SLR-SF-1

Seat No.	

Set P

M.Sc. (Semester - I) (New) (CBCS) Examination: March/April-2023
CHEMISTRY
Inorganic Chemistry - I (MSC05101)

Day & Date: Wednesday, 19-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

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

1) The ability to form complex compounds by the transitional metal ion is due to _____.
   a) Small size b) Vacant orbitals
   c) High nuclear charge d) All of these

2) U^{238} will undergo fission by_____.
   a) either fast or slow neutrons
   b) high energy (fast) neutrons alone
   c) low energy (slow) neutrons alone
   d) medium energy neutrons

3) The transition metal ion that has “spin-only" magnetic moment value of 5.92 is _____.
   a) Mn^{2+} b) Fe^{2+}
   c) V^{2+} d) Cu^{2+}

4) The 'd-d' transitions in an octahedral $[NiX_6]^{2+}$ complex are:
   a) Laporte forbidden but spin allowed
   b) Laporte allowed but spin forbidden
   c) Laporte allowed and spin allowed
   d) Laporte forbidden and spin forbidden

5) _____ is the geometry of pentacarbonyliron(O).
   a) Square planar b) Tetrahedral
   c) Trigonal bipyramidal d) Octahedral

6) The percentage p-character in sp^3 hybridization is _____.
   a) 50 b) 33
   c) 75 d) 25

7) Most common oxidation states of Cs (cesium) are _____.
   a) $+2, +3$ b) $+2, +4$
   c) $+3, +4$ d) $+3, +5$

8) _____ series correctly places the ligands in order of increasing nephelauxetic effect?
   a) $Br^- < Cl^- < NH_3 < H_2O$ b) $I^- < Br^- < H_2O < [OH]^-$
   c) $F^- < Cl^- < H_2O < NH_3$ d) $I^- < Cl^- < H_2O < en$

9) The "magic numbers" for atoms are _____.
   a) numbers of electrons that confer atomic stability
   b) n/p ratios that confer nuclear stability
   c) numbers of protons and/or neutrons that confer nuclear stability
   d) atomic masses that indicate fissile isotopes

10) A half-life is _____.
   a) constantly changing
   b) the time for one-half of an unstable nuclei to decay
   c) half of the lifetime of an unstable nucleus
   d) independent of the rate constant for decay

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

1) The EAN for iron in $Fe(CO)_5$ is _____.
2) The geometry of I_3^- molecules is _____.
3) A _____ material, large domains of magnetic dipoles are aligned in the opposite direction.
4) The nuclei having an equal number of neutrons are called _____.
5) Molecular solids are_____ solids.
6) The donation of lone pair of electrons of CO carbon into the vacant orbital of metal atom results in _____ bond.

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

a) Write note on doping of semiconductors.
b) What aretracer techniques? Explain it with suitable example.
c) Explain the energetics of hybridization with suitable-example.
d) Explain why $[FeF_6]^{3-}$ is almost colorless whereas $[CoFe]^{3-}$ is colored.

Q.3 Answer the following.

a) Give the proper interpretation of electronic spectra using the spectrochemical series, nephelauxetic effect. **10**
b) What are the rectifiers? Explain its construction and working. **06**

Q.4 Answer the following.

a) Explain in detail ligand field energy parameter. **08**
b) State and explain Jahn-Teller theorem. Show schematically the splitting of d-orbitals in d^7 case for octahedral and tetrahedral system. **08**

Q.5 Answer the following.

a) Write down types of nuclear reaction with examples. **08**
b) Write in detail the structural aspects of halide type clusters. **08**

Q.6 Answer the following.

a) What are radioactive techniques? Discuss the counting techniques such as G.M., ionization and proportional counters. **08**
b) Give in detail explanation of metal carbonyl structure-Low nuclear carbonyl structure. **08**

Q.7 Answer the following.

a) Write the preparation, properties & structures of mono, di & trinuclear carbonyl complexes. **08**
b) Which factor influencing magnitude of crystal field splitting and explain the colour of coordination complexes. **08**

SLR-SF-2

Seat No.	

Set P

M.Sc. (Semester - I) (New) (CBCS) Examination: March/April-2023
CHEMISTRY
Organic Chemistry - I (MSC05102)

Day & Date: Thursday, 20-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

Q.1 A) Choose the correct alternatives from the options. **10**

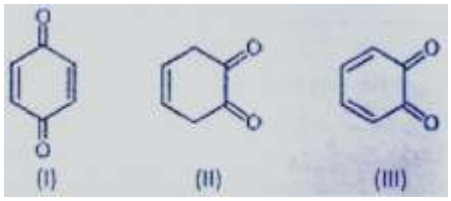
1) Enantiotropic hydrogens are _____.
   a) two hydrogens attached to a chiral carbon
   b) two hydrogens on same side of the double bond
   c) two hydrogens on same side of the cycloalkane
   d) two hydrogens attached to a carbon with two different groups

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

3) Select the correct statement for S_N2 reaction from the following option.
   a) it follows second order kinetics
   b) No intermediate is involved in S_N2 reaction
   c) It is one-step reaction
   d) All of the mentioned

4) Which of the following reactions are favored by polar aprotic solvent?
   a) S_N1 reactions b) S_N2 reactions
   c) Both S_N1 and S_N2 reactions d) None of the mentioned

5) Which of the following structure can show tautomerism?



   a) I b) II
   c) III d) I and III

6) Homoaromatic compounds contain _____ hybridized carbon atom in their conjugated network.
   a) SP^3 b) SP^2
   c) SP d) SP^2 and SP^3

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

8) Ketene on reaction with ammonia gives _____.
   a) ester b) Carboxylic acid
   c) amide d) ketone

9) If the introduction of polar substituent (X) enhances the value of equilibrium constant, then rho (ρ) value is _____.
   a) Positive b) Negative
   c) Zero d) Either positive or negative

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

B) State True/False: **06**

1) Naphthalene is a nonalternant aromatic hydrocarbon.
2) Bicyclic crown ethers are called as Cryptands.
3) Generally, +I effect stabilizes the carbanion.
4) The separation of a racemic modification into its constituent enantiomers is known as resolution.
5) [12] annulenes are antiaromatic whereas [18] annulenes are aromatic.
6) The best leaving group enhances the rate of SN reactions.

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

a) Explain the concept of hard and soft acids and bases.
b) Explain the optical activity due to helicity.
c) What are cryptands? Give two examples.
d) Describe ambient nucleophile with proper example.

Q.3 Answer the following. (10 + 6) **16**

a) What are crown ethers? Give suitable example, methods of preparation and applications of crown ethers.
b) Explain Neighbouring group (NGP) participation by π electrons with example.

Q.4 Answer the following. (8 + 8) **16**

a) Give Huckles rule and explain aromaticity in annulenes.
b) Discuss in detail the formation, stability and reactivity of carbanion intermediate.

Q.5 Answer the following. (8 + 8) **16**

a) Write a note on Aromaticity in benzenoid and non-benzenoid compounds.
b) Explain in detail Kinetic and Thermodynamic control of the reaction with example.

Q.6 Answer the following. (8 + 8) **16**

a) Explain stability of different forms of 1,2 and 1,4 dimethyl cyclohexane.
b) Explain Optical activity in case of allenes.

Q.7 Answer the following. (8 + 8) **16**

a) Discuss the role of cross-over experiments in the determination of the mechanism of organic reactions.
b) Write a note on Electrophilic substitution accompanied by double bond shifts.

SLR-SF-3

Seat No.	

Set P

M.Sc. (Semester - I) (New) (CBCS) Examination: March/April-2023
CHEMISTRY
Physical Chemistry - I (MSC05103)

Day & Date: Friday, 21-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

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

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

2) The value of Henry's constant K_H is _____.
   a) greater for gases with higher solubility
   b) greater for gases with lower solubility
   c) constant for all gases
   d) not related to the solubility of gases

3) The thermodynamic probability at absolute temperature i.e. at 0 K is _____.
   a) Infinite b) Only one
   c) Zero d) any finite value

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

5) As per the uncertainty principle, $\Delta x \Delta px$ equals to _____.
   a) $\lambda/2$ b) h^2
   c) $h/2\pi$ d) λ

6) Complete the equation $(dS/dV)_T = (\_\_\_\_/dT)_V$
   a) dP b) dH
   c) dG d) dq

7) The reduced form of Gibbs' phase rule is _____.
   a) F= C-P+2 b) F= C-P+1
   c) F= C-P-2 d) F= C-P-1

8) Maxwell-Boltzmann law is for the _____.
   a) Distinguishable particles
   b) Indistinguishable Particles
   c) Particles with half integral spin
   d) Particles with integral spin

9) For most probable distribution dW/dP is equal to _____.
   a) zero b) unity
   c) infinite d) can't say

10) The value of Maxwell- Boltzmann constant 'β' is given by _____.
   a) kT b) 1/kT
   c) 1/k d) kT^2

B) Fill in the blanks OR Write True/False. **06**

1) Wave-particle duality hypothesis was given by the scientist _____.
2) The activity of a substance in its purest form is always taken as infinity. [True/false]
3) The zero-point energy for a particle in three-dimensional box is given as _____.
4) Chemical potential is a partial molar quantity. [True/False]
5) The most probable configuration is that configuration which has highest microstates. [True/False]
6) The entropy of a substance at absolute zero temperature is _____.

Q.2 Answer the following.

a) Give the physical significance of wave function (Ψ). **04**

b) Derive for the expression representing the relationship between thermodynamic probability and the entropy. **04**

c) Discuss deviations from Raoult's law. **04**

d) What is de Broglie hypothesis? Calculate the de Broglie wavelength of electron moving with the speed of light. **04**

Q.3 Answer the following.

a) Derive Duhem-Margules equation. Write application of it. **08**

b) What are ensembles? Describe microcanonical ensemble. **08**

Q.4 Answer the following.

a) Write in detail on Excess thermodynamic properties of Non- ideal solutions. **08**

b) What is fugacity? Discuss fugacity determination by graphical method. **08**

Q.5 Answer the following.

a) Derive Gibbs-Duhem equation. What are the applications of it. **08**

b) Using particle in a one-dimensional box model, derive the energy expression for particle. **08**

Q.6 Answer the following.

a) Derive Maxwell-Boltzmann distribution law. **08**

b) What do you mean by thermodynamic equation of state? Derive any one thermodynamic equation of state. **08**

Q.7 Answer the following.

a) Write Φ, Θ and R equation for hydrogen atom and their solutions. **08**

b) Discuss the freezing point depression method for determination of activity coefficient. **08**

SLR-SF-4

Seat No.	

Set P

M.Sc. (Semester - I) (New) (CBCS) Examination March/April-2023
CHEMISTRY
Analytical Chemistry - I (MSC05108)

Day & Date: Saturday, 22-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Question 1and 2 are compulsory.
2) Attempt any Three from Q.3 to Q.7.
3) Figure to right indicate full marks.

Q.1 A) Choose the correct alternatives from the given options. **10**

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

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

3) Systematic errors occur due to _____.
   a) overuse of instruments b) careless usage of instruments
   c) both a and b d) human sight

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

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

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

7) Measurement which is close to true _____.
   a) Accurate b) Average
   c) Both a and b d) None of the above

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

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

10) The amperometric method is considered to be more accurate than polarographic method due to _____.
   a) Less dependent upon the characteristics of the capillary and the supporting electrolyte
   b) More dependent upon the characteristics of the capillary and the supporting electrolyte
   c) Not dependent upon the characteristics of the capillary and the supporting electrolyte
   d) None of above

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

1) In atomic absorption spectroscopy the most strongly absorbed light is called as _____ line.
2) ICP is used to analyse samples _____ following states.
3) Reference electrode used in polarography is _____.
4) Systematic errors can be removed by _____.
5) A character that is raised and smaller above the baseline is known as _____.
6) The electrode used in amperometric titration is _____.

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

a) Write a note on CHEM SKETCH.
b) Write a note on applications of Amperometry.
c) Explain X-Y plots.
d) Explain the difference between AAS and FES.

Q.3 Answer the following.

a) What is error and discuss in details of error. **08**
b) Discuss the principles, instrumentation, nature of titration curves of Polarography. **08**

Q.4 Answer the following.

a) Discuss in detail of method of sampling techniques. **08**
b) Discuss the principles and instrumentation of atomic absorption spectroscopy. **08**

Q.5 Answer the following.

a) What are electro analytical techniques? Explain the Amperometry principle and working. **08**
b) Discuss the principles and instrumentation of ICP. **08**

Q.6 Answer the following.

a) Explain in details of average deviation and standard deviation. **08**
b) Define precision and accuracy. Explain the analytical methods used for determination of the accuracy. **08**

Q.7 Answer the following.

a) What is half wave potential and give the qualitative and quantitative applications? **08**
b) Discuss the use of power point and excel in chemistry. **08**

SLR-SF-6

Seat No.	

Set P

M.Sc. (Semester - II) (New) (CBCS) Examination: March/April-2023
CHEMISTRY
Inorganic Chemistry –II (MSC05201)

Day & Date: Wednesday, 19-07-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

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

Q.1 A) Choose Correct Alternative. **10**

1) High purity of copper metal is obtained by _____.
   a) Carbon reduction b) Hydrogen reduction
   c) Electrolytic reduction d) Thermite reduction

2) _____ is the function of ferredoxin.
   a) Hole carrier protein b) Proton carrier
   c) Electron carrier protein d) None of these

3) _____ is the hybridization of boron in $B_3N_3H_6$
   a) sp^3 b) sp^2
   c) sp^3d d) dsp^2

4) Azurite is an ore of: _____.
   a) Iron b) Copper
   c) Lead d) All of these

5) _____ is the Wijs reagent.
   a) ICl b) IBr
   c) IF d) BrCl

6) _____ allotrope of phosphorus is the most stable.
   a) White phosphorus b) Red phosphorus
   c) Black phosphorus d) Phosphine

7) _____ is the most common oxidation state of lanthanides.
   a) $+2$ b) $+4$
   c) $+6$ d) $+3$

8) _____ methods used for the separation of lanthanides.
   a) Crystallization
   b) Ion exchange chromatography
   c) Both of A and B
   d) None of these

9) _____ of the following complex has a highest oxidation state of metal.
   a) $(\eta^6 - C_6H_6)_2Cr$ b) $Mn(CO)_5Cl$
   c) $Na_2[Fe(CO)_4]$ d) $K[Mn(CO)_5]$

10) Solvent extraction is governed by _____ Law.
   a) Boyle's law b) Ostwald dilution law
   c) Nernst distribution law d) Beer's law

B) Fill in the blanks **06**

1) Based on Wade's rules of electron counting, structure of car borane, CB_8H_{14}, is expected to be _____.
2) The substance which is mixed with ore for the removal of impurities is termed as _____.
3) S_6 and S_8 are examples of _____.
4) _____ is homogeneous catalysis.
5) Ziegler-Natta catalysis is associated with _____ polymerization.
6) _____ catalyst is used in Monsanto acetic acid process.

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

a) What are the organometallic compounds? Discuss their classification.
b) Write a note on applications of actinides.
c) Explain electrolytic refining of copper.
d) Explain the role of metal ions in biological processes.

Q.3 Answer the following.

a) What are phosphazenes? Write the applications of phosphazenes. **08**
b) Discuss the factors affecting the stability of metal complexes. **08**

Q.4 Answer the following.

a) What is Monsanto acetic acid process? Discuss the catalytic cycle involved it. **08**
b) Explain the pH metric determination of formation constant. **08**

Q.5 Answer the following.

a) What are the boranes? Discuss synthesis, structure and properties of car boranes, borazines. **10**
b) What is hydroformylation process? Discuss the catalytic cycle involved it. **06**

Q.6 Answer the following.

a) Discuss in detail in Ziegler and Natta catalysis. **08**
b) Discuss a brief account of extraction of zinc. **08**

Q.7 Answer the following.

a) Discuss in brief photosynthesis PS I and PS II. **08**
b) What are the Actinides? How are they separated? **08**

SLR-SF-7

Seat No.	

Set P

M.Sc. (Semester - II) (New) (CBCS) Examination: March/April-2023
CHEMISTRY
Organic Chemistry – II (MSC05202)

Day & Date: Sunday, 23-07-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

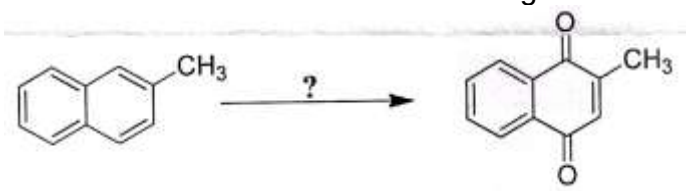
Instructions: 1) Q. No. 1 and. 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7.
3) Figure to right indicate full marks.

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

1) Which of the following conditions are used to convert -CO- into -CH_2- group?
   a) NH_2-NH_2/ KOH/ heat
   b) Zn/Hg/Conc. HCl/ heat
   c) HS-$(CH_2)_3$-SH followed by reduction with H_2/Ni
   d) All of the above

2) Manganese dioxide is mild reagent for the oxidation of _____ in neutral solvent at R.T.
   a) Tertiary alcohols b) Allylic alcohols
   c) α,β- unsaturated alcohols d) None of these

3) Mention suitable reaction conditions for following conversion.

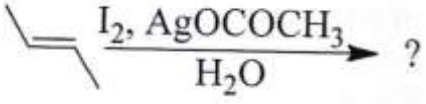


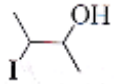
   a) CrO_3/CH_3COOH b) $KMnO_4/H^+$/ Heat
   c) O_3 d) O_2/ V_2O_5

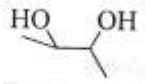
4) Electrophilic reagent approaches the double or triple bond of substrate to give _____ intermediate.
   a) Positive b) Negative
   c) Neutral d) None of these

5) Cyclic intermediates favours more preferentially _____ addition.
   a) Syn b) Anti
   c) Both A and B d) None of these

6) Choose the correct product



   a) 

   b) 

   c) 

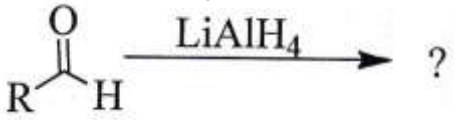
   d) None of these

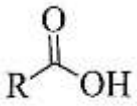
7) In Barton reaction if δ-carbon is _____ then nitroso compound tautomerises to oxime.
   a) Primary
   b) Secondary
   c) Tertiary
   d) Primary and secondary

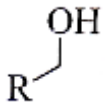
8) Epoxidation of α-β- unsaturated aldehydes and ketones can be carried out with _____
   a) H_2O_2/NaOH
   b) t-BuOOH/ alkali
   c) $KMnO_4$
   d) H_2O_2 or t-BuOOH in alkaline solutions

9) Which of the following is/ are m-directing group/s?
   a) -CN
   b) -CHO
   c) -COOH
   d) All of these

10) Select correct product



a) 

b) 

c) R−H

d) None of these

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

1) The self condensation of aromatic aldehydes (with no α hydrogen) in presence of cyanide ions as catalyst to α -hydroxy ketone is called _____ reaction.
2) The nucleophilic addition of an active methylene group containing compound to a double bond of an α-β- unsaturated compound is known as _____ reaction.
3) The oxidation of alcohols (particularly secondary alcohols) with aluminium tert-butoxide in the presence of hydrogen acceptor (generally ketones) is known as _____.
4) Aromatic compounds can be chlorinated or brominated with chlorine or bromine in the presence of a catalyst which is often called as a _____.
5) The replacement of a hydrogen or a substituent on an aromatic ring by a nucleophile is known as _____.
6) _____ is a type of elimination reaction that takes place in presence of heat without any reagent.

Q.2 Answer the following **16**

a) Write short note on: IPSO substitution
b) Write short note on: Sharpless asymmetric epoxidation
c) Define the following terms with examples
   i) Reduction
   ii) Hydrogenolysis
d) Explain role of Thallium (III) nitrate in organic synthesis.

Q.3 Answer the following

a) Give synthetic applications of $KMnO_4$ in oxidation reactions of different functional groups. **08**
b) Explain nitration reaction with its mechanism. **08**

Q.4 Answer the following.

a) Explain addition of Grignard reagent to carbonyl and α,β- unsaturated carbonyl compounds with its mechanism. **08**

b) Discuss orientation effect in ring system. **08**

Q.5 Answer the following

a) Explain various methods of hydrolysis of ester. **08**

b) Give the mechanism of the reduction of ketones into secondary alcohols in the presence of aluminium alkoxide. **08**

Q.6 Answer the following

a) Describe the mechanism for aldol condensation with suitable examples. **08**

b) Explain E1 reaction with its mechanism. **08**

Q.7 Answer the following

a) What type of products arises by the oxidation of olefinic double bonds with different oxidising agents? **08**

b) Compare the reduction using $LiAlH_4$ and sodium borohydride. **08**

SLR-SF-8

Seat No.	

Set P

M.Sc. (Semester - II) (New) (CBCS) Examination: March/April-2023
CHEMISTRY
Physical Chemistry – II (MSC05206)

Day & Date: Tuesday, 25-07-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

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

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

1) Which of the following electrodes can be used as a reference electrode?
   a) Platinum b) Cadmium
   c) Calomel d) Silver

2) _____ phenomenon represents radiation less transitions.
   a) intersystem crossing b) phosphorescence
   c) Fluorescence d) delayed Fluorescence

3) Which of the following laws are the principal laws of photochemistry?
   a) Grothus-Draper and Stark-Einstein law
   b) Raoult's and Dalton's law
   c) Raoult's and Henry's law
   d) Lamberts and Beer's law

4) Fluorescence emissions are confined to the _____ transitions.
   a) $\pi \rightarrow \pi^*$ b) $n \rightarrow n^*$
   c) $\sigma \rightarrow \sigma^*$ d) both (a) and (b)

5) The thickness of ionic atmosphere _____ as the concentration of electrolyte increases.
   a) increases b) decreases
   c) remains constant d) does not affect

6) Excitation energy transfer within a molecule from one chromophoric group to another is referred as _____.
   a) Intermolecular energy transfer b) Intramolecular energy transfer
   c) both a and b d) can't say

7) Which of the following is the advantage of alkaline battery?
   a) High energy density
   b) Good discharge characteristics over a wide range of temperature
   c) The specific gravity of electrolyte remains the same
   d) Cheap raw materials are used

8) Order of a chemical may be _____.
   a) zero b) integer
   c) half integer d) all of these

9) Increasing ionic strength of a solution _____ the rate of ionic reactions in solution state.
   a) decreases b) increases
   c) doesn't alter d) None of these

10) Electronic transitions are so fast in comparison to the nuclear motion that immediately after the transition, the nuclei have nearly the same relative position. This is the statement of _____.
   a) Franck-Condon principle
   b) Russel-Saunders coupling
   c) Heisebberg's uncertainty principle
   d) Kasha's rule

B) Fill in the blanks OR Write True/False. **06**

1) _____ is a non-radiative transition between two isoenergetic vibrational levels belonging to electronic states of different spin multiplicity.
2) The rate of ionic reactions in solution state doesn't affect with the dielectric constant of the solvent. [True/False]
3) Spin multiplicity value for singlet state is _____.
4) E-type delayed fluorescence first observed in _____.
5) The rate determining step in a chemical reaction is that step which possesses highest activation energy. [True/False]
6) _____ is the number of molecules reacted divided by the number of photons absorbed by the system.

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

a) Estimate the ionic strength of mixture of a solution containing 0.2 m KI, 0.2 m $K_2S_2O_8$ and 0.02 m $MgCl_2$.
b) Explain the delayed fluorescence emission.
c) With the help of suitable example explain Fractional order kinetics.
d) Write a note on Storage batteries.

Q.3 Answer the following.

a) Illustrate Gouy - Chapmann electrical double layer model. **08**
b) Discuss inter & intramolecular excitation energy transfer process with example. **08**

Q.4 Answer the following.

a) Illustrate the role of photochemistry in air pollution. **08**
b) Write in brief Debye Hückel theory. **08**

Q.5 Answer the following.

a) With the help of steady state approximation, discuss the kinetics of hydrogen-bromine reaction. Give final rate law. **08**
b) Derive an expression for Stern-Volmer equation. **08**

Q.6 Answer the following.

a) Write on photo-oxidation reactions. **08**
b) Discuss in detail the ozone decomposition reaction. **08**

Q.7 Answer the following.

a) What do you mean by excimer and exciplex? Discuss excimer formation with suitable example. **08**
b) Write on Debye-Huckel limiting law **08**

SLR-SF-10

Seat No.	

Set P

M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2023
ORGANIC CHEMISTRY
Advanced Organic Chemistry – I (MSC07301)

Day & Date: Monday, 10-07-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

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

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

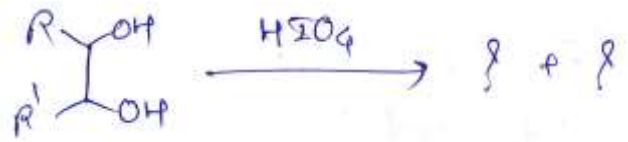
1) The Payne rearrangement occur with inversion of stereochemistry at _____ of 2,3-epoxyalchohol.
   a) C-2 b) C-1
   c) C-3 d) C-2 and C-3

2) In Brook rearrangement migration of _____ group is intramolecular.
   a) Alkyl b) Hydroxy
   c) Silyl d) Alkoxy

3) The regioselectivity of iodolactonisation reaction can be explained using _____.
   a) Baldwin's rule b) Markownikoff's rule
   c) Anti-Movkownikoff's rule d) None of these

4) The Henry reaction is a base catalyzed C–C bond forming reaction between _____ and _____.
   a) Nitroalkanes and aldehydes b) Nitroalkanes and ketones
   c) Nitroalkanes and esters d) Both a and b

5) In Suzuki's coupling reaction _____ can be used as an electrophilic component along with arylbromic acid.
   a) Arylhalide b) Triflate
   c) Aryldiazonium ion d) All three

6) 

   a) RCOOH + R'CHO b) RCHO + R'COOH
   c) RCHO + R'CHO d) RCOOH + R'COOH

7) _____ is used for oxidation of ketones to corresponding acyloins.
   a) Lead tetraacetate b) Selenium dioxide
   c) Iodoisobenzyl diacetate d) All three

8) Enols are ____.
   a) Nucleophiles b) Electrophiles
   c) Ambident nucleophiles d) Ambident electrophiles

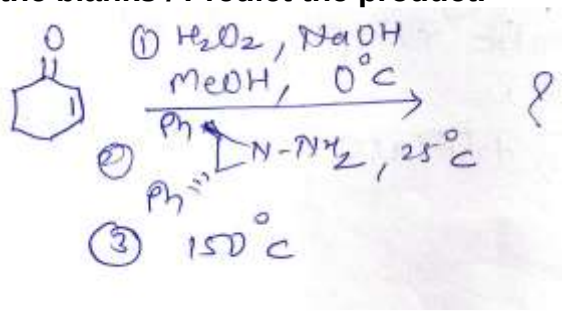
9) _____ can be used as a base for forming enolates from ketones.
   a) LDA b) LTMP
   c) LHMDS d) All three

10) ____ is the base promoted reaction of ethers to yield secondary or tertiary alcohols.

a) Witting reaction
b) [2,3] Witting rearrangement
c) [2,2] Witting rearrangement
d) [1,2] Witting rearrangement

B) Fill in the blanks / Predict the product. **06**

1)



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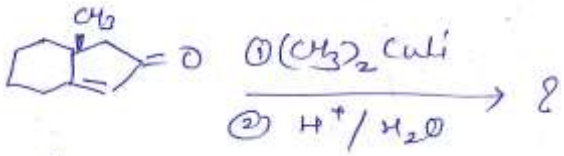

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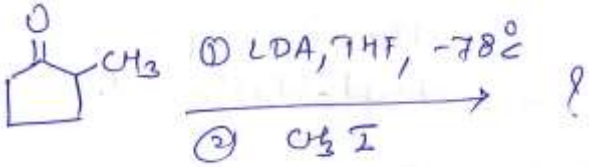

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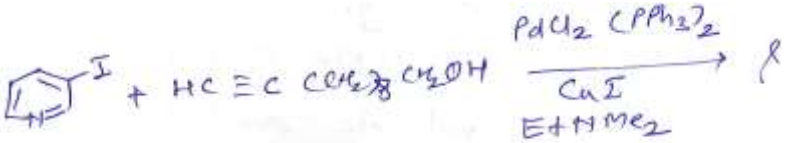

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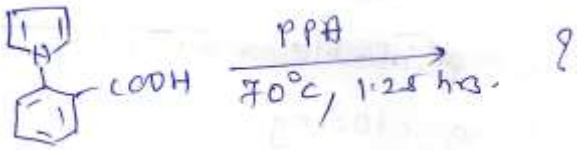

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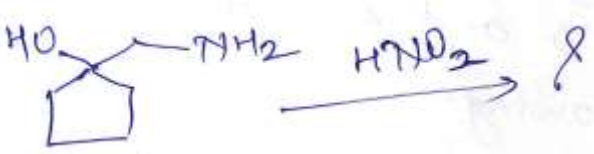


Q.2 Answer the following **16**

a) Explain with suitable example reaction mechanism of Duff reaction.
b) Discuss stereochemistry and mechanism of Wolff rearrangement reaction.
c) Discuss various applications of selenium dioxide.
d) Explain with suitable examples alkylation of highly stabilized enolates.

Q.3 Answer the following

a) Explain reactivity and applications of Lithium dialkylcuprate. **08**
b) Explain reaction mechanism of Witting rearrangement reaction and give its applications. **08**

Q.4 Answer the following

a) Discuss regioselectivity and stereoselectivity in enolate formation from ketones and esters. **08**

b) Explain with suitable examples various applications of trimethylsilyl iodide. **08**

Q.5 Answer the following

a) Discuss with suitable examples mechanism of ozonolysis and its oxidative and reductive work up. **08**

b) Explain with suitable examples reaction mechanism of Ring closing metathesis (Grubb's metathesis) reaction and give its applications. **08**

Q.6 Answer the following

a) Explain the reaction mechanism of Iodo-lactonization rearrangement reaction and give its various applications. **08**

b) Discuss with suitable examples alkylation of aldehydes, esters and carboxylic acids. **08**

Q.7 Answer the following

a) Explain with suitable examples reaction mechanism and application of Hiyama and Tsuji-Trost reaction. **08**

b) Discuss Peterson's synthesis. **08**

SLR-SF-11

Seat No.	

Set P

M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2023
ORGANIC CHEMISTRY
Chemistry of Bioactive Heterocycles (MSC07302)

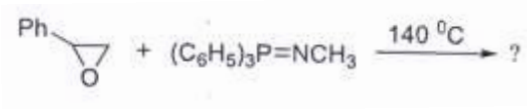
Day & Date: Tuesday, 11-07-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

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

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

1) Which of the following is the prefix of sulphur?
a) Oxa b) Thia
c) Aza d) Sila

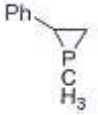
2) Predict the product of following reaction



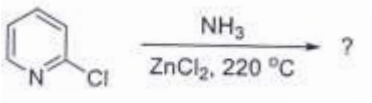
a) 

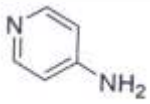
b) 

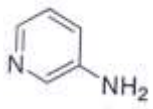
c) 

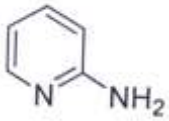
d) 

3) The major product formed in the following reaction is _____.



a) 

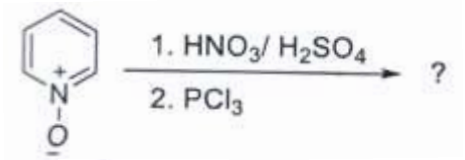
b) 

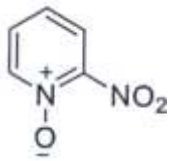
c) 

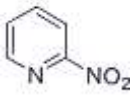
d) 

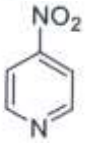
4) Which of the following is the most resonance stabilized five membered ring?
a) Furan b) Pyrrole
c) Thiophene d) Pyridine

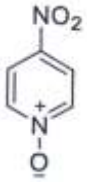
5) The major product formed, in the following reaction is _____



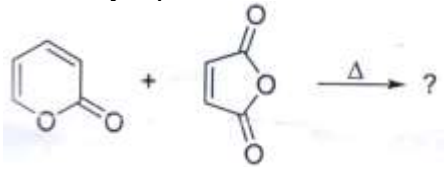
a) 

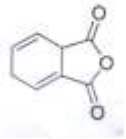
b) 

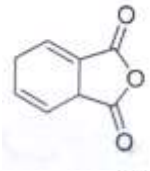
c) 

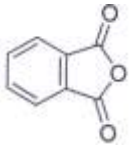
d) 

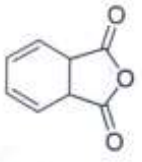
6) The major product formed in the following reaction is: _____.



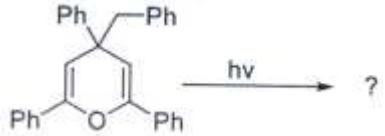
a) 

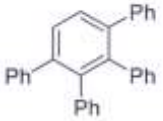
b) 

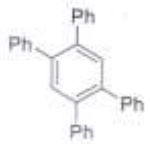
c) 

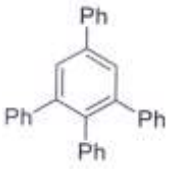
d) 

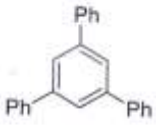
7) The product formed in the following reaction is _____.



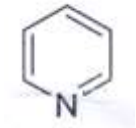
a) 

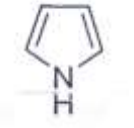
b) 

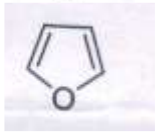
c) 

d) 

8) Which of the most reactive in electrophilic aromatic substitution?

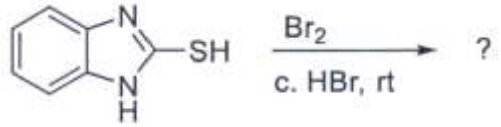
a) 

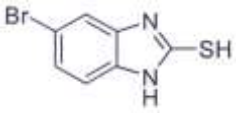
b) 

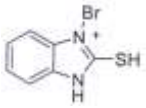
c) 

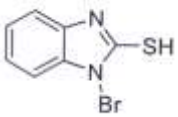
d) 

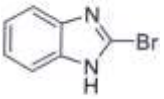
9) Which is the most probable main product of the following reaction?



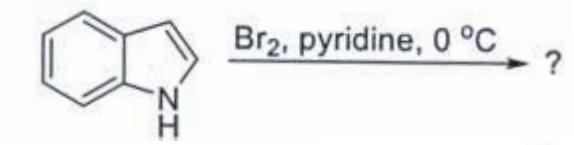
a) 

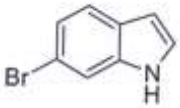
b) 

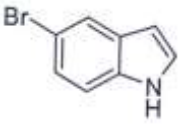
c) 

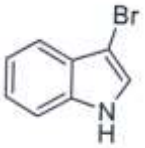
d) 

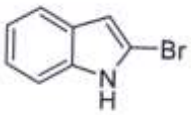
10) Which is the most probable main product of the following reaction?



a) 

b) 

c) 

d) 

B) True or False. **06**

1) Pyrrolidine is non-aromatic compound.
2) Pyridine is more reactive towards electrophiles than benzene.
3) 1,4-diazine is also known as pyrazine.
4) Benzimidazole nucleus appears in Vitamin C.
5) The suffix ‘ole’ used for the five membered unsaturated ring.
6) Indole does not exhibit weak acidic properties.

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

a) How to prepare 4yridines from 1,3-dicarbonyl compounds? Discuss in details with mechanism.

b) Discuss the two methods of each for synthesis of oxiranes and aziridines.

c) Give two methods of pyrazine synthesis with mechanism.

d) Write a short note on synthesis of tetrazole.

Q.3 Answer the following.

a) Write synthesis of thiazole and imidazole from α-halo-carbonyl compounds with mechanism. **08**

b) What is the reactivity of pyridine towards electrophilic substitution reaction with regioselectivity? **08**

Q.4 Answer the following.

a) What are the methods for synthesis of pyrimidine? Explain with examples. **08**

b) What are the various methods for synthesis of benzimidazoles and benzothiazoles? **08**

Q.5 Answer the following.

a) At which positions do indole and benzothiophene reacts most readily with electrophiles? Give reason of each. **08**

b) What are Skraup synthesis and Doebner-Miller synthesis reactions? Discuss with examples and mechanism. **08**

Q.6 Answer the following.

a) What is regioselectivity of bromination and nitration reactions in pyrrole with examples. **08**

b) What is the regioselectivity of nitration, halogenations and sulphonation reactions of thiophene? **08**

Q.7 Answer the following.

a) What are Baldwin Rules? Discuss in Details. **08**

b) Discuss synthesis of pyrrole, furan and thiophene heterocycles from 1,4-dicarbonyl compounds. **08**

SLR-SF-12

Seat No.	

Set P

M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2023
ORGANIC CHEMISTRY
Photochemistry and Pericyclic Reactions (MSC07306)

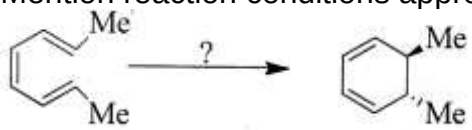
Day & Date: Wednesday, 12-07-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

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

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

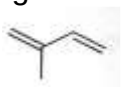
1) Which molecular orbitals are highly stable?
   a) Non-bonding molecular orbitals
   b) Bonding molecular orbitals
   c) Anti-bonding molecular orbitals
   d) All of above

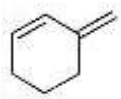
2) Mention reaction conditions appropriate for following transformation?



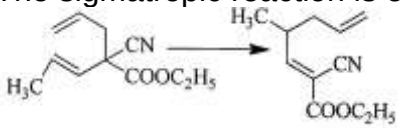
   a) Heat b) Light
   c) Both a and b d) None of these

3) Which of the following dienes can not undergo Diels-Alder reaction?

   a)  b) 

   c)  d) 

4) The sigmatropic reaction is example of .....



   a) [2,3]- Sigmatropic reaction b) [3,3]- Sigmatropic reaction
   c) [1,3]- Sigmatropic reaction d) All of these

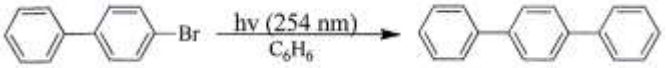
5) A reaction involving photochemical reorganization of phenolic ester is known as _____
   a) Photo-Fries rearrangement b) Perkin reaction
   c) Claisen rearrangement d) None of these

6) How many bonding interactions are present in (Ψ_1) energy orbital of 1,3- butadiene?
   a) 1 b) 2
   c) 3 d) None of these

7) The sigmatropic reaction is example of _____.

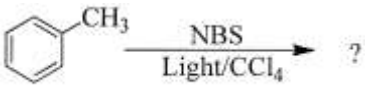
a) [1,5]- Sigmatropic reaction
b) [1,4]- Sigmatropic reaction
c) [3,3]- Sigmatropic reaction
d) All of these

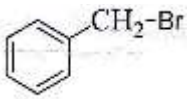
8) The photochemical reaction given below is _____

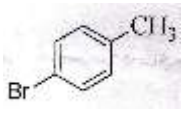


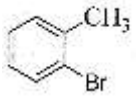
a) Photo rearrangement
b) Radical substitution
c) Cycloaddition reaction
d) None of these

9) Choose the correct product



a) 

b) 

c) 

d) None of these

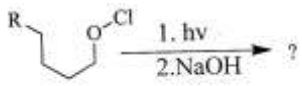
10) The photochemical [2+2] cycloaddition of a carbonyl group with an olefin to give an _____.
a) Indole
b) Oxetane
c) Azirine
d) Azitidine

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

1) If the highest occupied molecular orbital has M-symmetry the process will be _____.
2) Which is HOMO for hexa-1,3,5-triene under thermal condition is _____.
3) Photoinduced decarbonylation of saturated carbonyl compounds in gas phase is known as _____.
4) The light-initiated reduction of a variety of functional group in the presence of an electron donar or hydrogen atom donor is known as _____.
5) The photolytic conversion of organic nitrites into nitroso alcohols is known as _____.
6) If system has node then it is called _____.

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

a) Predict the product with mechanism

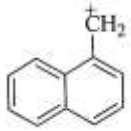


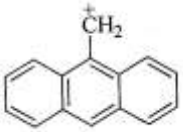
b) Write note on: Reactivity index
c) Draw molecular orbital diagram of 1,3- butadiene and show HOMO and LUMO at thermal condition?
d) **Define the following term**
i) Photoreduction
ii) Photooxidation

Q.3 Answer the following.

a) Explain why [1,5] sigmatropic shift of hydrogen is thermally allowed process? **08**

b) Assign coefficient and calculate charge density in following? **08**





Q.4 Answer the following.

a) Explain Norrish type-II reaction with suitable examples. **08**

b) With the help of FMO method, show that [4+2] cycloaddition reaction is thermally allowed process. **08**

Q.5 Answer the following.

a) Discuss the mechanism of di-pi-methane rearrangement reaction. **08**

b) Explain Huckel - Mobius method for electrocyclic reactions. **08**

Q.6 Answer the following.

a) Discuss Hoffman - Loeffler - Fretag reaction with suitable examples. **08**

b) Explain ene reaction with suitable examples. **08**

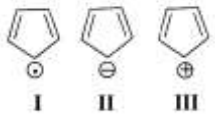
Q.7 Answer the following

a) Give the mechanism of the chelotropic cycloaddition reactions between **08**

i) alkene and carbene

ii) alkene and SO_2

b) Calculate Huckels delocalization energy and arrange the following molecules by decreasing order of stability. **08**



SLR-SF-14

Seat No.	

Set P

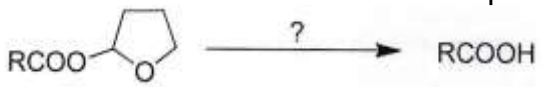
M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
Organic Chemistry
Advanced Organic Chemistry – II (MSC07401)

Day & Date: Monday, 10-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

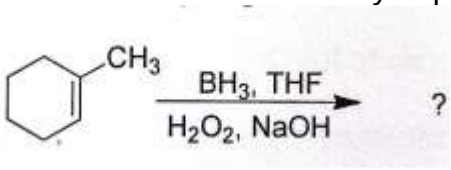
Q.1 A) Choose Correct Alternative. **10**

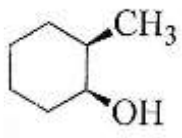
1) Mention the suitable conditions for deprotection of following

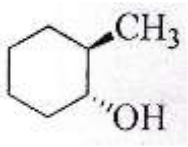


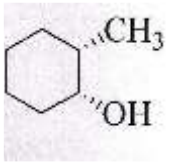
a) $H_2, Pd, heat$ b) $HgCl_2/ClCO_3aq, Me_2CO$
c) $AcOH - THF - H_2O$ d) All of above

2) What is the stereochemistry of product in following reaction?



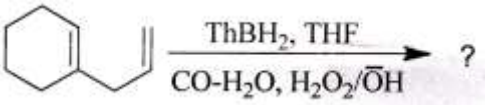
a) 

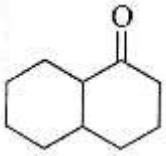
b) 

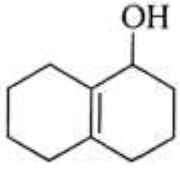
c) 

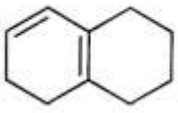
d) None of these

3) Select correct product



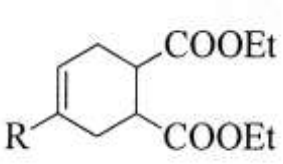
a) 

b) 

c) 

d) None of these

4) Which reaction would result in structure having a cyclohexene such as the following as a molecular structure?

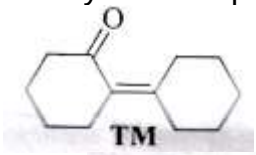


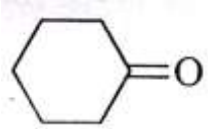
a) Claisen rearrangement
b) Diels-Alder reaction
c) Ene reaction
d) Aldol condensation

5) Which of the following act as umpolung reagent?

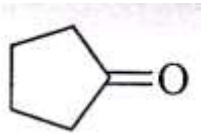
a) Nitro compounds
b) 1,3- Dithianes
c) Alkynes
d) All of the above

6) The synthetic equivalent for following Target molecule is?



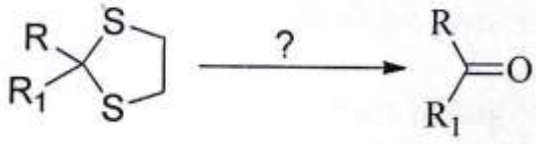
a) 

b) 

c) 

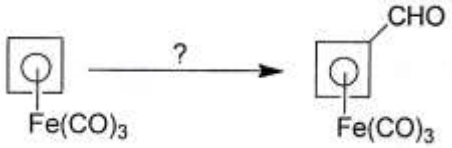
d) 

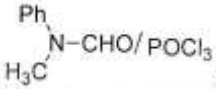
7) Mention suitable condition for deprotection of following protected carbonyl compounds?



a) $NaOH$
b) $Hg(ClO_4)_2/\ MeOH - CHCl_3$
c) $AlCl_3/CH_2Cl_2$
d) All of above

8) Which reaction conditions are appropriate for the following transformation?



a) 

b) $AlCl_3/\ HCHO$
c) $Hg(OAc)_2/H_2O$
d) None of These

9) Which combination of reagents is appropriate for following transformation?

a) 1) $HO-CH_2-CH_2-OH, H^+$ 2) $LiAlH_4, Et_2O, H_3O^+$
b) 1) $NaBH_4, MeOH$ 2) $LiAlH_4, Et_2O$, 3) H_3O^+
c) 1) $LiAlH_4, Et_2O$, 2)H_3O^+
d) 1) $NaBH_4, MeOH$

10) Choose reagents for following chemical conversion?

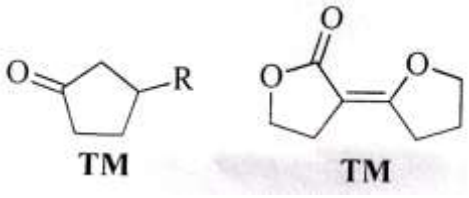
a) NH_3(1)
b) H_2/Pt
c) i) BH_3.THF ii) NH_4OH, NaOCl (aq)
d) All of the above

B) Fill in the blanks **06**

1) A reaction which predominantly produces one of several possible structural (position) isomers is called _____
2) Conversion of one functional group into another functional group is known as _____
3) The coupling of terminal alkynes with aryl or vinyl halides in the presence of Pd (0) is known as _____
4) The combination of reagents H_2O, $PdCl_2$, $CuCl_2$ and O_2 has been used to oxidise terminal vinyl groups to methyl ketones is known as _____
5) A reaction in which one functional group within a molecule reacts leaving other potentially reactive functional groups unaltered is called _____
6) _____ catalyst give effective reduction of 3-hexyne to cis-3-hexene.

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

a) Discuss one group C-X disconnections with suitable examples?
b) Outline the retrosynthetic analysis and design synthesis of the following target molecules?



c) Discuss Sonogashira coupling reaction.
d) Discuss the principle of protection of amines.

Q.3 Answer the following.

a) Explain various protecting groups for alkenes and alkynes. **08**
b) Explain role of aliphatic nitro compounds in synthesis. **08**

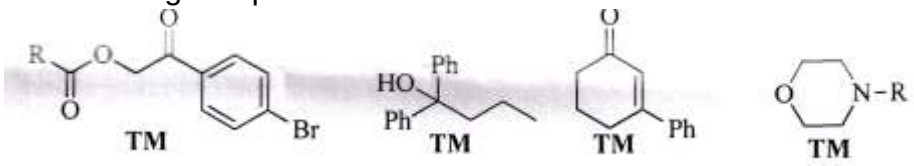
Q.4 Answer the following.

a) Explain role of Manganese complexes in organic synthesis. **08**

b) Discuss the principle of protection of carboxylic group with suitable examples. **08**

Q.5 Answer the following.

a) Using disconnection approach, design a convenient synthesis for each of the following compounds **08**



b) Explain role of Iron carbonyls in organic synthesis. **08**

Q.6 Answer the following.

a) Explain synthetic utility of silane complexes. **08**

b) Explain role of organoboranes in organic synthesis. **08**

Q.7 Answer the following.

a) Explain stereo and regioselectivity in hydroboration reactions. **08**

b) Discuss the importance of the order of events in organic synthesis. **08**

SLR-SF-15

Seat No.	

Set P

M.Sc. (Semester-IV) (New) (CBCS) Examination: March/April-2023
ORGANIC CHEMISTRY
Modern Organic Chemistry (MSC07402)

Day & Date: Wednesday, 12-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

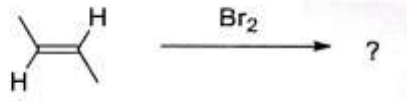
Instructions: 1) Question no. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7.
3) Figure to right indicate full marks.

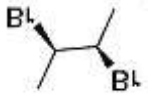
Q.1 A) Choose the correct alternative. **10**

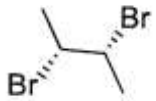
1) Considering the following reaction, the correct statements among A-C are _____.
   i) The carbonyl group has enantiotopic faces
   ii) The hydride attack is form Re face
   iii) It is diastereoselective reduction.

a) i and ii only b) i and iii only
c) ii and iii only d) i, ii and iii

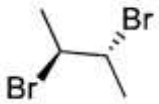
2) Predict the correct option of product.



a) 

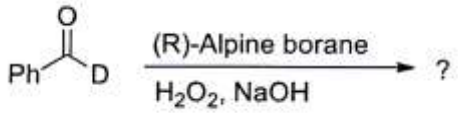
b) 

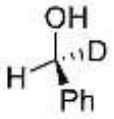
Both (a) and (b)

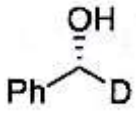
c) 

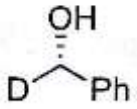
d)

3) Predict the correct option of major product.



a) 

b) 

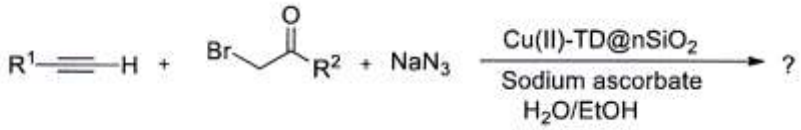
c) 

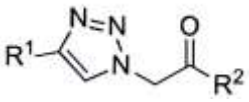
d) Both (a) and (b)

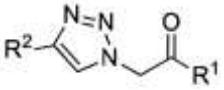
4) Which of the following asymmetric synthesis method give 100% ee guaranteed?

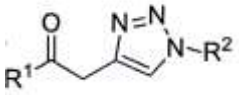
a) Chiral reagent
b) Chiral catalyst
c) Chiral pool
d) Chiral Auxiliary

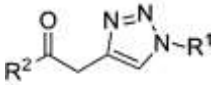
5) Predict the product of the following reaction



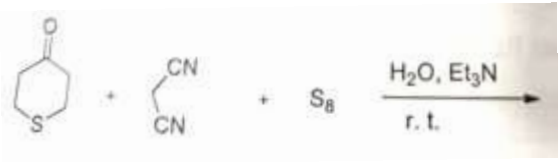
a) 

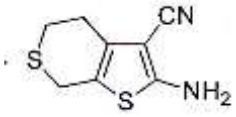
b) 

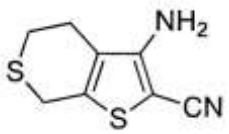
c) 

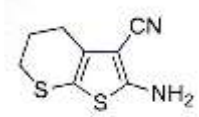
d) 

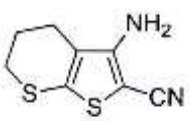
6) Predict the product of the following reaction



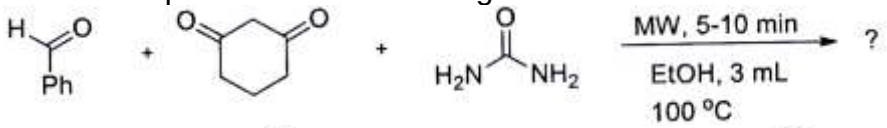
a) 

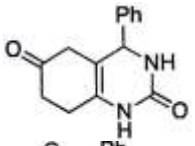
b) 

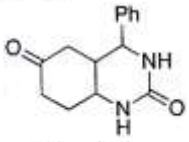
c) 

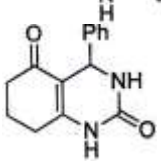
d) 

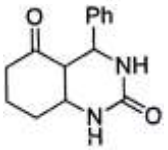
7) Predict the product of the following reaction



a) 

b) 

c) 

d) 

8) A mass production of MOFs could be achieved by _____ method.
   a) Ultrasound b) Solvo-thermal
   c) Crystal transformation d) Electro-chemical

9) Scanning Electron Microscopy (SEM) of MOF allows the chemist to study it's _____.
   a) Purity b) Morphology
   c) Adsorption/desorption d) Chemical composition

10) According to computational fitting results surface area of MOFs could probably reach up to _____.
   a) 15600 m^2/g b) 14800 m^2/g
   c) 7140 m^2/g d) 7040 m^2/g

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

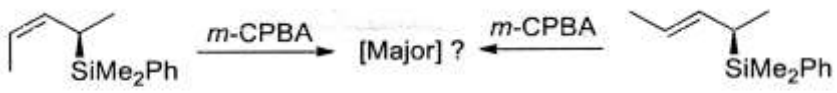
1) The pore size of mesoporous materials ranges between _____ Á.
2) In HKUST-1 metal organic framework, HKUST stands for _____.
3) The Bais voltage applied during electrochemical synthesis of MOF is _____ V
4) An increase in the number of benzene rings in organic linker could affect the _____ of metal organic frameworks.
5) Those reactions including three and more starting materials are classified as _____ reactions.
6) The synthesis involves reactions that include multiple chemical conversions between, substrates, reagents and catalysts which are performed in a single vessel are called _____ synthesis.

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

a) Define Pro-R, Pro-S, Re face and Si face with examples?
b) Write a short note on Enantiomeric excess?
c) Write a note on secondary building unit (SBUs).
d) Write a note on analysis methods of MOF.

Q.3 Answer the following.

a) Discuss the mechanism of epoxidation with stereochemistry of major product. Give justification for major and minor product. **08**

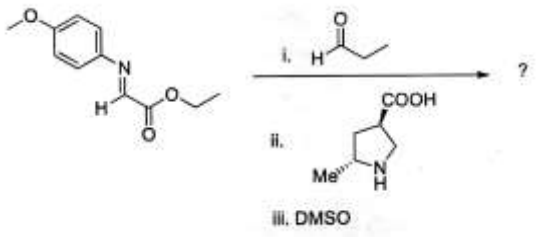


A B

b) How MCRs are useful for synthesis of heterocycles using Knoevenagel reaction? **08**

Q.4 Answer the following.

a) Predict the major product and give justification for diastereoselectivity with mechanism in following transformation? **08**



b) Explain diastereoselectivity of Aldol reactions with examples. **08**

Q.5 Answer the following.

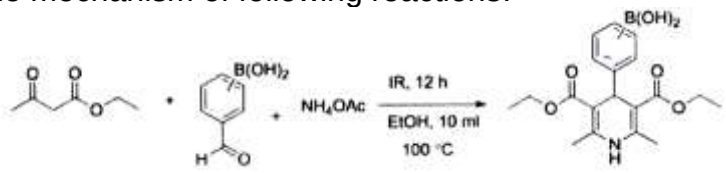
a) Define chiral catalyst? What is Sharpless epoxidation? Comment on the stereoselectivity with examples. **08**

b) What is chiral reagent? What is synthesis of CBS reagent and its applications in enantioselective synthesis? **08**

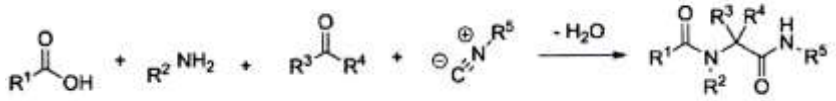
Q.6 Answer the following.

a) Write the mechanism of following reactions. **08**

i)



ii)



b) What is the mechanism of Passerini and Gewald reaction? Write different examples of each. **08**

Q.7 Answer the following.

a) What are the synthetic routes to metal organic frameworks? Explain Electrochemical and microwave/ultrasound methods of MOF synthesis with suitable diagrams. **08**

b) What are the functionalized MOFs? Explain in detail the methods involved in MOF Functionalization. **08**

SLR-SF-16

Seat No.	

Set P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
Organic Chemistry
Chemistry of Natural Products (MSC07403)

Day & Date: Friday, 14-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

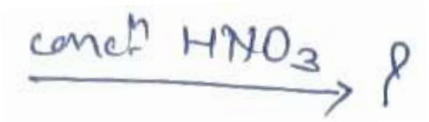
Q.1 A) Choose the correct alternatives. **10**

1) The _____ ring fusion in natural steroids is only trans.
   a) B/C b) A/B
   c) C/D d) A/D

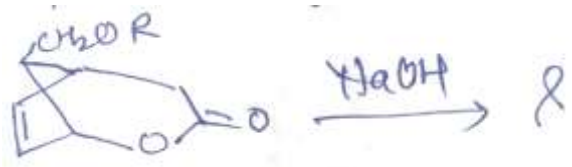
2) The C-19 methyl group if freely rotating, can couple with an axial hydrogen at _____ in the steroid if A/B ring fusion is trans.
   a) C-1 b) C-5
   c) C-9 d) All three

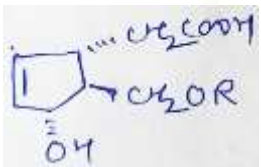
3) In trans-Decalin two rings are fused through _____bonds.
   a) a, a b) a, e
   c) e, e d) None of these

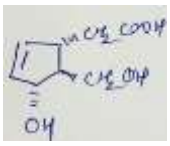
4) Zeisel's method showed that reserpic acid contains ____groups.
   a) Two methoxy b) Five methoxy
   c) Two carbonyls d) Two hydroxy

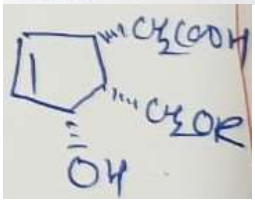
5) Strychnine 

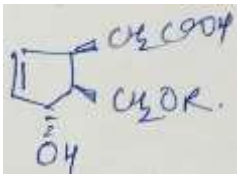
   a) Dinitrostrychol
   b) Dinitroisatin
   c) Dinitro-strychol carboxylic acid
   d) Hippuric acid

6) 

   a) 

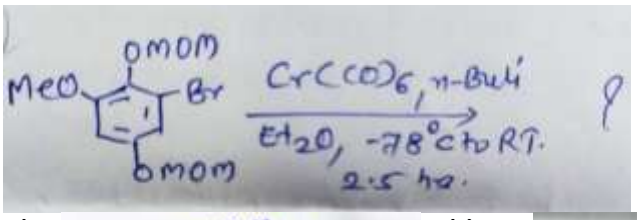
   b) 

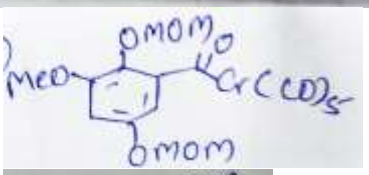
   c) 

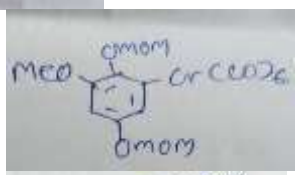
   d) 

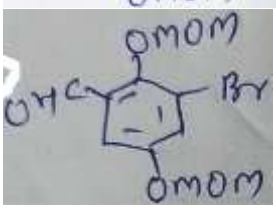
7) Structure of biotin is formed by fusion of _____.
   a) Imidazole & thiol ring
   b) Imidazole & thinophene ring
   c) Pyridine & thiophene ring
   d) Imidazole & thiazole ring

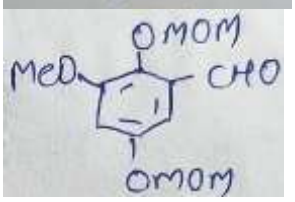
8) _____ is a group of three vitamins, namely pyridoxine, pyridoxal & pyridoxamine.
   a) Vit H b) Vit B_2
   c) Vit B_6 d) Vit B_1

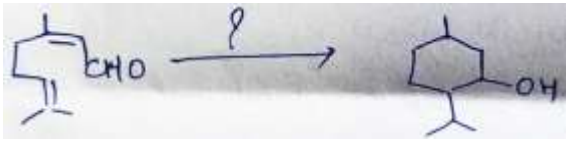
9) 

   a) 

   b) 

   c) 

   d) 

10) 

   a) $2H_2$ b) Cyclisation
   c) Cyclisation, $2H_2$ d) $2H_2$, cyclisation

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

1) Riboflavin functions as a coenzyme because of its ability to undergo ____.
2) _____ are believed to be precursors of alkaloids.
3) Pyrolthobillianic acid on Clemmenson's reduction gives ____.
4) Taxol is an important drug in the treatment of _____.
5) _____ derived antitumor agents include etoposide and teniposide.
6) Aspirin suppresses the production of _____ by inhibiting or killing an enzyme cyclooxygenase.

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

a) Discuss the synthesis of progesterone from cholesterol.
b) Discuss the structure elucidation of yobyrine.
c) Explain the biosynthesis of yohimbine from tryptophan.
d) Explain biological function of thiamine.

Q.3 Answer the following.

a) Explain the synthesis of Fredericamycin A. **10**
b) Explain the biochemical role of biotin. **06**

Q.4 Answer the following.

a) Discuss the constitution of Testosterone. **08**

b) Discuss the biosynthesis of sesquiterpenoids and diterpenoids. **08**

Q.5 Answer the following.

a) Discuss the constitution of Reserpine (synthesis is not expected). **10**

b) Explain biochemical role of Folic acid. **06**

Q.6 Answer the following.

a) Discuss Karrer's synthesis of Vit. B_2 & explain its biochemical role. **10**

b) Explain synthesis of podophyllotoxin from oxazoline. **06**

Q.7 Answer the following.

a) Explain the biosynthesis of phenylalanine by the Shikimic acid pathway. **08**

b) Discuss the geometry and symmetry of conformations of trans and cis-Decalin. **08**

SLR-SF-17

Seat No.	

Set P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
ORGANIC CHEMISTRY
Medicinal Chemistry (MSC07408)

Day & Date: Sunday, 16-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

Q.1 A) Choose the correct alternatives from the options. **10**

1) Dapsone is used primarily for the treatment of _____.
   a) Tuberculosis b) Leprosy
   c) Malaria d) Urinary tract infection

2) Topically used sulphonamide is _____.
   a) Sulphadoxine b) Sulphamethoxazole
   c) Silver Sulphadiazine d) Dapsone

3) Replacement of the oxygen at C-2 of barbituric acid by sulphur atom _____.
   a) Has no change on activity b) Increases activity
   c) Decreases activity d) Shows anxiolytic

4) Insulin is an essential hormone produced by the _____.
   a) Kidney b) Lungs
   c) Pancreas d) Liver

5) Which one of the following belongs to long-acting barbiturate?
   a) Pentobarbital b) Phenobarbital
   c) Thiopental d) Hexabutal

6) Antifungal antibiotic is _____.
   a) Naftifine b) 5-fluocytosine
   c) Nystacin d) Nafimidone

7) Mechanism of action of nitrates is to _____.
   a) Inhibit phosphodiesterase b) Stimulates guanylate cyclase
   c) Beta blockers d) Block calcium channel

8) Generic name of remdesivir is _____.
   a) Veklury b) Meklory
   c) Zeklocy d) Neklury

9) The penicillins are all strong _____ acids.
   a) monobasic b) dibasic
   c) tribasic d) none of these

10) Paracetamol can be synthesized from _____.
   a) o-nitrophenol b) m-nitrophenol
   c) p-nitrophenol d) None of these

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

1) Verapamil is a more potent vasodilator than Nifedipine.
2) Tolbutamide and Glipizide are oral Hypoglycemic agents.
3) Itraconazole is in the class of Antifungal medication.
4) Captopril is an oral drug & a member of class of drugs called ACE inhibitors.
5) The chemical name of a Paracetamol is 2-Acetoxybenzoic acid.
6) Penicillin G is classified under narrow spectrum antibiotics

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

a) Give classification and uses of Antihypertensive drugs.
b) Explain the synthesis of Paracetamol.
c) Explain Antineoplastic activity of Antimetabolites.
d) Explain classification of Penicillin.

Q.3 Answer the following.

a) Explain the SAR and synthesis of Phenelzine. **08**
b) Explain classification and SAR of Antibiotics. **08**

Q.4 Answer the following.

a) Explain the SAR and mechanism of action of Tetracyclines. **08**
b) Explain the SAR and synthesis of Chloroquine. **08**

Q.5 Answer the following.

a) Explain classification and mechanism of action of Antimetabolites. **08**
b) Explain the synthesis & SAR of Captopril. **08**

Q.6 Answer the following.

a) Explain the synthesis and mechanism of action of Sulfacetamide. **08**
b) Explain synthesis and mechanism of action of Diclofenac. **08**

Q.7 Answer the following.

a) Explain the synthesis and mechanism of action of Propranolol. **08**
b) Explain Anaesthetic activity for Lidocaine and Thiopental. **08**

SLR-SF-24

Seat No.	

Set P

M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2023
INDUSTRIAL CHEMISTRY
Unit operations of chemical Engineering (MSC06301)

Day & Date: Monday, 10-07-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

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

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

1) Separation of perfumes from flowers is a _____.
   a) Extraction b) Leaching
   c) Distillation d) Evaporation

2) Following factors affect rate of filtration _____.
   a) Viscosity of the filtrate
   b) Properties of liquid to be concentrated
   c) Resistance of the filter cake
   d) Both a & c

3) In fractionating column, the portion below the feed plate including feed plate is called _____.
   a) Rectifying section b) Stripping Section
   c) Accumulator d) Steam section

4) Packed tower is used in _____.
   a) Coal industry b) petrochemical industry
   c) polymer industry d) All above

5) Factors that affect the rate of leaching are _____.
   a) Solvent b) Agitation
   c) Temperature d) All of these

6) Grizzles are used to screen _____ Material.
   a) Coarse b) Fine
   c) Fairly large d) All of these

7) Induced distribution of two separate phases through one another is called _____.
   a) Mixing b) Agitation
   c) Crushing d) Conveying

8) Tray Dryer consist of the following _____.
   a) is a batch operated direct dryer
   b) consists of an enclosed insulated cabinet
   c) A heating coil either electrical or steam-heating
   d) All of the above

9) Certain hydrated crystalline salts when exposed to the atmosphere at ordinary temperature lose their water of crystallization molecule either partially or completely and become anhydrous are called as _____.
   a) Hygroscopic substances
   b) Crystal Hydrate
   c) Solvates
   d) Efflorescence

10) _____ is not a minimum boiling azeotrope is:
   a) Chloroform- Acetone
   b) Ethanol- Acetone
   c) Carbon Disulphide- Acetone
   d) 95.5 % ethyl alcohol and 4.5 % water

B) Write True / False **06**

1) Filter aids used in filtration should be Chemically reactive
2) Crystallization involves both mass and Heat transfer
3) The boiling point of 95% ethanol is higher than that of absolute ethanol
4) Pitched blade turbine is an axial flow impeller
5) Tray dryer is commonly used for wet filter cakes and wet lumpy solids
6) In the Blake jaw crusher, the movable jaw is pivoted at the bottom

Q.2 Answer the following **16**

a) What is volume and Shear strain?
b) What are different method of supersaturation? Explain Supersaturation achieved by adiabatic evaporation and cooling.
c) Explain Horizontal tube evaporator.
d) Explain working of Dorr agitator with neat labelled diagram.

Q.3 Answer the following

a) Explain with schematic diagram Centrifugal filter. **08**
b) Draw neat labeled sketch and explain working of gyratory crusher. **08**

Q.4 Answer the following

a) Explain with schematic diagram working of Internal floating head heat exchanger. **08**
b) Discuss Sieve and valve plate used in distillation column. **08**

Q.5 Answer the following

a) Explain how absolute ethanol is obtained by Azotropic distillation **08**
b) Explain with neat labeled diagram multiple effect evaporator. **08**

Q.6 Answer the following

a) Discuss construction and working of Agitated tank crystallizer. **08**
b) Explain with schematic diagram Stress-Strain relationship. **08**

Q.7 Answer the following

a) Draw neat schematic diagram of Rotating disc contactor and explain operation process. **08**
b) Draw neat labeled sketch and explain working of Batch plant for Extraction of oil. **08**

SLR-SF-25

Seat No.	

Set P

M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2023
INDUSTRIAL CHEMISTRY
Unit processes in Chemical Technology (MSC06302)

Day & Date: Tuesday, 11-07-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Question 1 and 2 are compulsory.
2) Attempt any Three from Q.3 to Q.7.
3) Figure to right indicate full marks.

Q.1 A) Choose the correct alternatives from the given options. **10**

1) Which is the most important Nitrating medium?
   a) Nitric acid and H_2SO_3
   b) Nitric acid and Sulphuric acid
   c) Nitrogentetraoxide and -H_2SO_4
   d) All of the mentioned

2) What do you mean by Optimum temperature?
   a) Least temperature at which the reaction starts
   b) Average temperature to produce desired product
   c) Temperature at which we get maximum yield
   d) All of the mentioned

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

4) Sulfation involves placement of which group on carbon atom?
   a) – OSO_2OH b) – SO_2-OH
   c) – $CISO_3H$ d) – SO_2CI

5) For what production are Sulfonates and Sulphates used?
   a) Detergents b) Emulsifying
   c) De-emulsifying d) All of the mentioned

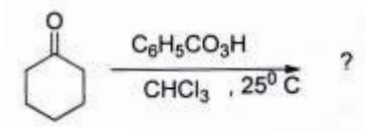
6) Which derivative is used for aerosol propellant?
   a) Bromine b) Chlorine
   c) Iodine d) Fluorine

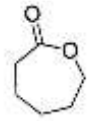
7) Under which temperature, with a mild catalyst does toluene oxidize to benzaldehyde?
   a) High b) Moderate
   c) Low d) None of the mentioned

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

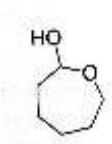
9) Chlorinated solutions of which hydroxides are active oxidizing agents?
   a) Sodium b) Aluminium
   c) Copper d) All of the mentioned

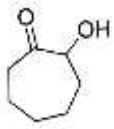
10) Predict the Product ____.



a) 

b) 

c) 

d) 

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

1) Polymerization at the double bond is a typical addition reaction.
   a) True b) False
2) The direct oxidation of ethanol to acetic acid in a continuous catalytic vapour-phase process is more difficult.
   a) True b) False
3) Vanadium oxide acts as a catalyst in vapour phase oxidation of olefins.
   a) True b) False
4) Calcium hypochlorite is also called as _____.
5) Formula of Fuming Sulphuric acid _____.
6) Ketene on reaction with alcohol produces _____.

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

a) Describe in brief the oxynitration.
b) Discuss in brief esterification by organic acid.
c) Explain the polyamides with example.
d) Explain the sulphoxidation.

Q.3 Answer the following.

a) How is epoxy resin prepared? What are its properties and applications? **08**
b) Describe in detail the manufacturing process of cellulose acetate. **08**

Q.4 Answer the following.

a) Discuss in detail the use of Prevost Reagent with respect to Alkene, also summarize the steriochemical aspect. **08**
b) Discuss the Shapiro reaction and the Mechanism with respect to Cyclohexanone. **08**

Q.5 Answer the following.

a) Explain with the diagram the manufacturing process of vinyl chloride from acetylene. **08**
b) Discuss with labeled diagram. **08**
   1) Batch sulphonation kettle and
   2) Ball Mill sulphantor

Q.6 Answer the following.

a) Give an account of liquid phase oxidation with Oxygen of acetaldehyde to acetic acid. **10**
b) Explain in details the Polypropylene and Polystyrene. **06**

Q.7 Answer the following.

a) Describe the manufacturing process, properties and application of monochloroacetic acid. **08**

b) What is polymerization? What are the methods of polymerization? **08**

SLR-SF-26

Seat No.	

Set P

M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2023
INDUSTRIAL CHEMISTRY
Instrumental Analysis-I (MSC06307)

Day & Date: Wednesday, 12-07-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

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

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

1) A _____ is necessary for introducing the sample at the head of the column.
   a) sample port b) test tube
   c) beaker d) funnel

2) In _____ electrode, Hg and Hg_2Cl_2 are used for construction purpose.
   a) SCE b) glass
   c) Auxiliary d) none of these

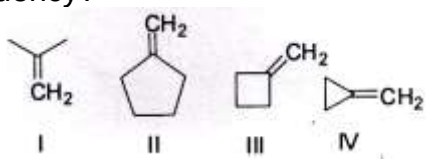
3) The columns used in gas chromatography are made up of _____.
   a) Plastic b) Stainless steel
   c) Rubber d) Both b & c

4) The electrode whose potential is varied with time is ____.
   a) Indicator b) Counter
   c) Auxiliary d) All of these

5) The _____ is special glass used to fabricate glass electrode.
   a) Diagonally b) corning 015A
   c) Linearly d) All of these

6) In D.C. polarography, dropping _____ electrode is used as a cathode.
   a) Silver b) Gold
   c) Mercury d) platinum

7) Which out of the following compounds, is expected to show lower C=C stretching frequency?

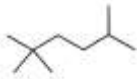
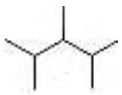


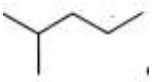
   a) I b) II
   c) III d) IV

8) Ionic conduction is due to the movement of ____.
   a) Ions b) Particles
   c) Gases d) liquid

9) In voltammetry, information about an analyte is obtained by measuring the current as the ____is varied.
   a) Temperature b) Volume
   c) Pressure d) potential

10) The CMR spectrum of an unknown compound shows 6 absorptions and the PMR spectrum shows 5 absorptions. Which of the following compounds is the unknown compound?

a)  b) 

c)  d) 

B) Write true/false. **06**

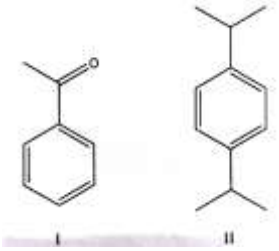
1) Voltammetry is used to analyze the colloidal system.
2) The output of chromatography is chromatogram.
3) The potential of reference electrode is set constant in voltammetry.
4) The mobile phase in GC-MS is gas.
5) In cyclic voltammetry, potential is swept linear.
6) N_2 is used as a carrier gas in gas chromatography.

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

a) Write any four applications of electro analytical sensors.

b) Enlist the differences between LC-MS and GC-MS.

c)



d) Define voltammetry and discuss its types.

Q.3 Answer the following.

a) An organic compound of molecular formula $C_9H_{11}O_2N$ shows the following features: **10**

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

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

Predict the structure.

b) An organic compound of molecular formula $C_{12}H_{15}O_2N$ shows the following features: **06**

IR(KBr) :1670cm^{-1};

^{1}HNMR : 8.0δ (d, 1H, J=12.1 Hz); 7.7δ (d, 2H, J=8.0 Hz); 6.8δ (d, 2H, J=8.0Hz); 5.88 (d, 1H, J=12.1 Hz); 3.8 δ (s, 3H); 3.0 δ (s, 6H)

Predict the structure.

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

a) Explain in detail principle, working and applications of turbidimetry with neat labelled diagram.

b) Discuss glass electrode in detail with necessary mechanism.

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

a) Discuss D.C. polarography with neat labelled diagram.

b) Describe linear sweep voltammetry in detail and how it is useful for analysis.

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

a) Write the principle, instrumentation, working and applications of gas chromatography.

b) Explain plate theory of chromatography and write the applications of GC-MS in various industries.

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

a) Describe with illustration programmed flow chromatography.

b) Explain gas sensors in detail with diagram.

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Seat No.	

Set P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
INDUSTRIAL CHEMISTRY
Chemical Industries (MSC06401)

Day & Date: Monday, 10-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

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

1) Which of the following is not a suitable ore for extracting iron?
   a) Hematite b) Magnetite
   c) Siderite d) Iron Pyrites

2) How is ore-dressing of iron done?
   a) Froth Flotation b) Magnetic separation
   c) Hand picking d) By wetting

3) How does the addition of magnesia and alumina affect soda lime glass?
   a) Enhances mechanical strength
   b) Reduces porosity
   c) Increases softening temperature
   d) Improves chemical durability

4) Which of the following is not a process involved in glass production?
   a) Extrusion b) Forming and shaping
   c) Heat treatment d) Finishing

5) Which of the following is a property of ceramics?
   a) Low strength b) Low melting point
   c) Resistant to corrosion d) Bad insulation

6) Which of the following is the chief ore of aluminium?
   a) Kaolinite b) Bauxite
   c) Malachite d) Cinnabar

7) Which forming method is used for the production of hollow glasses?
   a) Blowing b) Pressing
   c) Drawing d) Casting

8) Spray painting is used to:
   a) Apply paint without touching surface
   b) Apply large amount of paint
   c) Reach high areas
   d) Get textured paint

9) Anti-corrosive paint is _____ in colour.
   a) Blue b) White
   c) Black d) Yellow

10) The pesticide used in foundations of buildings for preventing termite attack is _____.
   a) DDT b) BHC
   c) Aldrin d) Endosulphan

B) Write True or False/ Fill in the blanks **06**

1) Cellulose acetate is end product is produced by the ethylene obtained from petroleum?
   a) True b) False
2) Air pollution is caused mainly due to agrochemical waste.
   a) True b) False
3) Solvents contain high levels of polyunsaturated fatty acids.
   a) True b) False
4) The _____ farming is in which there is less use of chemicals and lesser production of waste.
5) Pigments which are _____ variant of organic days are called vat dyes.
6) Driers in varnish are used as _____.

Q.2 Answer the following **16**

a) Give important application of borosilicate glass.
b) Give the synthesis of Malathion.
c) Describe the purification of bauxite ore by Baeyer process.
d) Explain in brief the purpose of alloying.

Q.3 Answer the following

a) Describe in the details the extraction of aluminum from its ore. **08**
b) Describe in the details the extraction of Iron from its ore. **08**

Q.4 Answer the following

a) Mention the main constituents of paint. What are their functions? Give examples. **08**
b) Describe in details the manufacturing process of the whiteware. **08**

Q.5 Answer the following

a) Explain in detail the manufacturing process of glass. **08**
b) Discuss manufacturing process, properties and applications of Aldrin. **08**

Q.6 Answer the following

a) Write the chemical reactions that takes place during the setting and hardening of cement and explain. **08**
b) Describe the manufacturing processes of zinc oxide. **08**

Q.7 Answer the following

a) Give the synthesis and application of Dimethoate. **08**
b) Explain in short the refining of crude oil. **08**

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Seat No.	

Set P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
INDUSTRIAL CHEMISTRY
Pollution Monitoring and Control (MSC06402)

Day & Date: Wednesday, 12-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

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

1) Organic agriculture advocates avoiding the use of _____.
   a) organic manure
   b) stored water
   c) modem technology in harvesting
   d) chemical fertilizers

2) The Air (Prevention and Control of Pollution) Act is passed in the year of _____.
   a) 1972 b) 1981
   c) 1974 d) 1983

3) Section 16 of Water act 1974 provides ____.
   a) Functions of Central Board b) Cognizance of offences
   c) State Water Laboratory d) none of these

4) ____ method is used for the analysis of phosphorous in the soil.
   a) Olsen b) Marks
   c) Belly d) Gilbert

5) The dissolved oxygen in water is determined by _____method.
   a) Arrhenius b) Briton
   c) Winkler d) Ongera

6) _____ is most recent pronouncement of the government's commitment to improve environmental conditions.
   a) Education policy
   b) Water management
   c) Sports council
   d) National Environmental Policy

7) ____ causes asthma to human beings.
   a) Water pollution b) Air pollution
   c) Soil pollution d) None of these

8) In ion exchange water treatment method ____ are used.
   a) resins b) Acids
   c) Salts d) bases

9) The pH of potable water should be _____.
   a) Acidic b) Basic
   c) Neutral d) All of these

10) _____ are responsible for air pollution.

a) H_2S b) CO

c) Particulate matter d) All of these

B) Write true or false **06**

1) The CPCB was established in the year of 1974.
2) Mercury is not a heavy toxic metal for human body.
3) The limit for zinc as per MINAS for synthetic fiber industries is 1 mg/L.
4) Activated sludge process is primary water treatment process
5) Tiny particles in the air that are two and one half microns or less in width are PM_{10}
6) Phenolic compounds can be removed by solvent extraction.

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

a) Explain the reverse osmosis process for waste water treatment.
b) Explain the different Indian standards for water quality management.
c) Give an account on reduction method of chromium removal.
d) Explain soil pollution and its sources briefly.

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

a) Explain in detail Air (Prevention and Control of Pollution) Act 1981, its implication and application in industrial pollution control.
b) Describe in detail with necessary diagrams the solvent extraction and oxidation methods for removal of phenolic residues.

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

a) Discuss any two primary treatment methods for waste water treatment with diagrams.
b) What is particulate matter? Explain how CO, NO_X and H_{2S} are analyzed in the air sample?

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

a) Discuss in detail removal of chromium by precipitation and lime coagulation method.
b) Explain in detail toxic effects of mercury and its removal from gaseous and liquid streams.

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

a) Define soil pollution and explain analysis of soil for the factors such as pH, phosphorous and manganese.
b) Explain water pollution and describe analysis of water for the factors of chloride, fluoride and cyanide content.

Q.7 Answer the following **16**

a) Discuss the methods used for the recycling of plastic polymers. What are the important products obtained from recycled plastic polymeric materials?
b) Explain water management in India. Discuss briefly IS-2490, IS-3360 and IS-3307.

SLR-SF-30

Seat No.	

Set P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
Industrial Chemistry
Nanomaterials and its Characterization (MSC06403)

Day & Date: Friday, 14-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

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

1) Chemical solution deposition technique is also known as_____.
   a) sol-gel method b) plasma-CVD
   c) UV-CVD d) laser pyrolysis

2) _____ are used in TEM for examining cellular structure.
   a) Negative-staining b) shadow casting
   c) ultrathin sectioning d) all of these

3) Nanomaterials are the compounds having particle size range from _____.
   a) 1 to 100 mm b) 1 to 100 nm
   c) 1 to 100 cm d) 1 to 100 μm

4) ____ are the materials that measure physical quantities and converts into the signal.
   a) Nanofibers b) Nanotubes
   c) Nanosensors d) all of these

5) ____ is a first step of crystal growth.
   a) Aggregation b) union
   c) Nucleation d) none of these

6) ____ is used as an electron source in SEM.
   a) Tungsten filament b) Cadmium lamp
   c) Carbon nanotubes d) all of these

7) For destructive interference to take place, the phase difference between the two waves should be_____.
   a) (2n+1) π /2 b) (2n+1) π
   c) (2n+1) λ d) (2n-1) π /2

8) Find the Miller index of a plane making intercept ½ a, ½ b, and ¾ c.
   a) (3 4 6) b) (6 6 4)
   b) (6 3 4) d) (4 6 3)

9) Differential Scanning Calorimetry (DSC) is a technique used to measure_____.
   a) Specific heat b) thermal expansion
   c) Electrical conductivity d) impact energy

10) DTA method is used to measure_____ of the material.
   a) Only endothermic phase transition
   b) Only exothermic phase transition
   c) Both endothermic & exothermic phase transitions
   d) None of these

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

1) Nanomaterial have applications in agriculture industries.
2) An UV source is used in plasma assisted chemical vapor deposition method.
3) Electron beams and magnetic fields are used in electron microscope.
4) In SEM, anode is placed between two lenses.
5) The relation between lattice constant 'r' and edge length 'a' in Face centered cubic unit cell is $r = a / 2\sqrt{2}$.
6) DSC device is a thermal analysis instrument that determines the temperature and heat flow is associated with material transitions.

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

a) Give in brief what nanotechnology is.
b) Explain hydrothermal method of synthesis of nanomaterials.
c) Explain with graph the Moisture content curve obtained in TGA analysis.
d) Explain in brief the process of X-ray Production.

Q.3 Answer the following.

a) Describe in detail the magnetron sputtering and electrodeposition methods with neat labeled diagram for the synthesis of materials. **10**
b) Explain the plasma assisted chemical vapor deposition and photon chemical vapor deposition methods for the synthesis of nanomaterials. **06**

Q.4 Answer the following.

a) Explain in detail the principle, construction, working and applications of transmission electron microscopy (TEM). **10**
b) Explain the principles with labeled diagrams of x-ray photoelectron microscopy (XPS) and scanning electron microscopy (SEM). **06**

Q.5 Answer the following.

a) Explain what are nanomaterial, their properties and applications in various fields. **10**
b) Explain in brief Czochralski method for the preparation of gallium and germanium. **06**

Q.6 Answer the following.

a) What is the principle of DSC? Describe the Heat flux DSC method. **10**
b) Give the details about instrumentation of TGA. **06**

Q.7 Answer the following.

a) What is Constructive interference phenomenon? Derive Bragg's equation. **10**
b) X-ray diffraction of copper has a face centered cubic structure, which is done using X- ray with a wavelength of 0.154nm. One peak is seen in XRD pattern at theta=21.6°. **06**
What are the miller indices for this peak?

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Seat No.		Set	P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
INDUSTRIAL CHEMISTRY
Industrial Management and Material Balance (MSC06408)

Day & Date: Sunday, 16-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

Q.1 A) Choose the correct alternatives from the options. **10**

1) Steam reforming is currently the least expensive method of producing _____.
   a) Hydrogen b) Coal
   c) Biogas d) Helium

2) Trans esterification process is the reaction of _____ with an alcohol.
   a) Triglyceride b) Fats and oil
   c) Glycerin d) Both a) and b)

3) A Solution contains 15% A by Mass (X_A = 0.15) Calculate the mass of A in 300 Kg of the solution.
   a) 35 Kg b) 30 Kg
   c) 45 Kg d) 50 Kg

4) A stream contains 20 g of oxygen gas, 70 g of nitrogen, 5 g of helium, and 5 g of hydrogen. Find the mass fraction of oxygen.
   a) 0.2 b) 0.3
   c) 0.4 d) 0.5

5) Which of the following is considered to be best pharmacopeia?
   a) IP b) USP
   c) BP d) PP

6) Which of the following is not an advantage of Incinerators?
   a) Waste are converted to harmless waste
   b) There is no commitment to long term containment of hazardous waste
   c) Ash from a hazardous waste incinerator must be disposed of in a secure landfill
   d) Incinerators handle most reactive wastes prohibited from landfills

7) Define Incompatible chemicals.
   a) Incompatible chemicals refer to chemicals that can react with each other randomly with evolution of heat or to produce flammable products or toxic products.
   b) Incompatible chemicals refer to reactants that can react with each other violently with evolution of water or to produce flammable products or toxic products.

c) Incompatible chemicals refer to chemicals that can react with each other violently with evolution of heat or to produce flammable products or toxic products.
d) Incompatible chemicals refer to chemicals that can react with each other violently with evolution of heat or to produce flammable products or non-toxic product.

8) _____ provide machinery on hire-purchase basis to small scale and ancillary industries, the value of which would not exceed Rs. 60 lakhs and Rs. 75 lakhs, respectively.
a) NSIC b) SSIC
c) IDBI d) Both a) and b)

9) Technology transfer activities for the transfer of technologies from industrial nations to less-developed countries, usually for the purpose of accelerating economic and industrial development in the poor nations of the world is _____.
a) International technology transfer
b) Private technology transfer
c) Developed to less developed
d) Public-private technology transfer

10) Differential type of balance usually applied to a _____.
a) Continuous process b) Batch process
c) Semi batch process d) Both b) and c)

B) Write true/false **06**

1) An Ancillary industrial undertaking shall mean an industrial undertaking in which the investment in fixed assets in plant and machinery, whether held on ownership terms or by lease or by hire purchase, does not exceed Rs 01 Crore.
a) True **b)** False

2) Small Scale Industry provide less scope for increasing employment with more investment.
a) True **b)** False

3) Applied research entails the activities used to gain knowledge with a specific goal in mind. The activities may be to determine and develop new products, policies, or operational processes.
a) True **b)** False

4) Flow work is the work done on the fluid at the system inlet minus work done by the fluid at the system outlet.
a) True **b)** False

5) The residual product discharged by the hydrogen-oxygen cell is carbon monoxide.
a) True **b)** False

6) According to the Factory Act 1948, working hours for men and women employee is 09 hours.
a) True **b)** False

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

a) Explain Biofuel and its economy.
b) Define and explain in brief the necessity of Recycle stream.

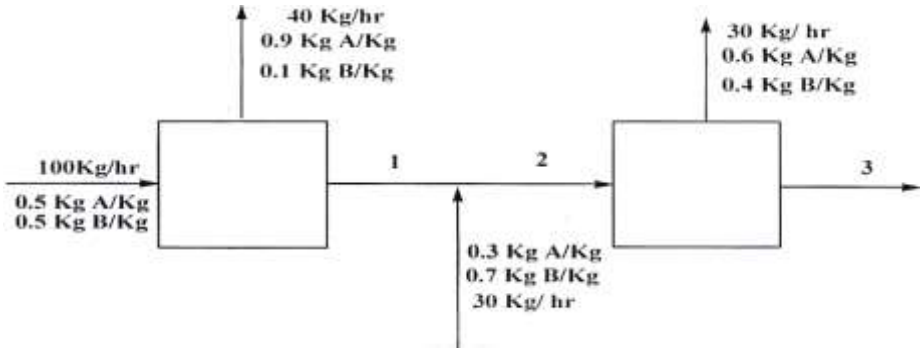
c) What is technology transfer? How is it transfer?
d) Explain pyrophoric chemicals with an example.

Q.3 Answer the following.
a) Discuss in details manufacturing process of Bio ethanol. **10**
b) Explain how solar energy is used as the source of energy. **06**

Q.4 Answer the following.
a) Define Patent. What is the procedure to obtain Patent? **10**
b) Explain with example p-chart in quality determination. **06**

Q.5 Answer the following. **16**
a) Discuss the rules and regulation for Transportation of Hazardous chemical waste. **08**
b) What is Pilot Plant? What is the purpose of Pilot Plant? **08**

Q.6 Answer the following.
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 t unknown flow rates & compositions of streams 1, 2, & 3. **10**



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) Define control chart. What are its advantages? **06**

Q.7 Answer the following.
a) What is the procedure to start Small scale Industry? **08**
b) One thousand kilograms per hour of a mixture of benzene (B) & toluene (T) containing 50% benzene by mass is separated by distillation into two fractions. The mass flow rate of benzene in top stream is 450 kg B/h & that of toluene in bottom stream is 475 kg T/h. The operation is at steady state. Write balances on benzene & toluene to calculate unknown component flow rates in output streams. **08**

SLR-SF-38

Seat No.	

Set P

M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2023
POLYMER CHEMISTRY
Fundamentals of Feedstocks and Polymers (MSC05301)

Day & Date: Monday, 10-07-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

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

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

1) Among the following which is IUPAC name of Nylon 6,6?
   a) Poly(imino hexamethylene imino sebacoyl)
   b) Poly(hexamethylene adipamide)
   c) Poly(imino hexamethylene imino adipoyl)
   d) Poly(hexamethylene sebasamide)

2) Which are the main components obtained in Cashew Nut Shell Liquid?
   a) Cardol b) Cardanol
   c) Anacardic acid d) All of these

3) Among the following, which is the main advantage of Continuous Process?
   a) Usually an induction period
   b) Easier operations and low cost
   c) Maintaining batch to batch uniformity
   d) Affects on glass transition temperature

4) Why polymer obtained with very high molecular weight in Interfacial polymerization?
   a) Diffusion control process
   b) Monomers having functional groups
   c) Two phases are immiscible
   d) All of these

5) Among the following, size of monomer droplets in suspension polymerization will depends upon?
   a) Type and speed of stirring
   b) Type and concentration of initiator
   c) Monomer to initiator ratio
   d) All of these.

6) Polymer containing uninterrupted series of rings connected by links around which rotation cannot occur, except bond breaking are known as?
   a) Branched polymers b) Semiladder polymers
   c) Ladder polymers d) Single strand polymers

7) Which polymer will form on reaction of monomers ethylene glycol with DMT?
   a) Poly(butylenes terephthalate)
   b) Poly(ethylene terephthalate)
   c) Poly(methylene isophthalate)
   d) Poly(ethylene isophthalate)

8) What is the requirements of monomer to undergo the bulk polymerization?
   a) Initiator is dissolve in monomer
   b) Monomer must be in liquid state
   c) Chain Transfer Agent is dissolve in monomer
   d) All of these

9) Temperature at which vapours of oil is sufficient to maintain the flame when oil is heated in standard apparatus, is known as?
   a) Fire Point
   b) Flash Point
   c) Smoke Point
   d) Spontaneous ignition temperature

10) Polymers can be repeatedly softened by heating and solidifies on cooling are known as?
   a) Thermosetting b) Thermoforming
   c) Thermoplastic d) Thermocrystals

B) Fill in the blanks Or Write True/False. **06**

1) In Step Growth Polymerisation only reactive center can monomer molecule one at a time. (True / False)
2) Polymers vulcanized into rubbery product exhibit good strength and elongation are termed as elastomers. (True / False)
3) Knocking characteristics of diesel oil are expressed in terms of Octane number. (True / False)
4) The trade name of phenol formaldehyde polymer synthesised by using acid catalyst is _____.
5) When there is chain transfer to polymer _____ type of polymer will form.
6) In solution polycondensation solvent may be act as _____ for byproduct and hence removal of byproduct is easy.

Q.2 Answer the following **16**

a) Discuss the theories associated with origin of petroleum.
b) Explain source based nomenclature system in polymers.
c) Discuss the Precipitation polymerisation technique with example.
d) Describe the mechanism of branching in polyethylene synthesis by high pressure method.

Q.3 Answer the following

a) Discuss the manufacturing, properties and applications of polystyrene. **10**
b) Explain the ladder and semiladder polymers with suitable examples. **06**

Q.4 Answer the following

a) Describe the use of benzene as a building block towards polymer industries. **10**
b) In detail explain the bulk polymerisation technique. **06**

Q.5 Answer the following

a) Discuss the use of CNSL as a raw material for various classes of polymers. **08**

b) In detail describe suspension polymerisation. **08**

Q.6 Answer the following

a) Describe the preparation process of poly(vinyl chloride) with their properties and application. **08**

b) Discuss the importance of ethylene as a building block for polymer industry. **08**

Q.7 Answer the following

a) Compare addition and condensation polymerisation with suitable example. **08**

b) Explain the batch, semibatch and continuous processes used for synthesis of commercial polymers. What are the limitations of these processes? **08**

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Seat No.	

Set P

M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2023
POLYMER CHEMISTRY
Morphology and Physical Chemistry of Polymers (MSC05302)

Day & Date: Tuesday, 11-07-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

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

Q.1 A) Multiple choice questions. (each will carry 1) 10

1) Photostabilisers are normally used to protect polymeric products of _____.
   a) Bright colours
   b) Non-staining
   c) Unwanted coloration or discolouration
   d) All of the above

2) Teflon is highly useful for domestic and industrial application because ___.
   a) it is very cheap material
   b) it is very chemical reactive
   c) it is chemically stable
   d) None of these

3) Spherulites are composed of _____.
   a) highly ordered lamellae b) amorphous regions
   c) only crystalline regions d) Both a) & b)

4) _____ are the biopolymers.
   a) Cotton b) Silk
   c) Cellulose d) All of these above

5) _____ is monodispersed systems.
   a) Alcohol b) Polyethylene
   c) Polypropylene d) Polystyrene

6) In GPC column is filled with a material called as _____.
   a) The Colum Powder silica b) Column silica
   c) Polymer beads d) None of the above

7) The physical mixture of two or more polymers that are not linked by covalent bonds is called _____.
   a) Oligomers b) Dendrimer
   c) Blends d) Copolymer

8) By XRD analysis of polymer _____ is estimated.
   a) thermal stability b) solubility
   c) crystallinity d) viscosity

9) The Tg of the polymer _____ on addition of plasticizer.
   a) Increases b) decreases
   c) is not affected d) suddenly increases

10) Fluid offer resistance to motion due to internal friction, this property is called _____.
   a) Viscosity b) Buoyancy
   c) Specific gravity d) Continuity

B) True or false OR fill in the blanks. **06**

1) In _____ analysis technique ΔT=0 is maintained.
2) The glass transition temperature of polymers shows transition from _____ to _____ state.
3) The viscosity-average molecular weight is denoted by _____.
4) _____ are used to protect the polymers from oxidation.
5) White synthetic garment becomes yellowing after long use is due to the _____.
6) GPC is used to determine _____ and _____ types of molecular weight

Q.2 Answer the following. (any four each will carry 4) **16**

a) Write a note on number average molecular weight of polymers.
b) What is the principle of DSC? Describe Heat flux DSC method?
c) Write a note on Inherent viscosity of polymers.
d) What is UCST behaviour of polymer solutions?

Q.3 Answer the following. (each will carry 8) **16**

a) Describe in brief theory, working principal about the Thermo mechanical analyser (TMA) with diagram.
b) Describe in brief theory working principal about the vapour pressure osmometry instrument with diagram.

Q.4 Answer the following. (each will carry 8) **16**

a) Describe in brief theory, working principal about the light scattering instrument with diagram.
b) Write a detailed note on various factors affecting the glass transition temperature (Tg) of polymers.

Q.5 Answer the following. (each will carry 8) **16**

a) Describe in brief theory, working principal about the gel permeation chromatography of polymer molecular weight analysis instrument with diagram.
b) Write a detailed note on end group analysis methods of polymers.

Q.6 Answer the following.

a) Describe in detail the Huggins and Kraemer equation. **10**
b) Write a brief note on amorphous phase of polymers with suitable diagram. **06**

Q.7 Answer the following.

a) Describe in brief theory, working principal about the Ultracentrifugation of polymer molecular weight analysis instrument with diagram. **10**
b) Write a note on thermal oxidation of polymers with suitable example. **06**

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Seat No.	

Set P

M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2023
POLYMER CHEMISTRY
Basic Concepts of Polymerization (MSC05306)

Day & Date: Wednesday, 12-07-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

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

Q.1 A) Choose correct alternatives. (MCQ)- (each will carry 1 mark) **10**

1) ____ is used as the redox initiators.
   a) Co^{2+} b) KCO_3
   c) CO d) CO_2

2) ____ is used for initiation of monomer to polymer.
   a) Heat or Light b) Electromagnetic radiation
   c) Initiator d) All of the above

3) The decomposition rate of initiator depends on _____.
   a) Chemical nature b) Temperature
   c) Solvent d) All of the above

4) _____ is used for analysis of Co-polymers.
   a) AAS
   b) Conductometry
   c) Radio isotopic labelling technique
   d) potentiometry

5) The terpolymer is formed by _____.
   a) Alternating monomer addition
   b) Multicomponent monomer addition
   c) Random monomer addition
   d) None of above

6) ____ is the driving force for ring opening reaction.
   a) Elasticity b) Van der wall force
   c) Ring strain d) None of these

7) Cyclosiloxanes are polymerized by _____.
   a) Condensation b) Substitution
   c) Ring opening d) Addition

8) ____ Initiator is used in anionic ROP of cyclic siloxanes.
   a) Protonic acid b) Metal halide
   c) Alkali metal hydroxides d) Transition metal oxide

9) Heck reaction of unsaturated halide or alkyl halide with an olefin or substituted olefin takes place in the presence of ____.
   a) Base and Pd catalyst b) Acid and Pd catalyst
   c) Base and Ru catalyst d) Acid and Pt catalyst

10) ____ are starting monomer in addition polymerization.
   a) Diacid and diol b) Ethylene monomer
   c) Styrene monomer d) Both b and c

B) Fill in the blanks OR Write true/false **06**

1) ____ is an example of the inhibiter.
2) Photoelectric effect was discovered by ____.
3) Ethenolysis is _____.
4) ____ is computed or calculated for reactivity ratio of various monomer.
5) _____ is the driving force for ring opening reaction.
6) Condensation polymerization is also called as _____.

Q.2 Answer the following **16**

a) Explain the thermal initiation polymerization.
b) Explain the Group transfer polymerization.
c) Give the examples and applications of commercially available copolymers.
d) Write the ADMET reaction.

Q.3 Answer the following

a) Discuss the photochemical initiation. **08**
b) Explain the copolymerization behavior (ideal r1, r2 = 1). **08**

Q.4 Answer the following

a) Explain the Kinetics of cationic polymerization. **08**
b) Explain the Structural arrangement of monomer units. **08**

Q.5 Answer the following

a) Distinguish between addition and condensation polymerization. **08**
b) Explain the Copolymer composition and Copolymerization equations **08**

Q.6 Answer the following

a) Explain the Suzuki coupling reaction with example. **08**
b) Explain the Ring opening polymerization mechanism of cyclosiloxanes. **08**

Q.7 Answer the following

a) Explain the Kinetics of condensation polymerization in presence of catalyst. **08**
b) Explain the Ring opening polymerization mechanism of cyclic ethers. **08**

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Seat No.	

Set P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
POLYMER CHEMISTRY
Step – Growth Polymers (msc05401)

Day & Date: Monday, 10-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

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

1) Kevlar has strong hydrogen bonding due to _____.
   a) aromatic structure b) non-linear structure
   c) linear structure d) branched structure

2) Epichlorohydrin can be prepared from _____.
   a) alkyl halide, H_2O b) Propylene gas, CH_4
   c) Propylene gas, Cl_2 d) alkyl halide, Cl_2

3) Polyphenylene oxide is an _____.
   a) aromatic polyether b) aliphatic polyether
   c) aromatic polyester d) aliphatic polyester

4) The crosslinked epoxy resin is obtained by using _____.
   a) 1^o mine b) 2^o mine
   c) anhydride d) All of these

5) The polyurethane is prepared by which of the following method.
   a) Interfacial method b) Solution method
   c) Suspension method d) Both a and b

6) The polysulfone resin obtained from bis-phenol-A have a trade name _____.
   a) VICTRES b) CALIBRE
   c) MERLON d) UDEL

7) During the formation of PF resin, when the methylol group reacted with another methylol group of phenol gives _____ bridge.
   a) an amide b) an ester
   c) an imide d) an ether

8) In ester interchange reaction of forming polycarbonate the rate of reaction is controlled by _____.
   a) removal of byproduct phenol
   b) adding NaOH in the reaction mixture
   c) adding KOH in the reaction mixture
   d) removal of byproduct acetone

9) The phenol is produced by which of the following method.
   a) Hocks process b) Rasching process
   c) Cumene process d) All of these

10) Celanex is the trade name of which of the following method.
a) PBT b) PTT
c) PET d) PEN

B) Fill in the blanks. (Each question carry one mark) **06**

1) Alkyd resin is also called as _____ resin.
2) _____ polymer has five times greater strength than steel.
3) _____ is used as an alternative source of phosgene gas.
4) _____ polymer is synthesised by reacting diisocyanate with diol.
5) The reaction of catechol with _____ in the presence of pyridine as catalyst gives polyparaphenylene.
6) The polyimide is prepared by using _____ and _____ monomer.

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

a) Define polyester. Give an example of formation of unsaturated polyester.
b) Write down the mechanism of preparation of monomers required for synthesis of PEN.
c) Describe the synthesis of ω - amino undecanoic acid.
d) Discuss the effect of hydrogen bonding on structure of Nylon.

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

a) Explain cross polycondensation and self-polycondensation mechanism of polysulfone and give its applications.
b) Discuss Hock process and sulfonation process for manufacture of phenol.

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

a) Explain the Interfacial and Solution polymerization method of polyurethane and give its applications.
b) What is Sarona? Explain the fermentation process for formation of propylene diol and direct method of DMT formation.

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

a) Write down the mechanism of formation of Epoxy resin with its monomer synthesis.
b) Give the synthesis of Polybenzimidazole (PBI). Write down the advantages of using diphenyl ester instead of acid.

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

a) Discuss the Solution and interfacial methods of polycarbonate.
b) What is PEEK? Write down its synthesis.

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

a) Describe the formation of cyclic saturated melamine structure in synthesis of UF resin.
b) Define Aramide. Discuss the synthesis of Kevlar and its applications.

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Seat No.		Set	P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
POLYMER CHEMISTRY
Stereoregular Polymers and Modern Polymerisation Methods
(MSC05402)

Day & Date: Wednesday, 12-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

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

1) In which the model terminal monomer unit is important in determining polymer stereochemistry?
   a) Ostwald Model b) First-Order Markov model
   c) Bernoullian Model d) Ziegler Model

2) Which is most commonly used catalyst in Atom Transfer Radical Polymerization?
   a) Copper b) Titanium
   c) Silicon d) Vanadium

3) Relative Configuration is denoted by which letters?
   a) E and Z b) D and L
   c) R and S d) P and Q

4) What type of insertion will occur when the unsubstituted end of the double bond carries the partial negative charge and is attached to the counterion G?
   a) Primary insertion b) Secondary Insertion
   c) Tertiary insertion d) Quaternary insertion

5) How many chiral centers are present in repeating unit of poly (vinyl alcohol)?
   a) Four b) Three
   c) Two d) One

6) Why, Gallium compounds have received little attention in the synthesis of Z-N Initiators?
   a) Availability b) Expensive
   c) Toxicity d) Solubility

7) What is full form of RAFT Polymerization?
   a) Reserve Addition-Fragmentation chain Transfer Polymerization
   b) Reversible Atom -Fragmentation chain Transfer Polymerization
   c) Reversible Addition-Fragmentation chain Transfer Polymerization
   d) None of above

8) Among the below what is the correct meaning of chiral carbon?
   a) Carbon attached to one different substituent
   b) Carbon attached to two different substituents
   c) Carbon attached to three different substituents
   d) Carbon attached to four different substituents

9) In two phase morphology block copolymers shows how many Tg's?
   a) One b) Two
   c) Three d) Four

10) Number average molecular weight of styrene-butadiene block copolymers can be determined by which of the following method?
   a) Membrane Osmometry b) Light Scattering
   c) Ultracentrifugation d) Viscometry

B) Fill in the blanks OR Write true/false. **06**

a) Write true/false.

1) When RI > RP narrow MWD will obtained in the synthesis of styrene-butadiene diblock copolymer?
2) In terms of the nomenclature used for stereo regular polymers, cellulose has Threodisyndiotactic structure?
3) In Ziegler-Natta polymerizations Titanium-Lithium initiator system has the major interest for isoselective polymerization?

b) Fill in the blanks.

1) In ether-ester (AB)n multiblock copolymer the polyester hard block provides physical crosslink effect and soft polyether block provides ____.
2) On polymerization of isobutylene monomer _____ number of stereoisomers will obtain.
3) _____ Scientist has proposed the Bimetallic mechanism which has gain more importance.

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

a) Discuss the chemical nature of propagating species in Z-N mechanism.
b) Discuss the R and S nomenclature system.
c) Discuss the synthesis and applications of styrene-butadiene diblock co-polymer.
d) Explain in brief, why propagation at carbon transition metal bond in Z-N Polymerization?

Q.3 Answer the following.

a) Discuss the stereoisomerism in polymerisation of 1, 3- butadiene monomer. **10**
b) Explain the mechanism of ionic and co-ordination polymerization **06**

Q.4 Answer the following.

a) Explain the monometallic mechanism of Z-N polymerisation with the help of nonpolar vinyl monomers. **10**
b) Give an account on Atom Transfer Radical Polymerisation. (ATRP) **06**

Q.5 Answer the following.

a) Describe the stereochemistry of polymers derived from polymerisation of monomer containing true chiral centre. **08**
b) Which conditions are required for living / controlled radical polymerisation to control molecular weight and dispersity? Discuss its applications. **08**

Q.6 Answer the following.

a) Discuss the various Stereoregular polymers obtained on polymerization of cyclopentene. **08**
b) Explain the synthesis, properties and applications of (ABA) triblock co-polymer. **08**

Q.7 Answer the following.

a)	Discuss the synthesis of (A-B)n multiblock copolymer.	**08**
b)	Explain the stereospecific polymerisation of MMA.	**08**

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Seat No.	

Set P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
POLYMER CHEMISTRY
Selected Topics in Polymers (MSC05403)

Day & Date: Friday, 14-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

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

1) The electron beam induces crosslinking of_____.
   a) PE b) PVC
   c) PC d) All of these

2) Bioconjugation occurs in_____>
   a) cell division b) click" chemistry
   c) bio-chemistry d) both b and c

3) Potassium Oleate is added to the latex compound to _____.
   a) improve the tackiness
   b) increase the viscosity of latex
   c) stabilize the latex
   d) cheapen the latex

4) Plastic & rubbers are _____ polymers.
   a) conducting b) non-conducting
   c) semi-conducting d) None of these

5) For oxidative doping _____ can be used.
   a) Lewis acid b) Lewis base
   c) Arhenious acid d) Arhenious base

6) Which of the following is not an application of conducting polymers?
   a) rechargeable batteries b) analytical sensors
   c) electronics d) adhesives

7) Nematic liquid crystal polymer shows_____.
   a) proper arrangement of molecules
   b) no any proper arrangement of molecules
   c) only some molecules are sequency arranged
   d) none of these

8) Polymer composites are used in_____.
   a) automobile b) aerospace
   c) satellite d) all of these

9) The hydrogel absorbs significant amount of water because it contains _____ functional group.
   a) hydrophobic b) polar
   c) positively charged d) hydrophilic groups

10) Which of the following is necessary in tissue engineering?
   a) cells b) biomaterial scaffolds
   c) growth factor d) all of these

B) Fill in the blanks (each question carries 1 mark) **06**

1) H_2SO_4 catalyst is used for the Polystyrene _____ reaction.
2) _____ is used as cigarette filters.
3) The art and science of producing pattern on substrate is known as _____.
4) The reductive doping is called _____ type of doping.
5) _____ catalyst is used to obtain polybutadiene of cis content <40%.
6) Polyethylene is treated with a mixture of chlorine and sulfur dioxide under UV-radiation which _____ as the by product.

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

a) Explain in short polymer blends and alloys.
b) Explain polystyrene modification by hydrogenation and sulfonation.
c) Write a note on polymer supported reagent.
d) Explain the manufacturing and physical properties of synthetic rubbers such as Nitrile.

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

a) Explain in short Rubber additives including fillers, colorants and pigments, antioxidants and stabilizers.
b) How does the solid-phase synthesis of polypeptides occur? Discuss advantages of Polymer Reagents.

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

a) Importance of polymer nanoparticles and characterization of polymer nanostructure.
b) Explain in short Waste polymer recovery, sortation, microsortation, polymer reprocessing.

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

a) Explain in detail silicone resins.
b) Explain the esterification and etherification of cellulose.

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

a) Explain the natural rubber modification by chlorination and epoxidation.
b) Explain the use of polymers in medicine and give its biomedical applications

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

a) Explain the blowing agents, lubricants and mold release agents.
b) Explain the PE modification by grafting and radiation crosslinking.

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Seat No.		Set	P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
POLYMER CHEMISTRY
Processing Technology and Polymer Properties (MSC09408)

Day & Date: Sunday, 16-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

Q.1 A) Choose the correct alternatives from the options. **10**

1) In plastics processing role of additive is to _____.
   a) increase the strength of plastics
   b) decrease the strength of plastics
   c) increase the volume of plastics
   d) all of above

2) The _____ process has the following cycles clamping, heating, forming, cooling and removal of the sheet.
   a) Injection molding b) Compression molding
   c) Thermoforming molding d) Transfer molding

3) The bottles, barrels and other liquid containers are especially manufactured by _____.
   a) Extrusion molding b) calendaring molding
   c) Blow molding d) All of the above

4) Flexural strength is also known as _____ strength.
   a) Tear b) Bending
   c) Ionic d) All of the above

5) Izod impact test or Charpy impact test are used for measuring the _____.
   a) Tear strength b) Impact strength
   c) Flexural strength d) Compressive strength

6) The acid value depends on the consumption of _____ in the titrimetric analysis.
   a) mg of NaOH b) mg of HCl
   c) mg of CH_3-COOH d) All of the above

7) Infrared Spectroscopy is used for the _____.
   a) Identification of polymer type
   b) Identification of H1 Proton
   c) Identification of functional groups
   d) Identification of polymer thermosetting

8) Bulk density is _____.
   a) The weight per unit mass
   b) The weight per unit Kilogram
   c) The weight per unit volume of material
   d) All of the above

9) The water absorbing materials are _____.
   a) Plastic based b) Rubber based
   c) Cellulosic or fiber-based d) All of the above

10) Dielectric loss factor of the polymer depends on _____.
   a) Polarization in space charge region
   b) Dielectric constant
   c) Porosity
   d) All of the above

B) Fill in the blanks **06**

1) _____ is the example of good insulator polymer.
2) Light reflection, absorption, scattering is observed in _____.
3) Fishy smell occurs during burning test for _____.
4) The burst threshold test is used for _____.
5) In Non Newtonian fluid stress strain, curve is _____.
6) The strength of the polymer increases with _____ in molecular weight.

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

a) Describe testing procedure for tires and adhesive.
b) Explain dielectric strength and dielectric loss factor.
c) Explain rotational molding process with neat labeled diagram.
d) Explain the rheological state equation.

Q.3 Answer the following.

a) Describe in detail HDT and MFI. **08**
b) Draw neat labeled diagram and explain in detail injection molding. **08**

Q.4 Answer the following.

a) Describe in detail Izod impact test. **08**
b) Explain the factors affecting mechanical spectra. **08**

Q.5 Answer the following.

a) Difference between ideal Newtonian and Non Newtonian fluid. **08**
b) Explain in detail with neat labeled diagram of calendaring molding. **08**

Q.6 Answer the following.

a) Explain the glow haze and yellowness index. **08**
b) Explain its general features of twin-screw extruder with neat labeled diagram. **08**

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

a) Difference between injection molding and thermoforming
b) Describe the flow properties of viscoelastic polymers.

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Seat No.	

Set P

M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2023
PHYSICAL CHEMISTRY
Quantum Chemistry (MSC11301)

Day & Date: Monday, 10-07-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

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

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

1) Hamiltonian operator for simple harmonic oscillator, H = _____.
   a) $p^2/2m$ b) $^1/_2\, kx^2$
   c) $p^2/2m + {}^1/_2\, kx^2$ d) $^1/_2\, kx$

2) The concept of matter wave was suggested by _____.
   a) Heisenberg b) de Broglie
   c) Schrodinger d) Bohr

3) The characteristics properties of waves are _____.
   a) reflection b) refraction
   c) interference d) all of these

4) $\int \Psi i \Psi j = 1$, if _____.
   a) $i = j$ b) $i \neq j$
   c) $i = 0$ d) $j = 0$

5) The splitting of the atomic orbitals in a magnetic field. This effect is referred as _____.
   a) Stark effect b) Zeeman effect
   c) Compton effect d) photoelectric effect

6) The zero point energy of a particle in three dimensional box is _____.
   a) $1\mathrm{h}^2/8\mathrm{mL}^2$ b) $2\mathrm{h}^2/8\mathrm{mL}^2$
   c) $3\mathrm{h}2/8\mathrm{mL}2$ d) $^1/_2\, \mathrm{h}^2/8\mathrm{mL}^2$

7) _____ is/are the approximate methods that are used to obtain solutions to almost any degree of accuracy in quantum mechanics.
   a) Variation method b) Perturbation theory
   c) both (a) and (b) d) Planck's equation

8) In photoelectric effect, electrons should be removed from the _____.
   a) inner shells b) surface
   c) from core d) the nucleus

9) The energy levels of butadiene are $\alpha + 2\beta$ and $\alpha + \beta$. The delocalization energy in butadiene is _____.
   a) 0 b) 1.12β
   c) 4.47β d) 0.47β

10) The degeneracy of an excited state of a particle in three dimensional cubical box with energy 2 times its ground state is _____.
   a) 3 b) 2
   c) 1 d) 4

B) Fill in the blanks OR Write true/false **06**

1) The Rayleigh Jean's equation obeys at higher wavelength only. [True / False]
2) The overlap integrals in Huckel molecular orbital theory is always taken as unity. [True/False]
3) The Hook's law is expressed as _____.
4) According to Stefan-Boltzmann law, the total energy emitted by the black body is proportional to _____.
5) The value of Rydberg's constant R is _____cm^{-1}
6) The condition for orthogonality is _____.

Q.2 Answer the following **16**

a) Sketch Ψ and Ψ^2 for the states $n = 2$ and $n = 3$ of a particle in one dimensional box.
b) Evaluate the commutator $[x, d/dx]$
c) Write on Heisenberg's uncertainty principle.
d) Give basic assumptions of Bohr's atomic theory.

Q.3 Answer the following

a) Using Huckel Molecular Orbital approach, evaluate the molecular orbital coefficients for wavefunctions of ethylene molecule. **08**
b) Show that a trial function that depends linearly on the variational parameters leads to a secular determinant. **08**

Q.4 Answer the following

a) What is Compton effect? Derive the expression for Compton shift. **08**
b) Estimate the average position of a particle $< x >$ and $< x^2 >$ in one dimensional box. **08**

Q.5 Answer the following

a) Describe quantum mechanical approach of photoelectric effect. **08**
b) Solve the radial part of the Schrodinger equation for hydrogen atom. Give its solution. **08**

Q.6 Answer the following

a) Derive the expression for momentum (p) and total energy operator (H). **08**
b) Estimate the wavelength of a particle having mass 160 g moving with 150 km/hr. compare this with the wavelength of an electron having mass $9.11 \times 10^{-28}\ g$ and velocity $3 \times 10^{8}\ m/s$. **08**

Q.7 Answer the following

a) Write on basic postulates of quantum mechanics. **08**
b) What do you mean by normalized wave function? Normalize the wave function, $\Psi = N \sin(n\pi x/L)$, within the limit $x = 0$ to $x = L$ and find out the normalization constant N. **08**

SLR-SF-53

Seat No.	

Set P

M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2023
PHYSICAL CHEMISTRY
Electrochemistry (MSC11302)

Day & Date: Tuesday, 11-07-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Question 1and 2 are compulsory.
2) Attempt any Three from Q.3 to Q.7.
3) Figure to right indicate full marks.

Q.1 A) Choose the correct alternatives from the given options. **10**

1) According to coulombs law forces acting between positive and negative ions present in solutions is by the equation F = _____.
   a) $\epsilon_1.\epsilon_2/D.r^2$ b) $\epsilon_1 + \epsilon_2/D.r^2$
   c) $\epsilon_1 - \epsilon_2/D.r^2$ d) $D.r^2/\epsilon_1.\epsilon_2$

2) The time for which the decay of old ionic atmosphere lags behind the formation of new one is called _____ time.
   a) relaxation b) half life
   c) full life d) all of these

3) $\wedge = \wedge_0 - (A + B \wedge_0)\sqrt{c}$ This conductance equation is known as _____ equation.
   a) Debye - Huckel –Bronsted
   b) Debye - Huckel - Onsager
   c) Debye –Bronsted
   d) Debye – Huckel

4) The concept of association of ions to form ion pairs was introduced by the scientist _____.
   a) Bjerrum b) Grotthus
   c) Falkenhagen d) Onsager

5) The difference between the observed decomposition potential and theoretical decomposition potential is known as _____.
   a) electrolysis b) electroforming
   c) polarization d) Oxidation

6) The relation between over voltage and current density $(\omega = a + b \log I)$ was derived by the scientist _____.
   a) Born b) Tafel
   c) Bjerrum d) Wien

7) Debye-Uuckel limiting law for the mean activity coefficient of an electrolyte is _____.
   a) $\log f\pm = -A\, z_+\, z_-\, (\mu)^{1/2}$ b) $\log f\pm = -A\, z_-\, z_-\, (\mu)^{1/2}$
   c) $\log f\pm = -A\, z_+\, z_+\, (\mu)^{1/2}$ d) $\log f\pm = +A\, z_+\, z_-\, (\mu)$

8) The equation used for estimating the electrostatic component of Gibbs free energy of solvation of an ion is _____.
   a) Gibbs free energy equation
   b) Born equation
   c) Arrhenius equation
   d) All of these

9) When the dispersed particles move under the influence of either gravity or centrifugation in a medium is known as _____.
   a) Sedimentation potential b) Streaming potential
   c) Decomposition potential d) Discharge potential

10) For H_2O_2 fuel cell $\Delta G°$ = _____.
   a) -237.2 kJ/mole b) -500 kJ/mole
   c) 327.2 kJ/mole d) -100 kJ/mole

B) Fill in the blanks OR write true/false. **06**

1) The mobile phase in electrosmosis is _____.
2) According to Faraday's first law of electrolysis, the amount of deposition on cathode is directly proportional to current applied. [True/False]
3) The expression for Tafel equation is _____.
4) The over voltage increases with increase in _____.
5) The movement of liquid through the pores of a diaphragm under the influence of an applied E.M.F. The phenomenon is known as _____.
6) In fuel cells oxidation occur at _____.

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

a) Write a note on Debye- Falkenhagen effect.
b) Discuss Bjerrum theory.
c) Explain the electrotyping process.
d) Calculate the thickness of ionic atmosphere for 1:1 electrolyte in water (D = 78.6) at 1 and 0.001 moles at 25°C and comment on the result.

Q.3 Answer the following.

a) Mention different methods of determination of heats of hydration. Discuss the Bernal and Fowler method in detail. **08**
b) Describe the construction and working of hydrogen-oxygen fuel cell developed by Apollo systems. **08**

Q.4 Answer the following.

a) Derive the expression for Debye-Huckel-Onsage equation. **08**
b) What is zeta potential? Explain the effects of electrolytes on the zeta potential. **08**

Q.5 Answer the following.

a) Describe the electrochemical nature of corrosion. **08**
b) Discuss the Helmholtz-Perrin theory of electrical double layer with its limitations. **08**

Q.6 Answer the following.

a) What is activity coefficients? Write different forms of activity coefficients and give their inter relationships. **08**
b) What is Pourbaix diagram? Give its significance in corrosion study. **08**

Q.7 Answer the following.

a) Describe abnormal ionic conductance of OH- and H+ ions in water media. **08**
b) Derive Tafel equation for electrode kinetics. Explain the terms involved in it. **08**

SLR-SF-54

Seat No.	

Set P

M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2023
PHYSICAL CHEMISTRY
Molecular Structure-I (MSC11306)

Day & Date: Wednesday, 12-07-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

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

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

1) All the symmetry operation in a molecule can be combined to form a molecular group is called as _____
   a) class b) point group
   c) sub group d) conjugate

2) Phosphorus pentachloride, PCl_5 is a trigonal bipyramidal molecule. To what point group does it belong?
   a) D_{3v} b) D_{3h}
   c) C_{3h} d) C_3

3) Joules can be converted to cm^{-1} _____.
   a) Multiply by h b) Multiply by hc
   c) Divide by h d) Divide by hc

4) The different type of energies associated with a molecule are ____.
   a) Vibrational energy b) Electronic energy
   c) Rotational energy d) All of these

5) The overtone and combination band arise in ____ molecule.
   a) Mono atomic b) Diatomic
   c) Polyatomic d) Double bond

6) O_2 molecule show Raman spectra since their vibration is accompanied by a change in _____ of the molecule.
   a) Polarizability b) Spin
   c) Mass d) dipole

7) Birge-Sponer extrapolation is used to determine _____energy of molecule.
   a) Predissociation b) Dissociation
   c) Transition d) infinite

8) Electronic spectra is observed in ____ region.
   a) Radio wave b) IR
   c) X-ray d) UV and visible

9) How many vibrational modes are possible for HCI?
   a) 0 b) 1
   c) 2 d) 3

10) For Oblate symmetric top molecule ____.
   a) $I_b = I_c < I_a$ b) $I_b = I_c > I_a$
   c) $I_b = I_c = I_a$ d) $I_a = 0$

B) Fill in the blanks OR Write true/false **06**

1) A cyclic group is always _____.
2) How many degrees of freedom does a chemical compound of N atoms?
3) The selection rule for a pure rotational transition is ΔJ = _____
4) In CO_2 molecule which mode of vibration is IR inactive?
5) A monoid is always a _____.
6) If %T = 80 the absorbance is _____.

Q.2 Answer the following **16**

a) What is point groups? Illustrate with examples.
b) Write note on: The Stark effect.
c) Write note on: Overtone and combination frequencies.
d) Discuss the electronic spectrum of helium atom.

Q.3 Answer the following

a) Explain diagrammatically that H_2O molecule is Abelian whereas NH_3 molecule is non-Abelian. **06**
b) What mean by rigid and non-rigid molecule? Discuss rotational spectra and selection rules of rigid diatomic linear molecules. **10**

Q.4 Answer the following

a) Describe the concept of polarizability in Raman scattering. **06**
b) Write notes on: **10**
1) Birje-Sponer extrapolation
2) The Fortrat diagram

Q.5 Answer the following

a) What is spectroscopy? Define frequency, wavelength and amplitude of electromagnetic radiation. **06**
b) Describe in brief rotational fine structure of electronic-vibration transitions. **10**

Q.6 Answer the following

a) Calculate the reduced mass and the moment of inertia of D^2Cl^{35}, given that the bond length of the molecule is 127.5×10^{-12} m. The masses of D^2 and Cl^{35} are 2.01410 and 34.96885 amu. Respectively. **06**
b) Discuss the theory of pure rotational Raman spectra of linear molecule. Sketch the energy levels and the spectrum arising from transition between them. **10**

Q.7 Answer the following

a) Describe the effect of breakdown of Born-Oppenheimer approximation on P and R branches of the IR spectrum of a diatomic molecule. **06**
b) Explain the constructions of character table for point groups from Great Orthogonality Theorem. **10**

SLR-SF-56

Seat No.	

Set P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
PHYSICAL CHEMISTRY
Statistical Mechanics and Irreversible Thermodynamics (MSC11401)

Day & Date: Monday, 10-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

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

1) The electrons in an atom which rotate about the nucleus possess what kind of energy?
   a) Translational energy b) Spin energy
   c) Sensible energy d) Rotational kinetic energy

2) All phase transformation processes are the constant _____ processes.
   a) pressure b) volume
   c) mass d) energy

3) The property, entropy, is _____.
   a) additive
   b) extensive
   c) both additive and extensive
   d) intensive

4) Bose-Einstein statistics is for the _____.
   a) distinguishable particles
   b) antisymmetrical Particles
   c) Particles with half integral spin
   d) Particles with integral spin

5) The magnitude of the vibrational partition function is of the order of ____.
   a) 10^2 to 10^4 b) 10 to 10^2
   c) 1 to 10 d) 10^{30} to 10^{32}

6) Which of the following is/are phenomenological law?
   a) Fick's law b) Fourier's law
   c) Ohm's law d) all of these

7) Which of the following is/are exact differentials?
   a) dE b) dG
   c) dS d) all of these

8) The Debye characteristic temperature is expressed as _____.
   a) $\theta_D = hv/T$ b) $\theta_D = hv \times T$
   c) $\theta = hv/k$ d) $\theta_D = hv \times k$

9) μ, T and V parameters remain same in the _____ ensemble.
   a) canonical b) microcanonical
   c) grand canonical d) both (a) and (b)

10) The potential difference per unit pressure difference in the state with zero electric current is defined as _____.
   a) streaming potential
   b) electro osmosis
   c) streaming current
   d) electro osmotic pressure

B) Fill in the blanks OR Write True/False. **06**

1) Streaming potential is reverse to _____.
2) Symmetry number for homonuclear diatomic molecules is _____.
3) All translational energy levels are non-degenerate. (True/False)
4) The entropy change in irreversible process is always greater than zero. (True/False)
5) Light photons follow _____ statistics.
6) As $\mathrm{T} \rightarrow 0, \mathrm{Cv} \rightarrow$ _____.

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

a) Discuss conservation of energy in an open system.
b) 5 quanta of energy shared among 5 hormonic oscillators. Estimate the possible configurations and total number of microstates associated with this system.
c) Illustrate the concept of Legendre transformations with suitable examples.
d) What is microstate? Estimate the number of possible microstates for an atom having nonequivalent configuration np^1d^1.

Q.3 Answer the following.

a) Derive Sackur - Tetrode equation. Using that equation calculate S_{trans} of Argon gas at 300 K and 1 atm pressure (Given - Mass of Ar is 39.9 g/mol). **08**
b) Explain how third helps in calculation of absolute entropy of gasous substance law of thermodynamics. **08**

Q.4 Answer the following.

a) Derive the values of α and β involved in classical Maxwell-Boltzmann distribution law. **08**
b) Describe Onsager's theory of microscopic reversibility. **08**

Q.5 Answer the following.

a) Discuss in brief Debye specific heat theory for solids. **08**
b) Establish the relation between partition function Q_{tranS} and the thermodynamic properties like S and E. **08**

Q.6 Answer the following.

a) Derive an expression for Bose-Einstein statistics. **08**
b) Derive an expression for rotational partition function. **08**
The rotational constant for HCl is $8.24\ \mathrm{cm}^{-1}$. Calculate rotational partition function for HCl at $300\ K$. $(\sigma = 1)$

Q.7 Answer the following.

a) What is entropy? Derive the expressions for the change in entropy during the various physical transformations. **08**
b) If $E = f(T, V)$ and dE is an exact differential then prove that **08**
$(dE/dV)_T = T\,(dP/dT)_v - P$
[Given: $dq = dE + Pdv$ and $1\ /\ (T$ is an intergrating factor)]

SLR-SF-57

Seat No.	

Set P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
PHYSICAL CHEMISTRY
Chemical Kinetics (MSC11402)

Day & Date: Wednesday, 12-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

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

1) In the sequence of reactions A $\xrightarrow{k1}$ B $\xrightarrow{k2}$ C $k1$ is greater than $k2$, then the determining step is _____.
   a) B → C b) A → B
   c) A → C d) Both a) & b)

2) For first order reaction A Products $t_{1/2}$ is 100 s, the rate constant of the reaction is _____.
   a) 6.9 X 10^{-2} s^{-1} b) 6.9 X $I0^{-4}$ s
   c) 6.9 X 10^{-3} s^{-1} d) 69.0 X 10^{-2} s^{1}

3) Potential energy of the reactant is higher than the potential energy of the product, then the reaction is _____.
   a) exothermic b) Endothermic
   c) Spontaneous d) chain

4) Which of the following will not increase the rate of reaction?
   a) raising the temperature
   b) increasing the concentration of the reactant
   c) increasing the volume of the container a gaseous reaction
   d) increasing the surface are of a solid reactant

5) The reaction A + B + C → Products is followed the rate law as, $r = -d[A]/dt = k [A]^2 [B]^{3/2} [C]^{-1/2}$ The overall order of reaction is ____.
   a) 3/2 b) 7/2
   c) 3 d) 5/2

6) If for a reaction the plot of In k verses 1/T gives a straight line, then _____.
   a) E_a = - (slope) x R b) E_a = (slope) x R
   c) slope = R x E_a d) R = slope x E_a

7) Enzyme catalyzed reaction is faster than a metal catalyzed reaction because its activation energy is ____.
   a) greater than that of metal catalyzed reaction
   b) same as that of metal of metal catalyzed reaction
   c) less than that of metal catalyzed reaction
   d) all of the above

8) The activation energy for the first propagation step of H_2-I_2 reaction is very _____ compared to that of H_2- Br_2 and H_2- CI_2 reaction.
   a) High b) Low
   c) Same d) Both a & b

9) An iodine molecule requires _____ energy to form free atoms or radicals than bromine or chlorine molecules.
   a) Less b) High
   c) No d) Both a & b

10) During decomposition of an activated complex _____>
   a) energy is always released b) energy is always absorbed
   c) energy does not change d) all of these

B) Fill in the blanks OR Write true/false **06**

1) A reaction in which all reactants are in the same phase is called _____ reaction.
2) Nuclear disintegration follows _____ order kinetics.
3) The role of catalyst in a chemical reaction is to change the _____.
4) The reaction which proceed in a series of successive stages initiated by suitable primary process is called _____.
5) The rate constant of a reaction is 5.8×10^{-2} s^{-1}. The order of the reaction is _____.
6) Minimum energy required for molecule to react is called ____ energy.

Q.2 Answer the following **16**

a) Assumptions made in activated complex theory.
b) Can the activation energy of a reaction be zero or negative? explain.
c) General aspects of chain reaction.
d) What do you mean by chain length?

Q.3 Answer the following

a) Illustrate the kinetics of first order reaction opposes by first order reaction. **10**
b) The rate constant for the first order decomposition of ethylene oxide in to CH_4 and CO may be described by **06**

$\log k(s^{-1}) = 14.35 - (1.25 \times 10^4 \text{ K} / T)$

i) What is energy of activation?
ii) What is the value of k at 670 K?

Q.4 Answer the following

a) Give the basic steps of chain reaction. Show that for the reaction $CH_3CHO_{(g)} \rightarrow CH_{4\,(g)} + CO_{(g)}$ the rate is given by, **08**

$$\text{Rate} = k[CH_3CHO]^{3/2}$$

b) Write a note on Weakness of collision theory? **08**

Q.5 Answer the following

a) Write a general mechanism of an enzyme catalyzed reaction and obtain an expression for Michaelis-Menten constant. **08**
b) Derive the rate equation using transition state theory. **08**

Q.6 Answer the following

a) Discuss the Lindemann's mechanism of unimolecular reaction. **08**
b) Derive the rate expression for the reaction between H_2 and Br_2. **08**

Q.7 Answer the following

a) What is an autocatalyzed reaction? Explain its kinetics with a suitable example. **08**
b) Explain the use of potential energy surfaces in the study of chemical reaction. **08**

SLR-SF-58

Seat No.	

Set P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
PHYSICAL CHEMISTRY
Molecular Structure – II (MSC11403)

Day & Date: Friday, 14-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

Q.1 A) Choose the most correct alternative of the following and rewrite the sentences. **10**

1) Polarizability is defined as the_____.
   a) Product of dipole moment and electric field
   b) Product of dielectric constant and dipole moment
   c) Ratio of electric field to dipole moment
   d) Ratio of dipole moment to electric field

2) Langevin's theory for Para magnetism mainly focus on orientation of_____.
   a) Proton b) Neutron
   c) Electron d) Molecule

3) Identify the correct statement_____.
   a) NMR signals towards the left of the spectrum correspond to low chemical shift values
   b) NMR signals towards the right of the spectrum correspond to high chemical shift values
   c) Chemical shift values are larger when shielding effects are greater
   d) Chemical shift values are larger when deshielding effects are greater

4) In ESR Spectrum the molecule contains more than one unpaired electron, it gives_____ splitting.
   a) zero field b) hyperfine
   c) unsymmetrical d) symmetrical

5) In the shielding of acetylene proton _____ effect is observed.
   a) Isotropic b) Anisotropic
   c) Protic d) aprotic

6) Mossbauer effect is related to _____.
   a) Resonance fluorescence of γ-rays
   b) Intranuclear rather than electronic energy levels
   c) Both (a) and (b)
   d) Stark effect

7) The total polarization of a material is the _____.
   a) Product of all types of polarization
   b) Sum of all types of polarization
   c) Orientation directions of the dipoles
   d) Total dipole moments in the material

8) The magnetic susceptibility of a material is equal to _____.
   a) product of the magnetization and the applied magnetic field
   b) sum of the magnetization and the applied magnetic field
   c) ratio of the magnetization to the applied magnetic field
   d) difference between the magnetization and the applied magnetic field

9) Signal splitting in NMR arises from?
   a) Shielding b) Spin-spin decoupling
   c) Spin-spin coupling d) Deshielding

10) Which of the following statement is true when atoms are electrically neutral?
   a) The number of electrons is equal protons
   b) The number of electrons is less than protons
   c) The number of electrons is more than protons
   d) The number of protons is equal to neutrons

B) Fill in the blanks OR Write true/false. **06**

1) The dipole moment of CO_2 molecule is ____.
2) Bhatnagar-Mathur method is useful to determine ____ of sample.
3) The Mossbauer Spectroscopy uses ____ radiation.
4) An atom containing unpaired electrons shows _____ magnetism.
5) In NMR spectroscopy, sample nuclei absorb electromagnetic radiation in region.
6) When electron interacts with 'n' equivalent nuclei, its resonance peak is split into _____ multiplet.

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

a) Pascal constants
b) Limitations of Debye theory
c) Write note on Exchange phenomena
d) Zero field splitting in ESR

Q.3 Answer the following.

a) Describe polarizability of molecules by Clausius-Mossotti equation. **10**
b) Discuss in detail the principles of NMR spectroscopy. **06**

Q.4 Answer the following.

a) Discuss applications to coordination complexes and complex ions of transition metals as a Ferro and Ferri magnetism. **10**
b) Explain Isotropic and anisotropic hyperfine coupling constants in ESR. **06**

Q.5 Answer the following.

a) What is dipole moment? Discuss applications of dipole moment measurement in the study of structure of compounds. **10**
b) What are the advantages of TMS as internal standard reference in NMR study? **06**
A compound show PMR peak at 240 HZ downfield from TMS peak operating at 60 MHz. What is value of τ?

Q.6 Answer the following.

a) Discuss- i) Atomic and ionic susceptibility, ii) Curie- Weiss law. **10**

b) Discuss the applications of Mossbauer spectroscopy of iron compounds with suitable examples. **06**
The half-life of the first excited state of Fe^{57} is 1.58×10^{-7} s. What is the line width of resonance? ($h = 6.626 \times 10^{34}$ Js, π=3.141)

Q.7 Answer the following.

a) Write note on- i) Fourier Transform and ii) double resonance in NMR. **10**

b) Describe how the ESR spectrum helps to study kinetics of electron transfer reactions. **06**

SLR-SF-59

Seat No.	

Set P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
PHYSICAL CHEMISTRY
Surface Chemistry (MSC11408)

Day & Date: Sunday, 16-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

Q.1 A) Choose the correct alternatives from the options. **10**

1) Adsorption gives the variation in the quantity of gas adsorbed by a unit mass of solid adsorbent with the change in pressure of the system for a given temperature.
   a) Langmuir b) Freundlich
   c) BET d) All of these

2) The difference between maximum and minimum contact angle values is called as _____.
   a) Dynamic contact angle b) Advanced contact angle
   c) Contact angle hysteresis d) Equilibrium contact angle

3) A substance that allows oil and water to mix or emulsify is known as _____.
   a) preservative b) emulsifier
   c) additive d) antioxidant

4) Wetting is _____ process.
   a) non spontaneous and exothermic
   b) non spontaneous and endothermic
   c) Spontaneous and exothermic
   d) spontaneous and endothermic

5) Which is the major application of adsorption phenomenon?
   a) gas masks b) removal of color
   c) as a catalyst d) all of these

6) When there are no external forces, the shape of a liquid drop is determined by _____.
   a) Surface Tension of the liquid b) The density of the liquid
   c) The viscosity of the liquid d) The temperature of air only

7) By which of the following forces, the gas molecules are held on solid surface in physical adsorption.
   a) chemical b) gravitational
   c) electrostatic d) van der Waal's

8) Capillary rise experiments are preferred with _____ contact angle.
   a) zero b) single
   c) double d) finite

9) The critical micelle concentration _____ with temperature.
   a) increases b) decreases
   c) does not affect d) initially increases then decreases

10) The specific surface free energy of a solid is the _____ work which requires to be done in creating 1 cm^2 of new surface.
   a) isothermal irreversible b) isothermal reversible
   c) adiabatic reversible d) adiabatic irreversible

B) Fill in the blanks OR Write true/false **06**

1) "If volume ratio of water to oil is three or more an oil/water emulsion is more probable than water/oil emulsion", state whether this statement is true or false.
2) "Positive adsorption is the phenomenon in which surface tension of liquid decreases with concentration of surfactant", state whether statement is true or false.
3) Does the ratio of surface area to volume affects the shape of the particles in sintering? Indicate yes or no.
4) Acetic acid does not form monomolecular film on the surface of water. True/False
5) The nanoparticles belong to _____ dimension.
6) At critical micelle concentration, all properties of solutions of surfactants undergo dramatic change. True/False

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

a) Derive following equation for the spreading coefficient of liquid B on the surface of liquid A.
$S_{B/A} = \gamma_A - \gamma_B - \gamma_{AB}$ where γ_A , γ_B, and γ_{AB} are the surface tension of liquid A, liquid B and interfacial tension between liquid A and B.

b) What is critical micelle concentration? How it is determined using surface tension measurements?

c) Discuss spreading of benzene on the surface of water.

d) At 25°C and a surface pressure of 0.10 dynes per cm lauric acid occupies an area of 31 nm^2 per molecule in a water surface. Assuming the film to be a two dimensional ideal gas, calculate the gas constant in ergs per degree per mole and compare the results with the accepted value.

Q.3 Answer the following.

a) Describe conductivity and fluorescence method of identification of types of emulsion. **08**

b) Derive Gibb's Adsorption equation with usual notation for dilute solution. **08**

Q.4 Answer the following.

a) Write on Langmuir-Adam surface pressure balance. **08**

b) Describe drop weight method of determination of surface tension of liquids. **08**

Q.5 Answer the following.

a) Describe 'Point B' method of determination surface area of an adsorbent. The adsorption of nitrogen on silica studied at 77K by Point B method has given the volume of gas corresponding to Point B, reduced to standard condition of P=1 atm and T=273 K as 40 cc. Calculate surface area of silica if area of nitrogen molecule is 16.2 A^0 **08**

b) Why falling drop of liquid is spherical? Describe drop number method of determination of surface tension of liquid. **08**

Q.6 Answer the following.

a) Show that for the spherical interferences $\Delta P = \frac{2\gamma}{r}$ using the concept of surface free energy change in droplet. **08**

b) Compare the equation describing physical states of monomolecular films with the three dimensional ideal gas equations. Discuss on molecular gaseous film using this equation. **08**

Q.7 Answer the following.

a) What are emulsions? Discuss theories of emulsion stabilization. **08**

b) Derive Gibb's adsorption equation. **08**

SLR-SF-66

Seat No.	

Set P

M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2023
ANALYTICAL CHEMISTRY
Advance Separation Techniques (MSC013301)

Day & Date: Monday, 10-07-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

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

Q.1 A) Choose correct alternative and rewrite the sentences. **10**

1) Characteristics of paper chromatography is _____.
   a) Identification of compound b) Detection and separation
   c) Separation d) Measurement of R_f value

2) The capillary action is performed in _____.
   a) liquid chromatography b) gas chromatography
   c) ion chromatography d) paper chromatography

3) In paper chromatography, the complex mixtures are separated by _____ technique.
   a) ascending b) descending
   c) two dimensional d) radiation

4) Ether is the most common _____ used for the extraction process.
   a) Solute b) Solvent
   c) Salt d) Solution

5) Electrophoresis was developed by the scientist _____.
   a) Tswett b) Tsvedberg
   c) Tiselius d) Sanger

6) Electrophoresis is not suitable for the separation of _____.
   a) proteins b) amino acids
   c) lipids d) nucleic acids

7) The role of urea in PAGE separation of DNA is to _____.
   a) acts as anion b) acts as cation
   c) denature the DNA d) provide buffer stability

8) _____ is sensitive for mass and shape of the molecule.
   a) Sedimentation constant b) Sedimentation velocity
   c) Sedimentation equilibrium d) Sedimentation

9) 0.1-0.01μm _____ used in ultrafiltration membrane.
   a) concentration b) solution
   c) pore size d) frequency

10) 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

B) Fill in the blanks **06**

1) In paper chromatography, usually stationary phase is a strip of paper which is also called _____.
2) _____ is the basis of solvent extraction.
3) In solvent extraction, _____ phases are observed.
4) _____ is the simple and the oldest technique for solvent extraction.
5) In electrophoresis cell, the pressure is about _____.
6) Blood pressure required for ultra-filtration is provided through _____.

Q.2 Answer the following **16**

a) Write a short note on zone refining.
b) Explain Micellar electro kinetics capillary chromatography.
c) Describe ascending chromatography.
d) Give principle and classification of extractor.

Q.3 Answer the following **16**

a) Explain the principle of dialysis. Give information of membranes used in haemodialysis.
b) Describe capillary electrophoresis in detail.

Q.4 Answer the following **16**

a) Explain in detail separation by electro dialysis.
b) Describe in detail capillary electro-chromatography.

Q.5 Answer the following **16**

a) What is the principle of affinity chromatography? Describe component involved in affinity medium.
b) Explain factors affecting solvent extraction.

Q.6 Answer the following **16**

a) Explain method used to give the spot in paper chromatography. How R_f and R_x values are calculated?
b) Explain in detail the techniques of solvent extraction.

Q.7 Write a short note on **16**

a) 1) Ultra filtration
2) Factors affecting on electrophoresis
b) 1) Radial chromatography
2) Solid phase extraction

SLR-SF-67

Seat No.	

Set P

M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2023
ANALYTICAL CHEMISTRY
Instrumental Methods of Analysis- I (MSC013302)

Day & Date: Tuesday, 11-07-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Question 1 and 2 are compulsory.
2) Attempt any Three from Q.3 to Q.7.
3) Figure to right indicate full marks.

Q.1 A) Choose the correct alternatives from the given options. **10**

1) Radioactive disintegration follows _____ order kinetics.
   a) Third b) Second
   c) Zero d) First

2) The self-sustaining nuclear fission reaction depends on the release of _____.
   a) Energy b) Protons
   c) Neutrons d) Electrons

3) Radioactive emission of _____, does not change the atomic number.
   a) Alpha b) Beta
   c) Gamma d) All of these

4) Loss of water crystallization can be represented in DSC plot as _____.
   a) Downward peak b) Upward slope
   c) Downward slope d) Upward peak

5) The heat versus temperature plot of DSC of a polymer cannot detect ____.
   a) gradual slope b) hump
   c) Glass transition d) All of these

6) Ion selective electrodes have _____ linear range detection limit than PH electrode.
   a) Lower & Higher b) Lower & Lower
   c) Higher & Higher d) Higher & Lower

7) The cell employed for high frequency titrations is a _____ vessel which acts as conductivity cell.
   a) Glass/Silica b) Glass
   c) Quartz/Silica d) Glass/ceramic

8) Electrogravimetry is similar to _____.
   a) Electroplating b) Dopping
   c) Gravimetry d) Potentiometry

9) The change in current with the varying voltage gives the plot is known as _____.
   a) Chromatogram b) Voltagram
   c) Both a & b d) none of these

10) _____ is the most sensitive electroanalytical method.
   a) coulometry b) potentiometry
   c) conductometry d) none of these

B) Fill in the blanks OR write true/false. **06**

1) If the electroactive substance acts as a current carrier it is called as _____.
2) In solid state membranes, the body of the electrodes are made of _____.
3) Dialatometry is also known as _____.
4) _____ thermal procedure is not destructive in nature.
5) Helium nucleus is also called as _____.
6) _____ is used for quantitative determination of ions in solutions.

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

a) Explain Typical DSC cell.
b) What are the various advantages of dropping mercury electrode.
c) Differentiate between nuclear radiations α, β and γ.
d) Explain biamperometric titration.

Q.3 Answer the following.

a) Describe in detail the basis of stripping voltametry technique. **08**
b) What are ion selective electrodes? Explain liquid-liquid membrane electrodes. **08**

Q.4 Answer the following.

a) What are radioactive tracers? Discuss the applications of it in physico-chemical investigations. **08**
b) Discuss the direct and reverse isotopic dilution analysis. **08**

Q.5 Answer the following.

a) Describe the cells used in high frequency titrations. **08**
b) Explain in detail Electro gravimetric titration. **08**

Q.6 Answer the following.

a) Sketch typical DTA curve for hypothetical substance and illustrate the terms endotherm and exotherm. **08**
b) Explain the factors that affects the shape of the TGA peaks. **08**

Q.7 Answer the following.

a) Explain applications of High frequency titration. **08**
b) Discuss the kinetic parameters of thermal degradation. **08**

SLR-SF-68

Seat No.	

Set P

M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2023
ANALYTICAL CHEMISTRY
Applied Analytical Chemistry (MSC013306)

Day & Date: Wednesday, 12-07-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

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

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

1) Spectrophotometer is used for estimation of _____ elements.
   a) Na & K b) K
   c) Na d) Cl

2) Fertilizer which supplies only one major plant nutrient is _____ fertilizer.
   a) Complex b) Straight
   c) Double d) Complete

3) _____ is name of aluminium ore.
   a) Hematite b) Gypsum
   c) Bauxite d) Dolomite.

4) Oxidation state of Fe in $FeCl_3$ is _____
   a) -3 b) 0
   c) 4 d) +3

5) Biotic constituent of soil are _____.
   a) Organic material b) Mineral
   c) Water, air d) All

6) Nitrogen content in ammonium nitrate is _____.
   a) 9 b) 18
   c) 33 d) 46

7) When ammonia is added to iron solution it gives precipitate of _____.
   a) Fe_2O_3 b) $Fe(OH)_3$
   c) $FeSO_4$ d) Fe_3O_4

8) $AgNO_3$ solution is used to estimate _____ ions.
   a) Cl b) SO_3
   c) NO_3 d) CO_3

9) The scientific term used for soil is _____.
   a) Lithosphere b) Pedosphere
   c) Hydrosphere d) Biosphere

10) Kjeldahl's method is used to estimate _____ element from soil.
   a) N b) S
   c) P d) K

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

1) Chemical formula of hematite is _____.
2) Hexachlorophen is example of _____.
3) _____ instrument is used to estimate potash.
4) The substance, that supplies plant food & help to increase yield of different crop through improvement of soil fertility is _____.
5) _____ indicator is used to estimate Ca & Mg from sample by EDTA method.
6) Face powder mainly contains _____ & _____ elements.

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

a) Explain cation exchange method.
b) Write note on fertilizer.
c) Write note on deodorant.
d) Explain analytical process for pyrolusite ore.

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

a) Explain the term soil fertility.
b) How phosphorous is determined from plant sample by colorimetric method.

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

a) Explain Kjeldahl's method for estimation of nitrogen from fertilizer.
b) Explain sample collection. Explain how will you estimate potassium from fertilizer.

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

a) Write in detail the analysis of brass alloy.
b) Write estimation of Al & Si from bauxite ore.

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

a) Explain estimation of Ca & Ba from face powder by gravimetric method.
b) Explain estimation of Mg & boric acid volumetrically from face powder.

Q.7 Answer the following **16**

a) Define alloy. Write the explanation to estimate Cu - Ni alloy.
b) Explain estimation of Zn & Fe by gravimetric method from deodorant.

SLR-SF-70

Seat No.	

Set P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
ANALYTICAL CHEMISTRY
Advanced Analytical Techniques (MSC013401)

Day & Date: Monday, 10-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

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

1) In GC-MS ion intensity is measured with _____.
   a) Intensity meter b) Ion meter
   c) Ion transducer d) Electrometer

2) The critical temperature is that temperature above which the _____ phase cannot exit.
   a) Solid b) Liquid
   c) Gas d) None of these

3) GS-MS uses _____ column system.
   a) capillary column b) open tabular column
   c) porous layer column d) packed column

4) Critical point of CO_2 gas is _____
   a) 0.47 b) -0.45
   c) 0.24 d) -0.40

5) Which of pump is required in flow injection analysis?
   a) Syringe b) Reciprocating
   c) Peristatic d) all of these

6) _____ is the normal nebulizer temperature used in LC-MS.
   a) 125- 150 °C b) 25- 50 °C
   c) 100- 150 °C d) 250-300 °C

7) In FIA dispersion of sample is seen by _____.
   a) Diffusion b) Conversion
   c) Osmosis d) convection and diffusion

8) In LC-MS _____ is the most commonly used interface.
   a) chopper b) Nebulizer
   c) vapoursing chamber d) filter

9) In ion chromatography suppressors used in anion analysis is a ____.
   a) anion exchanger b) cation exchanger
   c) Neutral d) all of these

10) In SFC mobile phase affinity for the analyte is a function of _____.
   a) mobile phase density b) mobile phase solubility
   c) mobile phase viscosity d) all of these

B) Write true/false **06**

1) At a temperature and pressure above its critical point a substance is called as super critical fluid.
2) SFC is superior to GC and HPLC.
3) Gas chromatography provides direct identification of compound.
4) An FIA curve is a plot of the detection signal as a function of temperature.
5) In flow injection analysis the peak heights are influenced by dispersion of sample.
6) The nebulizer gas and make up gas are introduced coaxially into the heated nebulization region.

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

a) Environmental speciation by ion chromatography
b) Atomic spectrometric detection
c) Advantages of automation
d) Properties of super critical fluids

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

a) Explain the principle of ion chromatography and its applications.
b) Explain the HPLC-MS technique and its applications.

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

a) Explain in brief instrumentation of ion chromatography.
b) Explain in brief GC-MS technique.

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

a) Explain in brief automatic elemental analyzer.
b) Discuss the structure determination of biopolymers.

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

a) Explain in brief basic instrumentation and Interfaces of LCMS.
b) Explain the structure of resins used in ion chromatography.

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

a) Explain in brief instrumentation of super critical fluid chromatography.
b) Explain in brief automated analyzer based on multilayer film principle and its instrumentation.

SLR-SF-71

Seat No.	

Set P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
ANALYTICAL CHEMISTRY
Instrumental Methods of Analysis II (MSC013402)

Day & Date: Wednesday, 12-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

Q.1 A) Choose correct alternatives. (MCQ)- (each will carry 1 mark) **10**

1) For very dilute suspensions, the most sensitive technique is _____.
   a) Turbidimetry b) Nephelometry
   c) Colorimetry d) Photometry

2) The good oxidants to excite metals in the flame is _____.
   a) Oxygen b) Cyanogens
   c) Butane d) hydrogen

3) In a series of aromatic compounds, the most fluorescent are _____.
   a) Rigid b) non planar
   c) Sterically crowded d) All of these

4) Fluorescence emission is observed mainly due to the _____ transition.
   a) $\pi \rightarrow \pi^*$ b $\sigma \rightarrow \sigma^*$
   c) $n \rightarrow \sigma^*$ d) none of these

5) The highest flame temperature is obtained in oxygen with _____.
   a) Acetylene b) Hydrogen
   c) Butane d) cyanogen

6) The absorption of X-rays in a material governed by _____.
   a) Bragg's law b) Beer Lambert's law
   c) Stefan's law d) All

7) For singlet state, the spin multiplicity is _____.
   a) 1 b) 2
   c) 3 d) 1/2

8) The smallest interplanar spacing in a crystal which will give the nth order Bragg reflection is _____.
   a) $d_{hkl} = n$ b) $d_{hkl} = n/2$
   c) $d_{hkl} = n/3$ d) $d_{hkl} = n/4$

9) Which of the following process is radiationless?
   a) delayed fluorescence b) Phosphorescence
   c) Fluorescence d) none of these

10) The typical lifetime of phosphorescence emission is _____.
   a) $\sim 10^{-6}$s b) $\sim 10^{-9}$s
   c) $\sim 10^{-3}$s d) $\sim 10^{-12}$s

B) Fill in the blanks OR Write true/false **06**

1) The Bragg's equation is written as nλ =_____
2) The wavelength of Cu$K\alpha$ line is_____ A (Angstrom).
3) Elements having atomic number less than 23 produce only _____series.
4) Refractive index is dimensionless property. True/False
5) The temperature of acetylene-oxygen flame is _____°C.
6) For phosphorescence detection, sample should keep at very low temperature. True/False

Q.2 Answer the following **16**

a) What is molar refraction? Calculate it of Cabonteterachloride at 298 K. (Given- n= 1.47 and d = 1.6g/cm^3)
b) Explain the concept of Quantum efficiency.
c) XRD pattern of a metal gives first order reflection at sinθ = 0.94. Calculate interplanar distance (Given incident x-ray wavelength = 1.54 A).
d) Comment on advantages and disadvantages of XRF technique.

Q.3 Answer the following

a) With the help of Jobionski's diagram, show various photophysical pathways with their typical lifetimes. **08**
b) Diagrammatically explain critical angle principle, a basis of refractometry. **08**

Q.4 Answer the following

a) With the help of block diagram explain the equipment used in flame photometry. **08**
b) Write different types of excitation sources encountered in emission spectroscopy. **08**

Q.5 Answer the following

a) Discuss various kinds of interferences encountered in flame photometry. **08**
b) Write on various types of emission spectra. **08**

Q.6 Answer the following

a) X-ray generation techniques. **08**
b) Illustrate different factors which contributes to atomic spectral line widths. **08**

Q.7 Answer the following

a) What do you mean by solid surfaces? How sampling of surfaces can be done? **08**
b) Give an account of X-ray fluorescence technique. **08**

SLR-SF-72

Seat No.	

Set P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
Analytical Chemistry
Biochemicals & Food Analysis (MSC013403)

Day & Date: Friday, 14-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

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

1) The purpose of food colouring is_____.
   a) increase colour that occur naturally
   b) to identify product
   c) provide colour to colourless food
   d) All

2) Normal level of Hb per 100 ml of blood is ____.
   a) 5 b) 10
   c) 14 d) 20

3) Phenobarbitals is example of _____ family.
   a) CNS b) Barbiturate
   c) Sedative d) Antidepressant

4) Vitamin A is called _____.
   a) Retinone b) Retinoic acid
   c) Retinol d) Retinoic ester

5) Rancidity depends on the ____value.
   a) base b) neutral
   c) acid d) none

6) Urine mainly contains____.
   a) Uric acid b) Na & k
   c) Ca d) All

7) Vitamin C is also known as_____.
   a) Ascorbic b) Palmitic
   c) Oxalic d) saturated

8) In biological sample, _____ poisonous materials are estimated.
   a) Na, k b) Fe, Zn
   c) Ag, Au d) Lead, arsenic

9) Disease _____ is caused due to Hb below normal level.
   a) Anemia b) Diarrhea
   c) Vomiting d) thyroid

10) The dose of chemical or biochemical preparation that likely cause of death is ____ dose.
   a) chemical b) lethal
   c) biological d) none

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

1) _____ is used as saponifying alkali.
2) Contents in urine is ____.
3) _____ is an antianxiety agent.
4) Deficiency of vitamin A causes _____.
5) _____ indicator is used in acid base titration.
6) Secretion of _____ hormone that controls blood sugar.

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

a) Pasteurization
b) Qualities of ideal drug
c) Estimation of glucose
d) Significance of LD 50

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

a) How will you estimate nitrogen from food sample by Kjeldahl's method?
b) Classify oil & how will you estimate honey by HPLC method.

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

a) How will you estimate bilirubin from blood sample?
b) Explain urine electrolysis. How phosphate is estimated from urine?

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

a) What is meant by drug? Give classification in detail.
b) Explain in detail effect of norcotics & it's uses.

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

a) Describe principle & estimation of blood urea & uric acid in serum. Give their interpretation.
b) Write essay on vitamin A.

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

a) How will you estimate saponification & polenske value of an oil?
b) What are barbiturates. Give examples & explain analysis of phenobarbital.

SLR-SF-74

Seat No.	

Set P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
ANALYTICAL CHEMISTRY
Pharmaceutical Analysis (MSC013409)

Day & Date: Sunday, 16-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

Q.1 A) Choose the correct alternatives from the options. **10**

1) Expiry date of medicine is expressed in terms of _____.
   a) day and month b) day and year
   c) month and year d) year only

2) Ointments are used for external applicant to _____.
   a) eye b) ear
   c) skin d) all of these

3) GLP stands for _____.
   a) Good laboratory practices
   b) Good logical preparations
   c) Guidelines for laboratory preparations
   d) none of these

4) Drug is developed from _____.
   a) synthetic method b) natural source
   c) a & b d) none of these

5) The limit test is ____ test used to identified small amount of impurities.
   a) qualitative b) quantitative
   c) semiquantitative d) both b & c

6) FDA works as visit to _____.
   a) Store b) quality control lab
   c) product and packing d) all of these

7) Arsenic is converted into arsine gas when passed over _____.
   a) starch paper b) chloride test paper
   c) turmeric paper d) pH paper

8) Ash is remaining residue after _____.
   a) Ignition b) sterilization
   c) Incubation d) Drying

9) In hard capsule generally the percentage of water is _____.
   a) 10-15 b) 25-30
   c) 1-5 d) 35-40

10) In dissolution test normal rotation speed is _____.
   a) 80 rpm b) 120 rpm
   c) 200 rpm d) 280 rpm

B) Fill in the blanks and rewrite the sentences. **06**

1) KFR (Karl Fisher Reagent) is used to determine _____ content.
2) Syrup is saturated solution of _____.
3) In capsule, inner substance is enclosed with small shell which is generally prepared from _____.
4) Arsenic limit test is also known as _____.
5) FDA stands for _____.
6) Ointments are used externally to _____.

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

a) Write a short note on lubricant.
b) Explain injections with suitable example.
c) Discuss advantages of aerosol.
d) How limit test of lead is carried out for pharmaceutical sample?

Q.3 Answer the following.

a) What is FDA? Discuss in detail how FDA control pharmaceutical and cosmetic Industries? **10**

b) 0.314 gm benzocaine [$C_9H_{11}NO_2$] dissolved in mixture of 25 ml HCl and 50 ml distilled water. After cooling this solution to 15°C titrate with 0.095 N $NaNO_2$ gave burette reading 12,2 ml. Calculate percentage of benzocaine in the given sample. **06**
[At. Wt.: C-12, H-1, O-16, N-14]

Q.4 Answer the following.

a) Explain loss on drying and loss on ignition. How personal error is controlled? **10**

b) Explain labeling procedure in pharmaceutical drug synthesis. **06**

Q.5 Answer the following.

a) How ointment bases are classified? Discuss uses of ointment and cream as dosage form. **10**

b) Discuss the terms pills and capsules. **06**

Q.6 Answer the following.

a) What is Karl-Fisher? How it prepared and standardized? **08**

b) Discuss in detail ophthalmic preparation in dosage form. **08**

Q.7 Answer the following.

a) What is ash value? How sulphated ash is determined for vegetable drug sample? **08**

b) 0.59 gm sample containing calcium lactate [$C_6H_{10}O_6Ca_5H_2O$] was dissolved in 100 ml of water containing 2 ml of HCl. This solution was titrated with 0.05 M EDTA using murexide naphtha indicator gave a burette reading 24.2 ml. Calculate the % of calcium lactate in given sample. [At. Wt.: C-12, H-1, O-16, Ca-20]. **08**

SLR-SF-80

Seat No.	

Set P

M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2023
INORGANIC CHEMISTRY
Inorganic Chemical Spectroscopy (MSC14301)

Day & Date: Monday, 10-07-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

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

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

1) PAS is comparable to _____.
   a) NMR b) Phosphorescence
   c) Fluorescence d) IR

2) An acoustical resonant frequency depends upon _____.
   a) Cell length b) Tunable dye laser
   c) Photoacoustic cell d) Chopper

3) PAS provides a means for obtaining UV, visible and IR absorption spectra of _____.
   a) Solids b) Semi solids
   c) Liquids d) all of these

4) The simplest molecule with a low potential barrier to inversion is _____.
   a) HCl b) OCS
   c) HCN d) NH_3

5) The inversion frequency rapidly decreases as the barrier height is _____.
   a) Increased b) Decreased
   c) Identical d) None of these

6) Transitions involving d-orbitals (d-d transitions) is _____.
   a) laporte allowed b) laporte forbidden
   c) spin forbidden d) spin allowed

7) Orgel diagram apply to _____.
   a) high spin complexes b) spin allowed transitions
   c) both a & b d) low spin complexes

8) The fundamental vibrational modes for H_2O molecule are _____.
   a) 5 b) 3
   c) 8 d) 1

9) The introduction of electronegative group results in _____ vibrational frequency.
   a) increased b) decreased
   c) constant d) zero

10) Analysis of surfaces can be achieved by _____.
   a) UV-PES b) ESCA
   c) AES d) All of these

B) Fill in the blanks OR Write true/false **06**

1) Scalar coupling is also termed as _____.
2) The energy separation of spectroscopic terms is expressed as _____.
3) Unsaturation causes _____ effect on the chemical shift.
4) In laser spectrometers _____detector is used.
5) The term symbol for Cr^{+3} ion is _____.
6) The experimental and theoretical aspects of PES were first pioneered by _____.

Q.2 Answer the following **16**

a) Orthogonality theorem
b) Electronic transitions
c) Applications of IR spectroscopy
d) Spin spin coupling

Q.3 Answer the following **16**

a) Explain the Principle of photoacoustic spectroscopy (PAS).
b) Explain the effect of isotopic substitution in microwave spectrum.

Q.4 Answer the following **16**

a) Explain the occurrence of stokes and antistoke lines in Raman spectrum of molecule.
b) Explain the Classification of molecules in point groups.

Q.5 Answer the following **16**

a) Explain the principle and instrumentation of Auger electron spectroscopy.
b) Explain the local and remote effects in NMR spectroscopy.

Q.6 Answer the following **16**

a) Construct and explain the character table for C2v point group.
b) Explain the Morse potential energy diagram.

Q.7 Answer the following **16**

a) Distinguish between proper and improper axis of symmetry with example.
b) Discuss in brief the Charge transfer spectra with suitable example.

SLR-SF-81

Seat No.	

Set P

M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2023
INORGANIC CHEMISTRY
Co-ordination Chemistry – I (MSC14302)

Day & Date: Tuesday, 11-07-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

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

Q.1 A) Choose the correct alternatives from the given options. **10**

1) The CFSE for a high-spin d^4 octahedral complex is _____.
   a) $-0.6\Delta_{oct}$ b) $-1.8\Delta_{oct}$
   c) $-1.6\Delta_{oct} + P$ d) $-1.2\Delta_{oct}$

2) Which calibrant is used in DTA?
   a) Glass beads b) Silicon carbide
   c) Alumina d) All of these

3) Which metal complex ion is expected to be subject to a Jahn-Teller distortion?
   a) $[Cr(OH_2)_6]^{3+}$ b) $[Cr(NH_3)_6]^{2+}$
   c) $[Cr(CN)_6]^{3-}$ d) $[Cr(bpy)_3]^{2+}$

4) The filling of molecular orbital takes place according to _____.
   a) The Aufbau Principle
   b) Pauli Exclusion Principle
   c) Hund's rule of maximum multiplicity
   d) All of the mentioned

5) The substance that increases the rate of reaction but is not itself consumed is _____.
   a) element b) Catalyst
   c) copolymerizer d) none of above

6) Acetic acid is produced by _____.
   a) olefin hydrogenation
   b) olefin polymerization
   c) Monsanto acetic acid process
   d) None of these

7) Wilkinson's catalyst is _____.
   a) $TiCl_4 + AlEt_3$ b) ZrO_4
   c) $[Rh(PPh_3)_3Cl]$ d) TiO_4

8) Which magnetic have negative susceptibility?
   a) Diamagnetic materials b) Paramagnetic materials
   c) Ferromagnetic materials d) All of the above

9) Under conditions of _____ heating, decomposition usually take place in TGA.
   a) First order b) Second order
   c) Third order d) Dynamic

10) One of the following is TA instrument.
a) TGA 2950 b) UV-3600
c) FTIR d) Spectrum 100

B) Fill in the blanks OR write true/false. **06**

1) Nickel (II) ion has _____ unpaired electrons.
2) In industrial processes, transition elements and their oxides are used as _____.
3) Basic source of magnetism _____.
4) Oxidation of ethylene to acetaldehyde is carried out by _____.
5) Zigler-Natta catalyst is _____.
6) Transition metals are complexes act as _____.

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

a) Diamagnetism.
b) Decarboxylation of B keto acids.
c) Spectrochemical series.
d) Factors affecting TGA curve.

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

a) Explain the determination of magnetic susceptibility by Gouy method.
b) Explain the factors affecting DTA curve.

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

a) Draw the DTA curve for CaC_2O_4. $2H_2O$ and explain mechanism of decomposition.
b) Explain the Octahedral structure involving sigma bonding with MO diagram.

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

a) Explain the different between CFT and MOT.
b) Write a brief note on current and future trends in catalysis.

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

a) Discuss the factors affecting stability of ternary complexes.
b) Explain the tetrahedral structure involving sigma bonding with MO diagram.

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

a) Explain the structure of $[Ni(CN)_4]^{2-}$ on the basis of VBT.
b) Explain in brief diamagnetism and paramagnetism with suitable example.

SLR-SF-82

Seat No.	

Set P

M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2023
INORGANIC CHEMISTRY
Nuclear Chemistry (MSC14306)

Day & Date: Wednesday, 12-07-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

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

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

1) In fast breeder nuclear reactor, the fuel used is _____.
   a) U-239 b) Th-231
   c) Th-232 d) Pu-232

2) The Liquid drop model of nucleus was developed by _____.
   a) Bohr, Wheeler b) Fermi
   c) Chadwick d) Rutherford

3) The commonly used material for shielding is _____.
   a) lead or concrete b) lead and tin
   c) Graphite d) thick galvanized sheets

4) If the mass of reactant is 8.02636 and mass of product is 8.02813, then the nuclear reaction is _____.
   a) Endoergic b) Exoergic
   c) Elastic d) none of these

5) What is B.E./A of He nucleus which has B.E. 28 MeV?
   a) 14 MeV b) 7 MeV
   c) 28 MeV d) 9.87 MeV

6) The unit of reaction cross-section is _____
   a) cm^3 b) Barn
   c) $\mathrm{N/m}$ d) $\mathrm{Joule\ m}^2$

7) Nuclear fusion reaction is also known as _____ reaction.
   a) Thermonuclear b) elastic scattering
   c) stripping reactions d) none

8) Which of the following is used to measure the rate of nuclear disintegration?
   a) Cyclotron b) mass spectrograph
   c) cold chamber d) Geiger-Muller counter

9) The act of measuring or estimating radiation doses is known as _____.
   a) Dosimetry b) Colorimetry
   c) Photometry d) None of these

10) The stopping power is the rate of energy loss per unit length of matter is referred as _____.
   a) LET b) EC
   c) EZ d) IE

B) Fill in the blanks OR Write true/false **06**

1) Even-even nuclides (both Z and A even) have zero intrinsic spin and _____ parity.
2) The range of N/Z ratio for stable nuclei is _____.
3) The first plant set up in India for the production of heavy water is at _____.
4) The packing fraction of 7N14isotope whose mass is 14.003 a.m.u.is ____.
5) _____ model corresponds to the magic numbers.
6) Nuclear reactions induced by X-rays or g-photons of high energy are referred as _____ reactions.

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

a) Write a note on magnetic moments of odd mass numbers nuclei.
b) Explain radiolysis of aqueous solution with suitable examples.
c) What is Packing fraction?
d) Write about nuclear reactors in INDIA?

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

a) What is nuclear cross section? And explain different types of nuclear reactions.
b) Give a brief account of general aspects of reactor design.

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

a) Write nuclear configuration, spin and parity of $_{29}C^{63}$ and $_{78}Pt^{195}$.
b) Discuss about the heavy water manufacturing in India.

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

a) Discuss about Chemical solutions to environmental problems biodegradability.
b) Discuss about the ionizing and non-ionizing radiations on living things.

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

a) Explain Liquid drop model. Derive semi-empirical mass equation.
b) Explain the stability of nucleus w.r.t mass defect, B.E, N/Z ratio.

Q.7 Answer the following **16**

a) Explain the construction and working of pressurized water reactor.
b) What is threshold energy of a nuclear reaction? Give Bohr's hypothesis of compound nucleus for nuclear reaction.

SLR-SF-84

Seat No.	

Set P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
INORGANIC CHEMISTRY
Instrumental Techniques (MSC14401)

Day & Date: Monday, 10-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

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

1) Which of the following is used as detector crystal in ESR spectrometer?
   a) Silicon rectifier b) Silicon tungsten rectifier
   c) Silicon boron rectifier d) Silicon quartz rectifier

2) The temperature below which the single Mossbauer line splits into six lines because sharp decrease in electron density at the nucleus is called _____.
   a) Curie point b) Neel point
   c) Transition point d) none of these

3) Mossbauer study is the study of γ-rays _____ and subsequent reabsorption.
   a) Transmission b) Absorption
   c) Emission d) none of these

4) The region in which NQR spectra are observed is _____.
   a) Radio frequency region b) Microwave region
   c) Visible region d) IR region

5) The absorption of X-rays is governed by _____.
   a) Bragg's law b) Beer' Lamberts law
   c) Stephan' law d) All of these

6) Neutron diffraction technique was developed by _____.
   a) C. G. Shall b) B. N. Brockhouse
   c) Both a & b d) J. Karle

7) In the schematic DTA sequence having reversible and irreversible changes, starting with the hydrated material, which of the following steps occurs first on heating?
   a) Esterification b) Methylation
   c) Rehydration d) Dehydration

8) What is the temperature required for the decomposition of $CaCO_3$ in degree Celsius?
   a) 200 b) 500
   c) 900 d) 1200

9) TMA is also known as _____.
   a) Dilatometry b) Volumetry
   c) TGA d) all of these

10) The number of ESR lines for triphenyl methyl radical are _____.

a) 7 b) 20

c) 3 d) 196

B) Fill in the blanks OR Write true/false **06**

1) The magnetic interaction between the electron spin and nuclear spin in the same molecule is known as_____ hyperfine coupling
2) The removal of degeneracy of states by the internal magnetic field of paramagnetic electrons are known as _____ fine splitting.
3) TMA involves measurement of penetration, _____, contraction and extension of material as a function of temperature. Expansion
4) Geiger tube cannot be used to measure the energy of _____ ionization energy
5) The absorption of X-rays is governed by _____ Beer' Lamberts law.
6) Mossbauer performed an experiment of recoilless _____ absorption and emission in solids, gamma rays.

Q.2 Answer the following **16**

a) What is the difference between DTA and DSC?
b) Write the applications of X-ray diffraction.
c) Explain in brief Mössbauer effect.
d) Give the applications of NQR spectroscopy.

Q.3 Answer the following **16**

a). Explain the principle and application of neutron diffraction technique.
b) Explain the factors affecting the magnitude of g value in ESR spectrum.

Q.4 Answer the following **16**

a) Discuss the theory of X-ray diffraction, giving a schematic diagram of instrumentation involved.
b) Explain quadrupole splitting and hyperfine interaction in Mössbauer spectroscopy with suitable example.

Q.5 Answer the following **16**

a) What is thermal analysis? Describe the principle and working of TGA.
b) Explain the use of Mössbauer spectroscopy in the determination of bonding in iron complexes.

Q.6 Answer the following **16**

a) Explain the splitting of NQR spectra in nucleus having spin I=1 and I=2 and show the observed NQR transitions.
b) Explain in brief determination of lattice parameters.

Q.7 Answer the following **16**

a) What is mean by thermo mechanical analysis (TMA)? Give a schematic representation of thermo mechanical analyzer.
b) A first order reflection from (111) planes of a cubic crystal observed at glancing angle 11.2° using Cu·Kα radiation. Calculate the length of the side of unit cell.

SLR-SF-85

Set No.	

Set P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
INORGANIC CHEMISTRY
Co-ordination Chemistry – II (MSC14402)

Day & Date: Wednesday, 12-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

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

1) In a photochemical reaction, each molecule of the reacting substance absorbs a _____ photon of reaction and is activated to form the product.
   a) single b) Double
   c) Half d) All of these

2) During SN^1 (CB) mechanism the TBP intermediate gives _____ product.
   a) cis product b) trans product
   c) both cis and trans product d) none of these

3) Electron transfer is fast if the coordinated ligands present in the system are _____.
   a) Pi acceptors b) Pi donors
   c) Neutral d) all of these

4) Unimolecular nucleophilic substitution follows_____.
   a) dissociative mechanism b) associative mechanism
   c) Solvation mechanism d) SN_1 (CB) mechanism

5) In photochemical reaction, absorption of _____ radiations take place
   a) ultraviolet and visible b) radio
   c) only visible d) visible and X-rays

6) According to VBT the complexes with _____ configuration is labile for SN^1 reactions.
   a) ns np3 nd^2 b) (n-1) d^2 ns np^3
   c) ns np2 nd^2 d) (n-1) d^2 ns np^2

7) Optical isomerism is shown by _____.
   a) $[Ni(CO)_4]$ b) $[Ni(CN)_4]^{2-}$
   c) $[Pt(NH_3)4]^{2+}$ d) $[Co(En)_3]^{3+}$

8) Which stable intermediate is formed during SN^1 substitution?
   a) square pyramidal b) tetrahedral
   c) trigonal d) octahedral wedge

9) Which of the following acts as $\pi - acid$ ligand?
   a) F b) O^{2-}
   c) CO d) NH_3

10) The optically active molecule must have _____.
   a) centre of symmetry b) plane of symmetry
   c) an improper axis d) none of these

B) Fill in the blanks OR Write true/false. **06**

1) The rate of electron transfer increases with increase in the _____ of the bridging Ligand.
2) The rate of electron transfer depends upon the _____of the central metal ion.
3) A beam of ordinary _____light is a bundle of rays.
4) The reactions which are caused by heat and in absence of light is called _____.
5) The symmetric molecule contains .
6) The rate of change of specific rotation with wavelength is known as ____.

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

a) Explain in brief racemisation reactions in octahedral complexes.
b) Discus the Substitution reaction.
c) Write note on Base hydrolysis.
d) Explain in brief reaction in non-aqueous solvent.

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

a) Discuss the types of nucleophilic substitution reactions in octahedral complexes.
b) Explain acid hydrolysis of Co (III) complexes by considering effect of chelation and steric factors.

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

a) Explain in brief photochemistry of metallocene.
b) Explain the polarization theory of trans effect.

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

a) Write the evidences to support SN2 reaction mechanism of square planner complex.
b) Explain the mechanism involved in isomerisation reaction in octahedral complexes

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

a) What is the role of bridging ligand in inner sphere electron transfer mechanism?
b) Define the photochemistry. Explain the concept of quantum yield in photochemistry.

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

a) Discuss the relationship between optically rotator dispersion and circular dichroism curves
b) Discuss the mechanism of outer sphere electron transfer. Illustrate your answer with examples.

SLR-SF-86

Seat No.	

Set P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
INORGANIC CHEMISTRY
Chemistry of Inorganic Materials (MSC14403)

Day & Date: Friday, 14-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

Q.1 A) Choose correct options (10 marks) **10**

1) _____ is the temperature dependence Arrhenius equations of electrical conductivity structure.
a) $\sigma = A\exp(-E/2RT)$ b) $\sigma = A\exp(-2E/RT)$
c) $\sigma = A\exp(-E/RT)$ d) $\sigma = 2A\exp(-E/RT)$

2) Crystals may align themselves in an ordered manner, so there is a net dipole moment, exhibit _____.
a) Pyro-electricity b) Piezo-electricity
c) Ferro-electricity d) Antiferro electricity

3) Average frequency of atomic vibrations in a solid (in Hz).
a) 10^{-12} b) 10^{-13}
c) 10^{12} d) 10^{13}

4) The width of a carbon nanotube is_____ nm.
a) 1 b) 1.3
c) 2.5 d) 10

5) Following is not the 2-dimensional imperfection.
a) Twin boundary b) Dislocation
c) Surface d) Grain boundary

6) Electrical conductivity of insulators is the range _____.
a) $10^{-10}(\Omega\text{-mm})^{-1}$ b) $10^{-10}(\Omega\text{-cm})^{-1}$
c) $10^{-10}(\Omega\text{-m})^{-1}$ d) $10^{-8}(\Omega\text{-m})^{-1}$

7) Flow of electrons is affected by the following.
a) Thermal vibrations b) Impurity atoms
c) Crystal defects d) all of these

8) The space occupied in bcc arrangement is_____.
a) 74% b) 70%
c) 68% d) 60.4%

9) The relations $a \neq b \neq c$ and $\alpha \neq \beta \neq \gamma$ belong to the system.
a) triclinic b) trigonal
c) hexagonal d) cubic

10) An element having bcc structure has 12.08×10^{23} unit cells. The no of atoms in these cells is_____.
a) 12.08×10^{23} b) 24.16×10^{23}
c) 48.68×10^{23} d) 12.08×10^{22}

B) Fill in the blanks OR Write true/false **06**

1) A solid having irregular shape is called _____ solid.
2) _____ solids are also called giant solids or network solids.
3) Schottky defect is noticed in _____.
4) Theoretical strength is about _____ times to average real strength of a material.
5) Stacking fault energies are in the range of _____.
6) Average frequency of atomic vibrations in a solid (in Hz) _____.

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

1) Explain in brief organic Semiconductors.
2) Discuss in detail magnetic bubble memory device.
3) Write note on Thin films.
4) Write note on co-precipitation techniques.

Q.3 Answer the following **16**

a) What are normal, inverse and random spinels? Explain the general structure of spinels.
b) Discuss any one method of manufacturing of nanomaterials

Q.4 Answer the following **16**

a) Discuss the mechanism of ionic conduction.
b) Explain ceramic technique used for synthesis of solid-state materials.

Q.5 Answer the following **16**

a) Explain the formation of spin glasses.
b) What are the challenges and opportunities of nanotechnology?

Q.6 Answer the following **16**

a) Write different method for making nonmaterial. Explain in brief combustion method.
b) Explain the energy conversion from fission and fusion reactions.

Q.7 Answer the following **16**

a) Explain Langevin's theory of paramagnetism.
b) List the types of defects that occur in the crystalline solids and give an example of each.

SLR-SF-87

Seat No.		Set	P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
INORGANIC CHEMISTRY
Applied Inorganic Chemistry (MSC14408)

Day & Date: Sunday, 16-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

Q.1 A) Choose the correct alternatives from the options. **10**

1) In what form is solar energy is radiated from the sun?
   a) Ultraviolet radiation b) Infrared radiation
   c) Electromagnetic waves d) Transverse waves

2) Solar radiation received at any point of earth is called _____.
   a) Insolation b) Beam Radiation
   c) Diffuse Radiation d) Infrared rays

3) Insolation is less _____.
   a) when the sun is low
   b) when the sun right above head
   c) at night
   d) at sun rise

4) Industrial catalysts should have _____ surface area.
   a) High b) Low
   c) Moderate d) None of these

5) The nano particles from iron and palladium are used to produce _____.
   a) Magnets b) Magnetic lens
   c) Magneto meters d) Magnetic storage devices

6) Oxidation of ethylene to acetaldehyde is carried out by _____.
   a) acetic acid process b) Polymerization
   c) Wacker's process d) arene coupling

7) Polymers are _____.
   a) Micro-molecules b) Macromolecules
   c) Sub-micromolecules d) None of these

8) Zeigler - Natta catalyst is used in the polymerisation of _____.
   a) Vinyl acetate b) Vinyl chloride
   c) Propylene d) Styrene

9) Which of the energy has the greatest potential among all the sources of renewable energy?
   a) Solar energy b) Wind Energy
   c) Thermal energy d) Hydro-electrical energy

10) Which is most common source of energy from which electricity is produced?
   a) Hydroelectricity b) Wind energy
   c) Coal d) Solar energy

B) Fill in the blanks OR Write true/false **06**

1) Nano crystalline materials synthesized by sol-gel technique in a foam like structures called _____.
2) Inorganic polymers, in general, are stronger, harder and more brittle than the _____ polymers.
3) The borophosphate glasses are used for manufacturing _____ lenses.
4) The synthesized nano particles from _____ have been found to self-arrange automatically.
5) The extensively used nano particles as catalyst is _____.
6) Quantum dots can be used in _____.

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

a) What are the types of inorganic polymers?
b) Explain in brief Inert gas rule.
c) Write note on Photovoltaic cell.
d) Discus the heterogeneous catalysis.

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

a) What are organosilicones? Discuss various types of silicones.
b) What are organometallic compounds? How they are classified?

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

a) Outline the various characterization techniques for nanomaterials. Explain in detail X-ray diffraction technique.
b) Give a brief account of boron-based polymers.

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

a) Explain the Ion exchange method for making nanomaterials.
b) Give the advantages of geothermal energy.

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

a) Write different method for making nanomaterials. Explain in brief combustion method.
b) Explain the energy conversion from fission and fusion reactions.

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

a) Write the general properties of inorganic polymers.
b) Write the applications nanomaterials.

SLR-SF-99

Seat No.	

Set P

M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2023
PHARMACEUTICAL CHEMISTRY
Advanced Organic Chemistry – I (MSC012301)

Day & Date: Monday, 10-07-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

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

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

1) Which of the following is one of the reactants in Eschenmoser rearrangement?
   a) β-hydroxy ketone b) β -amino alcohol
   c) α,β-epoxy ketone d) all of these

2) In Stevens rearrangement, formation of _____ takes place from quaternary ammonium salt.
   a) tertiary amine b) amide
   c) aldehyde d) none of these

3) The formation of alkenes by base catalysed decomposition of p-toulene sulfonyl hydrazo-nes of aldehydes and ketones is known as _____.
   a) Bomford-Steven's reaction b) Stille reaction
   c) Heck reaction d) Ugi reaction

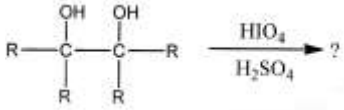
4) In Henry reaction, nitroalkanes should have _____.
   a) α -hydrogen b) β -hydrogen
   c) γ-hydrogen d) δ-hydrogen

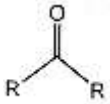
5) Migrating aptitude of groups for Wittig rearrangement is _____.
   a) ethyl > allyl > phenyl b) allyl > phenyl > ethyl
   c) allyl > ethyl > phenyl d) phenyl > ethyl > allyl

6) In Hoffmann-Loffler-Freytag reaction, N-haloamines should have _____.
   a) α -hydrogen b) β -hydrogen
   c) γ-hydrogen d) δ-hydrogen

7) Which of the following is act as inhibitor in free radical reactions?
   a) nitric oxide b) molecular oxygen
   c) Benzoquinone d) all of these

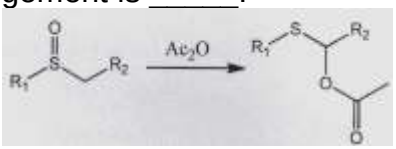
8) In _____, silver salt of carboxylic acid reacts with halogen to produce an organic halide.
   a) Sandmeyer reaction b) Molecular oxygen
   c) Benzoquinone d) All of these

9) 

   a) R-CHO b) 

   c) R-COOH d) Both a) and c)

10) The following rearrangement is _____.



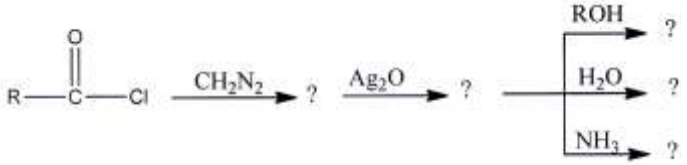
a) Payne reaction
b) Eschenmose reaction
c) Brook reaction
d) Pummerer reaction

B) Write True or False for the followings. **06**

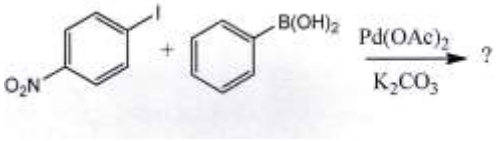
1) The Pummerer rearrangement is an organic reaction whereby an alkyl sulfoxide rearranges to an α-acyloxy-thioether (monothioacetal-ester) in the presence of acetic anhydride.
2) The Aldol- Tishchenko reaction is an organic chemical reaction that involves disproportionation of an aldehyde in the presence of an alkoxide.
3) Amides on treatment with sodium hypobromite gives primary amines.
4) DDQ is used as a powerful hydrogenating agent.
5) DCC is used as powerful dehydrating agent commonly used for the preparation of amides, esters and anhydrides.
6) Wagner-Meerwein rearrangements are common in many reactions involving nitrene as intermediate.

Q.2 Answer the following **16**

a) Discuss Allylic hydrogenation.
b) Write a note on Julia olefination.
c) Predict the product with illustration:



d) Predict the product; give the name and mechanism of following reaction:



Q.3 Answer the following **16**

a) Discuss Darzen reaction and give its application.
b) Write note on Hunsdiecker reaction.

Q.4 Answer the following **16**

a) Discuss the reaction, mechanism involved in McMurry reaction and give its applications.
b) Discuss the Eschenmoser fragmentation with mechanism and give its applications.

Q.5 Answer the following **16**

a) Discuss mechanism at an aromatic substrate in free radical substitution reaction.
b) Write reaction and mechanism involved in Tiffeneau-Demjanov rearrangement reaction in detail and give its application.

Q.6 Answer the following **16**

a) Discuss in detail Von Richter rearrangement reaction.
b) Explain Hoffmann-Loffler-Fretag reaction with suitable example and mechanism.

Q.7 Answer the following **16**

a) Write a brief note on:
1) DDQ
2) Organotin reagents

b) Write a brief note on:
1) Grubb's metathesis
2) Auto-oxidation

SLR-SF-100

Seat No.	

Set P

M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2023
PHARMACEUTICAL CHEMISTRY
Chemistry of Bioactive Heterocycles (MSC012302)

Day & Date: Tuesday, 11-07-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

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

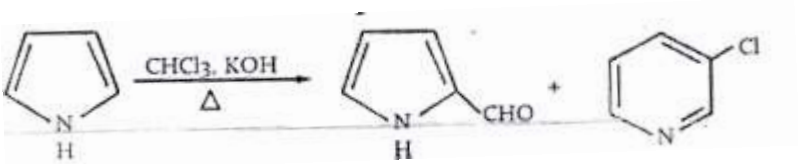
Q.1 A) Choose correct alternatives (MCQ). **10**

1) Which of the following is a not a five membered ring?
   a) Pyridine b) Pyrrole
   c) Furan d) Thiophene

2) Which of the following five membered rings is most resonance stabilized?
   a) Furan b) Thiophene
   c) Pyrrole d) Pyridine

3) What is the reactivity order in the following five membered heterocyclic compounds?
   a) Pyrrole b) Furan
   c) Thiophene d) Pyridine

4) What is the name of the following reaction?



   a) Gattermann reaction b) Riemer tiemann reaction
   c) Friedal craft reaction d) Blanc's chloromethylation

5) Oxidation of Isoquinoline with $KMnO_4$ gives _____ as one of the products.
   a) Benzoic acid b) Pyridine
   c) Phthalic acid d) Salicylic acid

6) Electrophilic aromatic substitutions in quinoline takes place at _____ positions.
   a) 4 b) 2
   c) 5 and 8 d) 2 and 4

7) 2- Aza naphthalene is the name of _____.
   a) Pyridine b) Quinoline
   c) Isoquinoline d) Indole

8) Quinoline is _____ compound.
   a) Homocyclic b) Heterocyclic
   c) Aliphatic d) Saturated

9) Thiophene cannot be prepared from _____.
   a) Acetylene b) n-butane
   c) Ethylene d) Sodium succinate

10) Furan on reaction with $CHCl_3$/KOH gives _____.
   a) 2-acetyl furan b) Furfural
   c) 3-acetyl furan d) 2-chloro furan

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

1) Pyridine has delocalized Pi-molecular orbital containing _____.
2) Furan containing _____ functional group is known as furfural.
3) Thiophene is _____ membered heterocyclic compound.
4) Isoquinoline on reaction with soda amide in liq. Ammonia gives _____.
5) Pyrrol on heating with methyl chloride in presence of sodium methoxide _____ formed.
6) Pyrazine contain _____ nitrogen atom.

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

a) Discuss aromaticity of pyrrole and thiophene.
b) Write any two methods of preparation of furan.
c) What is pyridine? Why pyridine is basic in nature.
d) Write a note on morphine.

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

a) Discuss the synthesis of thiophene and pyrrole with mechanism.
b) Write note on synthesis of benzofuran with mechanism and their applications.

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

a) Discuss the synthesis of indole with mechanism and their chemical reactions.
b) Discuss the synthesis of imidazole and pyrazole and their applications.

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

a) Discuss synthesis of benzothiophene with mechanism and their chemical reactions.
b) What is quinolone and isoquinoline? Write synthetic methods with examples.

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 of triazine and tetrazine in detail.
b) Write mechanism of Coumarin and Chromene with chemical reactions.

SLR-SF-101

Seat No.	

Set P

M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2023
PHARMACEUTICAL CHEMISTRY
Drug Development (MSC012306)

Day & Date: Wednesday, 12-07-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

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

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

1) Lipinski's rule of five is used for _____
   a) Docking b) Similarity search
   c) Drug likeness d) Dynamics simulation

2) _____ is meant by a lead compound in medicinal chemistry.
   a) A drug containing the element lead.
   b) A leading drug in a particular area of medicine.
   c) A compound that acts as the starting point for drug design and development.
   d) A drug which is normally the first to be prescribed for a particular ailment.

3) The study of absorption, distribution, metabolism and excretion of drug is known as _____.
   a) Pharmacy b) Pharmacokinetics
   c) Pharmacodynamics d) Pharmacopoeia

4) Among the following, _____ is not a type of cellular receptor
   a) Tyrosine kinase receptor b) G-protein coupled receptor
   c) Endocrine receptors d) Intracellular/nuclear receptor

5) The therapeutic index of a drug is a measure of its _____.
   a) Safety b) Potency
   c) Efficacy d) Dose variability

6) The concentration of drug in plasma above which toxic effect is produced is known as _____.
   a) Maximum safe concentration
   b) Minimum Effective Concentration
   c) Intensity of action
   d) Duration of action

7) A negative value of σ a for a substituent signifies that.
   a) It is electron donating b) It is hydrophobic
   c) It is hydrophilic d) It is neutral

8) Proteomics refers to the study of ____.
   a) Set of proteins in a specific region of the cell
   b) Biomolecules
   c) Set of proteins
   d) The entire set of expressed proteins in the cell

9) _____ of the following is a protein sequence database.
   a) DDBJ b) EMBL
   c) GenBank d) PIR

10) The MR represent in a QSAR equation is_____.
   a) Molar refractivity is a steric factor
   b) Molar refractivity is an electronic factor
   c) Molar refractivity is a hydrophobic factor
   d) Molar refractivity is a stereoelectronic factor

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

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 _____.
2) The change in the amount of drug in plasma by half of the drug during elimination is called as _____.
3) _____ value gives the regression coefficient a perfect fit.
4) Molecular weight as per Lipinsky's rule should be _____ daltons.
5) Margaret Dayhoff developed the first protein sequence database called _____.
6) The amount of drug in the body to the concentration of drug in plasma is called as _____.

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

a) Write a note on Ligand-based drug designing.
b) Explain the concept of drugs and its sources.
c) Write a note on bioavailability.
d) What are the principles of drug action?

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

a) What is lipophilicity? How does lipophilicity affect drug permeability?
b) What are receptors? Discuss in detail the interaction of drug with the receptors.

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

a) What is a lead molecule? Discuss the various stages involved in identification of a lead molecule.
b) Discuss the different pharmacokinetic parameters involved during ADME of drug.

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

a) Explain the development of Cemetidine on the basis of physico-chemical properties.
b) Explain the plasma drug concentration-time profile showing pharmacokinetic as well as pharmacodynamics parameters.

Q.6 Answer the following **16**

a) Explain in detail the combined effect of drugs administered together in the body.
b) What is dose-response relationship? Explain the potency and efficacy of the drug.

Q.7 Answer the following

a) What is pharmacokinetics? Explain the process of drug absorption. **06**
b) Define and classify molecular docking and discuss various steps involved in the. **10**

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Seat No.	

Set P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
PHARMACEUTICAL CHEMISTRY
Photochemistry and Pericyclic Reactions (MSC012401)

Day & Date: Monday, 10-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Q. Nos. 1 and. 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7
3) Figure to right indicate full marks.
4) Draw neat, labelled diagrams and give equations wherever necessary.

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

1) The thermally induced rearrangement of an allyphenyl ether to an o-allylphenol is known as _____ rearrangement.
   a) Lossen b) Claisen
   c) Schimdt d) Hofmann

2) The Diels-Alder reaction of cyclic diene always gives endo product as major product due to _____.
   a) primary interactions b) steric repulsion
   c) secondary interactions d) electronic effect

3) Huckel's delocalization energy (HDE) for 1,3,5-hexatriene is _____.
   a) 0.85 β b) 0.94 β
   c) 0.49 β d) 0.59 β

4) Chelotropic reactions are _____.
   a) Regioselective b) Chemoselective
   c) Stereoselective d) Stereospecific

5) The γ-hydrogen abstraction with β - bond cleavage to form olefin and enol is known as _____.
   a) Norrish type II b) Norrish type I
   c) Paterno-Buchi d) Photoreduction

6) _____ is the more stable according to Huckel's theory.
   a) Cycloheptatrienyl anion b) Cycloheptatrienyl cation
   c) Cycloheptatrienyl radical d) Cycloheptatriene

7) The _____ reaction is the concerted interconversion of a conjugated polyene and acycloalkene.
   a) Cycloaddition b) Sigmatropic
   c) Electrocyclic d) Chelotropic

8) The phenomenon in which electron returns to ground state (S_0) from singlet (S_1) by liberating energy is known as _____.
   a) Phosphorescence b) Fluorescence
   c) Photosensitisation d) Luminescence

9) The molecular orbitals having *m*-symmetry always give _____ motion.
   a) Rotational b) Vibrational
   c) Conrotatory d) Disrotatory

10) The light formed from a chemical reaction is called as _____.
   a) Luminescence b) Bioluminescence
   c) Chemiluminescence d) All the above

B) Fill in the blanks **06**

1) E_2 or Ψ_2 energy of butadiene has value _____.
2) The homolysis of protonated N-haloamines either thermally or photochemically to form amine salts with halogenated alkyl substituents is known as _____ reaction.
3) The thermal reaction of alkene having an allylic hydrogen with a compound having multiple bond is known as _____ reaction.
4) Rotation of bond in same direction either clockwise or anticlockwise is known as _____ motion.
5) The cycloaddition reaction between an electronically excited carbonyl group and a ground state olefin to yield an oxetane is known as _____ reaction.
6) The _____ rearrangement is an extensively studied organic reaction involving the [3,3]-sigmatropic rearrangement of 1,5-dienes.

Q.2 Answer the following **16**

a) Define the terms.
   i) Intersystem crossing
   ii) Singlet state (S_1)
   iii) Photo Fries reaction
   iv) Photoreduction

b) Give the mechanism of the chelotropiccycloaddition reactions between
   i) alkene and carbene
   ii) alkene and SO_2

c) Explain Suprafacial and antarafacial shifts with suitable example.

d) Write a note on oxidative coupling.

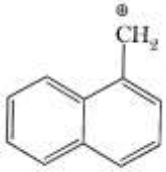
Q.3 Answer the following

a). The electrocyclic transformation of (2E, 4Z, 6E)-2,4,6-octatriene gives cis-5,6- dimethyl-1,3-cyclohexadiene under thermal conditions but gives the trans-isomer on photochemical conditions. Explain. **10**

b) Calculate charge density of the following. **06**

i)

ii)



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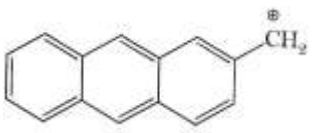


Q.4 Answer the following

a) 1,3- sigmatropic rearrangement is photochemically allowed process. Explain. **08**

b) What is Paterno-Buchi reaction? Discuss its mechanism along with the stereochemical consequences. **08**

Q.5 Answer the following

a) Explain the selection rules derived for electrocyclic reactions for (4n) π and (4n+2) π system by Huckel- Mobius (H-M) method. **08**

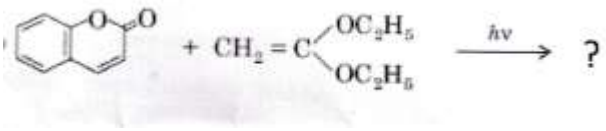
b) With the help of correlation diagram and PMO method, show that the Diels-Alder reaction is thermally allowed process. **08**

Q.6 Answer the following

a) Explain Huckel's molecular orbital theory (HMO) and calculate the Huckel's delocalization energy (HDE) for buta-1,3-diene & hexa-1,3,5-triene. **08**

b) Predict the product and write the mechanism for each. **08**

i)



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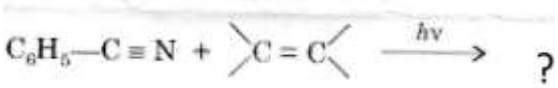

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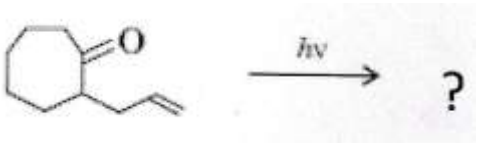

Q.7 Answer the following

a) Give name of the photochemical reactions for ketones. Describe Norrish type I and II reactions with suitable examples. **08**

b) Butadiene-cyclobutene interconversion under thermal condition, conrotatory mode is allowed process, explain by FMO method. **08**

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Seat No.	

Set P

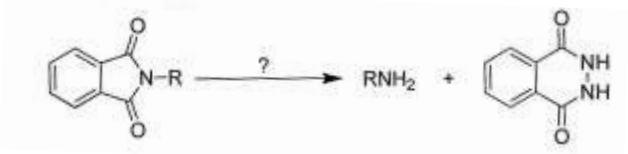
M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
PHARMACEUTICAL CHEMISTRY
Advanced Organic Chemistry - II (MSC012402)

Day & Date: Wednesday, 12-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

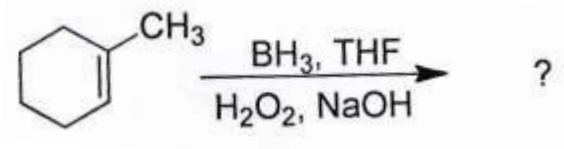
Q.1 A) Choose correct alternative. **10**

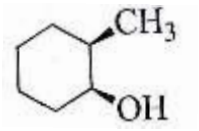
1) Mention suitable condition for deprotection of following protected carbonyl compounds?

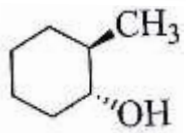


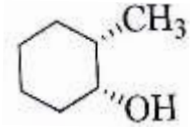
a) HCl b) NH_2NH_2 / EtOH
c) NaOH d) None of these

2) What is the stereochemistry of product in following reaction?



a) 

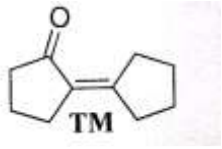
b) 

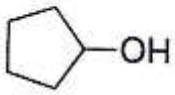
c) 

d) none of these

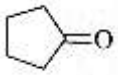
3) Which process that directly produces an optically active compound from symmetrically constituted molecules without requiring resolution of a racemic mixture?
a) Asymmetric synthesis b) Degradation
c) Synthesis d) None of These

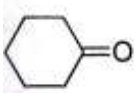
4) Choose the correct synthon for following taget molecule.



a) 

b) 

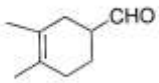
c) 

d) 

5) Which of the following act as umpolung reagent?

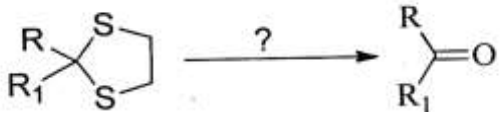
a) Nitro compounds
b) 1,3- Dithianes
c) Alkynes
d) All of the above

6) Which reaction would result in structure having a cyclohexene such as the following as a molecular structure?



a) Claisen rearrangement
b) Diels-Alder reaction
c) Ene reaction
d) Aldol condensation

7) Mention suitable condition for deprotection of following protected carbonyl compounds?

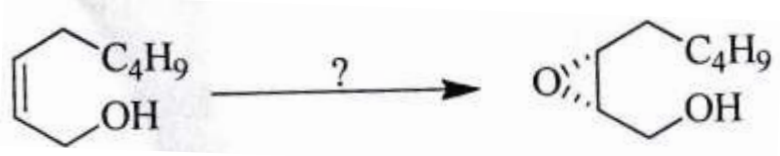


a) I_2/DMSO
b) MeI, aq. MeOH
c) OHCCOOH, AcOH; O_2/hv
d) All of above

8) When a tetrahedral carbon can be converted to a chiral center by changing only one of the attached groups, it is referred to as a _____.

a) Chiral carbon
b) Prochiral carbon
c) Carbon
d) None of these

9) Choose correct reagent for following asymmetric synthesis.



a) $Ti(O^iPr)_4$, (-) DET, TBHP
b) $Ti(O^iPr)_4$, (+) DET, TBHP
c) H_2O_2
d) none of these

10) In trans-Decalin, two rings are fused through _____ bonds.

a) a,e
b) e,e
c) a,a
d) none of these

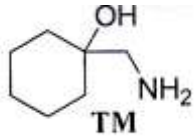
B) Fill in the blanks. **06**

1) The selectivity of a reaction towards one of a pair of enantiomers is called _____.
2) The cyclohexane units in both cis and trans decalins exist in _____ conformation.
3) Conversion of one functional group into another functional group is known as _____.
4) Cis- Decalin exists as a _____ pair.
5) A reaction in which one functional group within a molecule reacts leaving other potentially reactive functional groups unaltered is called _____.
6) Addition of borane to alkene follow _____ rule.

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

a) Discuss two group C-X disconnections with suitable examples?

b) Outline the retro synthetic analysis and design synthesis of the following target molecule.



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c) Explain nomenclature system for bridged rings?

d) Discuss the principle of protection of amines?

Q.3 Answer the following.

a) Discuss the principle of protection of carboxylic group with suitable examples? **08**

b) Explain role of aliphatic nitro compounds in synthesis? **08**

Q.4 Answer the following.

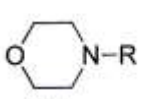
a) Explain prochirality with suitable example. **08**

b) Explain various protecting groups for carbonyl compounds? **08**

Q.5 Answer the following.

a) What is regioselectivity? Discuss regioselectivity in Michael reaction. **08**

b) Using disconnection approach, design a convenient synthesis for each of the following compounds? **08**



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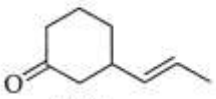

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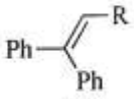

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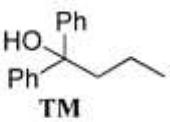

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Q.6 Answer the following.

a) What is stereoselective synthesis? Describe with suitable examples? **08**
   i) Stereoselective synthesis via chiral reagents
   ii) Stereoselective synthesis via chiral auxiliaries

b) Explain role of boranes in asymmetric synthesis? **08**

Q.7 Answer the following.

a) Draw different conformations of perhydrophenanthrene and explain its stability? **08**

b) Explain the stereochemical restriction in bridged ring system with help of Bredts rule? **08**

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Seat No.	

Set P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
PHARMACEUTICAL CHEMISTRY
Pharmaceutical Dosage Forms (MSC012403)

Day & Date: Friday, 14-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

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

1) Friability test is known as _____.
   a) LAL test b) Swelling index
   c) Brittle fracture index test d) Sham test

2) Name of the equipment/s used to measure hardness of tablet.
   a) Pfizer tester b) Strong Cobb
   c) Erweka tester d) All of the above tester

3) _____ method requires the addition of granulating agent.
   a) Wet granulation b) Dry granulation
   c) Moist granulation d) Direct compression

4) Emulsion is _____ type of dosage form.
   a) Monophasic b) Biphasic
   c) Triphasic d) None of the above

5) A hypertonic injection can cause _____.
   a) Shrinking of blood cells b) Hemolysis
   c) Fever d) All of the above

6) It is the stage of product development where scientist characterize physicochemical property of the drug substance is known as _____.
   a) Formulation b) Pre- Formulation
   c) Production d) None of the above

7) Biopharmaceutics Classification system (BCS) is done based on ____.
   a) Solubility b) Permeability
   c) Both a & b d) None of these

8) Determination of particle size is done by _____.
   a) Microscopic method b) Sieving method
   b) Coulter-Counter method d) All of the above

9) _____ is not component of the aerosol system.
   a) Propellant b) Dip tube
   c) Actuator d) Paddle

10) Ophthalmic preparations should be _____ with lachrymal secretions.
   a) Paratonic b) Isotonic
   c) Compatible d) None of these

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

1) Slugs are prepared in _____ kind of granulation techniques.
2) Separation of tablet into two or more distinct layers is _____.
3) _____ controls the movement of upper and lower punches in tablet compression.
4) _____ are biphasic phasic liquid dosage forms where solid particles are dispersed in liquid vehicle.
5) Packaging material which is direct in contact with product is known as ____.
6) A dilution test can be used for checking stability of _____.

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

a) Define and classify dosage forms with suitable examples.
b) Write the difference between flocculated and deflocculated suspension.
c) What are Parenteral? Write advantages and disadvantages.
d) Write the concept of pre-formulation.

Q.3 Answer the following.

a) Discuss the different tests to identify the type of emulsion. **08**
b) Discuss the different instability parameters of emulsion. **08**

Q.4 Answer the following.

a) What is Pre-formulation? Explain the factors influencing designing of dosage forms. **10**
b) Add a note on BCS classification of drugs. **06**

Q.5 Answer the following.

a) Write the rationality behind the development of sustained release dosage forms. **08**
b) Discuss the penetration enhancers in transdermal drug delivery system. **08**

Q.6 Answer the following.

a) Write the different excipients used in the formulation of tablet dosage forms. **08**
b) Discuss the drug candidate requirement for development of oral controlled drug delivery systems. **08**

Q.7 Answer the following.

a) Describe wet granulation technique. **08**
b) Describe dry granulation technique. **08**

Seat No.		Set	P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
PHARMACEUTICAL CHEMISTRY
Pharmaceutical Technology (MSC012408)

Day & Date: Sunday, 16-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

Q.1 A) Choose the correct alternatives from the options. **10**

1) What size of equipment is needed in continuous process when compared with batch process?
   a) does not depend on size b) Larger
   c) Smaller d) none of these

2) The formation of acetic acid through oxidation is done in _____ phase.
   a) Vapour b) Liquid
   c) Solid d) All of the above

3) _____ is the documented evidence which provides high degree of assurance that specific process produce product meeting its predetermined specification and quality characteristics.
   a) Validation b) Qualification
   c) Revalidation d) process validation

4) Brine is _____.
   a) heat exchanger b) tower
   c) coolant d) column

5) _____ is the most important state in dry granulation.
   a) Mixing b) Screening
   c) Milling d) Slugging

6) The first element of validation of new facilities systems or equipment is _____.
   a) installation qualification b) design qualification
   c) concurrent validation d) process validation

7) Coating used to protect the tablet from acidic environment of stomach is _____.
   a) film coating b) sugar coating
   c) enteric coated d) Encapsulation

8) Moisture and heat sensitive drug are formulated into tablets by _____.
   a) direct compression b) dry granulation
   c) wet granulation d) All of these

9) Which one of these is responsible for hardness of tablet?
   a) die filling b) compression force
   c) both a and b d) none of these

10) GMP guidelines provide the guidelines for maintaining _____.
   a) a clean & hygienic manufacturing area
   b) clarity & control in manufacturing processes
   c) records of manufacture
   d) All of these

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

1) FDA stands for _____.
2) GLP stands for _____.
3) API stands for _____.
4) IRB Stand for _____.
5) IP stands for _____.
6) ICH stands for _____.

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

a) Explain wet granulation.
b) Draw a unit process diagram for monochloroacetic acid.
c) Explain sugar coating process.
d) What is validation? Give its principle, importance and need of validation.

Q.3 Answer the following.

a) Explain unit process of vinyl chloride. **10**
b) Write a note on granulation method. **06**

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

a) Describe sampling techniques in cleaning validation.
b) What are the types of process validation?

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

a) Explain liquid phase oxidation of acetaldehyde to acetic acid by using oxygen.
b) Discuss compression method.

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

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

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

a) Write a brief note on reactors used in API manufacturing unit.
b) Describe Effluent Treatment Plant (ETP) process.

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Seat No.	

Set P

M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2023
MEDICINL CHEMISTRY
Advanced Organic Chemistry – I (MSC08301)

Day & Date: Monday, 10-07-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

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

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

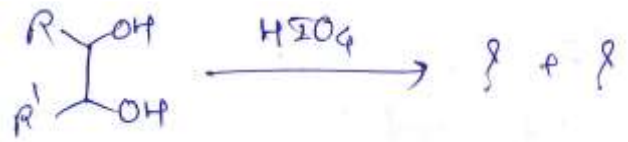
1) The Payne rearrangement occur with inversion of stereochemistry at _____ of 2,3-epoxyalchohol.
   a) C-2 b) C-1
   c) C-3 d) C-2 and C-3

2) In Brook rearrangement migration of _____ group is intramolecular.
   a) Alkyl b) Hydroxy
   c) Silyl d) Alkoxy

3) The regioselectivity of iodolactonisation reaction can be explained using _____.
   a) Baldwin's rule b) Markownikoff's rule
   c) Anti-Movkownikoff's rule d) None of these

4) The Henry reaction is a base catalyzed C–C bond forming reaction between _____ and _____.
   a) Nitroalkanes and aldehydes b) Nitroalkanes and ketones
   c) Nitroalkanes and esters d) Both a and b

5) In Suzuki's coupling reaction _____ can be used as an electrophilic component along with arylbromic acid.
   a) Arylhalide b) Triflate
   c) Aryldiazonium ion d) All three

6) 

   a) RCOOH + R'CHO b) RCHO + R'COOH
   c) RCHO + R'CHO d) RCOOH + R'COOH

7) _____ is used for oxidation of ketones to corresponding acyloins.
   a) Lead tetraacetate b) Selenium dioxide
   c) Iodoisobenzyl diacetate d) All three

8) Enols are ____.
   a) Nucleophiles b) Electrophiles
   c) Ambident nucleophiles d) Ambident electrophiles

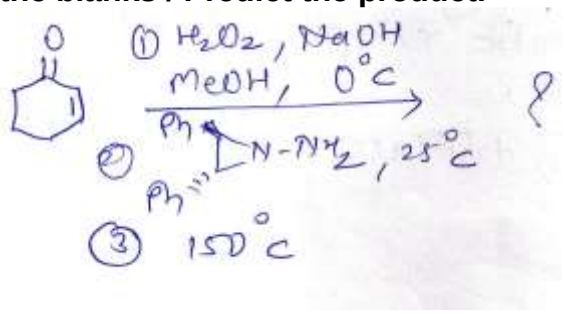
9) _____ can be used as a base for forming enolates from ketones.
   a) LDA b) LTMP
   c) LHMDS d) All three

10) ____ is the base promoted reaction of ethers to yield secondary or tertiary alcohols.

a) Witting reaction
b) [2,3] Witting rearrangement
c) [2,2] Witting rearrangement
d) [1,2] Witting rearrangement

B) Fill in the blanks / Predict the product. **06**

1)



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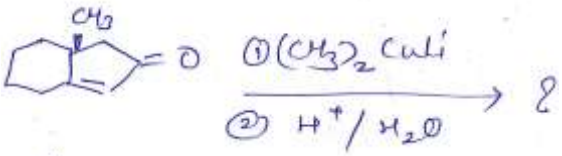

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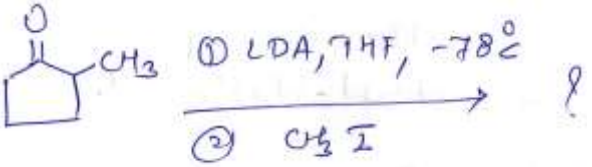

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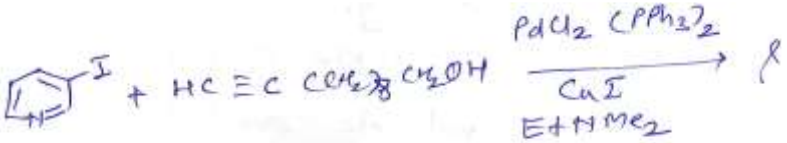

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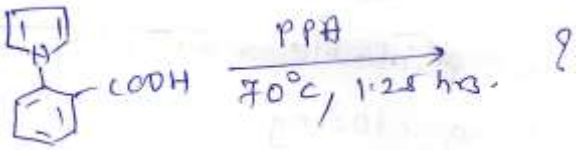

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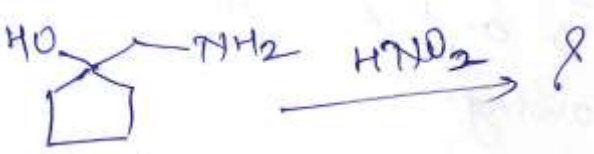

Q.2 Answer the following **16**

a) Explain with suitable example reaction mechanism of Duff reaction.
b) Discuss stereochemistry and mechanism of Wolff rearrangement reaction.
c) Discuss various applications of selenium dioxide.
d) Explain with suitable examples alkylation of highly stabilized enolates.

Q.3 Answer the following

a) Explain reactivity and applications of Lithium dialkylcuprate. **08**
b) Explain reaction mechanism of Witting rearrangement reaction and give its applications. **08**

Q.4 Answer the following

a) Discuss regioselectivity and stereoselectivity in enolate formation from ketones and esters. **08**

b) Explain with suitable examples various applications of trimethylsilyl iodide. **08**

Q.5 Answer the following

a) Discuss with suitable examples mechanism of ozonolysis and its oxidative and reductive work up. **08**

b) Explain with suitable examples reaction mechanism of Ring closing metathesis (Grubb's metathesis) reaction and give its applications. **08**

Q.6 Answer the following

a) Explain the reaction mechanism of Iodo-lactonization rearrangement reaction and give its various applications. **08**

b) Discuss with suitable examples alkylation of aldehydes, esters and carboxylic acids. **08**

Q.7 Answer the following

a) Explain with suitable examples reaction mechanism and application of Hiyama and Tsuji-Trost reaction. **08**

b) Discuss Peterson's synthesis. **08**

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Seat No.	

Set P

M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2023
MEDICINL CHEMISTRY
Chemistry of Bioactive Heterocycles (MSC08302)

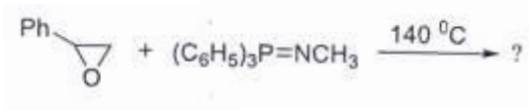
Day & Date: Tuesday, 11-07-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

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

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

1) Which of the following is the prefix of sulphur?
   a) Oxa b) Thia
   c) Aza d) Sila

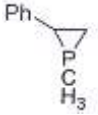
2) Predict the product of following reaction



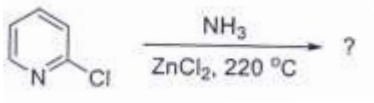
a) 

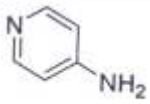
b) 

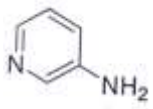
c) 

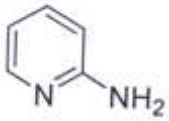
d) 

3) The major product formed in the following reaction is _____.



a) 

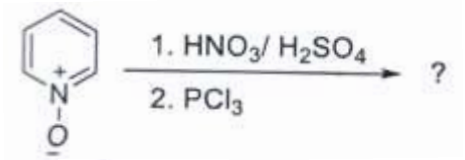
b) 

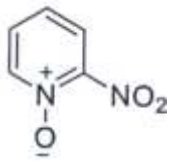
c) 

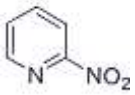
d) 

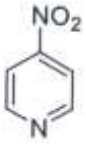
4) Which of the following is the most resonance stabilized five membered ring?
   a) Furan b) Pyrrole
   c) Thiophene d) Pyridine

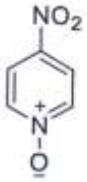
5) The major product formed, in the following reaction is _____



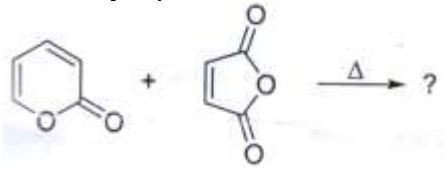
a) 

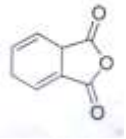
b) 

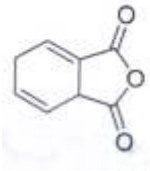
c) 

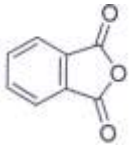
d) 

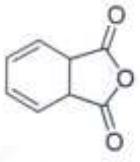
6) The major product formed in the following reaction is: _____.



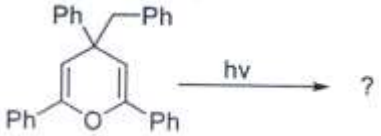
a) 

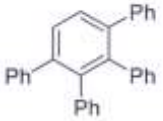
b) 

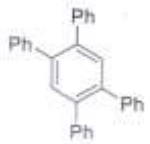
c) 

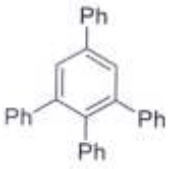
d) 

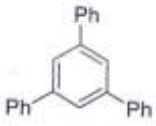
7) The product formed in the following reaction is _____.



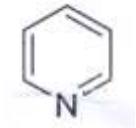
a) 

b) 

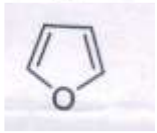
c) 

d) 

8) Which of the most reactive in electrophilic aromatic substitution?

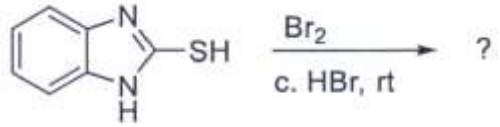
a) 

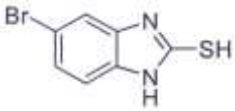
b) 

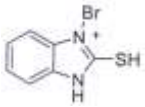
c) 

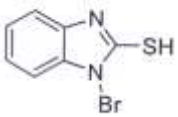
d) 

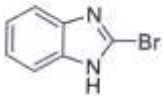
9) Which is the most probable main product of the following reaction?



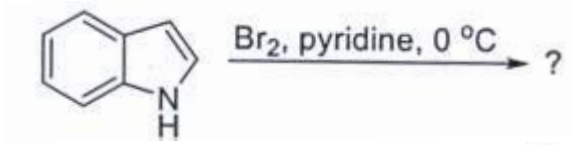
a) 

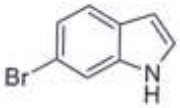
b) 

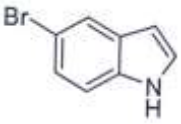
c) 

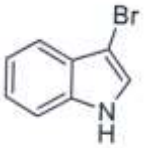
d) 

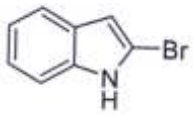
10) Which is the most probable main product of the following reaction?



a) 

b) 

c) 

d) 

B) True or False. **06**

1) Pyrrolidine is non-aromatic compound.
2) Pyridine is more reactive towards electrophiles than benzene.
3) 1,4-diazine is also known as pyrazine.
4) Benzimidazole nucleus appears in Vitamin C.
5) The suffix ‘ole’ used for the five membered unsaturated ring.
6) Indole does not exhibit weak acidic properties.

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

a) How to prepare 4yridines from 1,3-dicarbonyl compounds? Discuss in details with mechanism.

b) Discuss the two methods of each for synthesis of oxiranes and aziridines.

c) Give two methods of pyrazine synthesis with mechanism.

d) Write a short note on synthesis of tetrazole.

Q.3 Answer the following.

a) Write synthesis of thiazole and imidazole from α-halo-carbonyl compounds with mechanism. **08**

b) What is the reactivity of pyridine towards electrophilic substitution reaction with regioselectivity? **08**

Q.4 Answer the following.

a) What are the methods for synthesis of pyrimidine? Explain with examples. **08**

b) What are the various methods for synthesis of benzimidazoles and benzothiazoles? **08**

Q.5 Answer the following.

a) At which positions do indole and benzothiophene reacts most readily with electrophiles? Give reason of each. **08**

b) What are Skraup synthesis and Doebner-Miller synthesis reactions? Discuss with examples and mechanism. **08**

Q.6 Answer the following.

a) What is regioselectivity of bromination and nitration reactions in pyrrole with examples. **08**

b) What is the regioselectivity of nitration, halogenations and sulphonation reactions of thiophene? **08**

Q.7 Answer the following.

a) What are Baldwin Rules? Discuss in Details. **08**

b) Discuss synthesis of pyrrole, furan and thiophene heterocycles from 1,4-dicarbonyl compounds. **08**

SLR-SF-111

Seat No.	

Set P

M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2023
MEDICAL CHEMISTRY
Drug Development (MSC08307)

Day & Date: Wednesday, 12-07-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

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

Q.1 A) Choose the correct alternatives from the given options. **10**

1) Drug is used to _____.
   a) Elevate fever b) increase illness
   c) reduce mortality d) Cure disease

2) Lipinski's rule of five says the lipophilicity of a drug should be _____.
   a) <5 b) >4
   c) >10 d) >8

3) _____ is not a type of receptor.
   a) Osmoreceptor b) Chemoreceptors
   c) Thermoreceptor d) Muscle receptor

4) The rate of drug absorption is not affected by _____.
   a) Route of administration b) Drug Solubility
   c) Sex of the person d) The environment

5) _____ is a ligand or drug that blocks a biological response by binding to a receptor.
   a) Agonist b) Antagonist
   c) Enzymes d) Antibody

6) _____ tells the relationship between chemical structures and biological activity.
   a) QSPR b) QSRR
   c) QSAR d) QSBR

7) Study of adverse effects that occur in living organisms due to chemicals is called _____.
   a) Pharmacology b) Pharmacodynamics
   c) Toxicology d) Pharmacokinetics

8) _____ is the movement of a drug from the site of administration into the bloodstream.
   a) Drug absorption b) Drug Distribution
   c) Drug Metabolism d) Drug Elimination

9) _____ is not a type of molecular descriptor.
   a) 0D-descriptors b) 1D-descriptors
   c) 2D-descriptors d) 3D QSBR

10) The following are the properties of drug likeness except _____.
   a) Solubility b) Permeability
   c) Metabolic stability d) Mutagenicity

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

1) UniProt is _____ database.
2) Structure based drug design is an approach requires the knowledge of _____ structure.
3) _____ is an approach to find correlations between chemical structure and activity.
4) _____ is a major drug metabolizing enzyme.
5) If Logp value of a drug is more the 5, then the drug is _____.
6) _____is the dose of a medication that produces a desired pharmacologic effect in 50% of the studies patient population that takes the medication.

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

a) Write a note on principles of drug action.
b) Describe combined effect of drugs.
c) Write a note on different phases of drug metabolism.
d) Explain the 2D QSAR modeling.

Q.3 Answer the following.

a) Explain the electro kinetic and steric parameters in brief. **10**
b) Explain the drug receptor interactions. **06**

Q.4 Answer the following.

a) Explain molecular docking steps in detail. **10**
b) Describe the Lead and drug like properties. **06**

Q.5 Answer the following.

a) Explain the Drug development process. **10**
b) Describe Pharmacokinetic models in detail. **06**

Q.6 Answer the following.

a) Explain the LD50, ED50 and IC50 in detail. **10**
b) Explain the concept of lead identification and modification. **06**

Q.7 Answer the following.

a) Explain the ADMET properties in brief. **10**
b) Describe the dose-response relationships. **06**

SLR-SF-112

Seat No.	

Set P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
MEDICINL CHEMISTRY
Pharmaceutical Dosage Forms (MSC08401)

Day & Date: Monday, 10-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

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

1) _____ is not a semisolid dosage form.
   a) Cream b) Paste
   c) Solution d) Gel

2) _____ coatings are employed when the drug substance is destroyed by gastric acid.
   a) Film b) Sugar
   c) Enteric d) Encapsulation

3) Slugging is term associated with _____.
   a) Tablet manufacturing b) Suspension manufacturing
   c) Cream manufacturing d) Aerosol manufacturing

4) The finished parenteral products are subjected to the _____ tests, in order to maintain quality control.
   a) Sterility test b) Clarity test
   c) Leakage test d) All of these

5) Ophthalmic preparations are generally act at _____ which acts as gate way for these formulations.
   a) Optic nerve b) Cornea
   c) Sclera d) Choroid

6) With organic compounds, an increase in the number of _____ groups seem to increase the sweetness of the compound.
   a) Carbonyl b) Methyl
   c) Hydroxyl d) Ethyl

7) The formulation that best meets the goals for the product is selected to be its _____ formula.
   a) Matter b) Master
   c) Material d) None of these

8) The main advantage of biodegradable intraocular implant is _____.
   a) They don't have to be removed from body
   b) Production cost is comparatively low
   c) They are inert
   d) None of these

9) For injections _____ is the most common vehicle used.
   a) Solid b) Powder
   c) Water d) None of these

10) _____ are the common transdermal patch designs.
   a) Drug-in-adhesive patch
   b) Drug-in-matrix patch
   c) Rate -limiting membrane-type patch
   d) All of these

B) Fill in the blanks **06**

1) Drugs having shorter and longer _____ cannot be formulated as sustained release dosage formulation.
2) Noyes Whitney equation is _____.
3) Before the formulation of a drug substance into a dosage from, it is essential that it be _____ and _____ characterized.
4) _____ are defined as the containing therapeutically active ingredients dissolved, suspended or emulsified in a propellant or a mixture of solvent and propellant and intended for oral or topical administration into body cavities.
5) A _____ was used to produce flexibility and elasticity of the coating and thus provide durability.
6) _____ is used to introduce the medicated dusting powder into the body cavities.

Q.2 Answer the following **16**

a) Describe briefly the solid dosage forms.
b) Define the term ‘parenteral products’. Discuss in brief, the general requirements for parenteral dosage forms.
c) Define and give example of following ingredients.
   i) Tablet lubricant
   ii) Tablet disintegrant
   iii) Levigating agent
   iv) Suspending agent
d) Comment on delayed release drug delivery system.

Q.3 Answer the following

a) Write in detail about systemic routes of drug administration. **06**
b) Define the term ‘Emulsion’. Discuss about the stability of emulsion. **10**

Q.4 Answer the following

a) Elaborate in detail about biphasic liquid dosage forms. **10**
b) What are propellants? Discuss in detail various types of propellants. **06**

Q.5 Answer the following

a) i) Define excipient and explain selection and mode of action of preservatives. **04**
   ii) Define chelating agent and explain the mechanism of drug degradation. **04**
b) Write a note on membrane-controlled system and osmotic system. **08**

Q.6 Answer the following

a) Write in detail about design of transdermal patches. **08**
b) Write down the factors affecting on designing of dosage forms and comment on Accelerated stability studies. **08**

Q.7 Answer the following

a) Explain Wet granulation method of tablet manufacturing. **06**
b) What are ‘ointments’? Classify different ointment bases used in the preparation of ointments. Describe briefly each base. **10**

SLR-SF-113

Seat No.	

Set P

M.Sc. (Semester-IV) (New) (CBCS) Examination: March/April-2023
MEDICINL CHEMISTRYS
Modern Organic Chemistry (MSC08402)

Day & Date: Wednesday, 12-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

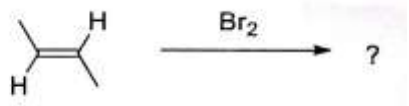
Instructions: 1) Question no. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7.
3) Figure to right indicate full marks.

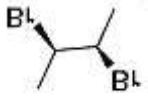
Q.1 A) Choose the correct alternative. **10**

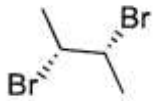
1) Considering the following reaction, the correct statements among A-C are _____.
   i) The carbonyl group has enantiotopic faces
   ii) The hydride attack is form Re face
   iii) It is diastereoselective reduction.

a) i and ii only b) i and iii only
c) ii and iii only d) i, ii and iii

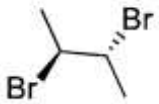
2) Predict the correct option of product.



a) 

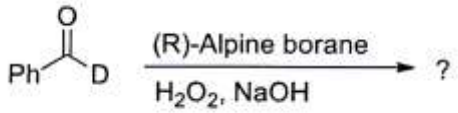
b) 

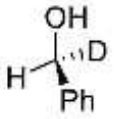
Both (a) and (b)

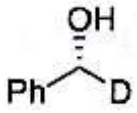
c) 

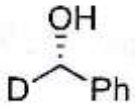
d)

3) Predict the correct option of major product.



a) 

b) 

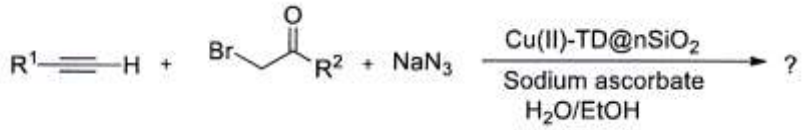
c) 

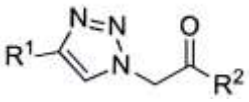
d) Both (a) and (b)

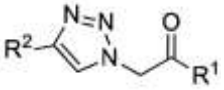
4) Which of the following asymmetric synthesis method give 100% ee guaranteed?

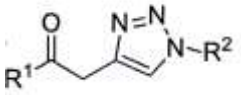
a) Chiral reagent
b) Chiral catalyst
c) Chiral pool
d) Chiral Auxiliary

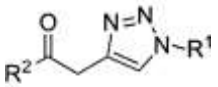
5) Predict the product of the following reaction



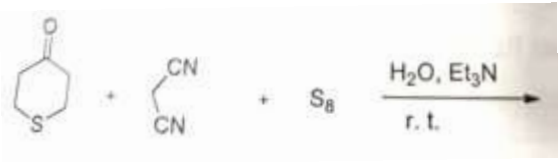
a) 

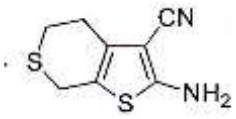
b) 

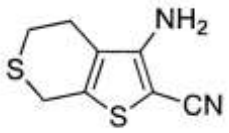
c) 

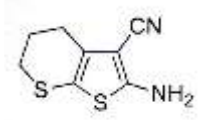
d) 

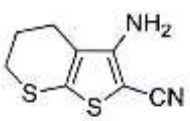
6) Predict the product of the following reaction



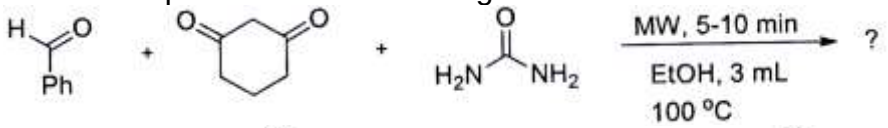
a) 

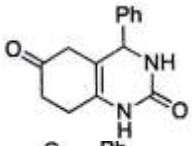
b) 

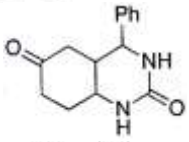
c) 

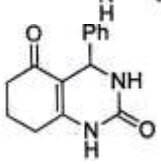
d) 

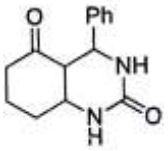
7) Predict the product of the following reaction



a) 

b) 

c) 

d) 

8) A mass production of MOFs could be achieved by _____ method.
   a) Ultrasound b) Solvo-thermal
   c) Crystal transformation d) Electro-chemical

9) Scanning Electron Microscopy (SEM) of MOF allows the chemist to study it's _____.
   a) Purity b) Morphology
   c) Adsorption/desorption d) Chemical composition

10) According to computational fitting results surface area of MOFs could probably reach up to _____.
   a) 15600 m^2/g b) 14800 m^2/g
   c) 7140 m^2/g d) 7040 m^2/g

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

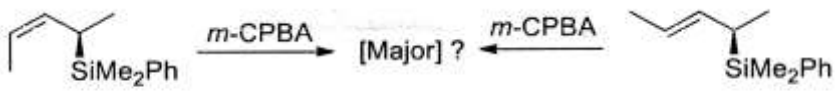
1) The pore size of mesoporous materials ranges between _____ Á.
2) In HKUST-1 metal organic framework, HKUST stands for _____.
3) The Bais voltage applied during electrochemical synthesis of MOF is _____ V
4) An increase in the number of benzene rings in organic linker could affect the _____ of metal organic frameworks.
5) Those reactions including three and more starting materials are classified as _____ reactions.
6) The synthesis involves reactions that include multiple chemical conversions between, substrates, reagents and catalysts which are performed in a single vessel are called _____ synthesis.

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

a) Define Pro-R, Pro-S, Re face and Si face with examples?
b) Write a short note on Enantiomeric excess?
c) Write a note on secondary building unit (SBUs).
d) Write a note on analysis methods of MOF.

Q.3 Answer the following.

a) Discuss the mechanism of epoxidation with stereochemistry of major product. Give justification for major and minor product. **08**

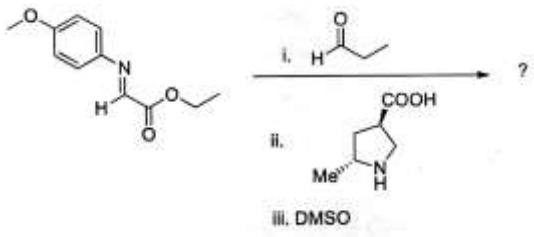


A B

b) How MCRs are useful for synthesis of heterocycles using Knoevenagel reaction? **08**

Q.4 Answer the following.

a) Predict the major product and give justification for diastereoselectivity with mechanism in following transformation? **08**



b) Explain diastereoselectivity of Aldol reactions with examples. **08**

Q.5 Answer the following.

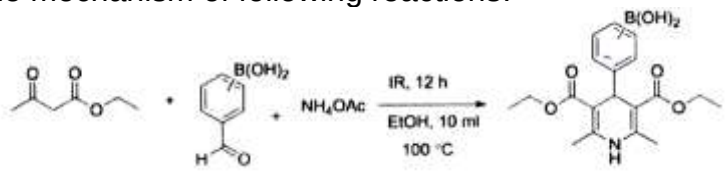
a) Define chiral catalyst? What is Sharpless epoxidation? Comment on the stereoselectivity with examples. **08**

b) What is chiral reagent? What is synthesis of CBS reagent and its applications in enantioselective synthesis? **08**

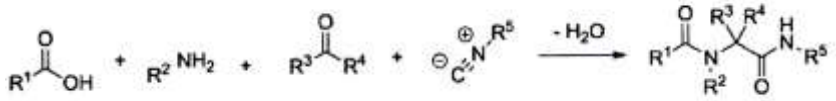
Q.6 Answer the following.

a) Write the mechanism of following reactions. **08**

i)



ii)



b) What is the mechanism of Passerini and Gewald reaction? Write different examples of each. **08**

Q.7 Answer the following.

a) What are the synthetic routes to metal organic frameworks? Explain Electrochemical and microwave/ultrasound methods of MOF synthesis with suitable diagrams. **08**

b) What are the functionalized MOFs? Explain in detail the methods involved in MOF Functionalization. **08**

SLR-SF-114

Seat No.	

Set P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
MEDICINL CHEMISTRY
Drug Regulatory Affairs (MSC08403)

Day & Date: Friday, 14-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

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

1) CFR stands for _____.
   a) Code of Federal Regulations
   b) Centre of Federal Regulations
   c) Code of Federal Register
   d) Centre of Federal Regulator

2) The ICH structure consists of the _____.
   a) Steering committee, The Secretariat, coordinators and expert working groups
   b) Steering committee, The Secretariat and expert working groups
   c) The Secretariat, coordinator and Steering committee
   d) The Secretariat, Expert working groups and coordinators

3) The ICH topics are divided into _____ Categories.
   a) Quality guidelines and safety guidelines
   b) Safety guidelines and Efficacy guidelines
   c) Multidisciplinary guidelines and Quality guidelines
   d) Quality guidelines, Safety guidelines, Efficacy and Multidisciplinary

4) Intellectual property rights (I.P.) in India covers _____.
   a) Patent b) Copyrights
   c) Trademarks d) All of the above

5) Every patent will be valid for 29 years from the date of _____.
   a) Issue of patent b) Filling of patent
   c) Invention d) Publish

6) The entry in Batch Manufacturing Record is done by _____.
   a) Quality Control Department
   b) Quality Assurance Department
   c) Production Department
   d) Warehouse Department

7) CTD is divided into _____modules.
   a) 3 b) 6
   c) 5 d) 4

8) Identify the relevant regulatory body in USFDA for approval of drugs?
   a) BLA b) IND
   c) CDER d) CBER

9) Functions of state licensing authorities, Deputy Drug Controller (DDC).
   a) Licensing of Drug testing laboratories
   b) Pre and Post Licensing inspection
   c) Recall of substandard drugs
   d) All of the above

10) Schedule _____ of the D & C Act 1940 and Rules 1945 deals with the guidelines for Good manufacturing Practices.
   a) Y b) M
   c) X d) P

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

1) _____ is the long form of FEFO.
2) In store management, ERP stands for _____.
3) To obtain a patent the inventor must give an application to ____ of patent.
4) The office for registration of Geographical indications for whole of India is located at ____.
5) A high efficiency air filter used in AHU is _____.
6) _____ is the name of regulatory authority in Australia.

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

a) Write a note on basic requirements of GMP.
b) What is copyright? Discuss in brief about copyright.
c) What drug master files and types of drug master files.
d) Discuss in brief about contract and loan licensing with case study.

Q.3 Answer the following.

a) Write name of six quality system in GMP and explain production management system in details. **08**
b) What are organization pillars in cGMP? Discuss in brief quality culture and pharmaceutical industry. **08**

Q.4 Answer the following.

a) What are essential documents with patent application? Write in brief about grant of patent, opposition and patent infringement. **08**
b) Discuss in details about Indian patent Law amendment. **08**

Q.5 Answer the following.

a) What is orange book? What are the main uses of orange book? What information can be searched on orange book? **08**
b) Write an overview of the Common Technical Document (CTD) regulatory dossier and overall organization of the CTD with five modules. **08**

Q.6 Answer the following.

a) Write an overview on Schedule ‘M’ in accordance with GMP and requirement of premises, plant and equipment’s. **08**
b) Describe in details about approval of new drugs in India. **08**

Q.7 Answer the following.

a) Write a note on following. **08**
   i) Material management as per GMP
   ii) Facilities and equipment management system as per GMP
   iii) Laboratory controls management system as per GMP
   iv) Pressure differential and different types of airlocks in HVAC system.
b) Write on overview on ICH and give details about steps ICH process. **08**

SLR-SF-115

Seat No.	

Set P

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
MEDICINL CHEMISTRY
Medicinal Chemistry (MSC08408)

Day & Date: Sunday, 16-07-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

Q.1 A) Choose the correct alternatives from the options. **10**

1) An Ibuprofen is _____ drug.
   a) Anti-inflammatory b) Antiviral
   c) Antidiabetic d) Anti histamine

2) Paracetamol can be synthesized from _____.
   a) o-nitrophenol b) m-nitrophenol
   c) p-nitrophenol d) None of these

3) Phenelzine is a _____ amine oxidase inhibitor.
   a) Mono b) Di
   c) Tri d) Tetra

4) Insulin is an essential hormone produced by the _____.
   a) Kidney b) Lungs
   c) Pancreas d) Liver

5) An Acyclovir is _____ drug.
   a) Anti-inflammatory b) Antiviral
   c) Antidiabetic d) Anti histamine

6) The penicillins are all strong ____ acids.
   a) monobasic b) dibasic
   c) tribasic d) none of these

7) _____ used in the treatment of rheumatoid pains.
   a) Lidocaine b) Diclofenac
   c) Aspirin d) Insulin

8) Tolbutamide gets oxidized extensively to the corresponding _____ and carboxylic acid.
   a) Amine b) Thiol
   c) Aldehyde d) Alcohol

9) Antineoplastic agents are classified into _____.
   a) Alkylating agents
   b) Antimetabolites
   c) Alkylating agents & Antimetabolites
   d) None of these

10) _____ is caused by genus plasmodium.
   a) Jaundice b) Fever
   c) Cancer d) Malaria

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

1) All the penicillin gives the same amines and different aldehyde.
2) Halothane both are local anesthetics.
3) Penicillin and Cephalosporin are classified under broad spectrum antibiotics.
4) Tolbutamide and Glipizide are oral hypoglycemic agents.
5) Abbreviation of NSAIDs is Non-steroidal Anti-inflammatory drugs.
6) Clotrimazole is in the class of antifungal medication.

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

a) Explain the mechanism of action of metformin.
b) Explain the synthesis of sulfa oxazole.
c) Explain antianginal activity of Nifedipine.
d) Explain classification of penicillin.

Q.3 Answer the following.

a) Explain the SAR and synthesis of chloroquine. **08**
b) Define and classify the NSAIDs. **08**

Q.4 Answer the following.

a) Explain the SAR and mechanism of action of diphenhydramine. **08**
b) Explain the SAR and synthesis of phenelzine. **08**

Q.5 Answer the following.

a) Explain classification of antimetabolites. **08**
b) Explain the SAR and synthesis of captopril. **08**

Q.6 Answer the following.

a) Explain the synthesis and mechanism of action of sulfacetamide. **08**
b) Explain synthesis and mechanism of action of Ibuprofen. **08**

Q.7 Answer the following.

a) Explain the synthesis and mechanism of action of propranolol. **08**
b) Explain anaesthetic activity of halothane and thiopental. **08**