistry
 - c) Catalysis
 - d) All of the above
- 5) What is the principle behind DTA?
 - a) The measurement of heat flow
 - b) The measurement of temperature difference
 - c) The measurement of mass change
 - d) The measurement of volume change
- 6) What is the primary function of Magnetron Sputtering?
 - a) To deposit thin films onto a substrate
 - b) To etch surfaces
 - c) To clean surfaces
 - d) To analyze surfaces

- 7) What is the purpose of the anode in an electrodeposition process?
 - a) To deposit metal ions
 - b) To oxidize metal ions
 - c) To reduce metal ions
 - d) To maintain the electrolyte

- 8) What is the primary process involved in spray pyrolysis?
 - a) Chemical vapor deposition
 - b) Physical vapor deposition
 - c) Electrochemical deposition
 - d) Pyrolytic decomposition

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

- 1) Researchers use _____ microscopy to study nanomaterials.
- 2) TGA is a technique used to measure the _____ of a material as a function of temperature.
- 3) TEM is capable of achieving _____ resolution, allowing for the observation of individual atoms.
- 4) Spray pyrolysis allows for the deposition of films with controlled _____ and morphology

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

- a) Define Electrodeposition.
- b) Write Advantages and Disadvantages of Electron Microscopy.
- c) Describe Chemical Bath Deposition.
- d) Explain the term TGA.
- e) Find the miller indices for the intercept 1,1/2,1.
- f) Write Application of TEM.
- g) Give Application of Nanotechnology.
- h) Explain spray pyrolysis.

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

- a) Write Instrumentation and Working of TGA.
- b) Write Advantages and Disadvantages of sol gel method.
- c) Explain in detail the production of X-ray by Coolidge tube.
- d) Explain the working of SEM.

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

- a) Give a brief note on DSC.
- b) Explain Constructive Interference and Derive Bragg Law.
- c) Explain Magnetron Sputtering with neat diagram.

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

- a) Give a brief discussion on Czochralski Method.
- b) Explain the Instrumentation and Application of AFM.
- c) Explain TGA with Instrumentation and Graph.

Seat No.	
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Set **P**

M.Sc. (Polymer Chemistry) (Semester - III) (New) (NEP CBCS)
Examination: March/April - 2026
Fundamentals of Polymer Science (2324301)

Day & Date: Friday, 17-04-2026
 Time: 11:00 AM To 01:30 PM

Max. Marks: 60

- 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 correct alternative.**08**

- 1) The glass transition temperature (T_g) is associated with _____.
 - a) Crystalline melting
 - b) Crystalline decomposition
 - c) Amorphous region softening
 - d) Chemical degradation
- 2) The ratio of weight average molecular weight (M_w) to number average molecular weight (M_n) is called _____.
 - a) Polarity
 - b) Polydispersity index
 - c) Degree of polymerization
 - d) Density
- 3) 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
- 4) In the polymer nomenclature "NYLON" is a _____.
 - a) Source-based name
 - b) Structure-based IUPAC name
 - c) Trade name
 - d) non-IUPAC name
- 5) What is the use of Phase transfer catalyst in polymerization?
 - a) to increase viscosity
 - b) to facilitate reaction of monomers present in immiscible phases
 - c) to control the molecular weight
 - d) to improve polymer color
- 6) What is the potential problems for carryout the reactions by Batch Process?
 - a) Removal of byproduct
 - b) Incremental addition of monomers
 - c) Maintaining batch to batch product uniformity
 - d) Suitable for polymerization to carried out higher conversion

- 7) Which type of isomerism arises due to restricted rotation around a double bond in a polymer?
- a) Optical isomerism b) Positional isomerism
c) Geometrical isomerism d) Chain isomerism
- 8) In the moving bed catalytic cracking method, what is the role of centrifugal separator called cyclone?
- a) Allows to pass only carbon
b) Allows to pass only vapours
c) Allows to pass only catalyst particles
d) Allows to pass nothing

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

- 1) Polymers made up of two or more different types of monomers are called _____ polymers.
- 2) The process of separating crude oil into useful fractions based on their boiling points is called _____.
- 3) M_w is always smaller than M_n for all polymers. (True or False)
- 4) $T_m > T_g$ for any polymer. (True or False)

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

- a) Explain the relative configuration using suitable example.
- b) What are BTX compounds?
- c) State the equation showing relation between T_g and T_m .
- d) Write the order of antiknocking in fuel.
- e) Define the terms monodisperse and polydisperse polymer.
- f) List out four advantage of solution polymerization.
- g) Write down names of petroleum products obtained from refining of crude oil.
- h) Write the IUPAC name of polypropylene and polystyrene.

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

- a) Discuss the nomenclature based on trade names of polymers.
- b) Explain the stereoregular structures of polypropylene.
- c) Write in detail on theories of the origin of petroleum.
- d) Discuss the importance of Cashew Nut Shell Liquid as a resource for monomers and polymers.

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

- a) Discuss in detail the bulk polymerization techniques with examples, merits and limitations.
- b) Write down the equations of different types of molecular weights and mention names of methods of their determination.
- c) Write a note on classification of polymers based on composition, physical properties and origin.

Q.5 Answer the following. (Any Two)

12

- a) Discuss the factors affecting glass transition temperature of polymers.
- b) Discuss the IUPAC nomenclature system of polymers.
- c) Describe stereochemistry in poly (vinyl chloride).

Seat No.	
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Set **P**

**M.Sc. (Polymer Chemistry) (Semester - III) (New) (NEP CBCS)
Examination: March/April – 2026
Chain Polymerization Mechanism and Kinetics (2324302)**

Day & Date: Monday, 20-04-2026
Time: 11:00 AM To 01:30 PM

Max. Marks: 60

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

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

- 1) Which polymerization technique uses dithioester compounds as chain transfer agents?
 - a) ATRP
 - b) NMP
 - c) RAFT
 - d) Ziegler-Natta
- 2) The mechanism of ROP usually involves _____.
 - a) Free radicals
 - b) Cationic, anionic, or coordination mechanisms
 - c) Ziegler-Natta catalysts
 - d) Condensation reaction
- 3) The copolymer composition depends primarily on _____.
 - a) Monomer feed ratio
 - b) Temperature
 - c) Solvent polarity
 - d) Initiator concentration
- 4) Block copolymers are made of _____.
 - a) Randomly arranged monomer units
 - b) Repeating units of one monomer only
 - c) Distinct segments of different monomers linked together
 - d) Unbranched chains with identical side groups
- 5) In photochemical initiation, the energy required to form radicals is provided by _____.
 - a) Heat
 - b) Light
 - c) Solvent polarity
 - d) Catalyst
- 6) Which of the following is a suitable monomer for ROP?
 - a) Methyl methacrylate
 - b) Vinyl chloride
 - c) Caprolactam
 - d) Toluene
- 7) The initiation step in radical polymerization involves _____.
 - a) Chain transfer
 - b) Coupling
 - c) Formation of monomer radical
 - d) Elimination reaction

- 8) Which of the following polymers is made via cationic polymerization?
- | | |
|--------------------|----------------------|
| a) Polyethylene | b) Polystyrene |
| c) Polyisobutylene | d) Polyacrylonitrile |

B) Write True or False. 04

- 1) ABA triblock copolymers consist of three blocks where the outer two blocks are the same. (True/False)
- 2) Thermoplastic elastomers combine the elasticity of rubber with the processability of plastics. (True/False)
- 3) The polymer polyisobutylene is synthesized using _____ polymerization.
- 4) When $r_1, r_2 = 0$ _____ type of Copolymer will form.

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

- a) Name two properties of a Polymer Blend.
- b) What is difference between primary and secondary insertion?
- c) Name two polar vinyl monomers that can undergo stereospecific polymerization.
- d) What is the difference between a heteropolymer and a homopolymer?
- e) What are dendrimers?
- f) Explain the term block polymers.
- g) Write down the mechanism of ROP (Ring Opening Polymerization) of a cyclic ether.
- h) Define living radical polymerization.

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

- a) Describe the monometallic mechanism of polymerization using Ziegler-Natta catalysts.
- b) Compare random, alternating, and block copolymers with examples.
- c) Bernoulli's Theorem? State the principle with its mathematical expression.
- d) Discuss the mechanism and kinetics of radical chain polymerization with respect to initiation, propagation and termination.

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

- a) What are the main components involved in Atom Transfer Radical Polymerization? What are the main steps in free radical polymerization?
- b) Discuss the different modes of propagation in radical polymerization. How do they affect the polymer structure and properties?
- c) What are the key components required in a Group Transfer Polymerization reaction? Explain the First Order Markov Model. Write in detail about the conditions and probability assumptions associated with it.

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

- a)** Explain the differences between A-B diblock, ABA triblock, and $(AB)_n$ multiblock copolymers, with examples. Mention their key physical properties and real-world applications.
- b)** Explain the mechanism of stereospecific polymerization of a polar vinyl monomer. Illustrate the polymerization of polystyrene.
- c)** Write a comparative note on coordination polymerization and free radical polymerization.

Seat No.	
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Set **P**

**M.Sc. (Polymer Chemistry) (Semester - III) (New) (NEP CBCS)
Examination: March/April – 2026
Polymer Analysis and Characterization Techniques (2324306)**

Day & Date: Wednesday, 22-04-2026
Time: 11:00 AM To 01:30 PM

Max. Marks: 60

- Instructions:** 1) All questions are compulsory.
2) All questions carry equal marks.
3) Figures to the right indicate full marks.
4) Use of log tables and calculators is allowed.

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

- 1) Beer's law states that the intensity of light decreases with respect to _____.
 - a) Composition
 - b) Distance
 - c) Concentration
 - d) Volume
- 2) Which of the following affects TGA results?
 - a) Sample mass
 - b) Heating rate
 - c) Atmosphere types
 - d) All of the above
- 3) In the MALDI-TOF technique, the matrix _____.
 - a) Helps ionize the sample
 - b) Protects the sample from laser damage
 - c) Solubilizes the sample
 - d) Both a) and b)
- 4) In ¹H NMR spectroscopy, the chemical shift (δ) is measured in _____.
 - a) Hertz
 - b) ppm (parts per million)
 - c) eV (electron volts)
 - d) Nanometers
- 5) Which technique provides surface topography with high depth of field?
 - a) TEM
 - b) SEM
 - c) XRD
 - d) XPS
- 6) Which of the following tests is used to determine the moisture content in polymers?
 - a) Ash content test
 - b) Heating and burning test
 - c) Weight loss after drying
 - d) Softening point test

- 7) Which test is commonly used to identify polymers by observing the color and smell of the smoke?
- Heating and burning test
 - Acid value test
 - Softening point test
 - Bulk density test
- 8) Which viscoelastic model consists of a spring and dashpot in series?
- Voigt model
 - Maxwell model
 - Boltzmann model
 - Hooke's model

B) Fill in the blanks / Write True or False.

04

- The temperature at which a polymer starts to melt is called the _____.
- DTA measures the temperature difference between a sample and an inert reference material during heating say. (True or False)
- Production of X-ray is done using _____ tube.
- The presence of a peak in the 1700 cm^{-1} region of the IR spectrum is typically indicative of a carbonyl group say. (True or False)

Q.2 Answer the following. (Any Six)

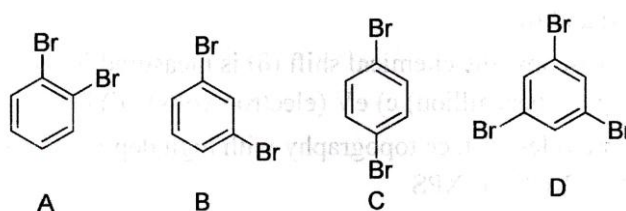
12

- Draw chemical structure of TMS. Give any four reasons for using TMS as a reference standard in NMR.
- Define the terms HDT and Tensile Strength with examples.
- State the rule for selection of target material for laboratory production of X-rays.
- Explain the meaning of terms T_{50} and T_{max} ?
- Calculate the wave number for IR radiation whose wavelength is $5\ \mu\text{m}$.
- List any four applications of XPS technique for polymer analysis.
- Draw the stress-strain curve for five types of polymeric materials with examples.
- Write the difference between IR and Raman Spectroscopy.

Q.3 Answer the following. (Any Three)

12

- Write note on DEPT technique.
- Explain the factors affecting the nature of TGA and DTA curves of polymers.
- How hardness in polymer is calculated, describe any one method in detail?
- Calculate number of signals for following structure using completely decoupling method.



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

- a) How stereoregular in polypropylene is study by using solid state CMR technique.
- b) Discuss the principles of TGA and DTA techniques. List out any two applications of each in polymer analysis.
- c) Write note on Heating Burning Test and Tensile Strength Test in polymer chemistry.

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

- a) Discuss the powdered diffraction method in detail and how it is useful to determine dimension of polymer unit cell?
- b) Write down the principles and applications of SEM and POM technique.
- c) Describe the Maxwell and Voigt models used for viscoelasticity.

Seat No.	
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Set **P**

**M.Sc. (Polymer Chemistry) (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2026
Industrial Polymer Science (2324401)**

Day & Date: Thursday, 16-04-2026
Time: 03:00 PM To 05:30 PM

Max. Marks: 60

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

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

- 1) _____ is a key component of tissue engineering.
 - a) Cells
 - b) Scaffold materials
 - c) Signaling molecules
 - d) All of these

- 2) _____ is used to increase the rate of reaction in interfacial method of polycarbonate.
 - a) PTC
 - b) Antimony trioxide
 - c) ZnO
 - d) All of the above

- 3) VICTRES is trade name of _____ polymer.
 - a) PBT
 - b) PTT
 - c) PEEK
 - d) PET

- 4) The intermediate formed during formation of polyimide is _____.
 - a) Polyamic acid
 - b) Polyamide chloride
 - c) Polyamino phenol
 - d) Poly chloride Benzene

- 5) The cross-linked epoxy resin is obtained by using _____.
 - a) amine
 - b) anhydride
 - c) anhydride & 3° amine
 - d) All of these

- 6) Glyptal is a copolymer of _____.
 - a) Phthalic anhydride & Ethyl alcohol
 - b) Phthalic anhydride & Methanol
 - c) Phthalic anhydride & Glycerol
 - d) Phthalic anhydride & Propanol

- 7) Terylene is an example of _____.
 - a) Polyamide
 - b) Polyacrylate
 - c) Polyester
 - d) Polyphenylene

- 8) Which of the following is an aramide?
 - a) Nylon 6T
 - b) Kevlar
 - c) Nomex
 - d) Both b & c

B) Fill in the blanks. 04

- a) _____ polymer is prepared from ϵ -caprolactam.
- b) The reaction between Bisphenol-A & Epichlorohydrine gives _____.
- c) The polyurethane contains _____ repeating unit in backbone of chain.
- d) Those polymers which conduct electricity are called as _____ polymers.

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

- a) Define epoxy resin and give an example.
- b) What is polyimide?
- c) Define polymer liquid crystal.
- d) Give the Structure of Nylon-6.
- e) What is Step growth polymerization.
- f) Give an example of aromatic polyamide.
- g) Give the synthesis of DMT by stepwise method.
- h) Give the Structure of bismaleimide.

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

- a) Explain the drawbacks of acid process while synthesis of PBT.
- b) Write a note on synthesis of Glyptal resin.
- c) Write a note on Polymer adhesives.
- d) Give the synthesis of polycarbonate by solution method with its advantages and disadvantages.

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

- a) Give the Synthesis of PEN with its applications.
- b) Give the synthesis of MF resin by C.S. Marvel mechanism and give its cross-linking mechanism.
- c) Explain the synthesis of phenol by any three processes.

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

- a) Explain the use of polymer membrane for gas separation method.
- b) Explain in details about polymers in tissue engineering.
- c) Give the synthesis of Nylon-7 with its applications.

Seat No.	
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Set **P**

**M.Sc. (Polymer Chemistry) (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2026
Paints and Coatings Technology (2324402)**

Day & Date: Saturday, 18-04-2026
Time: 03:00 PM To 05:30 PM

Max. Marks: 60

- 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 correct alternative. (MCQ)**08**

- 1) Which of the following pigments gives a white colour?
 - a) Red oxide
 - b) Titanium dioxide
 - c) Carbon black
 - d) All of above
- 2) The main constituent of paint that forms a thin film on the surface is called: _____.
 - a) Pigment
 - b) Thinner
 - c) Binder
 - d) Filler
- 3) Which pigment is commonly used for green colour in paints?
 - a) Chromium oxide
 - b) Zinc oxide
 - c) Iron oxide
 - d) Lead chromate
- 4) The primary solvent used in traditional lacquer is _____.
 - a) Water
 - b) Thinner (organic solvent)
 - c) Alcohol
 - d) Oil
- 5) Which of the following is a major environmental health issue?
 - a) Regular exercise
 - b) Air pollution
 - c) Balanced diet
 - d) Vaccination
- 6) The main constituent of paint that forms a thin film on the surface is called: _____.
 - a) Pigment
 - b) Thinner
 - c) Binder
 - d) Filler
- 7) Which of the following is NOT a major component of a typical paint formulation?
 - a) Binder
 - b) Catalyst
 - c) Pigment
 - d) Solvent
- 8) Which alcohol is most commonly used in alkyd resin synthesis?
 - a) Methanol
 - b) Glycerol
 - c) Isopropanol
 - d) Ethanol

B) Fill in the blanks/ True/False. 02

a) Fill in the blanks.

- 1) The main purpose of _____ in lacquer formulation is to provide a glossy and durable finish.
- 2) The main function of _____ in paint is to provide colour.

b) Write True/False. 02

- 1) Organic pigments are silica mica clay etc.
- 2) Thinner is added to paint to make it more viscous.

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

- a) Define Varnish.
- b) Define Triple roll mill and Ball Mill.
- c) What are Distempers?
- d) Define the term "enamel paint" and mention one of its key characteristics.
- e) What is Powder Coating?
- f) Explain Cement paint.
- g) What is particle size?
- h) Define specific gravity.

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

- a) What are the advantages and limitations of enamel paints?
- b) Compare different types of paints (e.g., emulsion, enamel, distemper, cement paint)
- c) What is the difference between dye and pigment?
- d) State various failures in the paint film.

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

- a) Write in detail different filtration techniques in details.
- b) Explain synthesis of Paints. Application and uses of paints.
- c) Explain synthesis of Epoxy Resin. Write their application and uses of Resin.

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

- a) Explain the synthesis of Alkyd Resin. Write their application.
- b) Tell me about powder coating. Give the Advantages and Disadvantages of Powder Coating.
- c) Give a brief with a flow chart of the 7-tank process/detail about powder coating.

Seat No.	
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Set	P
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**M.Sc. (Polymer Chemistry) (Semester - IV) (New) (NEP CBCS)
Examination: March/April – 2026**

Processing Technology and Polymer Properties (2324405)

Day & Date: Tuesday, 21-04-2026
Time: 03:00 PM To 05:30 PM

Max. Marks: 60

- Instructions:** 1) All questions are compulsory.
2) all questions carry equal marks.
3) Figures to the right indicate full marks.
4) Use of log tables and calculators is allowed.

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

08

- 1) Twin screw extruders are mainly preferred for _____.
a) Mixing and compounding b) Only melting polymer
c) Only cooling polymer d) Storage of polymer
- 2) Compression molding is commonly used for _____.
a) Thermoplastics b) Thermosets
c) Rubbers only d) Fibers
- 3) Loss modulus (G'') represents _____.
a) Thermal behavior b) Loss energy
c) Crystallinity d) Chain stiffness
- 4) Which coating method is widely used for automobile painting?
a) Roll coating b) Vacuum coating
c) Spray coating d) Powder coating
- 5) Calendaring consists of a series of _____.
a) Rollers b) Screws
c) Pistons d) Valves
- 6) Rheology is the study of _____.
a) Polymer synthesis
b) Flow and deformation of materials
c) Thermal properties of polymers
d) Electrical properties
- 7) Polymer coatings generally improve _____.
a) Surface finish b) Corrosion resistance
c) Barrier properties d) All of the above
- 8) Which model involve dash pot only _____.
a) Kelvin-Voigt model b) Maxwell model
c) Newtons model d) Hooke's model

B) Fill in the blanks and True or False. 04

- 1) Maxwell model is a combination of spring and dashpot in _____.
- 2) Melt flow index is _____ proportional to viscosity.
- 3) Compression molding cycle time is usually longer than injection molding. (True or False)
- 4) Composites always have shown two or more phases. (True or False)

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

- a) What is spray coating? Give one example of material used for this coating.
- b) Define composite materials and give examples.
- c) What is calendaring? Name two materials used in calendaring.
- d) What is creep and stress relaxation?
- e) What is dry spinning? give examples.
- f) Name the instruments used to measure flow properties of polymers.
- g) Draw the neat diagram for Hooks model and write its final equation.
- h) What are dynamic mechanical properties? List out the instrument used for measurement of these properties.

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

- a) Explain nanocomposites and their advantages.
- b) Write note on Compression Molding Process.
- c) Explain wet spinning process with diagram and applications.
- d) Explain rotational moulding with neat description.

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

- a) Explain thermoforming process with applications.
- b) What are dynamic mechanical spectra? Discuss the any three factors affecting on dynamic mechanical spectra.
- c) Explain transfer moulding with neat description.

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

- a) Explain calendaring process in detail.
- b) Write note on Injection Molding process in detail.
- c) Write note on the Kelvin Voigt Model for viscoelastic material.

Seat No.	
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Set	P
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**M.Sc. (Physical Chemistry) (Semester - IV) (New) (NEP CBCS)
Examination: March/April – 2026
Molecular Structure (2302402)**

Day & Date: Saturday, 18-04-2026
Time: 03:00 PM To 05:30 PM

Max. Marks: 60

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

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

08

- 1) Bond length can be determined using _____.
 - a) Moment of inertia
 - b) Energy
 - c) Angular momentum
 - d) Planck's constant
- 2) The correct order of different types of energies is _____.
 - a) $E_{el} \gg E_{vib} \gg E_{rot} \gg E_{tr}$
 - b) $E_{el} \gg E_{rot} \gg E_{vib} \gg E_{tr}$
 - c) $E_{el} \gg E_{vib} \gg E_{tr} \gg E_{rot}$
 - d) $E_{tr} \gg E_{vib} \gg E_{rot} \gg E_{el}$
- 3) Which of the following lines are most intense?
 - a) Stokes lines
 - b) Rayleigh-scattered lines
 - c) Anti-strokes lines
 - d) All have same intensity
- 4) According to Born- Oppenheimer approximation, vibrational changes will produce _____ on the spectra of electronic transition.
 - a) fine structure
 - b) coarse structure
 - c) bands
 - d) shades
- 5) Which of the following has more chemical shift?
 - a) CH_3F
 - b) CH_3Cl
 - c) CH_3Br
 - d) CH_3I
- 6) An application of electronic spectroscopy is _____.
 - a) Detection of impurities
 - b) Study of kinetics of the chemical reaction
 - c) Control of purification
 - d) All of the above
- 7) ESR Spectroscopy uses _____ radiation.
 - a) Visible radiation
 - b) Microwave radiation
 - c) Radio wave
 - d) UV radiation

Seat No.	
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Set **P**

**M.Sc. (Analytical Chemistry) (Semester - III) (New) (NEP CBCS)
Examination: March/April – 2026
Advance Separation Techniques (2304301)**

Day & Date: Friday, 17-04-2026
Time: 11:00 AM To 01:30 PM

Max. Marks: 60

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

Q.1 A) Select the most correct alternative for each of the following and rewrite the sentence. 08

- 1) 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

- 2) 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

- 3) Removal of waste from our body is the process of _____.

a) excretion	b) respiration
c) exhalation	d) double circulation

- 4) Ultrafiltration is the best techniques used for the separation and purification of _____.

a) micro-molecules	b) bulky molecules
c) nano molecules	d) All of the above

- 5) _____ is sensitive to both the mass and shape of the molecule.

a) Sedimentation constant	b) Sedimentation velocity
c) Sedimentation equilibrium	d) Sedimentation

- 6) Ether is the most common _____ used for the extraction process.

a) solute	b) solvent
c) salt	d) solution

- 7) The simplicity of extraction process is decided by _____.

a) gravity	b) boiling point
c) partition coefficient	d) None of these

- 8) The most common type of gel used for DNA separation is _____.
- a) agarose
 - b) agar
 - c) polyacrylamide
 - d) silica

B) Write True or False. 04

- 1) In gel electrophoresis DNA molecule are separated by their size.
- 2) Membrane extraction is also known as Liquid-liquid extraction.
- 3) Gibbs Phase rule is the basis of solvent extraction.
- 4) Electrophoresis is not suitable for the separation of lipids.

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

- a) What is electro osmotic flow?
- b) Define synergic extraction.
- c) State Gibbs Phase rule.
- d) Give the applications of ultrafiltration.
- e) What is micellar electrokinetic capillary chromatography?
- f) What do you understand by zone electrophoresis?
- g) Define exclusion chromatography.
- h) Describe in short ascending chromatography.

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

- a) Describe the various applications of sedimentation.
- b) Discuss the process of zone refining.
- c) What are the applications of dialysis.
- d) Write a note on affinity chromatography.

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

- a) Discuss in detail Electrodialysis cell and its applications.
- b) With schematic diagram explain two dimensional chromatography.
- c) Give applications of electrophoresis in inorganic and organic separations

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

- a) Describe the applications of high performance liquid chromatography.
- b) Explain the factors affecting on solvent extraction.
- c) Discuss the applications of electrophoresis.

Seat No.	
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Set **P**

**M.Sc. (Analytical Chemistry) (Semester - III) (New) (NEP CBCS)
Examination: March/April – 2026
Analytical Spectroscopy (2304306)**

Day & Date: Wednesday, 22-04-2026
Time: 11:00 AM To 01:30 PM

Max. Marks: 60

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

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

- 1) Unit for magnetic field strength is _____.
 - a) tesla
 - b) calories
 - c) debye
 - d) unitless
- 2) Photoacoustic spectroscopy is comparable to _____.
 - a) Mossbauer
 - b) Fluorescence
 - c) IR
 - d) NMR
- 3) The transition zone for Raman spectra is _____.
 - a) between vibrational and rotational levels
 - b) between electronic levels
 - c) between nuclear energy levels
 - d) all of these
- 4) The criteria for electron spin resonance is _____.
 - a) periodic change in polarizability
 - b) spin quantum number must be greater than zero
 - c) presence of unpaired electrons
 - d) presence of chromophore in a molecule
- 5) In NQR, η is a measure of _____.
 - a) symmetry of EFG
 - b) non symmetry of EFG
 - c) Spins
 - d) Couplings
- 6) All elements produce Auger electron spectra except _____.
 - a) Hydrogen
 - b) Helium
 - c) Nitrogen
 - d) both a and b
- 7) The electrons which contribute to electric field gradient are _____.
 - a) only p- and d-electrons in a valence cell
 - b) closed shell electrons
 - c) s-electrons
 - d) only f-electrons

- 8) Which of the following will NOT show electron spin resonance (ESR)?
- a) Paramagnetic materials b) Free radicals
c) Transition metals d) Diamagnetic materials

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

- 1) In Raman spectroscopy, anti-Stokes lines are appeared at higher energy side. [True or False]
- 2) For an unbound electron, value of Lande' factor (g-factor) will be equal to _____.
- 3) If a non bonding electron is removed, there is virtually no change in bond length or bond strength. [True / False]
- 4) The fundamental energy equation used in spectroscopy is _____.

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

- a) What do you mean by hyperfine structure?
- b) Calculate the frequency required at a magnetic field strength of 0.3 T. Write a note on PAS gases and condensed system.
- c) Predict the ESR spectrum of the $^{13}\text{CF}_2\text{H}$ radical.
- d) What do you mean by the term electric field gradient (EFG)?
- e) Give the block diagram of ESR spectrometer.
- f) What do you mean by the term isomer shift?
- g) Give the selection rule for rotational Raman spectrum.
- h) Give the examples of PAS gases.

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

- a) Discuss the applications of electron spin resonance spectroscopy in quantitative analysis.
- b) Explain how NQR spectroscopy is used in molecular structure determination.
- c) Discuss scanning electron microscope (SEM) w.r.t. principle and working.
- d) Explain in brief ESR spectrometer with instrumentation.

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

- a) Discuss chemical and surface applications of photoacoustic spectroscopy.
- b) What is Scanning Tunnelling Microscopy? Discuss basic principles of it.
- c) Explain the quadrupole splitting and hyperfine interaction in Mossbauer spectroscopy with suitable example.

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

- a) Write on ESCA instrumentation.
- b) Discuss pure rotational Raman spectrum.
- c) Write on applications of atomic force microscopy in various fields of study.

Seat No.	
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Set **P**

**M.Sc. (Analytical Chemistry) (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2026
Advanced Analytical Techniques (2304401)**

Day & Date: Thursday, 16-04-2026
Time: 03:00 PM To 05:30 PM

Max. Marks: 60

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

Q.1 A) Choose correct options. 08

- 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 44μ but greater than 1μ 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 of these
- 8) Capillary tube is most often used in _____.
 - a) NMR
 - b) FIA
 - c) GC-MS
 - d) COD

- B) Write True/ False. 04**
- a) Stoke's law establishes the relationship between the settling velocity of falling particles and particle size.
 - b) Under ideal conditions, the COD/TOC ratio for sewage containing only organic matter is 2.66.
 - c) A reagent blank is prepared by using external standard in FIA.
 - d) 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) COD analyzer
 - d) NMR and FTIR detection
 - 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) Discuss the principle of ion chromatography and its applications.
 - b) Explain LC-MS technique and its merits.
 - c) Discuss in short the molecular weight determination of biopolymers.
 - d) Explain GC-MS technique and its merits.
- Q.4 Answer the following. (Any Two) 12**
- a) Describe the structure of resins used in ion chromatography.
 - b) Explain the basic instrumentation of GC-MS and applications of it.
 - c) Discuss the structure determination of biopolymers.
- Q.5 Answer the following. (Any Two) 12**
- a) Write the instrumentation of super critical fluid extraction (SFE) and its applications.
 - b) Discuss low-angle laser light scattering instrumentation and its applications.
 - c) Discuss the instrumentation and operating variables of super critical fluid chromatography.

Seat No.	
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Set **P**

**M.Sc. (Analytical Chemistry) (Semester - IV) (New) (NEP CBCS)
Examination: March/April – 2026
Instrumental Methods of Chemical Analysis - II (2304402)**

Day & Date: Saturday, 18-04-2026
Time: 03:00 PM To 05:30 PM

Max. Marks: 60

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

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

- 1) Fluorescence always occurs at _____ than the excitation wavelength.
 - a) higher wavelength
 - b) lower wavelength
 - c) same wavelength
 - d) None of these

- 2) Which of the following principle is the basis of Abbe's refractometer?
 - a) Pogendorff's compensation
 - b) critical angle
 - c) null deflection
 - d) all of these

- 3) According to Snell's law, _____ = n (refractive index).
 - a) $\sin i / \sin r$
 - b) $\sin r / \sin i$
 - c) $\sin i \times \sin r$
 - d) $\sin^2 r$

- 4) The temperature of acetylene-oxygen flame is _____ °C.
 - a) 2400
 - b) 3400
 - c) 3000
 - d) 2700

- 5) Which of the following radiation is ionizing radiation?
 - a) infra red
 - b) X-ray
 - c) Visible
 - d) microwave

- 6) Which of the following is an incorrect statement?
 - a) Photochemical reactions are caused by absorption of ultraviolet only
 - b) When a molecule or atom in the ground state (S_0) absorbs light, one electron is excited to a higher orbital level
 - c) It is possible for the excited state S_1 to undergo spin inversion
 - d) First step in photochemistry is excited state (photoexcitation)

- 7) Turbidimetric method is similar to _____.
 - a) filter photometry
 - b) colorimetric method
 - c) fluorometry
 - d) both (a) and (b)

- 8) In X-ray tube generally _____ metals are used as targets (anode).
- | | |
|-------|-----------------|
| a) Cu | b) Mo |
| c) W | d) all of these |

B) Fill in the blanks OR Write True/False. 04

- 1) Elements having atomic number less than 23 produce only _____ series.
- 2) For very dilute suspensions, the most sensitive technique is _____.
- 3) The good oxidants to excite metals in the flame is _____.
- 4) Mention typical X-ray region of the electromagnetic spectrum.

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

- a) Define nebulization process.
- b) State Beer-Lambert's law.
- c) Give Franck-Condon principle.
- d) Why do excited molecules emit band spectra while excited atoms emit line spectra?
- e) Estimate the energy in joules for Cu $K\alpha$ line having wavelength 1.5406 Å.
- f) List any two fluorescence standard materials.
- g) Mention any two non-radiative photophysical pathways.
- h) Give the expression for Bragg's diffraction law.

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

- a) XRD pattern of a metal gives first order reflection at $\theta = 27^\circ$. Calculate the interplanar distance (Given: incident X-ray wavelength = 1.5406 Å)
- b) Write on the parameters which influence refraction.
- c) What do you mean by quantum efficiency? How it is estimated?
- d) Write on different excitation sources used in emission spectroscopy.

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

- a) With the help of Jablonski's energy level diagram, show various photophysical pathways with their typical lifetimes.
- b) Discuss Bragg's X-ray diffraction method.
- c) Describe the principle and working of flame photometer.

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

- a) Illustrate X-ray absorption phenomenon.
- b) Write on instrumentation of interferometry.
- c) Explain spectral and chemical interference encountered in flame photometry.

Seat No.	
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Set **P**

**M.Sc. (Analytical Chemistry) (Semester - IV) (New) (NEP CBCS)
Examination: March/April – 2026
Biochemical and Food Analysis (2304405)**

Day & Date: Tuesday, 21-04-2026
Time: 03:00 PM To 05:30 PM

Max. Marks: 60

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

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

- 1) Iodine value is an indicator of _____.
 - a) Saturation in oils
 - b) Unsaturation in oils
 - c) Oxidation stability
 - d) Viscosity
- 2) Creatinine is primarily excreted through _____.
 - a) Lungs
 - b) Liver
 - c) Kidneys
 - d) Skin
- 3) The estimation of blood glucose is generally done using _____.
 - a) Molisch test
 - b) Anthrone method
 - c) Benedict's test
 - d) Folin-Wu method
- 4) Polenske value determines _____.
 - a) Acid content
 - b) Non-volatile acids
 - c) Volatile fatty acids
 - d) Saturated acids
- 5) Diazepam is classified under _____.
 - a) Antibiotics
 - b) Sedative-hypnotics
 - c) Anti-anxiety drugs
 - d) Hallucinogens
- 6) For estimation of calcium in urine, the reagent commonly used is _____.
 - a) EDTA
 - b) NaOH
 - c) Nessler's reagent
 - d) Schiff's reagent
- 7) Lead in biological samples is estimated by _____.
 - a) Gas chromatography
 - b) Flame photometry
 - c) AAS
 - d) TLC
- 8) The enzyme pepsin acts on _____.
 - a) Fats
 - b) Proteins
 - c) Carbohydrates
 - d) Vitamins

B) Fill in the blanks. 04

- a) _____ is a method used to detect urea in blood.
- b) Saponification value indicates the amount of _____ present in oils.
- c) _____ is a common non-steroidal anti-inflammatory drug.
- d) The colour in jam is generally measured by _____ method.

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

- a) Define titre point and cloud point in fat analysis.
- b) Write two applications of drug assays.
- c) Mention any two clinical uses of blood analysis.
- d) What is the significance of saponification and iodine value in food analysis?
- e) What are the major constituents of body fluids?
- f) Write any two roles of vitamins in biological systems.
- g) Explain the term "dosage form" with an example.
- h) What is the difference between drug and medicine?

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

- a) Write a note on detection and analysis of preservatives in food.
- b) Explain the estimation of uric acid and creatinine in urine.
- c) Describe the classification of poisons and estimation of mercury.
- d) Write a note on the assay of any two hormones.

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

- a) Explain in detail the collection, preservation, and analysis of urine for clinical diagnosis.
- b) Describe the method for analysis of natural oils and fats.
- c) Discuss the analysis of phenobarbital and diazepam.

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

- a) Describe the estimation of cholesterol and bilirubin in blood.
- b) Explain forensic analysis with reference to LD-50, poisons, and sample handling.
- c) Discuss the composition and analytical testing of jam, honey, and milk.

Seat No.	
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Set **P**

**M.Sc. (Pharmaceutical Chemistry) (Semester - III) (New) (NEP CBCS)
Examination: March/April – 2026
Advanced Spectroscopic Methods (2303301)**

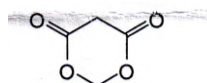
Day & Date: Friday, 17-04-2026
Time: 11:00 AM To 01:30 PM

Max. Marks: 60

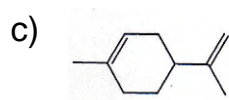
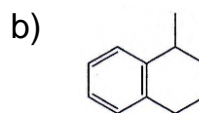
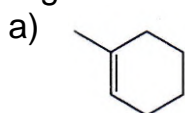
Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

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

- 1) In DEPT-135, CH₂ gives _____ peak whereas CH and CH₃ gives _____.
 a) positive, negative b) negative, positive
 c) no, positive d) no, negative
- 2) How many signals would you expect for this compound in ¹³C NMR?



- a) 3 b) 4
 c) 5 d) 6
- 3) Which of the following compound undergo retro-Diels Alder fragmentation?



d) All of these

- 4) What signals do you expect to see in the ¹H NMR spectrum of 1,1-dichloroethane (CH₃CHCl₂)?
 a) A doublet and a triplet b) A doublet and a quartet
 c) A singlet and a doublet d) A singlet and a quartet
- 5) Which of the following nuclei is NMR active?
 a) ¹H¹ b) ⁶C¹³
 c) ⁷N¹⁴ d) All of these
- 6) Chlorine possesses two isotopes (³⁵Cl and ³⁷Cl) in an approximate 3:1 ratio. In the mass spectrum of Cl₂, how many peaks will the parent ion contain?
 a) 1 b) 2
 c) 3 d) 4

Q.5 Answer the following. (Any Two)

12

- a)** Discuss DEPT with suitable example.
- b)** Discuss McLafferty rearrangement with suitable examples.
- c)** A compound having M.F. $C_6H_{12}O_2$ gave spectral data as follows:
UV: λ_{max} 283 nm ($\epsilon = 27$)
IR: 3300, 1705 cm^{-1}
 1H 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.

Seat No.	
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Set **P**

**M.Sc. (Pharmaceutical Chemistry) (Semester - III) (New) (NEP CBCS)
Examination: March/April – 2026
Drug Development (2303302)**

Day & Date: Monday, 20-04-2026
Time: 11:00 AM To 01:30 PM

Max. Marks: 60

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

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

- 1) _____ of the following is NOT a component of Computer aided drug design.
 - a) Computational Chemistry
 - b) Molecular Modeling
 - c) Cellular biology
 - d) Rational Drug Design

- 2) _____ is a key factor in determining a drug's distribution in the body.
 - a) Concentration at the site of action
 - b) The rate of drug absorption
 - c) The number of drug-metabolizing enzymes
 - d) The strength of the drug's receptor binding

- 3) Lipophilic drugs are more likely to _____.
 - a) Require active transport to cross membranes
 - b) Pass through the lipid-based cell membrane more easily
 - c) Be retained in the watery components of the blood
 - d) Become ionized in the plasma

- 4) _____ of the following is not a receptor.
 - a) Ligand-gated ion channel
 - b) G-protein coupled receptor
 - c) Nuclear receptors
 - d) Allosteric modulators

- 5) _____ term is used to describe a more gradual decrease in responsiveness to a drug, taking days or weeks to develop.

a) Refractoriness	b) Cumulative effect
c) Tolerance	d) Tachyphylaxis

- 6) Lipinski's rule of five is used for _____.

a) Docking	b) Similarity search
c) Drug likeness	d) Dynamics simulation

- 7) CADD helps to optimize identified leads in drug development ____.
- By increasing time consumption
 - By using traditional Methods
 - By being a slow process
 - By being fast and cost effective
- 8) _____enzyme comprises a major part of enzyme-linked receptors.
- Receptor Tyrosine Kinase
 - Receptor Threonine Phosphatase
 - Receptor Histidine Kinase
 - Receptor Serine Phosphatase

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

- Carrier mediated transport refers to the movement of molecules across membranes, with the help of carriers such as proteins.
- Process of movement of drug from site of administration to the systemic circulation is called as absorption.
- Receptor protein is decomposed and destroyed after removal of chemical messenger.
- Drug development focuses only on chemical formulas for medicines.

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

- Explain the pKa?
- Define LD₅₀ and ED₅₀
- Give the difference between Pharmacokinetics and Pharmacodynamics.
- Write a note on lippophilicity.
- Enlist factors affecting Drug distribution.
- Give the importance of CADD.
- Define Bioavailability, Drug metabolism, elimination and toxicity.
- Write a note on SAR.

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

- Discuss about the QSAR.
- What is the relationship between pKa and Solubility?
- Give the difference between Lippophilicity and Hydrophilicity.
- Write a note on Molecular Docking.

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

- Enlist methods of drug absorption. Explain in detail active and passive diffusion.
- Explain in detail Drug development.
- Explain in detail Drug metabolism.

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

- Explain in detail drug receptor interactions.
- Describe the different sources of Drug.
- Explain in detail the determination of MIC.

Seat No.	
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Set **P**

M.Sc. (Pharmaceutical Chemistry) (Semester - III) (New) (NEP CBCS)
Examination: March/April – 2026
Modern Pharmaceutical Analytical Techniques (2303306)

Day & Date: Wednesday, 22-04-2026
 Time: 11:00 AM To 01:30 PM

Max. Marks: 60

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

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

- 1) In which type of chromatography, the stationary phase held in a narrow tube and the mobile phase is forced through it under pressure?
 - a) Column chromatography
 - b) Planar chromatography
 - c) Liquid chromatography
 - d) Gas chromatography
- 2) Particle size of S.P. used in HPLC is _____.
 - a) 15-20-micron
 - b) 20-25-micron
 - c) 25-30-micron
 - d) 5-10 micron
- 3) Which of the following is not an application of Flame emission photometers?
 - a) Analysis of biological fluids
 - b) Determination of sodium, potassium in soil
 - c) Determination of metals such as Mn, Cu
 - d) Analysis of complex mixtures
- 4) _____ is an Ultra Violet range.
 - a) 300-800nm
 - b) 200-380nm
 - c) 10-100nm
 - d) Both a & b
- 5) In DTA, physical changes give rise to _____ peak.
 - a) Positive
 - b) Endothermic
 - c) Negative
 - d) None of these
- 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) Beer's law states that the intensity of light decreases with respect to _____.
 - a) Concentration
 - b) Distance
 - c) Composition
 - d) Volume

- 8) _____ functional group shows characteristic IR peak in the range of 1650 -1850 cm^{-1} .
- a) -OH (alcoholic) b) -NH₂ (amine)
c) -CN (nitrile) d) >C=O (carbonyl)

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

- 1) Colorimeters are used in applications where great accuracy is required.
- 2) IR range is 4000-667 cm^{-1} .
- 3) Elements such as Carbon, Hydrogen and Halides are detected by Flame Photometry.
- 4) Van Deemter equation contributes to band broadening effect.

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

- a) Give the difference between TLC and Paper chromatography.
- b) Enlist the applications of IR spectroscopy.
- c) Write principle of Potentiometer.
- d) Give advantages & disadvantages of Thermogravimetric analysis.
- e) Define Retention time & Retention volume.
- f) Enlist applications of Spectrofluorimeter.
- g) Give the common solvents used in UV spectroscopy with their one advantage.
- h) Write principle of differential thermal analysis.

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

- a) Discuss different modes of molecular vibrations.
- b) Discuss Beers & lamberts law.
- c) Write a note on ion exchange chromatography.
- d) Write on instrumentation of Flame emission spectroscopy.

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

- a) Explain instrumentation of double beam UV-Visible spectrophotometer.
- b) Discuss with suitable diagram any two detectors used in HPLC.
- c) Explain in detail principle behind AAS.

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

- a) Explain in detail principle behind DTA.
- b) Enlist and explain the factors affecting fluorescence.
- c) Discuss Instrumentation of Gas Chromatography.

Seat No.	
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Set **P**

M.Sc. (Pharmaceutical Chemistry) (Semester - III) (CBCS)
Examination: March/April - 2026
Advanced Organic Chemistry – I (MSC012301)

Day & Date: Friday, 17-04-2026
 Time: 11:00 AM To 02:00 PM

Max. Marks: 80

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

Q.1 A) Fill in the blanks by choosing correct alternatives given below: 10

- 1) Which of the following is act as inhibitor in free radical reactions?
 - a) Nitric oxide
 - b) Molecular oxygen
 - c) Benzoquinone
 - d) All of these

- 2) In Hunsdiecker's reaction the final product formed is _____.
 - a) Alkyl cyanide
 - b) Alkyl halide
 - c) Aryl halide
 - d) Alkyl ester

- 3) DCC is the _____ agent for preparation of amides, ketones and nitriles.
 - a) Oxidizing
 - b) Hydrolyzing
 - c) Hydrating
 - d) Dehydrating

- 4) In Hiyama coupling reaction the catalyst used is _____.
 - a) Nickel
 - b) Palladium
 - c) Enzyme
 - d) Platinum

- 5) Spontaneous oxidation of a compound in air is called as _____.
 - a) Redox reaction
 - b) Rapid oxidation
 - c) Combustion reaction
 - d) Autoxidation

- 6) In Shapiro reaction, ketone or aldehyde is converted to _____.
 - a) Methane
 - b) Alkyne
 - c) Alkene
 - d) Alkane

- 7) Sandmeyer reaction is a type of _____ reaction.
 - a) Substitution
 - b) Elimination
 - c) Addition
 - d) Rearrangement

- 8) In Wolff rearrangement, _____ has been formed by rearrangement of α -diazoketones.
 - a) nitrene
 - b) ketene
 - c) both a) and b)
 - d) None of these

- 9) Which of the following is one of the reactant in Eschenmoser rearrangement?
 a) β -hydroxy ketone b) β -amino alcohol
 c) α, β -epoxy ketone d) All of these
- 10) In _____ reaction, silver salt of carboxylic acid reacts with halogen to produce an organic halide.
 a) Sandmeyer b) Hunsdiecker
 c) Hammick d) Reformatsky

B) Write the answers in short. 06

- 1) How Lithium dialkylcuprate is formed?
- 2) In Chugaev elimination, what is eliminated and which product is formed?
- 3) What kind of reaction is NBS?
- 4) In iodolactonisation, by addition of an oxygen and iodine which ring is formed?
- 5) What is Heck reaction?
- 6) Which conversion is occurred in Wittig reaction?

Q.2 Answer the following. 16

- a) Write note on allylic hydrogenation.
- b) Explain Grubb's metathesis.
- c) Explain Hunsdiecker reaction.
- d) Write note on Peterson's synthesis

Q.3 Answer the following. 16

- a) Explain Julia olefination and Corey-Winter olefination.
- b) Explain Pyne rearrangement and Brook rearrangement.

Q.4 Answer the following. 16

- a) What are the types of free radical reactions? Explain free radical substitution mechanism.
- b) How DDQ is prepared? Write its four applications.

Q.5 Answer the following. 16

- a) Explain the coupling of alkynes and arylation of aromatic compounds by diazonium salt.
- b) How trimethylsilyl iodide is prepared? Write its four applications.

Q.6 Answer the following. 16

- a) Explain Wagner-Meerwein rearrangement reaction in detail.
- b) Explain Darzens reaction and Bamford-Steven reaction.

Q.7 Answer the following. 16

- a) Discuss Hofmann rearrangement with mechanism and give its applications.
- b) Explain Strecker amino acid synthesis in detail.

- Q.5 Answer the following.** **16**
- a) Discuss synthesis of benzothiophene with mechanism and their chemical reactions.
 - b) Discuss the synthesis of Isoquinoline with mechanism and their chemical reactions.
- Q.6 Answer the following.** **16**
- a) Write a detail note on aziridine and oxirane with examples.
 - b) Discuss the synthesis of azitidine and thietane with chemical reactions.
- Q.7 Answer the following.** **16**
- a) Discuss the synthesis and tetrazine in detail.
 - b) Write mechanism of Coumarin with chemical reactions.

Seat No.	
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Set **P**

**M.Sc. (Pharmaceutical Chemistry) (Semester - IV) (New) (NEP CBCS)
Examination: March/April – 2026
Advanced Organic Chemistry - II (2303401)**

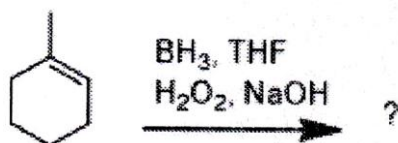
Day & Date: Thursday, 16-04-2026
Time: 03:00 PM To 05:30 PM

Max. Marks: 60

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

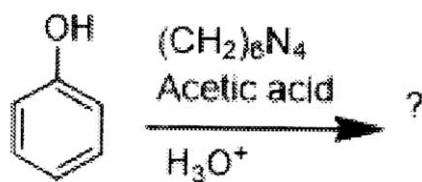
Q.1 A) Choose correct alternative. (MCQ)**08**

- 1) Which of the following chemical reaction that converts the tosylhydrazone of aldehydes or ketones into alkene by using strong base?
- a) Ugi reaction b) Kumada reaction
c) Heck reaction d) Shapiro reaction
- 2) Complete the following reaction _____.



- a) b)
- c) d)
- 3) Ozone is a very electrophilic _____ molecule.
- a) 1,3-dipolar b) 1,3-polar
c) Non polar d) None of these
- 4) Julia olefination can be used to _____ alkenes.
- a) monosubstituted b) disubstituted
c) trisubstituted d) All three

- 5) Write the correct product of following reaction.



- a)
- b)
- c)
- d)

- 6) In Eschenmoser fragmentation α, β -epoxy ketones and aryl sulphonyl hydrazine give _____ and _____.
- a) alkenes and carbonyl compounds
 b) alkynes and carbonyl compounds
 c) alkanes and carbonyl compounds
 d) alcohols and carbonyl compounds
- 7) Factors favouring the formation of kinetic enolates is/are _____.
- a) Aprotic solvent
 b) Strong base
 c) Oxophilic cations and low temperature
 d) All three
- 8) In Hofmann-Löffler-Freytag reaction, N-haloamines should have _____.
- a) α -Hydrogen b) β -Hydrogen
 c) γ -Hydrogen d) δ -Hydrogen

B) Fill in the blanks.

04

- a) The Wolf rearrangement involves the conversion of α -diketones into _____.
- b) The _____ reaction is used for amino acid synthesis from aldehydes.
- c) The hydroboration of alkenes with BH_3 gives _____ alcohols due to anti- Markovnikov addition.
- d) Organotin hydrides (R_3SnH) are widely used in _____ reaction.

- Q.2 Answer the following. (Any Six) 12**
- Define Baylis-Hillman reaction with example.
 - Explain hydroboration of alkenes using BH_3 .
 - How are the organoboranes prepared from Grignard reagents?
 - Define Heck reaction with example.
 - Explain the Brook rearrangement with example.
 - Give any two applications of DDQ.
 - Explain the reduction of ketone using borane.
 - Discuss the stereo & regioselectivity observed in alkylation of enolates.
- Q.3 Answer the following. (Any Three) 12**
- Explain Wagner-Meerwein rearrangement and give its applications.
 - Explain the Shapiro reaction with suitable example and mechanism.
 - Discuss the application of selenium dioxide.
 - Discuss alkylation of enolates stabilized by two functional groups.
- Q.4 Answer the following. (Any Two) 12**
- Explain reaction mechanism of Negishi and Kumada reaction.
 - Write the synthesis of aldehyde and ketones using Organoboranes.
 - Discuss the Iodolactonisation reaction and give its application.
- Q.5 Answer the following. (Any Two) 12**
- Explain with suitable examples generation of enolates along with nitrogen Analogs, of enols and enolates
 - Explain the Eschenmoser fragmentation with suitable example and mechanism.
 - Explain Corey-Fuchs reaction and give its application.

Seat
No.Set **P**

**M.Sc. (Pharmaceutical Chemistry) (Semester - IV) (New) (NEP CBCS)
Examination: March/April – 2026
Drugs and Heterocycles (2303402)**

Day & Date: Saturday, 18-04-2026
Time: 03:00 PM To 05:30 PM

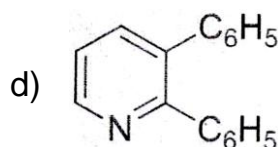
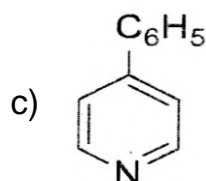
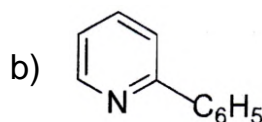
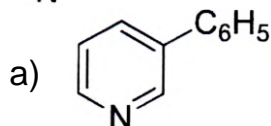
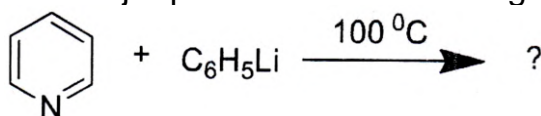
Max. Marks: 60

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

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

- 1) The science which is concerned with the study of mechanism of action of drug and pharmacological effects produced on the human body is known as _____.
a) Pharmacokinetics b) Toxicology
c) Pharmacolog d) Pharmacodynamics

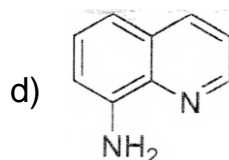
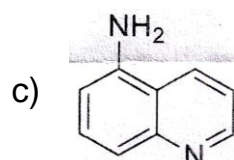
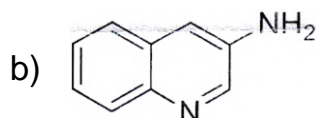
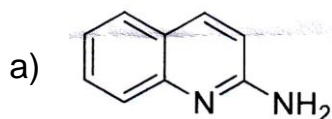
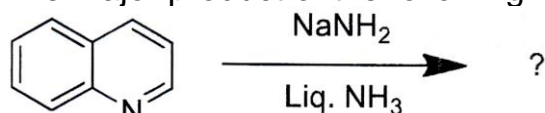
- 2) The major product of the following reaction is _____.



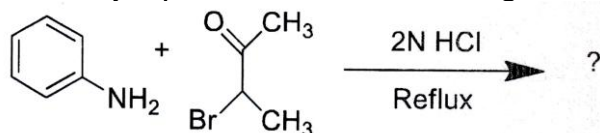
- 3) Drugs used to relieve pain are _____.

- a) Antipyretics b) Analgesics
c) Antibiotics d) Anti-Pruritics

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



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



- a)
- b)
- c)
- d)

- 6) The drug used to prevent or treat convulsions in a epileptic patient is _____.

- a) Antihistamine b) Anticoagulant
c) Anesthetics d) Anticonvulsants

- 7) The study of absorption, distribution, metabolism and excretion of drug is known as _____.

- a) Pharmacy b) Pharmacokinetics
c) Pharmacodynamics d) Pharmacopoeia

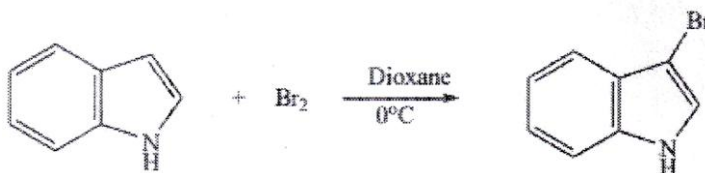
- 8) Which of the following method can be used for synthesis of indole?

- a) The Fisher-Indole synthesis
b) Madelung Synthesis
c) Bischler's synthesis
d) All of these

B) Predict weather True or False.

04

- Atenolol acts as antihypertensive Drug.
- Glipizide is used as Anesthetic drug.
- Weather the product of following reaction is true or false?



- Choromphenecol can be used as anticonvulsant drugs.

- Q.2 Answer the following. (Any Six) 12**
- a) Give the synthesis of paracetamol.
 - b) Give the synthesis quinazolines.
 - c) Give the synthesis of tolbutamide.
 - d) Define and classify Antimalarial drug.
 - e) Give the synthesis of Aspirin.
 - f) Give the synthesis of benzopyrazole.
 - g) Give the synthesis of captopril.
 - h) Define and classify antibiotics.
- Q.3 Answer the following. (Any Three) 12**
- a) Write a note on piperazine.
 - b) Write synthesis and aromatic character of Pyridine.
 - c) Write a note on alkylating agent.
 - d) Discuss the 2 methods of synthesis of imidazole.
- Q.4 Answer the following. (Any Two) 12**
- a) Discuss the synthesis of chloramphenicol give its SAR.
 - b) Describe 3 methods of synthesis for oxazole.
 - c) Write the synthesis of tetracycline and thiopental.
- Q.5 Answer the following. (Any Two) 12**
- a) Discuss the 3 methods of synthesis of Quinoline.
 - b) Discuss the synthesis of Amoxicillin and give its SAR.
 - c) Discuss electrophilic substitution reactions of indole and benzothiophene.

Seat
No.Set **P**

M.Sc. (Pharmaceutical Chemistry) (Semester - IV) (New) (NEP CBCS)
Examination: March/April – 2026
Pharmaceutical Dosage Forms (2303405)

Day & Date: Tuesday, 21-04-2026
Time: 03:00 PM To 05:30 PM

Max. Marks: 60

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

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

08

- 1) Powders used for external use are _____.
 - a) Dusting powder
 - b) Bulk powder
 - c) Divided powder
 - d) Effervescent powders
- 2) Suspending agent imparts _____.
 - a) Solubility
 - b) Viscosity
 - c) Absorption
 - d) Wetting
- 3) What is the primary purpose of dosage forms in pharmaceuticals?
 - a) To enhance drug taste
 - b) To extend drug shelf life
 - c) To deliver medications to patients
 - d) To reduce drug cost
- 4) What is the primary advantage of using film-coated tablets?
 - a) Improved taste
 - b) Faster dissolution
 - c) Enhanced stability
 - d) Extended release
- 5) What is the primary purpose of a transdermal patch?
 - a) To deliver medication directly to the lungs
 - b) To provide controlled and continuous drug release through the skin
 - c) To enhance the taste of the medication
 - d) To treat gastrointestinal disorders
- 6) Which of the following will be the slowest step in tablet drug absorption?
 - a) Tablet disintegration to granules
 - b) Granules disintegration to fine particles
 - c) Fine particles dissolution
 - d) Dissolution absorbed into the blood
- 7) Eye drops are also called _____.
 - a) Intravenous
 - b) Ophthalmic solution
 - c) Buccal preparation
 - d) Otic drops

- 8) What is the primary function of a dosage form's excipients?
- To color the medication
 - To aid in the manufacturing and administration of the medication
 - To enhance the medication's taste.
 - To extend the medication's shelf life.

B) Write true/ false. 04

- Aging of dosage form affects drug release.
- Oral controlled release drugs release the drug only inside the intestine.
- Disintegration time is directly proportional to the amount of binder present in the tablet.
- Flocculation is desirable for pharmaceutical suspensions.

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

- What are requirements for selection of route of Administration?
- Enlist defects in tablet manufacturing.
- Define Suspensions, Emulsions, Aerosols and tablets.
- What is the rationale for sustained release?
- Write a note on excipients.
- Give the difference between suspension and emulsion.
- Give the schematic representation of types of dosage forms.
- Give the parameters of stability studies.

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

- What are different types of emulsions?
- Write a note on Aerosols.
- Why coating of tablets is carried out?
- What are powders?

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

- What is wet granulation?
- Explain in detail Strip or blister packaging.
- Explain in detail transdermal drug delivery system.

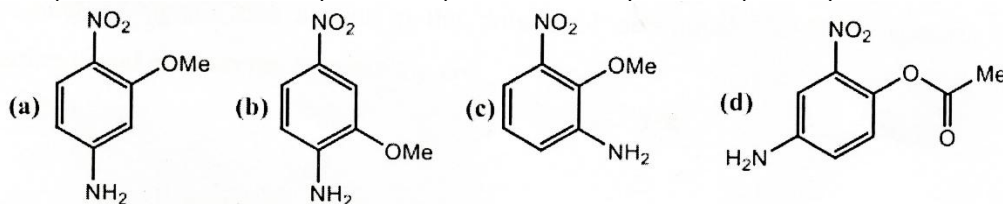
Q.5 Answer the following. (Any Two) 12

- Explain in detail parenteral formulation method.
- How the ophthalmic preparations are evaluated?
- Write a note on pre-formulation.

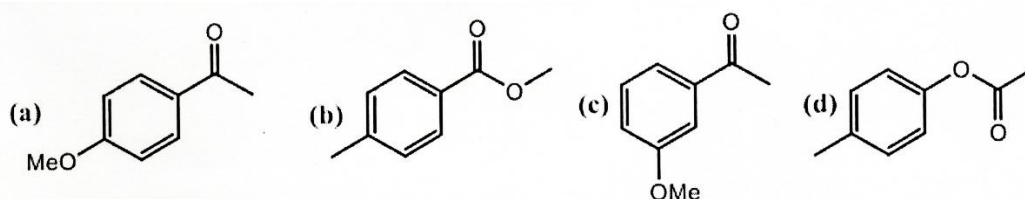
Q.3 Answer the following. (Any Three)

12

- a) Assign signals and give justification for the correct structure of the compound that matches the given ^1H NMR data: ^1H NMR (DMSO- d_6): δ 7.75 (dd, $J = 8.8, 2.4$ Hz, 1H), 7.58 (d, $J = 2.4$ Hz, 1H), 6.70 (d, $J = 8.8$ Hz, 1H), 6.50 (broad s, 2H), 3.80 (s, 3H)



- b) Write a short note on Karplus equation.
 c) Find out number of signals for the following compounds in ^1H NMR and ^{13}C NMR and explain their chemical and magnetical equivalence?



- d) Find out structure of organic compound from following data with detail justifications Molecular Formula.: $\text{C}_5\text{H}_{10}\text{O}$
 ^1H NMR (δ in ppm): 1.22 (d, $J = 6$ Hz, 12 mm), 2.0 (m, 16 mm), 3.65 (t, $J = 6$ Hz, 8 mm), 3.80 (m, 4 mm); ^{13}C NMR (δ in ppm): 21, 26, 33, 68, 77.

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

12

- a) What is 2D NMR? Discuss COSY spectra of 2-Hexanone.
 b) What is second order spectra? Discuss AB_2 , AX_2 spin systems in NMR with examples.
 c) Discuss the mode of fragmentation in aldehydes, ketones and esters.

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

12

- a) A compound has $M^+ = 96$ in its mass spectrum and exhibits the ^{13}C spectral data Broadband-decoupled ^{13}C NMR: 27.6, 29.3, 32.2, 132.4; DEPT-90: 132.4; DEPT-135: positive peak at 132.4; negative peaks at 27.6, 29.3, 32.2 ppm. Find the structure for this compound.
 b) Find out structure of organic compound from following data with justifications
 Molecular Formula: $\text{C}_9\text{H}_{11}\text{O}_2\text{N}$
 ^1H NMR (δ in ppm): 7.9 (d, $J = 8$ Hz, 2H), 6.6 (d, $J = 8$ Hz, 2H), 4.3 (q, $J = 6$ Hz, 2H), 4.0 (br s, 2H, D_2O exchangeable), 1.4 (t, $J = 6$ Hz, 3H); Mass: m/z 165, 137, 120, 92
 c) Find out structure of organic compound from following data
 Molecular Formula: $\text{C}_9\text{H}_{10}\text{O}_2$
 IR = 1690, 1100 cm^{-1} ; ^1H NMR (δ in ppm): 2.8 (s, 3H), 3.8 (s, 3H), 6.9 (d, $J = 8$ Hz, 2H), 7.8 (d, $J = 8$ Hz, 2H); ^{13}C NMR (δ in ppm): 197, 165, 130, 129, 114, 56, 26

Seat No.	
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Set **P**

**M.Sc. (Medicinal Chemistry) (Semester - III) (New) (NEP CBCS)
Examination: March/April – 2026
Drug Development (2327302)**

Day & Date: Monday, 20-04-2026
Time: 11:00 AM To 01:30 PM

Max. Marks: 60

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

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

- 1) Bioisoterism is the process of _____.
 - a) Replacement similar group
 - b) Replacement similar valence group
 - c) Replacement similar mass no. group
 - d) Addition of group having different mass no.

- 2) When activated, a metabotropic receptor triggers a series of intracellular events, often involving _____.
 - a) Direct opening of an ion channel pore
 - b) G proteins and second messengers
 - c) Covalent binding to the ligand
 - d) Receptor-mediated endocytosis

- 3) _____ technique is commonly used in Structure-Based Drug Design (SBDD).
 - a) Pharmacophore modeling
 - b) QSAR
 - c) X-ray crystallography
 - d) Molecular similarity searching

- 4) _____ is a common method for virtual screening in drug design.

a) Molecular docking	b) NMR spectroscopy
c) ADMET analysis	d) Chemical synthesis

- 5) If a patient takes an enteric-coated tablet, the coating is designed to disintegrate and release the drug in the _____.

a) Small intestine	b) Stomach
c) Large intestine	d) Esophagus

- 6) The process of engulfing the particulate matter is called as _____.

a) Pinocytosis	b) Phagocytosis
c) Convective transport	d) Facilitated diffusion

Seat No.	
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Set **P**

**M.Sc. (Medicinal Chemistry) (Semester - III) (New) (NEP CBCS)
Examination: March/April – 2026
Biochemistry (2327307)**

Day & Date: Wednesday, 22-04-2026
Time: 11:00 AM To 01:30 PM

Max. Marks: 60

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

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

- 1) Which of the following is a ketose sugar?
 - a) Glucose
 - b) Fructose
 - c) Galactose
 - d) Ribose
- 2) Epimers differ in configuration at _____.
 - a) One carbon
 - b) All carbon
 - c) Two carbons
 - d) None
- 3) Which metal is commonly found in hemoglobin?
 - a) Copper
 - b) Zinc
 - c) Iron
 - d) Magnesium
- 4) Metalloproteins are proteins that _____.
 - a) Carry sugars
 - b) Bind metal ions
 - c) Store lipids
 - d) Carry nucleotides
- 5) Which amino acid contains a sulphur atom?
 - a) Glycine
 - b) Methionine
 - c) Serine
 - d) Alanine
- 6) Which technique is used for protein synthesis?
 - a) Edman degradation
 - b) X- ray crystallography
 - c) SDS – page
 - d) NMR
- 7) The left-handed DNA form is _____.
 - a) A-DNA
 - b) B-DNA
 - c) Z- DNA
 - d) None
- 8) Vitamin A is required for _____.
 - a) Bone growth
 - b) Vision
 - c) Blood clotting
 - d) Antioxidant

- B) Fill in the blanks. 04**
- a) _____ are carbohydrate-protein complexes.
 - b) Ferritin stores _____ ions.
 - c) The stop codons are _____.
 - d) Vitamin A is also called as _____.

- Q.2 Answer the following. (Any Six) 12**
- a) Define anomers with one example.
 - b) Give two differences between aldose and ketose.
 - c) Name two metalloproteins and their functions.
 - d) Name two metal-binding cofactors and their role.
 - e) Write two functions of lipids.
 - f) Give examples of two water soluble vitamins and their deficiency diseases.
 - g) Define coenzyme with two examples.
 - h) Write two roles of Vitamin D.

- Q.3 Answer the following. (Any Three) 12**
- a) Explain the scope of biochemistry in pharmaceutical sciences.
 - b) Describe mechanisms for Metal Ion Uptake.
 - c) Explain A, B and Z forms of DNA.
 - d) Explain protein synthesis with neat stages.

- Q.4 Answer the following. (Any Two) 12**
- a) Describe structural and functional aspects of proteoglycans.
 - b) Discuss specialized Units in Bioinorganic Chemistry.
 - c) Explain the process of DNA replication.

- Q.5 Answer the following. (Any Two) 12**
- a) Give the difference between prokaryotic vs. eukaryotic cells and explain structural organization.
 - b) Explain the control and utilization of metal ion concentration in cells.
 - c) Describe vitamins as coenzymes with suitable examples.

Set No.	
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Set	P
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M.Sc. (Medicinal Chemistry) (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2026
Modern Organic Chemistry (2327401)

Day & Date: Thursday, 16-04-2026
 Time: 03:00 PM To 05:30 PM

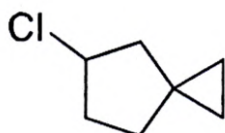
Max. Marks: 60

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

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

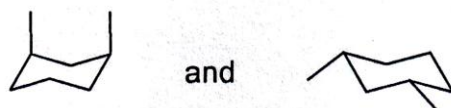
08

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



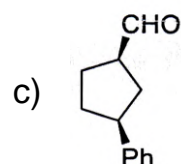
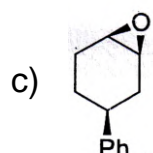
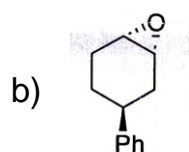
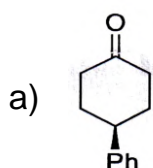
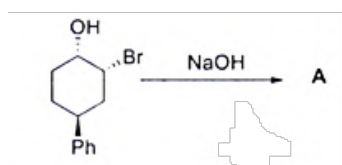
- a) 5-chlorospiro[2,4]heptane
- b) 5-chlorospiro[2,4]pentene
- c) 4-chlorospiro[3,4]heptane
- d) 4-chlorospiro[3,4]pentene

2) What relationship do the following pairs of compounds have to each other?

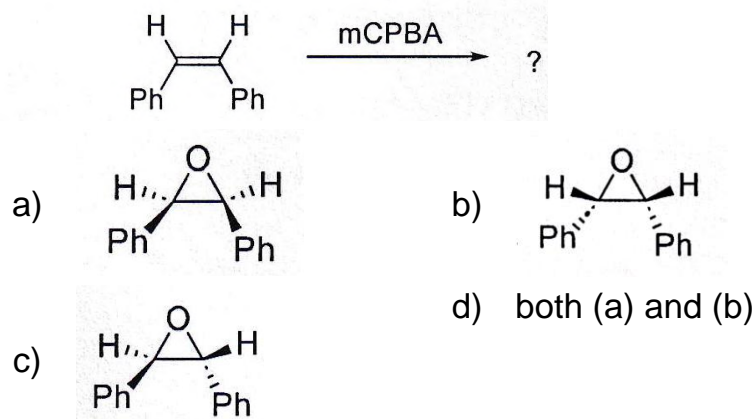


- a) Enantiomers
- b) Diastereomers
- c) Identical
- c) Epimers

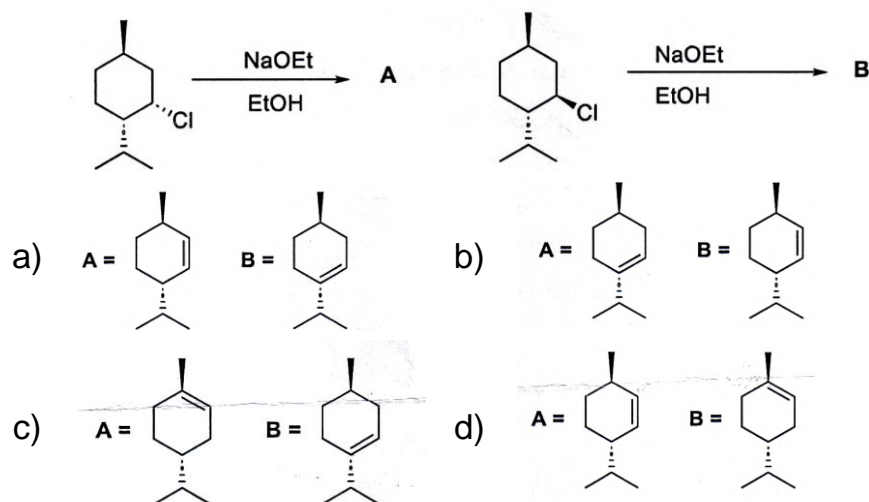
3) Choose the correct alternative for the following reaction transformation.



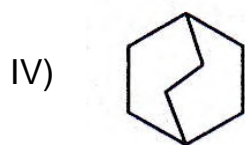
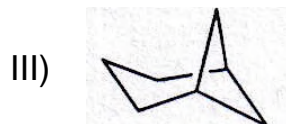
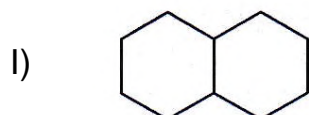
4) Predict the correct option of product.



5) Predict the correct option of a major product A and B _____.

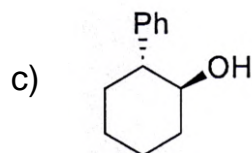
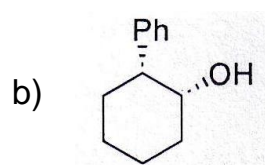
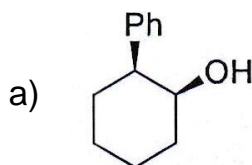
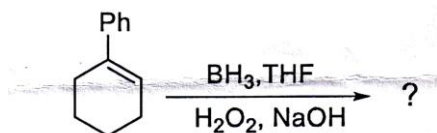


6) The fused ring system among the following is _____.



- a) I b) II
 c) III d) IV

- 7) If the molecule having 60% optical purity of S enantiomers. What should be the total % of S and R enantiomers present in the solution?
- 20% of S and 80% of R
 - 60% of S and 40% of R
 - 80% of S and 20% of R
 - 40% of S and 60% of R
- 8) Predict the correct option of a major product.



d) Both a) and b)

B) Write True/False.

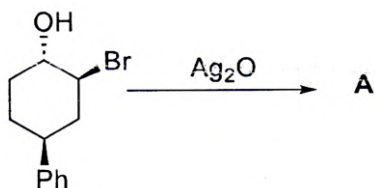
04

- The chiral catalyst approach for asymmetric synthesis always gives product with 100% ee.
- The point group of cis-decalin is D_{2h} .
- The least stable isomer of perhydrophenanthrene is trans-syn-trans.
- The dihedral angle between the axial bond and the equatorial bond on adjacent carbons is 120 degrees in cyclohexane.

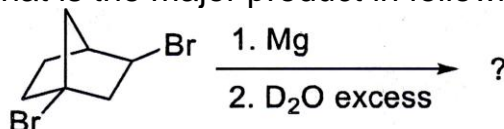
Q.2 Answer the following. (Any Six)

12

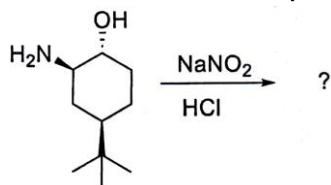
- a) Predict the correct option of a major product with mechanism.



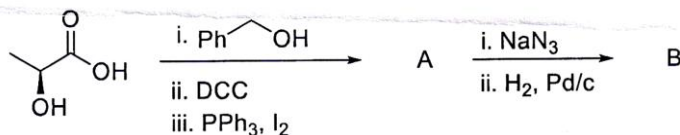
- b) What is the major product in following reaction with stereochemistry?



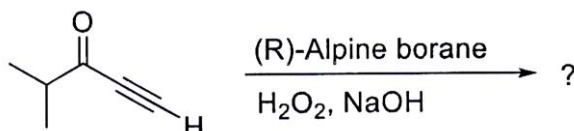
- c) Predict the correct option of a major product with mechanism.



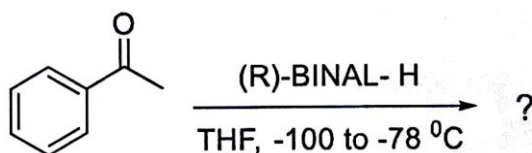
- d) Discuss the reactivity in diastereomers of stilbene dichloride in presence of pyridine at 200 °C reaction temperature.
- e) Draw Newman projection of trans-c-trans perhydroanthracene.
- f) What is the product A and B in following transformation?



- 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)

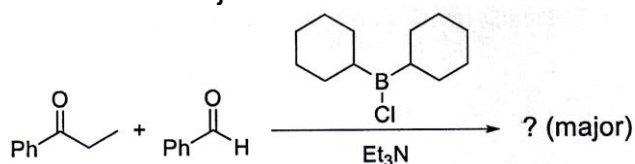
12

- a) What is the reactivity of 2,3-dibromobutane diastereomers with Br₂ in ionic elimination reaction?
- b) Write a short note on Mayers oxazolines.
- c) What is Shi asymmetric epoxidation? Discuss in details with examples.
- d) Write a short note on cis-decalin and trans-decalin.

Q.4 Answer the following. (Any Two)

12

- a) Discuss relative reactivity of diastereomers in NGP?
- b) Rationalize the Diastereoselectivity of following reaction with mechanism and justification.

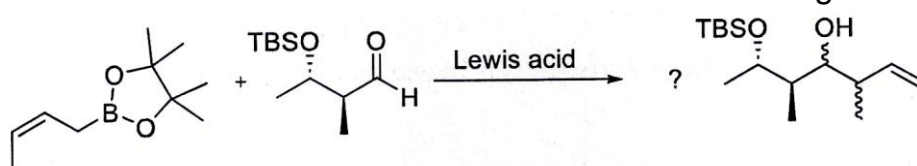


- c) Explain different isomers of perhydroanthracene and comment on its stability and chirality?

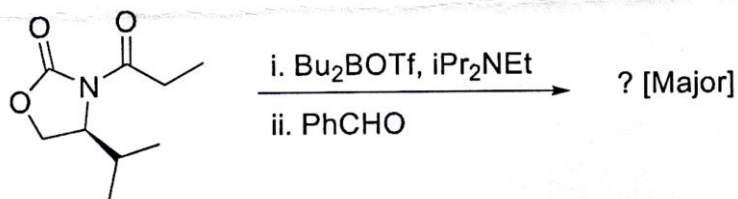
Q.5 Answer the following. (Any Two)

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) What is the product of Evans-Saksena and Evans-Tishenko diastereoselective reduction? Discuss with stereochemistry.

Seat No.	
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Set **P**

M.Sc. (Medicinal Chemistry) (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2026
Drug & Heterocycles (2327402)

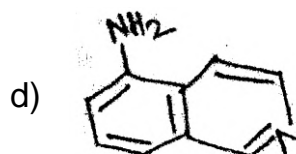
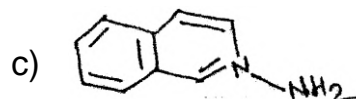
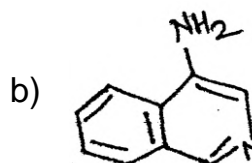
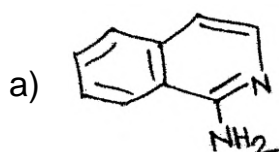
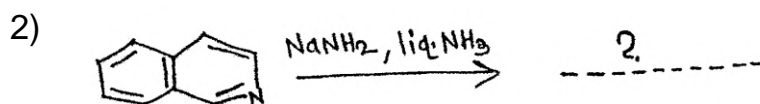
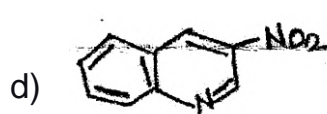
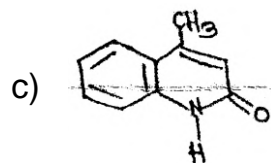
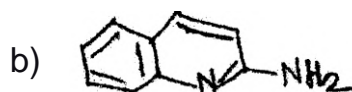
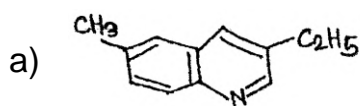
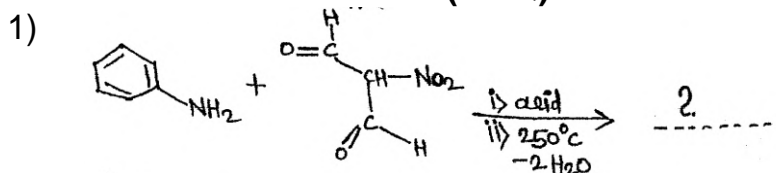
Day & Date: Saturday, 18-04-2026
 Time: 03:00 PM To 05:30 PM

Max. Marks: 60

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

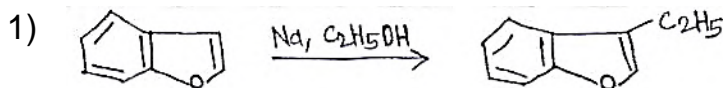
Q.1 A) Choose correct alternative. (MCQ)

08



B) Write True/ False.

04



- 2) When both the heteroatoms are present in a 1, 3- relationship then they are referred to as imidazole, oxazole and thiazole.
- 3) Starting reactant used in synthesis of Chloramphenicol is P-Nitroacetophenone.
- 4) Alkylating agents are chemically reactive compounds that combine most readily with Nucleophilic centres a fully saturated carbon atom of the alkylating group becoming attached to the nucleophile.

Q.2 Answer the following. (Any Six)

12

- a) Write down with reaction the Bischler-Napieralski synthesis of Isoquinolines.
- b) Write down with reaction the Madelung synthesis of Indole.
- c) Write down with reaction the synthesis of pyridazine from Maleic Anhydride.
- d) Write down with reaction the synthesis of pyrimidines from Malonic ester.
- e) Write down the classification of sedative and hypnotics drug.
- f) Write a short note on Cephalosporins.
- g) Write down the structure and mechanism of action of Methyldopa drug.
- h) Write down the structure and mechanism of action of Atenolol drug.

Q.3 Answer the following. (Any Three)

12

- a) Write in detail the following chemical reactions of Benzothiophene.
 - 1) Reaction with oxidizing agents.
 - 2) Desulfurization reaction.
- b) Explain with reaction the various synthetic methods of pyrazines.
- c) Write down the structure, SAR and mechanism of action of Tetracycline drug.
- d) Write down the structure, SAR and mechanism of action of Aceclofenac drug.

Q.4 Answer the following. (Any Two)

12

- a) Explain with reaction any six chemical reactions of pyrroles.
- b) Write down the SAR, mechanism of action and synthesis of Phenytoin Sodium (Hydantoin) drug.
- c) Write down the SAR, mechanism of action and synthesis of Paracetamol drug.

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

- a) Explain with reaction the various synthetic methods of pyrazoles.
- b) Write down the SAR, mechanism of action and synthesis of Diazepam drug.
- c) Write down the SAR, mechanism of action and synthesis of Captopril drug.

Seat No.	
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Set **P**

**M.Sc. (Medicinal Chemistry) (Semester - IV) (New) (NEP CBCS)
Examination: March/April – 2026
Pharmaceutical Dosage Forms (2327405)**

Day & Date: Tuesday, 21-04-2026
Time: 03:00 PM To 05:30 PM

Max. Marks: 60

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

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

- 1) _____ testing is used to test the durability of tablets during packing processes and transit.
 - a) Friability
 - b) Tablet disintegration
 - c) Dissolution
 - d) Tablet weight
- 2) Compressed tablets are made by _____ method
 - a) Wet granulation
 - b) Dry granulation
 - c) Direct compression
 - d) All of the above
- 3) Test for particulate matter in ophthalmic solution is done by _____.
 - a) Light obscuration method
 - b) Microscopic method
 - c) Both a & b
 - d) Spectroscopic method
- 4) _____ is the example of semi-synthetic polysaccharide emulsifying agent.
 - a) Magnesium oxide
 - b) Methyl cellulose
 - c) Bentonite
 - d) Benzethonium chloride
- 5) Storage condition required for accelerated stability study is _____.
 - a) 30°C
 - b) 40°C
 - c) 60°C
 - d) 15°C
- 6) The rate of formation of color in epinephrine solutions, for instance, is greatly increased by the presence of _____ ion.
 - a) Ferric
 - b) Cupric
 - c) Ferrous
 - d) All of the above
- 7) Controlled release follows _____ release.
 - a) First order
 - b) Third order
 - c) Zero order
 - d) Second order
- 8) The periocular route comprises _____ routes of administration, which place the drug close to the sclera.
 - a) Sub-Tenon
 - b) Retrobulbar
 - c) Subconjunctival
 - d) All of the above

- B) Write True/False. 04**
- 1) Cream is not a semisolid dosage form.
 - 2) LAL stands for Limulus amoebocyte lysate.
 - 3) Nitroglycerine 0.3 mg drug is indicated for Hypothyroidism.
 - 4) Noyes Whitney equation gives the relation between dissolution rate and the aqueous solubility.

- Q.2 Answer the following. (Any Six) 12**
- a) Write a note on Chewable tablets.
 - b) Write a note on Direct Compression method used for tableting.
 - c) Write down the Advantages and Disadvantages of Aerosol product.
 - d) Write down the brief introduction of semisolid dosage forms.
 - e) Define and give example of following ingredients.
 - 1) Adsorbent,
 - 2) Aerosol propellant.
 - f) Define and give example of following ingredients.
 - 1) Antifungal preservative,
 - 2) Antimicrobial preservative.
 - g) Write the advantages of controlled release over conventional release system.
 - h) Write a note on Coating Dissolution Controlled Systems and Diffusion Controlled Release Systems.

- Q.3 Answer the following. (Any Three) 12**
- a) Explain about:
 - 1) Enteric Coating of tablets.
 - 2) Fluid bed or air suspension Coating of tablets.
 - b) Explain in detail about the Dry-powder inhalers and write down the formulation considerations for Dry-powder inhalers.
 - c) Explain in detail about preservative selection, general preservative considerations and their mode of action.
 - d) Which crucial factors are taken into account during formulating ophthalmic preparations, write in detail about these factors.

- Q.4 Answer the following. (Any Two) 12**
- a) Explain in detail Dry granulation method used for manufacture of compressed tablets.
 - b) Explain in detail the formulation of parenteral preparations and evaluation tests of parenteral preparations.
 - c) Write in detail about the Enhancing Stability of Drug products.

- Q.5 Answer the following. (Any Two) 12**
- a) Explain in detail Quality standards and compendial requirements of tablet.
 - b) Write in detail about ingredients used in preparation of semisolids dosage forms.
 - c) Write about Transdermal delivery patches and explain with figure about various designs of transdermal patches.

Seat
No.

Set P

**M.Sc. (Pharmaceutical Chemistry) (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2026**

Photochemistry and Pericyclic Reactions (MSC012401)

Day & Date: Tuesday, 21-4-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) Questions no. 1 & 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 from the options. 10

- 1) Cope rearrangement reaction is type of _____ reaction.
 - a) sigmatropic
 - b) cycloaddition
 - c) electrocyclic
 - d) ene
- 2) Chelotropic reactions are _____.
 - a) Regioselective
 - b) Stereospecific
 - c) Stereoselective
 - d) both Stereoselective & Stereospecific
- 3) In cycloaddition reaction two π bonds are converted into _____.
 - a) One π and one σ bond
 - b) One π bond
 - c) One σ bond
 - d) Two σ bonds
- 4) Diel's Alder reaction is type of _____.
 - a) sigmatropic reaction
 - b) electro cyclic reaction
 - c) ene reaction
 - d) cycloaddition reaction
- 5) In Paterno-Buchi reaction product synthesised is _____ ether ring.
 - a) three membered
 - b) four membered
 - c) five membered
 - d) six membered
- 6) _____ is the more stable according to Huckel's theory.
 - a) Cycloheptatrienyl anion
 - b) Cycloheptatrienyl cation
 - c) Cycloheptatrienyl radical
 - d) Cycloheptatriene
- 7) Norrish type II reaction involves intramolecular _____ hydrogen abstraction.
 - a) β
 - b) γ
 - c) δ
 - d) α
- 8) The light formed from a chemical reaction is called as _____.
 - a) Luminescence
 - b) Bioluminescence
 - c) Chemiluminescence
 - d) All the above

Q.7 Answer the following questions.

- a)** Explain Huckel-Mobius aromatic and antiaromatic transition state method. **08**
- b)** Explain Norrish type-I reaction in cyclic ketones and strained cycloalkanediones. **08**

- 7) Which of the following is not an acyloin equivalent?
 a) Cyanide ion b) Alkene
 c) Amine d) All of the above
- 8) Conversion of one functional into another is called _____.
 a) Functional group interconversion
 b) Protection
 c) Deprotection
 d) None of above
- 9) Which of the following metal catalyses hydroformylation reaction?
 a) Aluminium b) Nickel
 c) Cobalt d) All of above
- 10) The transformation of a terminal or 1,2- disubstituted alkene to a ketone through the action of catalytic palladium (II), water, and a co-oxidant is known as _____.
 a) Suzuki coupling b) Wacker oxidation
 c) Stille coupling d) None of these

B) Write True/False.**06**

- a) Alcohols can be protected as amides.
 b) A real chemical compound equivalent carrying out function of synthon is called synthetic equivalent.
 c) Acetylene can act as synthetic equivalent for acyloin.
 d) 1,6 difunctional compounds on disconnection gives synthons of unnatural polarity.
 e) Acetals and ketals act as protecting groups for alcohols as well as carbonyl compounds.
 f) Iron carbonyls are used in hydroformylation of alkenes.

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

- a) Explain protection of amines.
 b) Write note on Wacker oxidation.
 c) Explain preparation and properties of RBH_2 , R_2BH .
 d) Explain one group C-X disconnection.

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

- a) Explain protection of carboxylic acids in detail.
 b) Explain functional group interconversion with example.

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

- a) Explain Pausal-khand reaction and its applications.
 b) Explain applications of hydroboration in organic synthesis.

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

- a) Explain protection of hydroxyl group.
 b) Explain Stille coupling and Sonogashira coupling reactions with respect to mechanism and applications.

- Q.6 Answer the following.** **16**
- a) Explain Synthesis of EE, EZ, ZZ dienes and alkyenes.
 - b) Explain palladium Heck reaction in detail.
- Q.7 Answer the following.** **16**
- a) Explain two group disconnections in 1,3 and 1,5 difunctional compounds.
 - b) Explain protection and deprotection of carbonyl compounds.

Seat No.	
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Set **P**

**M.Sc. (Pharmaceutical Chemistry) (Semester - IV) (CBCS)
Examination: March/April - 2026
Pharmaceutical Technology (MSC012408)**

Day & Date: Tuesday, 21-04-2026
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) Q. No. 1 & 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) How many batches we need for validation?
 - a) 1
 - b) 3
 - c) 2
 - d) 4

- 2) Direct oxidation of Ethanol produces _____.
 - a) Alcohol
 - b) Aldehyde
 - c) Carboxylic Acid
 - d) Acetic acid

- 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) Chlorination is effect by passing gaseous chlorin through ethyl acetate in a _____.
 - a) Gas - lined water
 - b) Ceramic tower
 - c) Both a & b
 - d) None of these

- 5) Shape of mixing element present in Zig -Zag mixer _____.
 - a) V-shaped
 - b) Cube
 - c) Double cone
 - d) Sigma

- 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

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

- a) Discuss the typical industrial nitration process for the preparation of Nitrobenzene.
- b) Give a brief note on master plan of validation.

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

- a) Discuss in detail types of mixers.
- b) Describe Effluent Treatment Plant (ETP) process.