**SLR-GF-1**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - I) (New) (CBCS) Examination: Oct/Nov - 2022
## (CHEMISTRY)
## Inorganic Chemistry - I

Day & Date: Monday, 13-02-2023 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) $Cd^{2+}$ is isoelectronic with _____.
   a) $Cu^{+}$ b) $Au^{+}$
   c) $Zn^{2+}$ d) $Ag^{+}$

2) _____ is not used as a moderator.
   a) Heavy water b) Water
   c) Graphite d) Boron

3) The oxidation state of Cr in $Cr_2O_7 2^{-}$ ion is _____.
   a) $+5$ b) $+6$
   c) $+7$ d) $+4$

4) _____ is the function of coolant.
   a) slow down neutron b) control the reaction
   c) extract heat from reactor d) none of these

5) The colour of the d-block elements is due to _____.
   a) $nd - (n + 1)$ transition b) $nd - (n + 1)p$ transition
   c) $nd - nd$ transition d) $nd - (n + 1)d$ transition

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

7) $Zn^{2+}$ complexes are atypical of d-block complexes is general". _____ answer below is correct and supports this statement.
   a) $Zn^{2+}$ complexes are paramagnetic
   b) $Zn^{2+}$ complexes tend to be colourless, unless the ligand contains a chromophore.
   c) $Zn^{2+}$ complexes are always octahedral
   d) $Zn^{2+}$ is one of several common oxidation states of $Zn$

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 spin only magnetic moment value (in Bohr magneton units) of $Cr(CO)_6$ is _____.
   a) 4.90 b) 2.84
   c) 5.92 d) 0

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 OR Write true/false** **06**

1) The EAN for iron in $Fe(CO)_5$ is _____.
2) The geometry of $SF_4$ molecules is _____.
3) A _____material, large domains of magnetic dipoles are aligned in the same direction.
4) Graphite and beryllium can be used as _____ in a nuclear plant.
5) Diamond is an example of _____ solids.
6) A pi- donor ligand is donates _____to the metal center in an interaction that involve a filled ligand orbital and an empty metal orbital.

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

**a)** How will you distinguish the intrinsic and extrinsic semiconductors?
**b)** What is carbon dating? Explain it with suitable example.
**c)** Explain the Bent rule with suitable example.
**d)** Explain why $[FeF_6]^{3-}$ is almost colorless whereas $[CoFe]^{3-}$ is colored.

**Q.3 Answer the following**

**a)** Explain in detail need of Walsh diagram with examples. **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)** What is cross section? Give the relation between cross section and rate of reaction. **08**
**b)** Write the postulates of VSEPR theory. Explain the structure of CIF3 molecule. **08**

**Q.6 Answer the following**

**a)** What are nuclear reactions? Discuss the nuclear fission reaction with suitable examples. **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)** Explain the origins of MLCT and LMCT absorptions in the electronic spectra of d-block metal complexes. Give examples to illustrate your answer. **08**

**SLR-GF-2**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - I) (New) (CBCS) Examination: Oct/Nov - 2022
## (CHEMISTRY)
## Organic Chemistry - I

Day & Date: Tuesday, 14-02-2023 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**

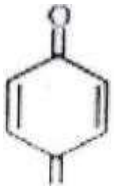
1) Enantiotropic hydrogens are _____.
   a) two hydrogens attached to a chiral carbon
   b) two hydrogens on same side of the double bond
   c) two hydrogens on same side of the cycloalkane
   d) two hydrogens attached to a carbon with two different groups

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

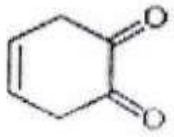
3) Select the correct statement for $S_N2$ reaction from the following option.
   a) It follows second order kinetics
   b) No intermediate is involved in $S_N2$ reaction
   c) It is one-step reaction
   d) All of the mentioned

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

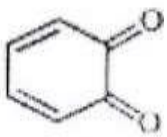
5) Which of the following structure can show tautomerism?



(I)



(II)



(III)

   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) carboxylicacid
   c) amide d) ketone

9) If the introduction of polar substituent(X) enhances the value of equilibrium constant, then rho($\rho$) 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) Write True or False.** **06**

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

**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.**

**a)** What are crown ethers? Give suitable example, methods of preparation and applications of crown ethers. **10**
**b)** Explain Neighbouring group (NGP) participation by $\pi$ electrons with example. **06**

**Q.4 Answer the following.**

**a)** Give Huckles rule and explain aromaticity in annulenes. **08**
**b)** Discuss in detail the formation, stability and reactivity of carbanion intermediate. **08**

**Q.5 Answer the following.**

**a)** Write a note on Aromaticity in benzenoid and non-benzenoid compounds. **08**
**b)** Explain in detail Kinetic and Thermodynamic control of the reaction with example. **08**

**Q.6 Answer the following.**

**a)** Explain stability of different forms of 1,2 and 1,4 dimethyl cyclohexane. **08**
**b)** Explain Optical activity in case of allenes. **08**

**Q.7 Answer the following.**

**a)** Discuss the role of cross-over experiments in the determination of the mechanism of organic reactions. **08**
**b)** Write a note on Electrophilic substitution accompanied by double bond shifts. **08**

**SLR-GF-3**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - I) (New) (CBCS) Examination: Oct/Nov-2022
## (CHEMISTRY)
## Physical Chemistry - I

Day & Date: Wednesday, 15-02-2023 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) In an open system, for maximum work, the process must be entirely _____.
   a) irreversible b) reversible
   c) adiabatic d) spontaneous

2) All gases behaves ideally as _____.
   a) $P \to 1$ b) $P \to 0$
   c) $P \to \infty$ d) $P \to -1$

3) $(\delta T/\delta P)\ s = (- - -/\delta S)p$
   a) $\delta G$ b) $\delta N$
   c) $\delta V$ d) $\delta H$

4) Albert Einstein has been awarded the Nobel prize for the _____ scientific work.
   a) Special theory of relativity b) Brownian motion of a particle
   c) Photoelectric effect d) All of the above

5) In Grand canonical ensemble T, V and _____remains constant.
   a) P b) T
   c) $\mu$ d) E

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

7) The mathematical statement of Boltzmann-Planck equation is given as _____.
   a) S=k ln W b) S=k N ln W
   c) S=k/ln W d) S=ln W/k

8) The fugacity of a solute in dilute solution is proportional to its mole fraction. This statement belongs to _____.
   a) Henry's law b) Raoult's law
   c) Planck's law d) Boyle's law

9) Which of the following condition is not satisfied by an ideal solution?
   a) $\Delta H_{mixing} = 0$
   b) $\Delta V_{mixing} = 0$
   c) Raoult's Law is obeyed
   d) Formation of an azeotropic mixture

10) According to Planck's equation, the energy of a electromagnetic wave is given as _____.

a) $E = h\nu$ b) $E = hc/\lambda$

c) $E = h\lambda$ d) both a) and b)

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

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

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

**a)** Write on wave-particle duality hypothesis.
**b)** Derive Maxwell's thermodynamic relations.
**c)** Explain Excess thermodynamic functions.
**d)** What is black body? Give Planck's quantum mechanical approach towards the distribution of its energy.

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

**a)** Derive the expression for Gibbs' phase rule. Give its applications.
**b)** Explain in detail microcanonical and canonical ensemble.

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

**a)** Define fugacity. Discuss fugacity determination by graphical method.
**b)** Derive the expression $n_i = e^{-(\alpha+\beta\varepsilon i)}$. Give the significance of the terms $\alpha$ and $\beta$.

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

**a)** Describe classical and quantum mechanical approach for photoelectric effect.
**b)** Discuss the freezing point depression method for determination of activity coefficient.

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

**a)** Explain how third law of thermodynamics can be used in the estimation of absolute entropy of a gas at 298 K.
**b)** Define microstates and Configurations. Explain them with suitable examples.

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

**a)** Derive Schrodinger time independent wave equation.
**b)** Derive Gibbs-Duhem equation. Mention various applications of this equation.

**SLR-GF-4**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - I) (New) (CBCS) Examination: Oct/Nov-2022
## (CHEMISTRY)
## Analytical Chemistry - I

Day & Date: Thursday, 16-02-2023 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 voltage range DME can be applied in polarography.
   a) +2.3 to -3.3 V b) +2.4 to -3.3 V
   c) +2.3 to -3.0 V d) +2.4 to -3.0 V

2) Text-styling feature of MS word is _____.
   a) Word Color b) Word Font
   c) Word Art d) Word Fill

3) Systematic errors occur due to _____.
   a) Overuse of instruments b) Careless usage of instruments
   c) Both a) and b) d) Human sight

4) Standard deviation of population is denoted by _____.
   a) $\Omega$ b) $\omega$
   c) $\sigma$ d) $\Sigma$

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

6) Superscript, subscript, strike through is known as _____.
   a) Font Face b) Font Style
   c) Font Effects d) Font Format

7) Measurement which is close to true value is _____.
   a) Accurate b) Average
   c) Precise d) Error

8) _____ of the following is the principle of Atomic Absorption Spectroscopy.
   a) Radiation is absorbed by non-excited atoms in vapour state and excited to higher states
   b) Medium absorbs radiation and transmitted radiation is measured
   c) Colour is measured
   d) Colour is simply observed

9) 'ICP's principle is similar to which of the following _____.
   a) Flame emission spectroscopy
   b) Fourier transforms spectroscopy
   c) Atomic emission spectroscopy
   d) Absorption spectroscopy

10) _____ is capillary constant in Ilkovic equation.

a) $m^{1/3}.t^{1/6}$ b) $m^{3/2}.t^{1/6}$

c) $m^{2/3}.t^{1/6}$ d) None of above

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

1) In Atomic absorption spectroscopy, _____ is the generally used radiation source.
2) Liquid samples are introduced into the ICP spectrometer using _____.
3) The auxiliary electrode in polarography is _____.
4) Linear regression analysis is _____.
5) The least square method is _____.
6) Half-wave potential ($E_{1/2}$) is _____.

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

**a)** Write a note on CHEM DRAW.
**b)** Write a note on applications of polarography.
**c)** Explain Least Square method.
**d)** Explain the difference between AAS and FES.

**Q.3 Answer the following**

**a)** Discuss in brief average deviation and standard deviation. **08**
**b)** Discuss the principles, instrumentation, nature of titration curves of Amperometry. **08**

**Q.4 Answer the following**

**a)** Discuss in detail various types of errors observed in measurement. **08**
**b)** Discuss the principles and instrumentation of ICP. **08**

**Q.5 Answer the following**

**a)** What are electroanalytical techniques? Explain the polarography principle and working. **08**
**b)** Discuss the principles and instrumentation of AAS. **08**

**Q.6 Answer the following**

**a)** What is sampling, explain the technique used for sampling of gases and solids. **08**
**b)** Define precision and accuracy. Explain the analytical methods used for determination of the accuracy. **08**

**Q.7 Answer the following**

**a)** Advantages and disadvantages of DME. **08**
**b)** Discuss the use of power point and excel in chemistry. **08**

**SLR-GF-6**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - II) (New) (CBCS) Examination: Oct/Nov-2022
## (CHEMISTRY)
## Inorganic Chemistry - II

Day & Date: Monday, 20-02-2023 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 which _____ furnace the roasting of zinc ore is carried out.
   a) Hegeler furnace b) blast furnace
   c) reverberator furnace d) sintered

2) _____ is the electronic configuration of $Ce^{4+}$
   a) [Xe] $4f^0$ b) [Xe] $4f^6$
   c) [Xe] $4f^8$ d) [Xe] 4f

3) _____ catalyst is used in wacker process.
   a) $PdCl_2$ b) $HCORh(PPh_3)_3$
   c) $Rh[I_2CO_2]^-$ d) $HCO(CO)_4$

4) Solid SO3 exists as _____.
   a) Plane triangular structure b) Bent structure
   c) Linear structure d) Cyclic trimer structure

5) _____ of the following reacts with haemoglobin in the blood to form carboxyhaemoglobin.
   a) CO b) $CO_2$
   c) $H_2CO_3$ d) HCOOH

6) _____ of the following (Wij's reagent) is used for estimation of iodine number of fats and oils.
   a) IBr b) ICl
   c) $IF_3$ d) IF

7) _____ of the following lanthanoid ion is paramagnetic.
   a) $Ce^{4+}$ b) $Yb^{2+}$
   c) $Lu^{3+}$ d) $Eu^{2+}$

8) Stability of metal complexes increases with _____.
   a) $F^- > H_2O > NH_3$ b) $F^- < H_2O > NH_3$
   c) $F^- < H_2O < NH_3$ d) None of these

9) _____ catalyst is used in Ziegler and Natta catalysis.
   a) $PdCl_2$ b) $RhCl_2$
   c) $NiCl_2$ d) $TiCl_4$

10) $XeF_6$ on complete hydrolysis gives: _____.
   a) Xe b) $XeO_2$
   c) $XeO_3$ d) $XeO_4$

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

1) What is difference between myoglobin and hemoglobin?
2) Use the VSEPR model to predict the structures of
   (a) $H_2Se$, (b) $[BH4]^-$, (c) $NF_3$, (d) $SbF_5$
3) Why the lanthanide ions are coloured?
4) What would you expect to form when?
   a) Sn is heated with concentrated aqueous NaOH;
   b) $SO_2$ is passed over $PbO_2$
5) What is Hapticity of ferrocene?
6) What is difference between calcination and roasting process?

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

**a)** Give detailed description of oxoacids of Sulphur.
**b)** What are the organometallic compounds? Discuss their classification.
**c)** Explain electrolytic refining of zinc.
**d)** Write note on photosynthesis PS I and PS II.

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

**a)** Discuss synthesis, structure and properties of silicates, carbides, silicones, phosphazenes.
**b)** What is Monsanto acetic acid process? Discuss the catalytic cycle involved it.

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

**a)** Discuss in detail in hydroformylation.
**b)** What are the Actinides? How are they separated?

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

**a)** Explain factors affecting stability constant referring to the properties of metal ion and ligand.
**b)** How is copper extracted? What are its properties and uses?

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

**a)** Discuss the classical methods of separation of lanthanides.
**b)** Discuss the role of metal ions in biological processes.

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

**a)** Describe in details the preparation, properties of the oxyacids of nitrogen, phosphorous and halogen.
**b)** Explain the pH metric determination of formation constant.

**SLR-GF-7**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - II) (New) (CBCS) Examination: Oct/Nov - 2022
## (CHEMISTRY)
## Organic Chemistry - II

Day & Date: Tuesday, 21-02-2023 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) 2-Butanone can be converted into 2-methyl but-1-ene by _____ reaction.
   a) Mannich b) Benzoin
   c) Witting d) Perkin

2) Nitration of nitrobenzene with $HNO_3$ and $H_2SO_4$ involves _____ reaction.
   a) electrophilic addition b) electrophilic substitution
   c) nucleophilic substitution d) radical substitution

3) Electron donating substituent directs incoming electrophile to _____ position in monosubstituted aromatic ring system.
   a) meta b) para
   c) ortho d) ortho/para

4) Amides of carboxylic acids on oxidation/dehydration give _____ as main product.
   a) esters b) nitriles
   c) oximes d) isocyanate

5) Benzoyl chloride can be converted into benzaldehyde by _____.
   a) $CH_3MgBr$ b) $LiAlH_4$
   c) Gilaman reagent d) Ruthenium tetraoxide

6) _____ reaction involves addition of nucleophile to alpha-beta unsaturated carbonyl compounds.
   a) Mannich b) Knovenagel
   c) Perkin d) Micheal

7) _____ mechanism involves formation of carbocation as an intermediate.
   a) $SN^1$ b) E2
   c) $SN^{Ar}$ d) Elcb

8) Addition of HBr to 1-butene in presence of benzoyl peroxide involves _____ mechanism.
   a) cationic b) radical
   c) anionic d) both cationic or anionic

9) _____ mechanism involves base in rate determining step of the reaction.
   a) E1 b) E2
   c) $SN^1$ d) $SN^{Ar}$

10) $NaBH_4$ can carry out reduction of _____.
   a) aldehydes  b) esters
   c) acid chlorides  d) amides

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

1) Sharpless asymmetric epoxidation works for benzyl alcohols.
2) Thallium (III) nitrate is reducing agent.
3) Lindlard catalyst is used for selective reduction of alkynes to alkenes.
4) Polar solvent increases the rate of $SN^1$ reaction.
5) Pyrolytic elimination is always syn elimination.
6) Ethylene oxide on reduction with $H_2$ in presence of Pd will give ethanol.

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

**a)** Write a note on Pyrolytic elimination reaction.
**b)** Write a note on applications of Thallium (III) nitrate in oxidative transformations.
**c)** Write reactions of addition of Grignard reagent to ester and ketone.
**d)** Write a note on Michael addition reaction.

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

**a)** Write a note on $SN^1$ mechanism with respect to effect of substrate structure, leaving group and attacking nucleophile on reactivity.
**b)** Write addition reactions of Organo zinc and Organo lithium reagent to carbonyl compounds.

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

**a)** Write mechanism of Perkin and Stobbe reaction.
**b)** Write a note on E1 mechanism with respect to effect of substrate structure, attacking base, the leaving group and the solvent.

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

**a)** Write mechanism of Knovenagel and Mannich reaction.
**b)** Explain concept of *ortho/para* directing and *meta* directing group with respect to phenol and nitrobenzene respectively.

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

**a)** Explain nitration, sulphonation of benzene with mechanistic details.
**b)** Write a note on Wittig reaction and Aldol condensation.

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

**a)** Mention one catalyst for reduction of alkenes, alkynes, aromatic ring and aldehyde functional group give one example of each catalyst.
**b)** Write examples of oxidation reactions with Ruthenium tetraoxide and Iodobenzen diacetate.

**SLR-GF-8**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - II) (New) (CBCS) Examination: Oct/Nov - 2022
## (CHEMISTRY)
## Physical Chemistry – II

Day & Date: Wednesday, 22-02-2023 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) Fluorescence intensity _____ with presence of hetero atoms in the molecule.
   a) increases b) decreases
   c) remains constant d) doesn't affect

2) _____ phenomenon represents radiative transition.
   a) phosphorescence b) fluorescence
   c) delayed Fluorescence d) all of these

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

4) Which of the following gas is not a green house gas?
   a) $H_2O$ vapors b) $CO_2$
   c) $CH_4$ d) $O_3$

5) The activity of pure metal is generally taken as _____.
   a) zero b) unity
   c) infinite d) finite

6) In the SSA, if I is intermediate formed then, _____.
   a) [I] = 0 b) d[I]/dt = 0
   c) all of these d) None of these

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

8) Which of the following laws are the principle 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) Lambert's and Beer's law

9) The ground state of molecular oxygen is _____.
   a) singlet b) doublet
   c) triplet d) quartet

10) Which of the following electrodes can be used as a reference electrode?
   a) platinum b) cadmium
   c) calomel d) silver

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

1) Order of a reaction may be zero, integer and half integer. (True/False)
2) Molecularity and order of a chemical reaction is always same. (True or False)
3) All photophysical pathways are radiative. (True/False)
4) One Einstein of energy = _____ hv.
5) Lead accumulator is an example of _____ storage cell.
6) Hydrogen gas electrode is an example of an indicator electrode. (True/False)

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

**a)** Write on different possible electronic transitions.
**b)** Explain Ozone decomposition reactions.
**c)** Illustrate Gouy-Chapmann model of electrical double layer.
**d)** With suitable examples discuss photooxidation reactions.

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

**a)** Using steady state approach, discuss thermal decomposition of ethane.
**b)** Using Franck-Condon principle, discuss shapes of absorption bands.

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

**a)** Illustrate the influence of ionic strength on the rates of ionic reactions.
**b)** Write on Excimer and exciplex formation and their emission features.

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

**a)** Give an account of various photophysical processes using Jablonski's diagram.
**b)** Explain excitation energy transfer mechanism by giving suitable examples.

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

**a)** Illustrate Stern's model of electrical double layer.
**b)** With the help of steady state approximation, discuss kinetics of hydrogen-halogen reaction.

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

**a)** Discuss kinetics of bimolecular quenching process.
**b)** Describe the method of determination of dissociation constant of monobasic acid using emf data.

**SLR-GF-10**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - III) (New) (CBCS) Examination: Oct/Nov-2022
## (ORGANIC CHEMISTRY)
## Advanced Organic Chemistry – I

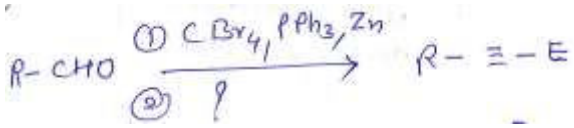
Day & Date: Monday, 13-02-023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

**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**

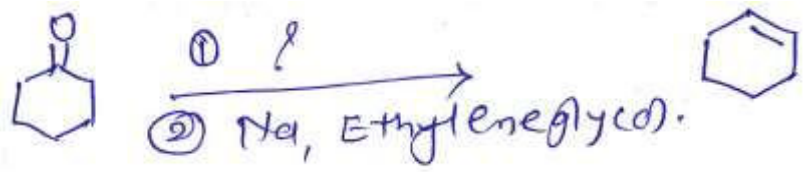
1) In Eschenmoser fragmentation $\propto, \beta$ −epoxy ketones and aryl sulphonyl hydrazine give _____ and _____.
   a) alkenes and carbonyl compounds
   b) alkynes and carbonyl compounds
   c) alkanes and carbonyl compounds
   d) alcohols and carbonyl compounds

2) The base catalyzed [2,3] – witting rearrangement of _____ occur at low temperature.
   a) Ethers b) Allyl alcohols
   c) Allylethers d) All three

3) 

   a) $E^{\oplus}$ b) $n$ −Buli then $E^{\oplus}$
   c) $E^{\oplus}$ then $n$ −Buli d) $n$ −Buli + $E^{\oplus}$

4) Julia Olefination can be used to prepare _____ alkenes.
   a) Monosubstituted b) Disubstituted
   c) Trisubstituted d) All three

5) 

   a) KCN b) $NH_2NH_2$
   c) $TsNHNH_2$ d) All three

6) Ozone is a very electrophilic _____ molecule.
   a) 1, 3-dipolar b) 1,3-polar
   c) Non polar d) None of these

7) Organocopper reagents are _____ and give _____ addition reaction in Michael Addition.
   a) Soft nucleophile and 1,4 addition
   b) Soft nucleophile and 1,2 addition
   c) Hard nucleophile and 1,4 addition
   d) Hard nucleophile and 1,2 addition

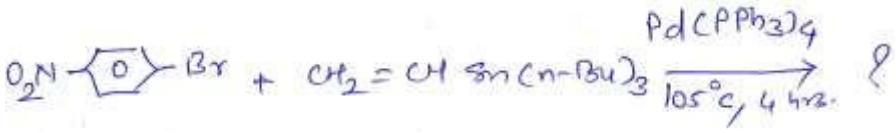
8) Factor/s favouring the formation of the kinetic enolate is/are _____.
   a) Aprotic solvent
   b) Strong base
   c) Oxophilic cations and low temperature
   d) All three

9) Secondary and tertiary leaving groups should not be used as alkylating agents in alkylation of ketone enolates because of _____.
   a) their poor reactivity
   b) possible competition with elimination reaction
   c) their high reactivity
   d) both a) & b)

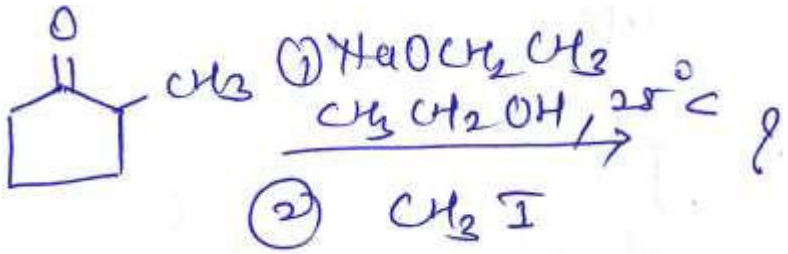
10) The ideal use of Tiffeneau- Demjanove rearrangement reaction is for the synthesis of _____ membered rings.
   a) Four
   b) Eight
   c) Five
   d) Three

**B) Predict the product.** **06**

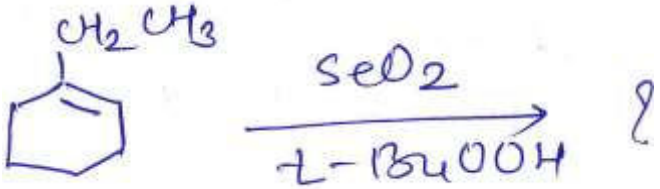
1)



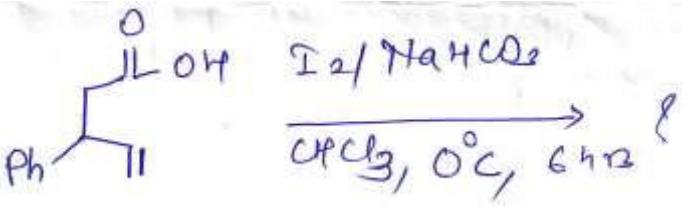

2)



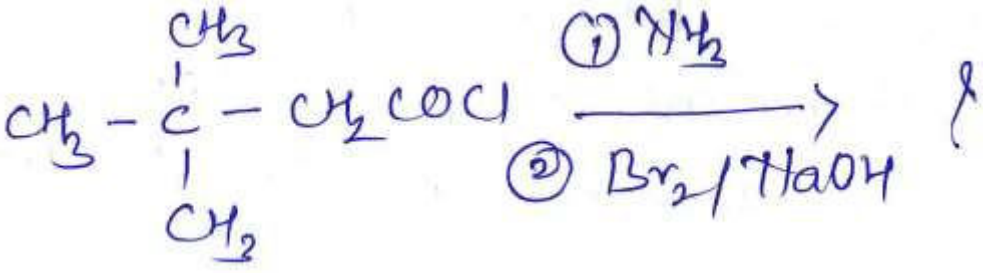

3)



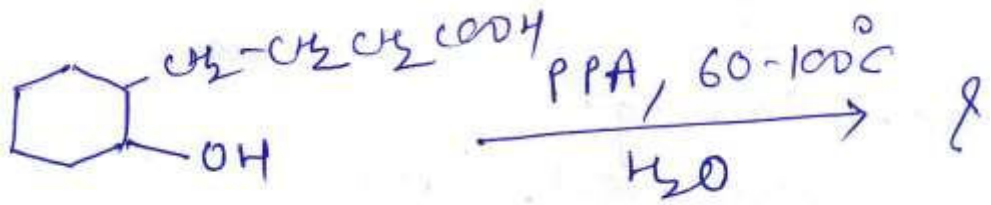

4)




5)



6)




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

**a)** Explain the mechanism of Shapiro reaction with suitable example.
**b)** Explain the reaction mechanism of Brook rearrangement reaction.
**c)** Discuss alkylation of enolates stabilized by two functional groups.
**d)** Give the synthetic applications of polyphosphoric acid.

**Q.3 Answer the following**

**a)** Discuss with suitable examples application of complex metal hydride reagents. **08**
**b)** Explain reaction mechanism of Hofmann rearrangement and give its various applications. **08**

**Q.4 Answer the following**

**a)** Explain with suitable examples generation of specific enolates by different methods other than deprotonation method. **08**
**b)** Discuss various applications of periodic acid with suitable examples & give its mechanism. **08**

**Q.5 Answer the following**

**a)** Discuss with suitable examples reaction mechanism and applications of peracids. **08**
**b)** Give reaction mechanism and applications of Mistunobu reaction. **08**

**Q.6 Answer the following**

**a)** Discuss reaction mechanism and applications of Wagner-Meerwien rearrangement reaction. **08**
**b)** Explain generation & alkylation of dianions with suitable examples. **08**

**Q.7 Answer the following**

**a)** Explain reaction mechanism of Negeshi and Kumada reaction. **08**
**b)** Discuss applications and reaction mechanism of DCC. **08**

**SLR-GF-11**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - III) (New) (CBCS) Examination: Oct/Nov-2022
## (ORGANIC CHEMISTRY)
## Chemistry of Bioactive Heterocycles

Day & Date: Tuesday, 14-02-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

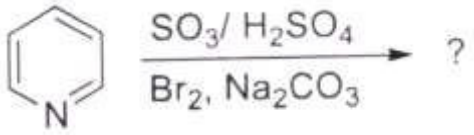
**Instructions:** 1) Question Nos.1 and 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7.
3) Figure to right indicate full marks.

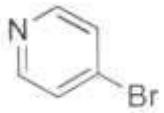
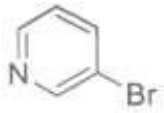
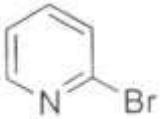
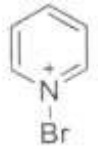
**Q.1 A) Choose correct alternative (MCQ).** **10**

1) The IUPAC nomenclature for the given heterocycle is _____.

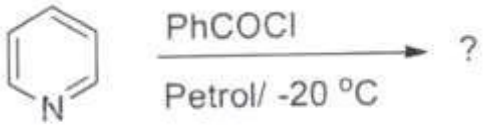
a) Oxarane b) Oxorane
c) Oxane d) Oxirane

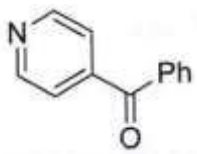
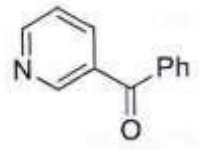
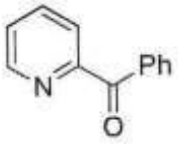
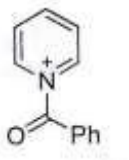
2) The major product formed in the following reaction is _____.



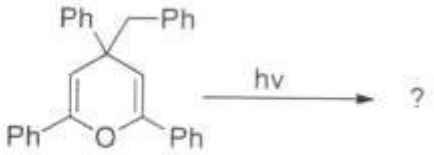

a) 
b) 
c) 
d) 

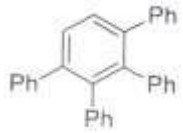
3) The major product formed in the following reaction is _____.

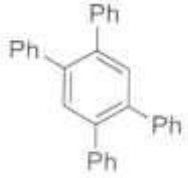


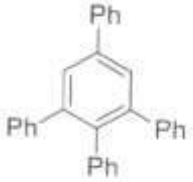

a) 
b) 
c) 
d) 

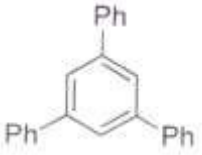
4) The product formed in the following reaction is _____.



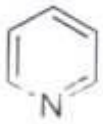

a) 

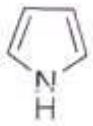

b) 


c) 


d) 


5) Which compound is most basic?

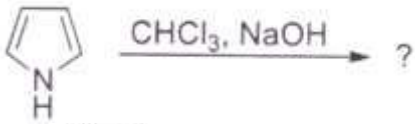
a) 

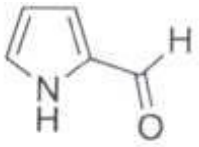

b) 

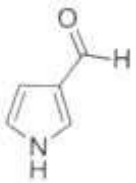

c) 

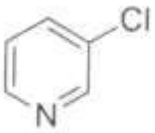

d) 

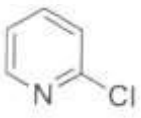

6) The major product formed in the following reaction is: _____.



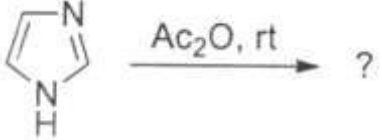

a) 

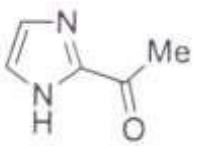

b) 

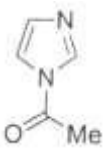

c) 

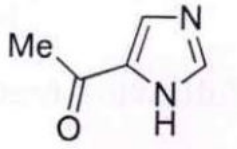

d) 

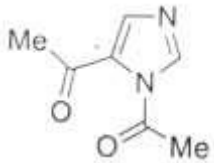

7) Which is the main product of the following reaction?



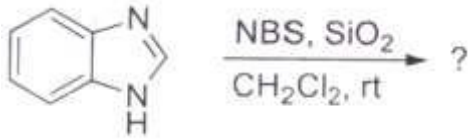

a) 

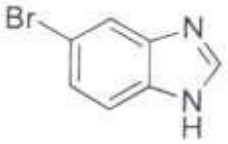

b) 


c) 

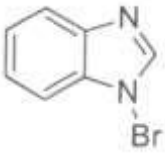

d) 

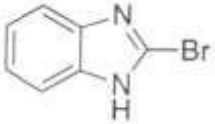
8) Which is the most probable main product of the following reaction?




a) 

b) 

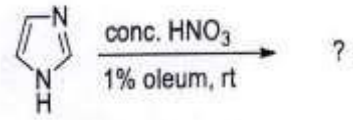
c) 

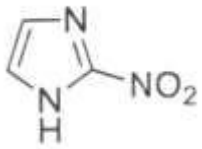
d) 

9) Piperazine is an organic compound that consists of a _____ membered ring containing two _____ atoms at opposite positions in the ring.

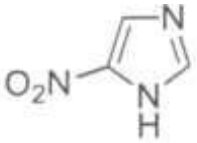
a) four, nitrogen
b) four, oxygen
c) six, nitrogen
d) six, oxygen

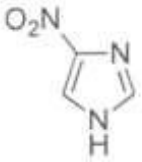
10) Which is the main product of the following reaction?




a) 

b) 

c) 

d) 

**B) a) Fill in the blanks.** **03**

1) 1,4-diazine is also known as _____.
2) The number of nitrogen atoms in the pyrazine heterocyclic moiety are _____.
3) Azetidine is _____ liquid having _____ structure.

**b) True or False.** **03**

1) The base catalysed cyclocondensation of malonamides with carboxylic esters leads to 6-hydroxypyrimidin-4(3*H*)-ones is known as Remfry-Hull synthesis.
2) The suffix 'ole' is used for six membered unsaturated ring.
3) The reaction of 4-chloropyridine with sodium ethoxide is an example of addition reaction.

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

**a)** How are 1,3-dicarbonyl compounds used for the synthesis of isoxazoles and pyrazoles?

**b)** How could one prepare 2-bromo-, 3-bromo- and 3,4-dibromothiophenes?

**c)** Name three types of compound which will react with 4,5-diamino-pyrimidines to produce purines. Explain reactions of each for synthesis of purines.

**d)** Discuss different methods for synthesis of aziridines and thiiranes.

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

**a)** What is the regeoselectivity of nitartion, halogenations and sulphonation reactions of indoles?

**b)** At which positions do benzofuran and benzothiophene reacts most readily with electrophiles? Give reason of each.

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

**a)** Which ring synthesis method and what reactants would be appropriate for the synthesis of a pyrrole, unsubstituted on the ring carbons, but carrying CH(Me)($CO_2$ Me) on nitrogen?

**b)** How one can prepare imidazoles and thiazoles from α-halo-carbonyl compounds? Give mechanism in details.

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

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

**b)** What is the reactivity of pyridine towards nucleophilic substitution reaction? Discuss regioselectivity?

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

**a)** At which positions do quinoline and isoquinoline react most readily with nucleophiles? Why these positions?

**b)** How could one convert.

1) isoquinoline into 2-methyl-1-isoquinolone
2) quinoline into 2-cyanoquinoline?

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

**a)** What are the different methods for synthesis of pyrimidine?

**b)** Discuss Baldwin ring closure rules for the formation of 3, 4, 5 and 6 membered rings.

**SLR-GF-12**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - III) (New) (CBCS) Examination: Oct/Nov-2022
## (ORGANIC CHEMISTRY)
## Photochemistry and Pericyclic Reactions

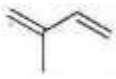
Day & Date: Wednesday, 15-02-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

**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.

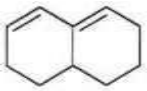
**Q.1 A) Choose** **10**

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

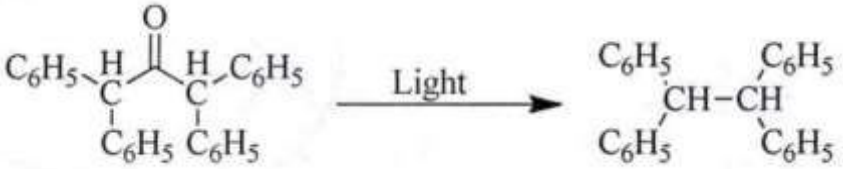
a) 

b) 

c) 

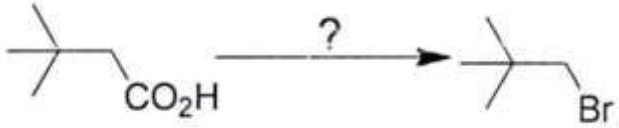
d) 

2) The photochemical reaction given below is _____.



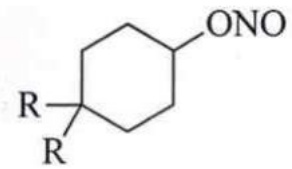

a) Norrish Type-I
b) Norrish Type – II
c) Di-$\pi$- Methane
d) Photo-oxidation

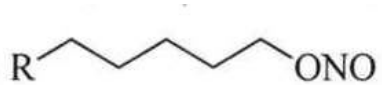
3) Mention reaction conditions appropriate for following transformation?

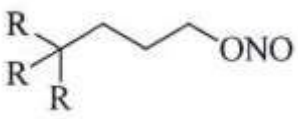



a) Light
b) $Ag_2O$, $Br_2$, heat, $CCl_4$
c) $Br_2$, heat, $CCl_4$
d) Heat

4) Among the following compounds, how many compound/s gives Barton reaction?

a) 


b) 

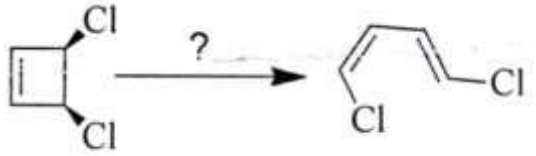

c) 


d) All of these

5) If system has node then it is called _____.
   a) Huckel system  b) Mobius system
   c) Both a) and b)  d) Cyclic system

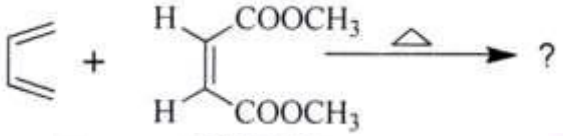
6) If the highest occupied molecular orbital has m-symmetry the process will be _____.
   a) Conrotatory  b) Disrotatory
   c) Both a) and b)  d) Cyclic

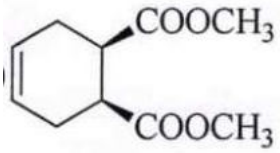
7) Which reaction conditions appropriate for following transformation?

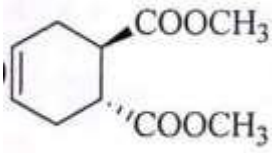



   a) Heat  b) Light
   c) Both a) and b)  d) None

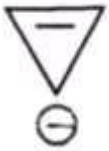
8) The major product formed in following reaction is _____.



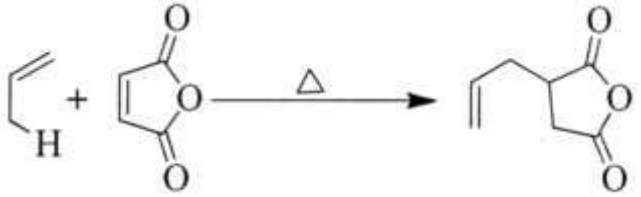

   a) 

   b) 

   c) 
   d) None of these

9) Which of the following molecular species having greatest stability?
   a) 
   b) 
   c) 
   d) None of these

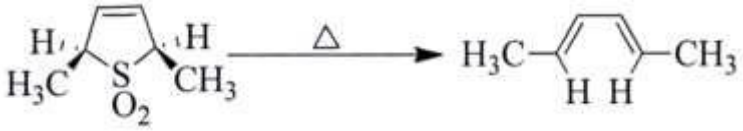
10) Following reaction is an example of _____.




   a) Cycloaddition reaction  b) Sigmatropic reaction
   c) Group transfer reaction  d) Chelotropic reaction

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

1) If the highest occupied molecular orbital has $C_2$-symmetry the process will be _____.
2) N-haloamines having hydrogen on $\delta$ carbon are substrates for _____ reaction.
3) Following reaction is an example of _____.

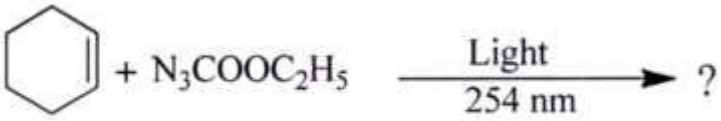


4) Di-$\pi$- Methane rearrangement given by $\beta,\gamma-$ unsaturated ketone is known as _____.
5) _____ is the value of first energy level $(E_1)$ in monocyclic conjugated system.
6) The photochemical [2+2] cycloaddition of a carbonyl group with an olefin to give an _____.

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

**a)** Draw moleculrar orbital diagram of 1,3,5- hexatriene and slow HOMO and LUMO at thermal condition?

**b)** Predict the product with mechanism?



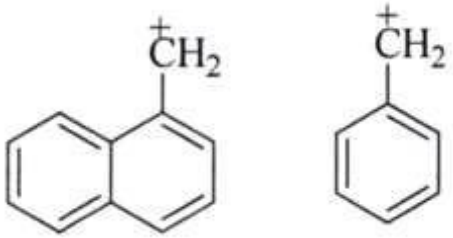
**c) Define the following term:**

1) Conrotation
2) Disrotation

**d)** Write note on: Reactivity index

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

**a)** Assign coefficient and calculate charge density in following?



**b)** Discuss stereochemistry of [3,3] sigmatropic rearrangement under thermal and photochemical conditions?

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

**a)** Explain Norrish type-I reaction with suitable examples?

**b)** Define group transfer reaction and explain with suitable examples?

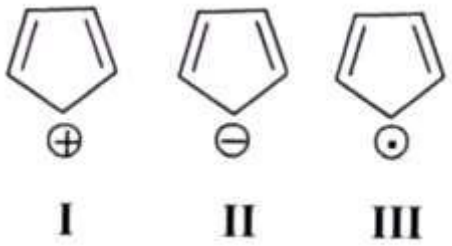
**Q.5 Answer the following.** **16**

**a)** Discuss aza-di-$\pi$ methane rearrangement and give its mechanism?

**b)** With the help of FMO method, show that 1,3 dipolar cycloaddition reaction is thermally allowed process?

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

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




**b)** Give the mechanism of the chelotropic cycloaddition reactions with suitable examples.

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

**a)** Discuss photochemistry of azides and diazo compounds?

**b)** Explain Woodward-Hofmann rule for electrocyclic reactions?

**SLR-GF-14**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - IV) (New) (CBCS) Examination: Oct/Nov-2022
## (ORGANIC CHEMISTRY)
## Advanced Organic Chemistry-II

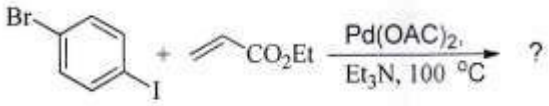
Day & Date: Monday, 20-02-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

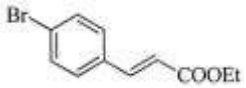
**Instructions:** 1) Q. Nos. 1 and. 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7
3) Figure to right indicate full marks.

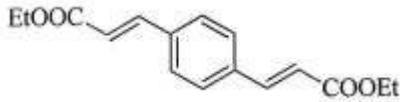
**Q.1 A) Fill in the blanks by choosing correct alternatives given below.** **10**

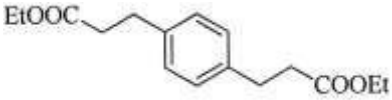
1) A reaction which predominantly produces one of several possible structural (position) isomers is called _____.
   a) Stereoselective reaction b) Regioselective reaction
   c) Enantioselective reaction d) All of these

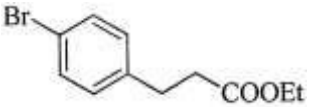
2) Which of (a)-(d) is the correct product for the following reaction?



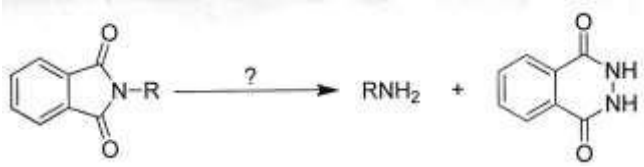

a) 


b) 


c) 

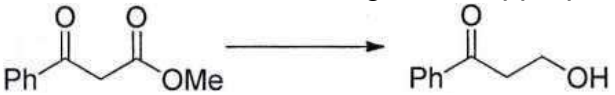

d) 


3) Mention the conditions for deprotection of following protected amine.




   a) HCl b) $NH_2NH_2$ / EtOH
   c) NaOH d) None of these

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



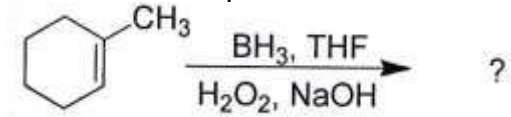

   a) 1) HO-$CH_2$-$CH_2$-OH, $H^+$ 2) $LiAlH_4$, $Et_2O$, $H_3O^+$
   b) 1) $NaBH_4$, MeOH 2) $LiAlH_4$, $Et_2O$, 3) $H_3O^+$
   c) 1) $LiAlH_4$, $Et_2O$, 2) $H_3O^+$
   d) 1) $NaBH_4$, MeOH

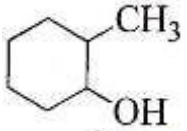
5) The transformation of a terminal or 1,2-disubstituted alkene to a ketone through the action of catalytic palladium (II), water, and a co-oxidant is known as _____.
   a) Wacker oxidation b) Suzuki coupling
   c) Stille coupling d) None of these

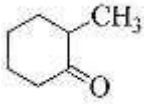
6) Conversion of one functional group into another functional group is known as _____.
   a) Reduction
   b) Oxidation
   c) Functional group interconversion
   d) None of these

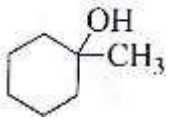
7) Which of the following act as umpolung reagent?
   a) 1,3-Dithianes  b) Cyanide
   c) Alkynes  d) All of the above

8) Choose correct product



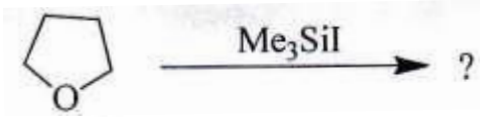

a) 

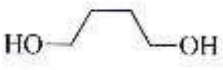

b) 


c) 


d) None of these

9) The major product formed in the following reaction.



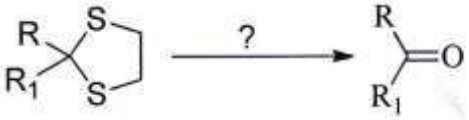

a) 


b) 


c) 


d) None

10) 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

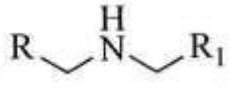
**B) Fill in the blanks.** **06**

1) The molecule to be synthesised is known as _____.
2) An imaginary bond breaking corresponding to the reverse of real reaction is known as _____.
3) The process of addition of Hydrogen-Boron bond to C-C, C-N and C-O double bond as well as triple bond is known as _____.
4) Coupling reaction between halide and alkene in the presence of Pd(0) complex is known as _____.
5) Addition of borane to alkene follow _____ rule.
6) A group whose use makes possible to react a less reactive functional group selectively in the presence of a more reactive group is known as _____.

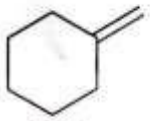
**Q.2 Answer the following** **16**

**a)** Discuss the principle of protection of alcohols?

**b)** Outline the retrosynthetic analysis and design synthesis of the following target molecules.




TM



TM

**c)** Discuss the guidelines for choosing suitable disconnections?

**d)** Discuss Stille coupling reaction with suitable examples?

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

**a)** Discuss the principle of protection of carbonyl compounds with suitable examples.

**b)** Explain cyclization reactions with suitable example.

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

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

**b)** Explain various protecting groups for alkenes and alkynes.

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

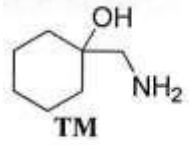
**a)** What is umpolung? Explain with suitable examples.

**b)** Explain regioselectivity in hydroboration reactions.

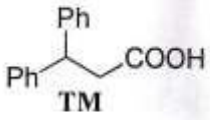
**Q.6 Answer the following** **16**

**a)** Explain role of $Co_2(CO)_8$ in organic synthesis.

**b)** Suggest synthesis for the following compounds, using disconnection approach.

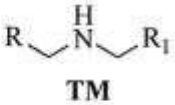



TM




TM

TM




TM

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

**a)** Define organoboranes. Explain the role of organoboranes in asymmetric synthesis.

**b)** Explain Suzuki coupling reactions with mechanism.

**SLR-GF-15**

| Seat No. | |
|---|---|

**Set P**

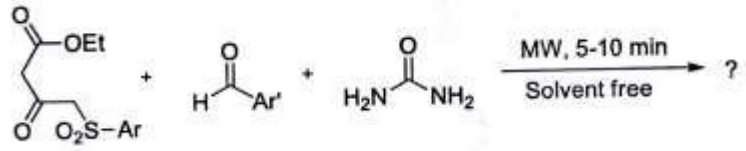
# M.Sc. (Semester-IV) (New) (CBCS) Examination: Oct/Nov-2022
## (ORGANIC CHEMISTRY)
## Modern Organic Chemistry

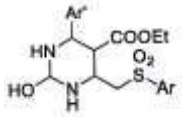
Day & Date: Tuesday, 21-02-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

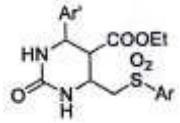
**Instructions:** 1) Question no. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7.
3) Figure to right indicate full marks.

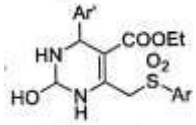
**Q.1 A) Multiple choice questions.** **10**

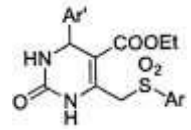
1) Predict the product of the following reaction _____



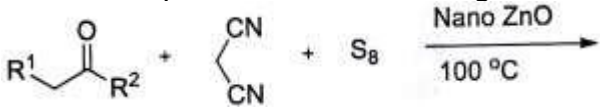

a) 

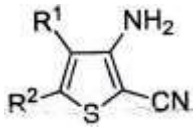

b) 

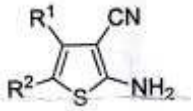

c) 

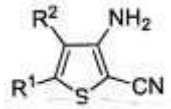

d) 

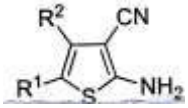

2) Predict the product of the following reaction _____



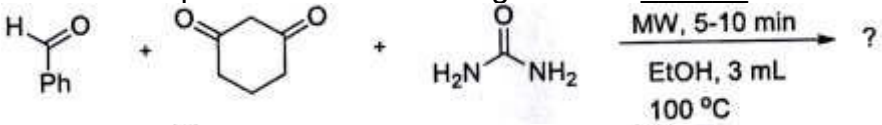

a) 

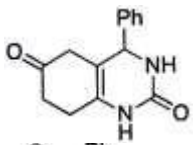

b) 

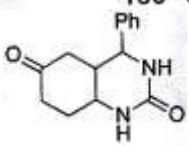

c) 

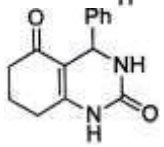

d) 

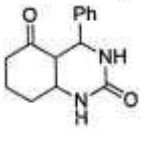

3) . Predict the product of the following reaction _____.



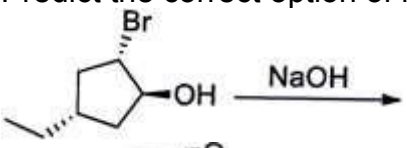

a) 

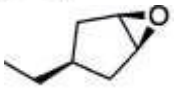

b) 

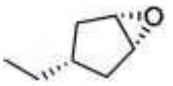

c) 

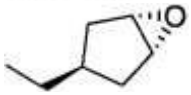

d) 

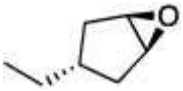
4) Predict the correct option of major product _____.




a) 

b) 

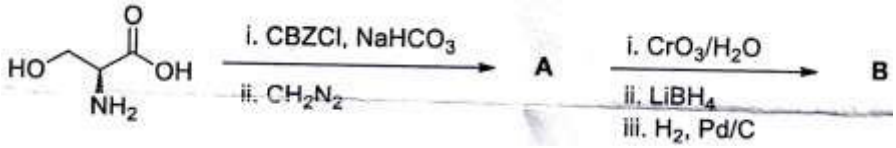
c) 

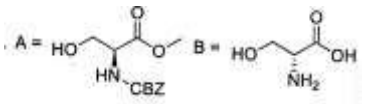
d) 

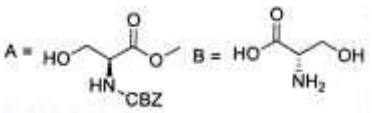
5) If a sample is 50% ee of R stereoisomer, what is the %R in the mixture?

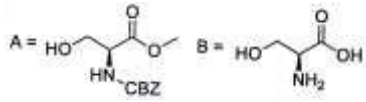
a) 25 b) 50
c) 75 d) 100

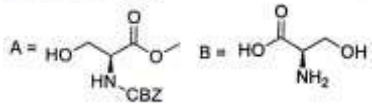
6) In the following transformation, the correct option is _____.



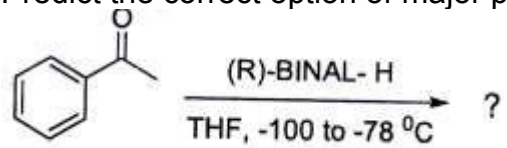

a) 

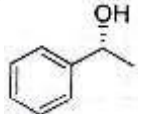

b) 

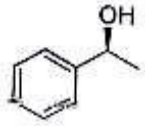

c) 

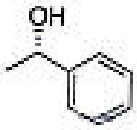

d) 


7) Predict the correct option of major product _____..




a) 


b) 


c) 


d) both (a) and (c)

8) The MOFs which are hard to synthesize by traditional routes, are synthesized by _____ method.

a) Ultrasound b) Solvo-thermal
c) Crystal transformation d) Microwave

9) In MOF-5, metal node is _____.

a) Fe b) Ti
c) Zn d) Cu

10) By partial substitution of surface ligands in the ZIF-8 framework, the surface _____ improves to enhance thermal stability of the material.

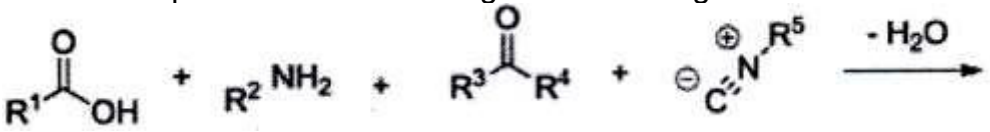
a) Texture b) Morphology
c) Hydrophilicity d) Hydrophobicity

**B) True or False** **06**

1) The Bais voltage applied during electrochemical synthesis of MOF is 12-19 V.
2) The synthesis involves reactions that include multiple chemical conversions between, substrates, reagents and catalysts which are performed in a single vessel are called Multicomponent reactions.
3) An increase in the number of benzene rings in organic linker could affect the pore size of metal organic frameworks.
4) The addition of $Br_2$ with olefins is not stereospecific reaction.
5) The chiral catalyst approach for asymmetric synthesis always gives product with 100% ee.
6) The poly-substituted 2-amino-thiophene is the product of Ugi reaction.

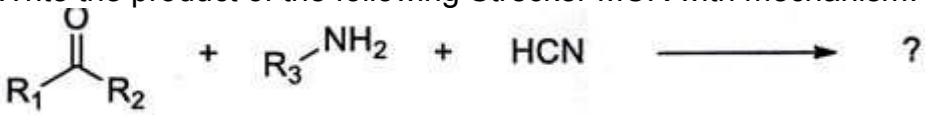
**Q.2 Answer the following.** **16**

**a)** What is the product in the following reaction and give its mechanism?




**b)** Define sterospecific reaction? Why addition of bromine and electrophilic eposxidation with alkene are distereospecific?

**c)** Write the product of the following Strecker MCR with mechanism.




**d)** Differentiate zeolites, active carbons, and MOFs on the basis of their surface area and porous structure with the help of suitable examples.

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

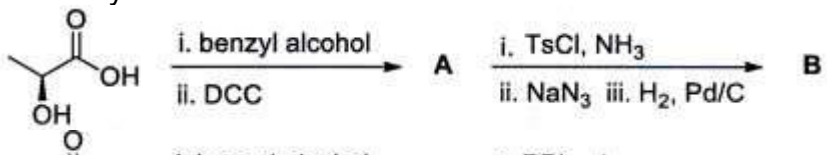
**a)** Define stereoselective reaction? Explain stereoselectivity of epoxidation with mCPBA and vanadyl reagent?

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

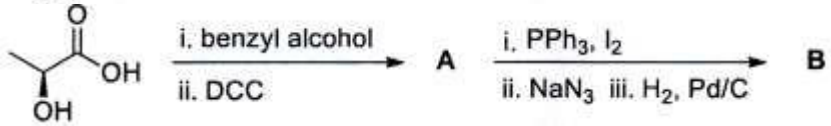
**Q.4 Answer the following.** **16**

**a)** Define chiral Pool? Explain the following transformation with stereochemistry.

i)




ii)

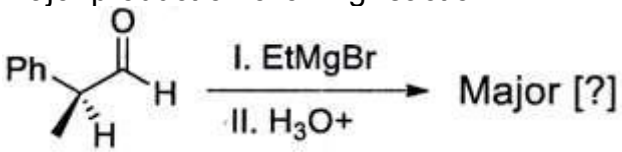



**b)** What is Jacobson-katsuki epoxidation and Shi epoxidation? Comment on the stereoselectivity with three examples of each.

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

**a)** What is the mechanism of Ugi and Gewald reaction? Write different applications of each.

**b)** What is Felkin Ahn Model? Discuss in details and give justification for the major product of following reaction.



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

**a)** How SAMP/RAMP chiral auxiliary useful in the asymmetric synthesis? Discuss their applications in enatioselective synthesis

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

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

**a)** What are the synthetic routes to metal organic frameworks? Explain solvo-thermal and solid-state methods of MOF synthesis with suitable diagram.

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

**SLR-GF-16**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - IV) (New) (CBCS) Examination: Oct/Nov-2022
## (ORGANIC CHEMISTRY)
## Chemistry of Natural Products

Day & Date: Wednesday, 22-02-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

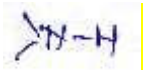
**Instructions:** 1) Q. Nos. 1 and 2 are compulsory.
2) Attempt any Three questions from Q.No.3 to Q.No.7.
3) Figures to the right indicate full marks.

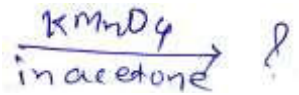
**Q.1 A) Choose the correct alternative.** **10**

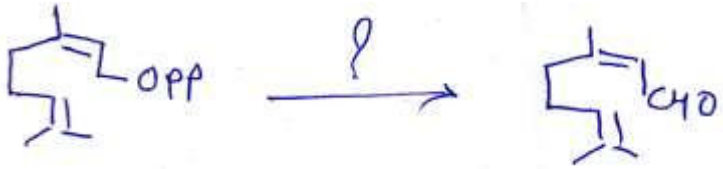
1) Steroids are characterized by the presence of _____ ring system.
   a) 1,2-cyclopentenophenanthrene
   b) Phenanthrene
   c) 1,2-cyclopentenoanthrucene
   d) Diel's hydrocarbon

2) Trans C/D ring fusion occurs in _____.
   a) bile acids b) cardiac glycosides
   c) toad poisons d) all three

3) In cis-Decalin, two rings are fused through _____ bonds.
   a) a,a b) e,e
   c) a,e d) none of these

4) Reserpine forms a monoacetyl derivative which indicates that it contains _____ group.
   a) -COOH b) -OH
   c) $-NH_2$ d) 

5) Strychnine 
   a) Strychninolic acid b) Strychninolone
   c) Strychninonic acid d) Glycollic acid

6) 
   a) Hydrolysis b) oxidation
   c) Hydrolysis, oxidation d) reduction

7) Folic acid is sensitive to _____.
   a) sunlight b) acid
   c) water d) sunlight and high temperature

8) Mifepristone is a 19-norsteriod that blocks the action of the female hormone _____.
   a) Progesterone b) Estrone
   c) Androsterone d) all three

9) Synthesis of benzene ring from _____ in living organism is known as shikimic acid route.
   a) proteins  b) fats
   c) carbohydrates  d) none of these

10) Ingested pyridoxine is converted in the _____ to pyridoxal phosphate.
   a) intestine  b) stomach
   c) liver  d) kidney

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

1) The vit. $B_2$ occurs in nature as _____.
2) Tyrosin on de carboxylation gives _____.
3) Steroids are isolated from _____.
4) Camptothecin is a pentacyclic _____ alkaloid having anti tumor activity.
5) Fredericamycin A is _____ agent.
6) Misoprostol is a stable derivative for _____, that is used for the treatment of ulcer.

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

**a)** Discuss the synthesis of testosterone from cholesterol.
**b)** Explain the conversion of strychnine to malonic acid and glycolic acid.
**c)** Explain the biosynthesis of mevalonic acid from acetic acid.
**d)** Discuss the biochemical role of vit B6.

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

**a)** Discuss the synthesis of strychnine.
**b)** Discuss the synthesis of Biotin.

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

**a)** Discuss the constitution of Androsterone.
**b)** Discuss the biosynthesis of quinoline and isoquinoline group.

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

**a)** Explain the formation of ring A, ring C and ring B of taxes.
**b)** Discuss the synthesis of Folic Acid from guanidine.

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

**a)** Discuss Harries-Folker's synthesis of vit. B6 and explain its biochemical role.
**b)** Explain the synthesis of reserpine.

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

**a)** Explain the biosynthesis of tryptophan by shikimic acid pathway.
**b)** Discuss the conformations of perhydroanthracene.

**SLR-GF-17**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - IV) (New) (CBCS) Examination: Oct/Nov-2022
## (ORGANIC CHEMISTRY)
## Medicinal Chemistry

Day & Date: Thursday, 23-02-2023 Max. Marks: 80
Time: 03:00 PM To 6:00 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) Antineoplastic agents are classified into _____.
   a) Alkylating agents
   b) Antimetabolites
   c) Alkylating agents & Antimetabolites
   d) None of these

2) Tolbutamide gets oxidized extensively to the corresponding _____ and carboxylic acid.
   a) Amine b) Thiol
   c) Aldehyde d) Alcohol

3) An Acyclovir is _____ drug.
   a) Anti-inflammatory b) Antiviral
   c) Antidiabetic d) Anti-histamine

4) Antimetabolites usually employed in the treatment of_____.
   a) Cancer b) Hepatitis
   c) Covid d) Fever

5) _____ is caused by genus plasmodium.
   a) Jaundice b) Fever
   c) Cancer d) Malaria

6) Phenelzine is a drug which shows _____ activity.
   a) Antidepressant b) Antineoplastic
   c) Antihistamine d) Antiviral

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

8) The penicillins are all strong _____ acids.
   a) Monobasic b) Dibasic
   c) Tribasic d) none of these

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

10) _____ is used in the treatment of rheumatoid pains.
   a) Lidocaine b) Diclofenac
   c) Aspirin d) Insulin

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

1) All the penicillins gives the different amines and same aldehyde.
2) Halothane and Thiopental are local anaesthetics.
3) Abbreviation of NSAIDs is Non-steroidal Anti-inflammatory drugs.
4) Penicillin and Cephalosporin are classified under broad spectrum antibiotics.
5) Clotrimazol is in the class of antifungal medication.
6) Tolbutamide and Glipizide are oral hypoglycaemic agents.

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

**a)** Explain the mechanism of action of metformin.
**b)** Explain classification of penicillin.
**c)** Explain the synthesis of sulfaoxazole.
**d)** Explain antianginal activity of Nifedipine.

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

**a)** Explain the SAR and synthesis of chloroquine.
**b)** Explain the SAR and synthesis of captopril.

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

**a)** Explain the synthesis and mechanism of action of sulfacetamide.
**b)** Explain synthesis and mechanism of action of Ibuprofen.

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

**a)** Explain classification of antimetabolites.
**b)** Explain the synthesis and mechanism of action of propranolol.

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

**a)** Explain the SAR and mechanism of action of diphenylhydramine
**b)** Explain the SAR and mechanism of action of Ampicillin.

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

**a)** Explain anaesthetic activity for halothane and thiopental.
**b)** Define and classify the NSAIDs.

**SLR-GF-24**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - III) (New) (CBCS) Examination: Oct/Nov - 2022
## INDUSTRIAL CHEMISTRY
## Unit Operation in Chemical Engineering

Day & Date: Monday, 13-02-2023 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 sugar from sugar beets using hot water is a _____.
   a) Extraction b) Leaching
   c) Distillation d) Evaporation

2) Substance absorbs moisture from the atmosphere at ordinary temperature but does not dissolve in it. These are called as _____.
   a) Hygroscopic substances b) Crystal Hydrate
   c) Solvates d) None of the above

3) The system that forms maximum boiling azeotrope is:
   a) Chloroform - Acetone
   b) Ethanol - Acetone
   c) Carbon Disulphide - Acetone
   d) None of the above

4) The function of spiral agitator in Swenson-Walker is to _____.
   a) Prevent the accumulation of the crystal on cooling surface
   b) Accumulate crystal on cooling surface
   c) Increase the rate of crystallization
   d) Increase the rate of cooling

5) Distribution of two separate phases randomly through one another is called _____.
   a) Mixing b) Agitation
   c) Crushing d) Conveying

6) The ball mill, works on the principle of _____.
   a) Compression b) Attribution
   c) Impact d) Impact and Attrition

7) Factors that affect the rate of leaching are _____.
   a) Solvent b) Particle size
   c) Temperature d) All of these

8) The unit 'Mesh' is used to measure _____.
   a) Distance between adjacent wire
   b) Number of opening per linear inch
   c) Number of opening per linear cm
   d) Number of opening per linear meter

9) Internal floating head possess _____ advantage over fixed tube heat exchanger.
   a) Eliminates differential expansion
   b) Tube bundle is removable for inspection
   c) Tube bundle is removable for mechanical cleaning from outside
   d) All of the above

10) Which one of the following is not a batch dryer?
   a) Agitated vacuum dryer  b) Tray dryer
   c) Rotary dryer  d) Pan dryer

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

1) Filter aids used in filtration should be Chemically inert.
2) Crystallization involves Only mass transfer.
3) On adding acetone to methanol some of the hydrogen bonds between methanol molecules break and it forms maximum boiling azeotropes.
4) A propeller is an axial-flow impeller.
5) In stage-type extractors, the two phases are allowed to mix together so as to reach equilibrium and then are separated before being passed countercurrent to each other.
6) In the Dodge jaw crusher, the movable jaw is pivoted at the bottom.

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

**a)** What is volume and Longitudinal Strain?
**b)** What are different methods of supersaturation? Explain Supersaturation achieved by evaporation.
**c)** Explain Long tube Vertical tube evaporator.
**d)** Explain working of Dorr thickener with neat labelled diagram.

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

**a)** Explain with schematic diagram Rotary drum filter.
**b)** Draw neat labeled sketch and explain working of Blake Jaw crusher.

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

**a)** Explain with schematic diagram working of Kettle reboiler.
**b)** Discuss Bubble cap and valve plate used in distillation column.

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

**a)** Explain the process of Steam distillation with respect to suitable example.
**b)** Explain with neat labeled diagram multiple effect evaporator.

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

**a)** Discuss construction and working of Oslo cooling crystallizer.
**b)** Explain with schematic diagram Stress-Strain relationship.

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

**a)** Draw schematic diagram of Pulse column and explain operation process.
**b)** Draw neat labeled sketch and explain working of Bollman Extractor.

**SLR-GF-25**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - III) (New) (CBCS) Examination: Oct/Nov - 2022
## (INDUSTRY CHEMISTRY)
## Unit Processes in Chemical Technology

Day & Date: Tuesday, 14-02-2023 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) To calculate the D.V.S. from the mixed acid, the analysis formula is _____.
   a) $D.V.S = \frac{S}{EN/R+W}$ b) $D.V.S = \frac{W}{EN/R+W}$
   c) $D.V.S = \frac{R}{EN/S+W}$ d) $D.V.S = \frac{S}{R+W}$

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

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

4) $(CH_3CO)_2O + (CH_3)_3COH \rightarrow$
   a) $CH_3COOCH_3$ b) $(CH_3)_2CHOH$
   c) $CH_3COOC_2H_5$ d) $CH_3COOC(CH_3)_3$

5) $C_2H_2 + 2Cl_2 \rightarrow$
   a) $ClCH_2 - CH_2Cl$ b) $Cl_2CH - CHCl_2$
   c) $Cl_2CH - CH_2Cl$ d) $ClCH = CHCl$

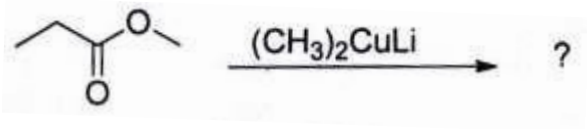
6) The nitrating agent is a _____ reactant.
   a) Electrophilic b) Nucleophilic
   c) All of the mentioned d) None of the mentioned

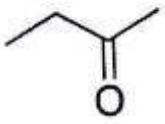
7) Permanganate can be used as an oxidizing agent for which compound?
   a) Alkaline b) Neutral
   c) Acid solutions d) All of the mentioned

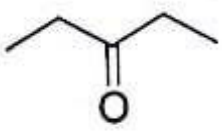
8) What effect does removal of water has on esterification?
   a) Increase reaction b) Decrease reacting
   c) Completes reaction d) Acts as catalyst

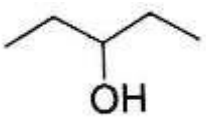
9) Which type of reaction do we use for the production of Fluorobenzene?
   a) Sandmeyer's reaction b) Addition reaction
   c) Substitution reaction d) Rearrangement reaction

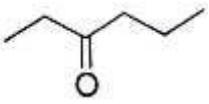
10) Predict the product




a) 


b) 


c) 


d) 


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

1) Primary nitramines cannot be prepared by the direct nitration of primary amines. (True/False)
2) Cellulose acetate is used in manufacturing of photographic films. (True/False)
3) During emulsion polymerization particle size decreases. (True/False)
4) _____ reaction of polymerization proceeds step-wise.
5) IUPAC name of DDT is _____.
6) _____ process equipment is safer for the nitration reaction.

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

**a)** Describe in brief the polyamides.
**b)** Discuss in brief the manufacturing process of chlorobenzene.
**c)** Describe the Schmid nitrator.
**d)** Discuss the mechanism of aromatic sulphonation.

**Q.3 Answer the following.**

**a)** How is vinyl chloride manufacture? What are its physical and chemical properties? **08**
**b)** Describe in detail the manufacturing process of vinyl acetate. **08**

**Q.4 Answer the following.**

**a)** Discuss in detail the use of Woodward Reagent with respect to Alkene, also summarize the stereochemical aspect. **08**
**b)** Discuss the Baeyar Villiger reaction and the Mechanism with respect to Acetophenone. **08**

**Q.5 Answer the following.**

**a)** Explain with the flow chart the manufacturing process of monochlorobenzene from ethylene. **08**
**b)** What is sulphonation? What are the working up procedures for sulphonation process? **08**

**Q.6 Answer the following.**

**a)** Write notes:
1) Alkyd resins and 2) Epoxy resins **10**
**b)** What is nitration? Discuss in brief nitrating agents. **06**

**Q.7 Answer the following.**

**a)** What is oxidation? Explain in brief different types of oxidative reactions. **08**

**b)** Describe in detail the manufacture of polyethylene. **08**

**SLR-GF-26**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - III) (New) (CBCS) Examination: Oct/Nov-2022
## (INDUSTRIAL CHEMISTRY)
## Instrumental Analysis- I

Day & Date: Wednesday, 15-02-2023 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) In GC-MS, the gas molecules exiting the GC are bombarded by a high-energy _____ beam.
   a) proton b) neutron
   c) electron d) all of these

2) The plate theory concept was adapted to chromatography by _____ and _____ in 1941.
   a) Martin & Synge b) Lewis & Mark
   c) John & John d) Sara & John

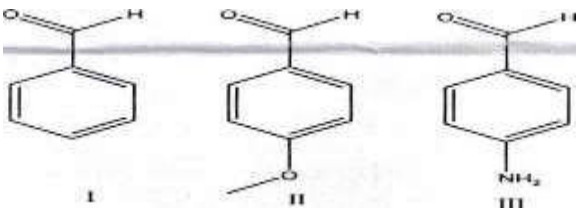
3) At the end of voltammetric analysis, the plot is of potential versus __.
   a) current b) pressure
   c) temperature d) both a) and b)

4) The electrode whose potential is varied with time is _____.
   a) indicator b) counter
   c) auxillary d) all of these

5) In linear sweep voltammetry, the current at a working electrode is measured while the potential between the working electrode and a reference electrode is swept _____ in time.
   a) diagonally b) radially
   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) Arrange the following in the increasing order of C=O stretching frequency.




   a) (I)>(II)>(III) b) (III)>(II)>(I)
   c) (II)>(III)>(I) d) (II)>(I)>(III)

8) Nephelometry is concerned with measure of the intensity of _____ light as a function of concentration.
   a) scattered  b) transmitted
   c) reflected  d) absorbed

9) In turbidimetry, the intensity of transmitted light is measured in a line i.e. _____° to the incident light.
   a) 120  b) 180
   c) 90  d) 60

10) A proton $H_b$ is coupled to four equivalent proton $H_a$. The relative intensity of lines in the signal $H_b$ is _____.
   a) 1:4  b) 1:4:6
   c) 1:4:6:4:1  d) 1:4:6:4

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

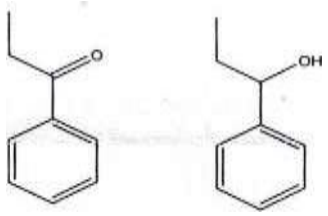
1) Nephelometry is used to analyze the colloidal system.
2) The output of polarography is chromatogram.
3) The potential of reference electrode is set constant in voltammetry.
4) The mobile phase in LC-MS is gas.
5) The residual current in D.C. polarography is due to the reduction of analyte.
6) $H_2S$ is used as a carrier gas in gas chromatography.

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

**a)** Write any four applications of ionic conductors with examples.

**b)** Enlist the differences between classical D.C. polarography and voltammetry.

**c)** How many $^{13}$C NMR resonances are predicted for the following compound?




I  II

**d)** Define chromatography and discuss its types.

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

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

IR (KBr) : 1670cm$^{-1}$;
$^1$HNMR : 8.0$\delta$ (d, 1H, J=12.1 Hz); 7.7$\delta$ (d, 2H, J=8.0 Hz); 6.8$\delta$ (d, 2H, J=8.0Hz); 5.8$\delta$ (d, 1H, J=12.1 Hz); 3.8$\delta$(s,3H); 3.0$\delta$ (s,6H)

Predict the structure

**b)** An organic compound of molecular formula $C_8H_8O_2$ shows the following features:

IR (KBr) : 1740cm$^{-1}$; 3200-3300cm$^{-1}$ (broad)
$^1$HNMR : 3.89 $\delta$(s,3H); 6.88 $\delta$ (dd, 1H, J=7.2 Hz and J=1.5 Hz); 6.90 $\delta$ (s,1H, broad); 7.41-7.49 $\delta$ (m, 2H); 7.88 $\delta$ (dd,1H, J=8.0 Hz and J=2.0Hz);

Predict the structure

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

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

**b)** Discuss membrane and enzyme electrodes with necessary mechanism.

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

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

**b)** Describe cyclic voltammetry in detail and how it is useful for analysis of metal ions.

**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 LC-MS in various industries.

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

**a)** Discuss with illustration programmed temperature chromatography.

**b)** Explain gas sensors in detail with diagram.

**SLR-GF-28**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - IV) (New) (CBCS) Examination: Oct/Nov-2022
## (INDUSTRIAL CHEMISTRY)
## Chemical Industries

Day & Date: Monday, 20-02-2023 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 the primary element used for making stainless steel alloy?
   a) Vanadium b) Indium
   c) Chromium d) Zirconium

2) How much $SiO_2$ does Pyrex contain?
   a) 70.3% b) 73%
   c) 80.5% d) 91%

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

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

5) Which of the following is not a step in making ceramics?
   a) Powder pressing b) Sintering
   c) Alloying d) Vitrification

6) Which of the following is not a pesticide?
   a) BHC b) Ephedrine
   c) DDT d) Aldrin

7) Which of the following raw material obtained from petroleum can be in preparation of acetic acid?
   a) Acetone b) Phosphoric acid
   c) Ethylene d) Tartaric acid

8) Carbamates employed as insecticides are _____.
   a) Phenyl carbamates b) Thiocarbamates
   c) Ziram d) Dithiocarbamates

9) In which of the below, it is not necessary to remove existing paint to apply a new one?
   a) Aluminium paints b) Cement paints
   c) Oil paints d) Enamel paints

10) Which of the below is most commonly used resin in commercial varnishes?
   a) Alkyd b) Phenolic
   c) Polyurethane d) Satin Gloss

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

1) Solvents contain high levels of polyunsaturated fatty acids. (True/False)
2) Anticorrosive paint is black in colour. (True/False)
3) Concentration of ores is also known as ore-dressing. (True/False)
4) _____ is the chief ore of aluminum.
5) Driers in varnish are used as _____.
6) Pigments which are _____ variant of organic days are called vat dyes.

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

**a)** Describe the purification of bauxite ore by Baeyer process.
**b)** Explain the classification of dyes on the basis of their application.
**c)** Give the synthesis of Malathion.
**d)** Explain in brief the purpose of alloying.

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

**a)** Describe in detail the extraction of Iron from its ore.
**b)** Write the chemical reactions that take place during the setting and hardening of cement and explain.

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

**a)** Describe in detail the manufacturing process of the whiteware.
**b)** Discuss with flow diagram manufacture of paints and their applications.

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

**a)** Discuss manufacturing process, properties and applications of Aldrin.
**b)** Give the synthesis of Ziram and Zineb.

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

**a)** What are petrochemicals? Give an outline of chemicals derived from ethylene.
**b)** Describe the manufacturing processes of zinc oxide.

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

**a)** What are dyes? Explain the preparation, properties and applications of any one dye.
**b)** Explain in short the refining of crude oil.

**SLR-GF-29**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - IV) (New) (CBCS) Examination: Oct/Nov-2022
## (INDUSTRIAL CHEMISTRY)
## Pollution Monitoring and Control

Day & Date: Tuesday, 21-02-2023 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.** **10**

1) Which of the following is not a greenhouse gas?
   a) $O_2$ b) $CO_2$
   c) water vapor d) methane

2) The Water (Prevention and Control of Pollution) Act is passed in the year of _____.
   a) 1980 b) 1973
   c) 1974 d) 1975

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

4) _____ appoints chairman of Central Pollution Control Board.
   a) Central Government b) Citizens
   c) State Government d) Governor of the State

5) _____ in water is estimated by Winkler method.
   a) dissolved oxygen b) cyanide
   c) iodide d) molecular nitrogen

6) Phenolic compounds as an emerging pollutant have been enlisted by firstly by _____ and _____.
   a) WHO, US-FDA b) MHRA, EU
   c) US-EPA, EU d) IP, ANVISA

7) The head office of Central Pollution Control Board is at _____.
   a) Mumbai b) Chennai
   c) New Delhi d) Hyderabad

8) Heavy metals ions are known to be very _____.
   a) toxic b) non-poisonous
   c) carcinogenic d) both a and c

9) In removal of chromium by reduction method, $Cr^{+6}$ is converted to __.
   a) $Cr^{+3}$ b) $Cr^{+7}$
   c) $Cr^{+6}$ d) $Cr^{+8}$

10) The red colour of the soil is due to _____.
   a) anthracite b) hematite
   c) bituminous coal d) lignite

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

1) The CPCB plays an important role in the abatement and control of pollution in the country.
2) Sodium is a heavy toxic metal for human body.
3) The BOD limit as per MINAS for distilleries is 100 mg/L.
4) Melt processing is used for polymer recycling.
5) Alum is used as flocculating agent in water treatment.
6) Steam gas stripping method is used for removal of phenols.

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

**a)** Explain the sedimentation process for waste water treatment.
**b)** Explain the sources of phenolic residues in the environment.
**c)** Give an account on reduction method of chromium removal.
**d)** What is water pollution and explain the sources of water pollution.

**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 ion exchange and biological methods for removal of phenolic residues.

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

**a)** Discuss any two tertiary treatment methods for waste water treatment with diagrams.
**b)** Explain the nature of gaseous and liquid industrial effluents? Discuss how CO, $SO_2$ and $NO_X$ are analyzed in the air sample?

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

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

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

**a)** What is soil pollution? Explain analysis of soil for the factors like moisture content, pH and phosphorus.
**b)** Explain analysis of water for the factors of free acids, bases, dissolved oxygen and chloride.

**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)** What is water management? Explain briefly IS-2296, IS-3360 and IS-3307.

**SLR-GF-30**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - IV) (New) (CBCS) Examination: Oct/Nov-2022
## (INDUSTRIAL CHEMISTRY)
## Nanomaterial and Its Characterization

Day & Date: Wednesday, 22-02-2023 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) An important physical property of nanomaterials is _____.
   a) large surface to volume ratio
   b) big strength
   c) shining in colour
   d) none of these

2) Nanomaterials have large applications in _____.
   a) fuel cell b) medicine
   c) catalysis d) all of these

3) Nanotechnology is the synthesis and application of material having size range from _____.
   a) 1 to 100 mm b) 1 to 100 cm
   c) 1 to 100 nm d) 1 to 100 $\mu$m

4) In zero dimensional nanomaterial, _____ dimension is outside the nano range.
   a) one b) two
   c) three d) no

5) CVD stands for _____.
   a) Chemical Vapor Deposition b) Chemical Volume Deposition
   c) Chemical Vapor Degradation d) none of these

6) SEM belongs to the family of _____ spectroscopies.
   a) photo-emission b) photo-absorption
   c) electron d) none of these

7) For constructive interference to take place, the path difference between the two waves should be _____.
   a) 2n $\lambda$/2 b) (n-1/2) $\lambda$
   c) (n + 1/2) $\lambda$ d) (2n - 1/2) $\lambda$ XX

8) The number of atoms present in simple cubic cell is _____.
   a) 2 b) 1
   c) 3 d) 4

9) _____ technique is used to measure change in enthalpy with respect to temperature in terms of differential power.
   a) DSC b) DTA
   c) Both a) and b) d) None of the above

10) DTA curve is plotted in between _____.
   a) Change in heat vs Pressure
   b) Change in heat vs Volume
   c) Change in heat vs Temperature
   d) Change in heat vs Gibbs free energy

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

1) In nanotechnology, SEM can be used to study the surface phenomenon of the materials.
2) Nano-sensors are highly selective towards their target side.
3) Electrodeposition method is not used for synthesis of nanomaterial.
4) Nano-devices are small enough to enter into the cell.
5) A infinite regular arrangement of lattice point in three dimension in which every lattice points has identical surrounding is called as space lattice.
6) Unwanted material remain as it is after decomposition of sample Residual temperature in TGA.

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

**a)** What are zero-, one-, two-, and three-dimensional nanomaterials?
**b)** Explain some properties and applications of nano-sensors.
**c)** Describe the basic principle of TGA analysis.
**d)** Find the Miller index of a plane making intercept 1/3a, 2/3b, and 1c and draw plane.

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

**a)** Describe in detail the electrodeposition and spray pyrolysis methods with neat labeled diagram for the synthesis of materials.
**b)** Explain the chemical bath deposition and chemical vapor deposition methods for the synthesis of nanomaterials.

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

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

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

**a)** Explain in detail the applications of nanomaterials in agriculture and electronics Industries.
**b)** Explain in brief Czochralski method for the preparation of gallium and indium.

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

**a)** What is destructive interference phenomenon? Derive Bragg's equation.
**b)** Derive a diffraction pattern equation for a cubic system.

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

**a)** Give the principle of DTA & describe the factors affecting on DTA analysis.
**b)** Describe in details the instrumentation of DSC analysis.

**SLR-GF-31**

| Seat No. | | Set | P |
|---|---|---|---|

# M.Sc. (Semester - IV) (New) (CBCS) Examination: Oct/Nov - 2022
## (INDUSTRIAL CHEMISTRY)
## Industrial Management and Material Balance

Day & Date: Thursday, 23-02-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

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

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

1) Following is not the substrates used for ethanol production?
   a) Starch containing substrate
   b) Juices from sugarcane or molasses or sugar beet
   c) Waste product from wood or processed wood
   d) Fats containing substances

2) The renewable source of energy is _____.
   a) Coal b) Solar Energy
   c) Wind energy d) Ocean tides

3) A Solution contains 20 mole % B ($Y_B$ = 0.20) Calculate the molar flow rate of B in 500 moles solution /min stream _____.
   a) 200mols B/min b) 100mols B/min
   c) 250mols B/min d) 300mols B/min

4) Researchers use the _____ method to choose the sample members of a population at regular intervals. It requires the selection of a starting point for the sample and sample size that can be repeated at regular intervals. This type of sampling method has a predefined range, and hence this sampling technique is the least time-consuming.
   a) Simple random sampling
   b) Cluster sampling
   c) Systematic sampling
   d) Stratified random sampling

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

6) Which statement is wrong with respect to Industry - University Collaborative Relationships?
   a) Society get benefitted
   b) University get benefits, as it procures infrastructural facility available with industry
   c) It stimulate companies' internal research and development programs
   d) When university researchers develop a patent, sponsored by industry the university often gains the first right to license the product

7) _____ institute offers SSI, a technical Consultancy, Calibration and testing of Electrical, Electronic equipment.
   a) NSIC b) IDEMI
   c) SIDO d) CITD

8) Acetone is incompatible with _____.
   a) Concentrated nitric and sulphuric acid mixtures
   b) Water and sulphuric acid mixtures
   c) Concentrated nitric and water mixtures
   d) All of the above

9) _____ financial Institution provide assistance to SSI to enable them a well-run export-oriented units to acquire ISO 9000 series certification.
   a) SIDBI b) Commercial Bank
   c) IDBI d) NABARD

10) A solution contains 30% by mass NaOH, calculate the total solution flow that contains 30Kg- NaOH /sec _____.
   a) 125Kg-mols solution /sec
   b) 100Kg-mols solution /sec
   c) 100Kg solution /sec
   d) 125Kg solution /sec

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

1) When manufacture is carried out by the owner himself with the help of his family members or relatives or a few wage earners, it is said to be a Cottage or Household Industry. (True/False)
2) 'Selection of Product' is a parameter towards establishing Small scale Industry. (True/False)
3) Organic peroxide are shock sensitive chemicals. (True/False)
4) $\Delta U + \Delta E_k + \Delta E_P = Q + W$ is not the final energy balance equation. (True/False)
5) Work done on the process fluid by a moving part within the system is called as flow work. (True/False)
6) Applied research is aimed at a fuller, more complete understanding of the fundamental aspects of a concept or phenomenon. (True/False)

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

a) Explain Biofuel and its economy
b) Explain in brief Bypass stream and Purge stream
c) Why is research and development (R&D) important?
d) Write a short note on Role of Small Scale Industry.

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

a) Discuss in details manufacturing process of Bio Diesel.
b) What is Fuel Cell? Explain in Detail working of Hydrogen-Oxygen Fuel Cell.

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

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

b) Discuss with example the X and R bar chart with respect to sample size five for quality determination.

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

a) Define Patent. What is the procedure to obtain Patent?

b) What is Incineration? State advantages of incineration process

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

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

b) Discuss in detail the Export-Import Regulation.

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

a) Define quality control. Explain its importance

b) Discuss the typical research program steps involved to minimize the risk associated with a new product.

**SLR-GF-33**

| Set No. | |
|---|---|

**Set P**

# M.Sc. (Semester - IV) (Old) (CBCS) Examination: Oct/Nov-2022
## (INDUSTRIAL CHEMISTRY)
## Chemical Industries

Day & Date: Monday, 20-02-2023 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) What is a vehicle in paint used for?
   a) To obscure surface
   b) To adhere to surface
   c) To provide shine to surface
   d) To reduce crack on surface

2) Which of the following cannot be concentrated by electromagnetic separation?
   a) Chromite b) Magnetite
   c) Pyrolusite d) Zinc blende

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

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

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

6) In how many layers is oil paint applied to a surface?
   a) 3 b) 4
   c) 2 d) 1

7) Driers in varnish are used as:
   a) Reducers b) Retarders
   c) Accelerators d) Oxidizers

8) Paint should provide resistance to:
   a) Corrosion b) Sound
   c) Heat d) Warping

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

10) Which of the following raw material obtained from petroleum can be in preparation of acetic acid?
   a) Acetone  b) Phosphoric acid
   c) Ethylene  d) Tartaric acid

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

1) Cement paints require a smooth surface to be applied on.
   a) True  b) False
2) Cellulose acetate is end product is produced by ethylene obtained from petroleum.
   a) True  b) False
3) Air pollution is caused mainly due to agrochemical waste.
   a) True  b) False
4) The _____ farming is in which there is less use of chemicals and lesser production of waste.
5) _____ is the most commonly used base for making Whiteware.
6) The _____ pesticides is used in killing aquatic pests (including insects) are

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

**a)** Give important application of borosilicate glass.
**b)** Discuss in Fluorescent brightening agents.
**c)** Give the synthesis and application of Aldrin.
**d)** How are ceramics classified? What are the basic raw materials used in ceramics?

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

**a)** Describe in the details the extraction of aluminum from its ore.
**b)** Discuss the manufacturing process of stainless steel.

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

**a)** Mention the main constituents of paint. What are their functions? Give examples.
**b)** What are petrochemicals? Give an outline of chemicals derived from Benzene.

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

**a)** Explain in detail the manufacturing process of glass.
**b)** Explain in detail the manufacture of White ware in details.

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

**a)** Explain in detail the blast furnace process for the extraction of iron.
**b)** Write the chemical reactions that takes place during the setting and hardening of cement and explain.

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

**a)** Give the synthesis and application of Dimethyl carbamate.
**b)** Give the synthesis and application of Dimethoate.

**SLR-GF-38**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - III) (New) (CBCS) Examination: Oct/Nov - 2022
## POLYMER CHEMISTRY
## Fundamentals of Feedstocks and Polymers

Day & Date: Monday, 13-02-2023 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) What is the IUPAC name of poly(methyl methacrylate)?
   a) Poly[2-(methoxycarbonyl) ethylene]
   b) Poly[1,1-(methoxycarbonyl, methyl) ethylene]
   c) Poly[1-(methoxycarbonyl) ethylene]
   d) None of these

2) Which monomers are used for synthesis of PET polymer?
   a) Ethylene glycol and terephthalic acid
   b) Ethylene glycol and adipic acid
   c) Ethylene glycol and sebacic acid
   d) Ethylene glycol and benzoic acid

3) Which of the following metal oxide used as a catalyst for the synthesis of HDPE by Philips process?
   a) Molybdenum oxide b) Calcium oxide
   c) Titanium oxide d) Chromium oxide

4) In the Nylon 6, 10 what does the second number added onto nylon indicates?
   a) Indicate number of carbon atoms in
   b) Indicate number of carbon atoms in repeating unit
   c) Indicate number of carbon atoms in diacid
   d) Indicate number of carbon atoms in polymer

5) What is the role of centrifugal separator called cyclone in the moving bed catalytic cracking method?
   a) Allows to pass only vapours
   b) Allows to pass nothing
   c) Allows to pass only catalyst particles
   d) Allows to pass only carbon

6) Polymers of aldehyde are commonly termed as?
   a) Polyacetals b) Polyketals
   c) Polyols d) All of these

7) Gasoline fraction obtained in Refining of crude oil is known as?
   a) Reformed gasoline b) Cracked gasoline
   c) Straight run gasoline d) None of these

8) Why melt polycondensation is carried out under inert atmosphere of nitrogen or carbon dioxide?
   a) To avoid crosslinking
   b) To control the molecular weight
   c) To make polymer more flexible
   d) To avoid the side reactions

9) What is the role of chain transfer agent in polymerization?
   a) To increase the polymerization rate
   b) To control the molecular weight
   c) To increase the molecular weight
   d) To initiate the polymerization

10) Why, thermal activation is difficult in Solid phase polymerization?
   a) Polymerization is restricted to low temperature
   b) Monomer may undergo melting
   c) Photo or radiation activation is used
   d) All of these

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

1) Monomer containing double bond will under goes condensation polymerization. (True/False)
2) Polymers which can reshaped into high & tough utility articles by application of heat and pressure are called as Plastics. (True/False)
3) Knocking characteristics of fuel used in petrol engine are expressed in terms of Cetane number. (True/False)
4) Poly(1-phenylethylene) is IUPAC name of _____ commercial polymer.
5) Hexamethylene diamine with _____ monomer is required for the synthesis of Nylon 6,6?
6) Polymers of _____ are commonly termed as Polyketals.

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

**a)** Explain the gas phase polymerisation with one suitable example.
**b)** Explain the preparation of PMMA by bully polymerization.
**c)** Discuss the structure - properties relationship in linear, branched and crosslinked polymers.
**d)** Describe nomenclature of polymers based on trade names.

**Q.3 Answer the following**

**a)** Discuss in detail on classification of polymers with suitable examples. **10**
**b)** Write on synthesis, properties and applications of poly(formaldehyde) polymer. **06**

**Q.4 Answer the following**

**a)** Discuss the manufacturing and properties of LDPE and HDPE. **10**
**b)** Give an account on any one renewable resource as building blocks towards polymer industries. **06**

**Q.5 Answer the following**

**a)** Discuss the interfacial and phase transfer catalysed interfacial polymerisation techniques. **08**
**b)** Describe the use of propylene as a feedstock for polymer industry. **08**

**Q.6 Answer the following**

**a)** Discuss the refining process of crude oil in details. **08**

**b)** Explain in detail about IUPAC Nomenclature of polymers with examples. **08**

**Q.7 Answer the following**

**a)** Discuss the use of Xylene as a building block towards polymer synthesis. **08**

**b)** Explain the Emulsion polymerisation method in detail. **08**

**SLR-GF-39**

| Seat No. | | Set | P |
|---|---|---|---|

# M.Sc. (Semester - III) (New) (CBCS) Examination: Oct/Nov - 2022
## (POLYMER CHEMISTRY)
## Morphology and Physical Chemistry of Polymers

Day & Date: Tuesday, 14-02-2023 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) Three dimensional structure of polymer chain can be estimated using _____.
   a) Viscometry
   b) Light scattering
   c) Vapour pressure osmometry
   d) Ultracentrifugation

2) In GPC analysis method molecules eluted first in column are _____.
   a) monomer b) high molar mass polymer
   c) low molar mass polymer d) mixture

3) Polydispersity index is calculated by _____.
   a) Mw/Mn b) Mv/Mn
   c) Mn/Mw d) Mz/Mn

4) Weight average molecular weight is denoted as _____.
   a) Mw b) Mn
   c) Mz d) None of above

5) _____ is the first molecular weight estimation method developed.
   a) GPC analysis b) Viscosity analysis
   c) Light scattering analysis d) None of above

6) Which method is most accurate molecular weight estimation method?
   a) Viscosity analysis
   b) End group analysis
   c) Light scattering analysis
   d) Membrane osmometry analysis

7) X-ray spectra of polymer gives information about _____.
   a) Melt transition temperature
   b) Crystallinity
   c) Glass transition temperature
   d) All of above

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

9) Spherulites are composed of _____.
   a) Highly ordered lamellae  b) Amorphous regions
   c) Only crystalline regions  d) Both a) and b)

10) Which polymer is biodegradable polymer?
   a) Polyethylene  b) Polyurethane
   c) Polycarbonate  d) Polylactic acid

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

1) Polymers do not have crystalline phase or crystals. (True/False)
2) Polymers do not degrade in environment. (True/False)
3) Polymers have Tg and Tm. (True/False)
4) Viscosity of polymers gives information about _____.
5) DSC scans of polymer gives information about _____.
6) Ultracentrifugation analysis of polymer gives information about _____.

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

**a)** Write a note on intrinsic viscosity of polymers.
**b)** What is LCST behaviour of polymer solutions?
**c)** Write a note on weight average molecular weight of polymers.
**d)** With suitable example write down the factors affecting on Tg.

**Q.3 Answer the following**

**a)** Describe the different transition curves obtained by DSC. **08**
**b)** Describe in brief theory, working & principle about the X-Ray diffraction instrument with diagram. **08**

**Q.4 Answer the following**

**a)** Describe in brief theory, working principle about the membrane osmometry instrument with diagram. **08**
**b)** Write a detailed note with suitable example on biodegradation of polymers using microorganisms. **08**

**Q.5 Answer the following**

**a)** Describe in brief theory, working principal about the vapour phase osmometry instrument with diagram. **08**
**b)** Write a detailed note on depolymerisation methods of polymers. **08**

**Q.6 Answer the following**

**a)** Describe in details the various mechanisms of degradation with suitable example. **10**
**b)** Write a brief note on spherulites in polymers with suitable diagram. **06**

**Q.7 Answer the following**

**a)** What are biodegradable polymers? Describe in detailed classification with examples and applications of it. **10**
**b)** Write a note on end group analysis of polymer molar mass estimation method. **06**

**SLR-GF-40**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - III) (New) (CBCS) Examination: Oct/Nov-2022
## (POLYMER CHEMISTRY)
## Basic Concepts of Polymerization

Day & Date: Wednesday, 15-02-2023 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 below which is used as a catalyst for cationic polymerization?
   a) AIBN b) Benzyl peroxide
   c) Protonic acids d) Metal alkoxide

2) Highly strained, 3-membered ring epoxides are polymerized by _____ initiators.
   a) Cationic b) Anionic
   c) Neutral d) Both a) and b)

3) _____is the chemical reaction of unsaturated halide or alkyl halide with an olefin.
   a) Heck reaction
   b) Suzuki reaction
   c) ADMET olefinic metathesis reaction
   d) All of the above

4) _____ is used as a coupling agent as it has various oxidation state.
   a) Pd b) K
   c) Na d) Li

5) _____ approaches are used to control molecular weight in linear polycondensation reaction.
   a) Stoichiometric balance
   b) Quenching
   c) Addition of mono functional monomers
   d) All of the above

6) _____ pair of monomers undergo cationic copolymerization.
   a) Styrene and acrylonitrile b) Styrene and ethyl vinyl ether
   c) Styrene and acrylamide d) None of the above

7) Random / Ideal copolymerization is obtained when _____.
   a) $r_1 r_2 = 0$ b) $r_1 r_2 = 1$
   c) $r_1 > 1, r_2 > 1$ d) All of the above

8) _____ is used as chain modifier in polymers.
   a) Diisopropyl xanthate disulfide
   b) Diisopropyl xanthate
   c) Diisobutyl xanthate disulfide
   d) All of the above

9) Impurities present in the monomer may act as _____.
   a) Initiators  b) Inhibitors or retarder
   c) Both a) and b)  d) Catalyst

10) _____ is the example of redox initiator.
   a) Benzyl peroxide  b) Ferrous ion
   c) Hydrogen peroxide  d) All of the above

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

1) Free- radical contains an _____ electron.
2) In 1983 _____ scientist discovered group transfer polymerization.
3) In absence of catalyst the order of polycondensation reaction is ____.
4) _____ is used for the microelectronic fabrication.
5) In polymers ionized gaseous molecule stage is called as _____.
6) _____is the chemical reaction of unsaturated halide or alkyl halide with an olefin.

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

**a)** Explain free radical polymerization.
**b)** Discuss Heck polymerization method with suitable examples.
**c)** Explain the kinetics of cationic polymerization.
**d)** Explain copolymerization equation and reactivity ratio.

**Q.3 Answer the following.**

**a)** Discuss the Reactivity of functional groups in step growth polymerization. **08**
**b)** Explain the chain transfer reaction. **08**

**Q.4 Answer the following.**

**a)** Discuss the various types of redox initiators used in polymerization. **08**
**b)** Explain the Q-e scheme. **08**

**Q.5 Answer the following.**

**a)** Distinguish between radical and ionic polymerization. **08**
**b)** Explain the Suzuki coupling reaction with example. **08**

**Q.6 Answer the following.**

**a)** Explain the Ring opening metathesis polymerization. **08**
**b)** Explain the copolymerization behavior. **08**

**Q.7 Answer the following.**

**a)** Explain the Kinetic equation for polyesterification. **08**
**b)** Ring opening polymerization mechanism of cyclic amides. **08**

**SLR-GF-42**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - IV) (New) (CBCS) Examination: Oct/Nov-2022
## (POLYMER CHEMISTRY)
## Step-growth Polymers

Day & Date: Monday, 20-02-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

**Instructions:** 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of nonprogrammable calculator is allowed.

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

1) The reaction between Bis-phenol-A and Epichilorohydrine gives_____.
   a) PF resin b) Epoxy resin
   c) MF resin d) UF resin

2) The intermediate formed during the formation of PTT is _____.
   a) Bis (3-hydroxy propyl) terephthalate
   b) Tris (3-hydroxy propyl) terephthalate
   c) Bis (3-hydroxy propylene) terephthalate
   d) None of these

3) The starting materials used for formation of polycarbonate are _____.
   a) $COCl_2$, benzene b) $COCl_2$, Bis-phenol-A
   c) $COCl_2$, Phenol d) $COCl_2$, Naphthalene

4) _____ is the trade name of PBT.
   a) Celanex b) Cortora
   c) Sarona d) Dacron

5) The PF resin formed by using acid catalyst is called as _____.
   a) Bakelite b) Polyamide
   c) Resole d) Polyimide

6) In the first step of preparation of polyparaphenylene (PPP) polymer _____ catalyst is used.
   a) $CuCl_2$ b) Pd-C
   c) Ziegler-Natta d) Zn

7) Which of the following is 3GT polymer?
   a) PTT b) PBT
   c) PET d) PEN

8) Glyptal resin is also called as _____.
   a) UF resin b) MF resin
   c) Alkyd resin d) PF resin

9) The crosslinking agent used for Novolac is _____.
   a) Formaldehyde b) Ammonia
   c) Hexa d) HMDA

10) Terelene belongs to which of the following class of polymers _____.
   a) Polyamide b) Polyazomethines
   c) Polyimides d) Polyester

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

1) GD- amino undecanoic acid gives_____ polymer.
2) Base catalysed PF resin gives _____.
3) The polysulfone obtained from Bis-phenol-A have a trade name _____.
4) While formation of Novolac, formaldehyde to phenol ratio is _____.
5) _____ polymer is prepared from diflurobiphenyl ketone and bis-phenol-A in the presence of polar aprotic solvent.
6) _____ polymer will be formed by reacting m-phenylene diamine with IPC.

**Q.2 Answer the Following. (Each Question carry four marks)** **16**

**a)** Define polyester. Give an example of synthesis of aromatic polyester.
**b)** Explain the direct method of preparation of DMT and give an advantage of use of DMT over terephthalic acid in PET synthesis.
**c)** Describe the synthesis and manufacture of PBT with mechanism.
**d)** Write a short note on flame retardant epoxy resin.

**Q.3 Answer the following. (Each Question carry eight marks)** **16**

**a)** Write down the synthesis of Glyptal resin and its applications.
**b)** Explain the manufacture of Nylon 6,6 by Batch process and continues process.

**Q.4 Answer the following. (Each Question carry eight marks)** **16**

**a)** What is polycarbonate. Explain its Solution & Interfacial polymerisation method.
**b)** Discuss the formation of PTT polymer.

**Q.5 Answer the following. (Each Question carry eight marks)** **16**

**a)** Define Aramide. Discuss the synthesis of Nomex and its applications.
**b)** Write down the general structure of polyurethane and discuss the different mechanism of synthesis of ethylene glycol.

**Q.6 Answer the following. (Each Question carry eight marks)** **16**

**a)** Write a short note on synthesis of Polybenzimidazole (PBI).
**b)** Describe the synthesis of PPP. Explain with suitable example.

**Q.7 Answer the following. (Each Question carry eight marks)** **16**

**a)** Define epoxy resin and describe the synthesis of liquid epoxy resin.
**b)** Describe the reaction mechanism given by the Marvel in acidic condition for the synthesis of UF resin.

**SLR-GF-43**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - IV) (New) (CBCS) Examination: Oct/Nov-2022
## (POLYMER CHEMISTRY)
## Stereoregular Polymers and Modern Polymerization Methods

Day & Date: Tuesday, 21-02-2023 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. (MCQ)** **10**

1) Which is the most powerful spectroscopic technique for analysis of stereoregularity in polymers?
   a) FT-IR b) UV
   c) NMR d) Mass

2) The enantiomorphic site control model attributes stereocontrol in isoselective Z-N polymerization is depends on what?
   a) Propagating chain b) Initiator active site
   c) Terminated chain d) None of above

3) What is NMP in Controlled or Living Radical Polymerization?
   a) Nitroxide-Mediated Polymerization
   b) Nitrogen - Mediated Polymerization
   c) Nitrogen- Mercury Polymerization
   d) None of above

4) Which basic morphological units are observed in block copolymers?
   a) Spheres b) Cylinders
   c) Lamellae d) All of these

5) How many stereoisomerism will obtain on polymerization of 1, 1-dimethyl ethylene? (R=R')
   (R =R')
   a) Zero b) One
   c) Two d) Three

6) Why, block copolymer of PS-1,2-PB has been avoided?
   a) Relatively high Tg. b) Relatively low Tg.
   c) Relatively high viscosity d) All of these

7) What type of polymer one can get by using the Ziegler-Natta initiator in polymerization of propylene?
   a) Stereo irregular b) Random
   c) Atactic d) Stereo regular

8) Among the following which is the function of Co-ordination initiator?
   a) Terminate the polymerization
   b) Retard the polymerization
   c) Initiates the polymerization
   d) Inhibit the Polymerization

9) When the reactivity ratio r1, r2 > 1 what type of copolymer will obtain?
   a) Random  b) Block
   c) Alternating  d) Graft

10) Which letters are used in denoting Absolute Configuration?
   a) D and L  b) P and Q
   c) E and Z  d) R and S

**B) Fill in the blanks and write True / False.** **06**

**a) Write True/False.**

1) FT-IR will determine the impurity present in block copolymer A-B as (A + B) or in A-B- A as (AB + A + B).
2) In terms of the nomenclature used for stereoregular polymers, amylose has Erythrodiisotactic structure.
3) Secondary Insertion will occur when the substituted end of the double bond attached to gegenion 'G'.

**b) Fill in the blanks.**

1) The ability of a chemical substance to rotate the plane of polarized light to the right or left is _____.
2) The ABS copolymer is prepared by using _____ Co-monomers.
3) Simultaneous Reverse and Normal ATRP (SR&NI) was developed to overcome the problems _____ ATRP.

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

**a)** Explain the observed rate behavior in kinetic of Z-N Polymerization.
**b)** Describe the stereoisomerism in polyactaldehyde.
**c)** Explain the various properties of block copolymers in brief.
**d)** Give an account on advantages of ATRP over commercial free radical polymerization.

**Q.3 Answer the following.**

**a)** From practical point of view there is only one disyndiotactic polymer, but two diisotactic polymers, explain with suitable example. **10**
**b)** Compare the stereoselective and stereoelective polymerization in chiral monomer with suitable example. **06**

**Q.4 Answer the following.**

**a)** Explain the Bimetallic mechanism of Z-N initiators for polymerization of propylene monomer. **10**
**b)** Discuss the Co-ordination polymerization of olefins and dienes. **06**

**Q.5 Answer the following.**

**a)** Discuss the various stereoregular structures obtained on polymerization of 1-substituted 1,3- butadiene monomer. **08**
**b)** Explain the synthesis, properties and applications of (ABA) triblock co-polymer. **08**

**Q.6 Answer the following**.

**a)** Discuss the effect of components of Z-N initiator system in polymerization of $\alpha$-olefins. **08**
**b)** Discuss the stereoisomerism in polymerization of styrene. **08**

**Q.7 Answer the following**.

**a)** What is living / controlled radical polymerization? Explain RAFT Polymerization. **08**
**b)** Discuss the synthesis, properties and applications of styrene-butadiene dibloc co-polymer. **08**

**SLR-GF-44**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - IV) (New) (CBCS) Examination: Oct/Nov-2022
## (POLYMER CHEMISTRY)
## Selected Topics in Polymers

Day & Date: Wednesday, 22-02-2023 Max. Marks: 80
Time: 03:00 PM To 6:00 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) Crack growth is minimum for _____.
   a) SBR b) CR
   c) NBR d) NR

2) Antimony oxide is an additive which imparts _____.
   a) Flame resistance b) Heat resistance
   c) Conductivity d) Weather resistance

3) The inorganic rubber among the following is _____.
   a) Nitrile rubber b) Butyl rubber
   c) Silicone rubber d) Chloroprene rubber

4) The cotton plant is composed of about _____ of cellulose and _____ of water.
   a) 93% and 5 % b) 89% and 7%
   c) 90% and 8% d) None of these

5) _____is used as cigarette filters.
   a) Cellulose b) Silk
   c) cellulose ether d) cellulose acetate

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

7) Which of the following is used for making rechargeable batteries?
   a) Polypyrrol b) Polyester
   c) Polyaniline d) Polyacrylonitrile

8) Polymer matrix composites are used as components in _____.
   a) mri- scanner b) x-ray couches
   c) surgical target tools d) all of these

9) _____ polymer blend has two glass transition temperatures.
   a) Missible b) Soluble
   c) Immisible d) Insoluble

10) Which of the compound is used in plastic surgery & pipes used for medical purposes?
   a) silicone fiber b) silicone fluid
   c) silicone rubber d) silicone resin

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

1) _____ polymers can not be recycled.
2) _____ polymer are used to locate blockages in veins & arteries.
3) The polymer which conducts electricity is known as _____ polymers.
4) _____ is the process of adding certain positive or negative impurities in polymer to conduct electricity.
5) _____ is the IUPAC name of the monomer of polychloroprene.
6) _____ catalyst is used for hydrogenation of polystyrene.

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

**a)** Explain the Cellulose modification.
**b)** Discuss the polymers in tissue engineering.
**c)** Write note on waste management of polymers.
**d)** Explain the physical properties and chemistry of natural rubber.

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

**a)** Explain in detail the role of additives in rubber.
**b)** Explain the Classification of polymers and it recycling processes.

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

**a)** Discuss the Hydrogel and stimulli sensitive hydrogel.
**b)** Explain the PE modification by halogenations and epoxidation.

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

**a)** Explain the controlled release drug delivery polymer systems.
**b)** Explain in detail composites and nanocomposites.

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

**a)** Explain the Advantages of Polymer Reagents and Catalysts.
**b)** Explain the Manufacturing and physical properties of synthetic rubber SBR.

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

**a)** Explain the blowing agents, lubricants, mould release agents.
**b)** Explain the Polymers used in medicine and give its biomedical applications.

**SLR-GF-45**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - IV) (New) (CBCS) Examination: Oct/Nov - 2022
## (POLYMER CHEMISTRY)
## Processing Technology and Polymer Properties

Day & Date: Thursday, 23-02-2023 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) Blow molding products are _____.
   a) Pipes and wire coating b) bottles
   c) syntax tank & car bumper d) all of the above

2) _____ is the Natural fiber.
   a) cotton b) jute
   c) wool d) all of the above

3) _____ are rheological aspects in polymer Processing.
   a) Viscosity b) Elasticity
   c) Molecular weight d) all of the above

4) Maxwell model gives information about _____.
   a) Only viscosity b) Only elasticity
   c) Electricity d) Viscoelasticity

5) Polymers have photo elastic properties due to _____.
   a) Insulation b) Elasticity
   c) Optical activity d) Polarization

6) Polymers are normally electrical insulators because it posses _____.
   a) completely filled valance bonds and empty conduction bonds
   b) incompletely filled valance bonds and full field conduction bonds
   c) completely filled valance bonds and full field conduction bonds
   d) All of the above

7) The yellowness index is measure of _____ colour change.
   a) White to yellow b) White to Brown
   c) White to cream d) White to Black

8) Superabsorbent polymer (SAP) is also called as _____.
   a) Lime powder b) Snow powder
   c) Slush powder d) Detergent powder

9) _____ factors affect % elongation at the break.
   a) Orientation level b) temperature
   c) filler content d) All of the above

10) The highest point of the stress-strain curve denotes _____.
   a) Weak strength b) Abrasion strength
   c) Tensile strength d) Ultimate tensile strength

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

1) ISO stands for _____.
2) ASTM- stands for _____.
3) _____ molding is used to manufacture products like drain pipes, waste pipes, vent pipes etc.
4) Male and Female mold parts are used in _____.
5) _____ is an example of Ideal fluid.
6) _____ is the thermal testing.

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

**a)** What is hardness and Explain optical properties of polymers?
**b)** Explain the testing procedure for tubes and containers.
**c)** Explain the Compressive strength.
**d)** Explain the blow molding.

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

**a)** Explain the ideal fluid and Non Newtonian fluid with example.
**b)** Draw neat labeled diagram and explain in detail twin-screw extruder.

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

**a)** Discus mechanical spectra, and explain factor affecting on it.
**b)** What are difference between compression molding and transfer molding?

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

**a)** Explain in detail ultimate polymer properties and structure relationship of elastomer, fiber and plastic.
**b)** Explain in detail injection molding with well labeled diagram.

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

**a)** Explain testing of adhesive and laminate.
**b)** Describe in detail extrusion molding.

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

**a)** Explain stress strain curve in detail.
**b)** Explain in short, Gel spinning, Phase separation spinning and Reaction spinning.

**SLR-GF-52**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - III) (New) (CBCS) Examination: Oct/Nov - 2022
## PHYSICAL CHEMISTRY
## Quantum Chemistry

Day & Date: Monday, 13-02-2023 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) Quantization concept was first introduced by _____.
   a) A. Einstein b) Max Planck
   c) de Broglie d) W. Pauli

2) The value for $a_o$ (Bohr radius) in Angstrom is _____.
   a) 0.0529 b) 0.529
   c) 5.29 d) 52.9

3) The Compton shift depends on _____.
   a) angle of scattering
   b) Wavelength of incident light
   c) interacting material
   d) all of these

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

5) The number of nodes for 2 s atomic orbital is _____.
   a) 0 b) 1
   c) 2 d) 3

6) The energy calculated according to variation principle is always _____ the ground state energy.
   a) less than b) greater than
   c) equal to d) all of these

7) The atomic orbital which is allowed according to a quantum theory is _____.
   a) 0 s b) 1 p
   c) 2 f d) 3 d

8) 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) $^1/_2\, kx$

9) Which orbital is represented by the wave function,
$$\Psi = 1/(32\pi)^{1/2}(Z/a_0)^{3/2}(2 - r)e^{-r/2}$$
   a) 1s b) 2s
   c) 2p d) 3d

10) If there exist more than one eigen function corresponding to a given eigen value, then the eigen value is called _____.
   a) non degenerate  b) degenerate
   c) discrete  d) continuum

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

1) The ejection of electron happens at only particular frequency of radiation which is characteristics of that metal. (True / False)
2) The Heisenberg's uncertainty principle is applicable to all conjugate pair of variables. (True / False)
3) Classical frequency of oscillation is given by an expression _____.
4) The zero point energy of particle in three dimensional box model is _____.
5) The expression for the momentum operator in one dimension is _____.
6) The $\nabla^2$ operator is expressed as _____.

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

**a)** Discuss radial plots for the orbitals in which $1 \neq 0$.
**b)** Normalize the function $\Phi m = N\, e^{im\Phi}$. Find out the normalization constant N.
**c)** What are the acceptability conditions for a wave function?
**d)** The work function for metallic Rb is 2.09 eV. Calculate kinetic energy and speed of electron ejected due to irradiation by light of wavelength 195 nm.

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

**a)** Explain the various observations of Compton effect. Derive the expression for Compton shift.
**b)** What is Hermitian type of operator? Write on the properties exhibited by the Hermitian operators.

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

**a)** Using Huckel Molecular Orbital Theory, estimate the $\pi$ electron energy, $\pi$ bonding energy and delocalization energy of 1,3-butadiene.
**b)** On the basis of wave mechanics, derive the expression for time independent Schrodinger wave equation.

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

**a)** Using method of separation of variables break up the Schrodinger wave equation for rigid rotator into ordinary angular equations.
**b)** Mention various approximate methods used in quantum mechanics for calculation of energy. Discuss linear variation principle.

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

**a)** Explain Slater and Gaussian type orbitals.
**b)** Describe Semiempirical approximate method: Perturbation theory.

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

**a)** What is black body? Derive Planck's black body radiation distribution equation.
**b)** Derive Schrodinger wave equation for a particle in a cubical box. Give the zero point energy.

**SLR-GF-53**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - III) (New) (CBCS) Examination: Oct/Nov - 2022
## (PHYSICAL CHEMISTRY)
## Electrochemistry

Day & Date: Tuesday, 14-02-2023 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) In Debye-Huckel Onsager equation the value of constant A= _____.
   a) $82.4/\ (\mathrm{DT})^{1/2}\ \eta$ b) $82.4/\ (\mathrm{DT})\ \eta$
   c) $82.4/\ (\mathrm{DT})^{2}\ \eta$ d) None of these

2) At high voltage the conductance of an electrolyte solution increases due to _____ effect.
   a) Debye b) Falkenhagen
   c) Wien d) Debye-Falkenhagen

3) The concept of association of ions to form ion pair was introduced by the scientist _____.
   a) Debye-Huckel b) Onsager
   c) Bjerrum d) Grotthuss

4) The overvoltage _____ with increase in temperature.
   a) decreases b) increases
   c) becomes zero d) remains constant

5) Streaming potential method is used to measure the _____.
   a) zeta potential b) single electrode potential
   c) discharge potential d) both (b) and (c)

6) In fuel cells oxidation occur at the at the _____.
   a) anode b) cathode
   c) on both electrode d) first at cathode then at anode

7) The abnormal conductance of hydrogen ion is explained by _____ mechanism.
   a) Einstein b) Grotthus-Draper
   c) Debye-Falkenhagen d) Grotthuss

8) Molten carbonate fuel cells (MCFCs) operate at temperature _____.
   a) $100^0\mathrm{C}$ and below b) $400^0\mathrm{C} - 500^0\mathrm{C}$
   c) $600^0\mathrm{C}$ and above d) below $0^0\mathrm{C}$

9) Which of the following electrolytes will give same value of molar conductance and equivalent conductance?
   a) $\mathrm{NaCl}$ b) $\mathrm{Na_2SO_4}$
   c) $\mathrm{H_2SO_4}$ d) $\mathrm{MgCl_2}$

10) The unit of equivalent conductance _____.
   a) mho $cm^2$ $equi^{-1}$ b) ohm$cm^2$ $equi^{-1}$
   c) mho $cm^{-2}$ $equi^{-1}$ d) ohmcm

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

1) At high frequency the conductance of an electrolyte solution _____.
2) The mobility of an ion decreases due to electrophoretic force. (True or False)
3) The ionic strength of an electrolyte is calculated by using the expression _____.
4) According to Debye-Huckel theory of interionic attraction the ion is considered as a dimensionless point charge. (True or False)
5) The mobile phase in electrophoresis is _____.
6) According to Debye-Huckel theory each ion is surrounded by an ionic atmosphere of _____ charge.

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

**a)** Discuss the concept of equivalent conductance at infinite dilution.
**b)** What is polarization? Explain the types of polarization.
**c)** Write on electroforming process.
**d)** Describe hydrogen-oxygen fuel cell.

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

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

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

**a)** Write on theories of overvoltage.
**b)** Explain Stem theory of electrical double layer.

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

**a)** Derive Debye - Huckel - Onsager equation.
**b)** What are the experimental proofs for Debye- Huckel theory? Explain how they support the ionic atmosphere formation.

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

**a)** Derive Debye- Huckel limiting law.
**b)** Explain the mechanism of abnormal ionic conductances of hydrogen and hydroxyl ions.

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

**a)** What is hydration number? Discuss Van Arkel method for determination of it.
**b)** Write a note on electrokinetic phenomena.

**SLR-GF-54**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - III) (New) (CBCS) Examination: Oct/Nov-2022
## (PHYSICAL CHEMISTRY)
## Molecular Structure- I

Day & Date: Wednesday, 15-02-2023 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 characters of all matrices belong to the symmetry operation in the same class are _____.
   a) identical b) different
   c) zero d) infinite

2) $BF_3$ molecule possesses _____ axis of symmetry.
   a) $S_{2h}$ b) $C_{2v}$
   c) $C_n$ d) $S_n$

3) The microwave active molecules are _____.
   a) $HCl, CO_2$ b) $CO, CO_2$
   c) $O_2, Cl_2$ d) $HCl, CO$

4) Rotational spectrum is useful to determine the _____.
   a) bond length b) bond order
   c) bond strength d) bond angle

5) The energy of the lowest vibrational level of oscillator is called as _____ Energy.
   a) potential b) vibrational
   c) zero point d) kinetic

6) In mutual exclusion rule for a molecule possess a centre of symmetry, the vibration which is active in IR is _____ in Raman.
   a) active b) inactive
   c) exclusive d) intense

7) Beer Lambert's law gives the relation between which of the following?
   a) Reflected radiation and concentration
   b) scattered radiation and concentration
   c) Energy absorption and reflected radiation
   d) Energy absorption and concentration

8) Which of the following is an application of electronic spectroscopy?
   a) Detection of impurities
   b) Control of purification
   c) Study of kinetics of the chemical reaction
   d) All of the above

9) Which of the following transitions mainly occur in IR?
   a) Electronic transitions only
   b) Rotational and vibrational transitions
   c) Rotational transitions only
   d) All the electronic, rotational, vibrational transitions

10) The correct order of different types of energies is _____.
   a) Eel>>Evib>>Erot>>Etr  b) Eel>>Erot>>Evib>>Etr
   c) Eel>>Evib>>Etr>>Erot  d) Etr>>Evib>>Erot>>Eel

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

1) A monoid is always a _____.
2) The moment of inertia for linear molecule along principle axis is ____.
3) In Raman spectroscopy the elastic scattering of photons is called as _____.
4) In Fortrat diagram, the band head is at the _____ of parabola.
5) According to Born-Oppenheimer approximation, $E_{total}$ = _____.
6) According to Franck-Condon principle vibrating molecule does not change its _____ during electronic transition.

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

**a)** What is the importance of symmetry?
**b)** Write note on: The effect of isotopic substitution on rotational spectra.
**c)** What do you understand by depolarisation ratio?
**d)** Write note on: term symbols.

**Q.3 Answer the following.**

**a)** Explain the terms: **06**
   1) Axis of rotation
   2) Plane of symmetry
   3) Centre of symmetry

**b)** Obtain the expression for moment of inertia for rigid diatomic molecule. **10**
Show the allowed rotational energies of a rigid diatomic molecule.

**Q.4 Answer the following.**

**a)** Discuss different types of vibrations in a polyatomic molecule. **06**
**b)** Describe in detail rotational fine structure of electronic-vibration transitions. **10**

**Q.5 Answer the following.**

**a)** Explain the factors influencing width and intensity of spectral lines. **06**
**b)** How is the dissociation energy of a diatomic molecule determined from vibrational coarse structure in its electronic spectrum? **10**

**Q.6 Answer the following.**

**a)** The B value estimated for $H^1Cl^{35}$ is 10.59342 $cm^{-1}$. The masses of $H^1$ and $Cl^{35}$ are 1.0078250 and 34.9688527 amu. What is the bond length of the molecule? **06**
**b)** What is the significance of zero-point energy? Obtain, an expression for zero-point energy of an anharmonic oscillator. **10**

**Q.7 Answer the following.**

**a)** What is Raman Effect? Explain the mechanism of Raman excitation. **06**
**b)** How we can use the Grand Orthogonality Theorem to construct the characters table for the $C_{3v}$ point group. **10**

**SLR-GF-56**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - IV) (New) (CBCS) Examination: Oct/Nov-2022
## (PHYSICAL CHEMISTRY)
## Statistical Mechanics and Irreversible Thermodynamics

Day & Date: Monday, 20-02-2023 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) Fermi-Dirac statistics is for the _____.
   a) Distinguishable particles
   b) Symmetrical Particles
   c) Particles with half integral spin
   d) Particles with integral spin

2) For an atom, the term is $^4D_{5/2}$, the Qele will be _____.
   a) 2 b) 5
   c) 6 d) 7

3) Which of the following element has highest specific heat?
   a) Si b) Au
   c) Cu d) C

4) The symmetry number of CO molecules is _____.
   a) 0 b) 1
   c) 2 d) 6

5) Which of the following is exact differential?
   a) dS b) dw
   c) dq d) both (a) and (b)

6) What is the ratio of ortho to para hydrogen at room temperature?
   a) 25:75 b) 75:25
   c) 50:50 d) 0:100

7) In an open system, for maximum work, the process must be entirely _____.
   a) irreversible b) reversible
   c) adiabatic d) isothermal

8) Protons obeys _____ statistics.
   a) Fermi-Dirac b) Maxwell-Boltzmann
   c) Bose-Einstein d) all of these

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

10) How many particles can occupy the single energy state if these particles obey Fermi-Dirac statistics?
   a) one b) two
   c) many d) infinite

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

1) Electrons follow _____ statistics.
2) As temperature increases ortho to para hydrogen ratio _____.
3) The molecular partition function is dimensionless. (True/False)
4) As $T \rightarrow 0, Cv \rightarrow$ _____.
5) Symmetry number for benzene molecules is _____.
6) Streaming current is reverse to _____.

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

**a)** For an ideal gas PV = nRT, show that 1/T is an integrating factor for dw= PdV.
**b)** Derive Saxen's relations.
**c)** Derive the expressions for the change in entropy during the various physical transformations.
**d)** Explain the concept of electron gas in metals.

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

**a)** If H= f(T,P) and dH is an exact differential then prove that $(dH/dP)_T = V - T(dV/dT)_P$
[Given: dq = dH - VdP and 1/T is an integrating factor]
**b)** Discuss in detail electrokinetic effects.

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

**a)** Derive the expression for vibrational partition function.
Calculate vibrational characteristic temperature for $O_2$ gas at 3050 K.
[Given v = 3600 $cm^{-1}$]
**b)** For Cu, $\Theta_E$ is -63°C. Calculate heat capacity of Cu using Einstein's heat capacity model at 100 K and 150 K.

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

**a)** Derive an expression for Fermi-Dirac statistics.
**b)** Discuss the concept of reciprocity relations and Onsager theorem.

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

**a)** Define ensemble. Discuss in detail canonical and grand canonical ensembles.
**b)** Show that $Q_{trans} = (2 \pi m k T)^{3/2}/h^3.V$. Write down the equation for $S_{trans}$

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

**a)** Derive the expression for the Maxwell-Boltzmann distribution law. Write the significance of the term $\beta$.
**b)** Discuss in brief Einstein's theory for heat capacity of solid.

**SLR-GF-57**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - IV) (New) (CBCS) Examination: Oct/Nov-2022
## (PHYSICAL CHEMISTRY)
## Chemical Kinetics

Day & Date: Tuesday, 21-02-2023 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 rate constant k and temperature are related by _____ equation.
   a) Arrhenius b) Vant Hoff
   c) both (a) and (b) d) Kirchhoffs

2) The molecularity of a reaction A + B → C + D is _____.
   a) zero b) one
   c) two d) three

3) Arrhenius equation may be written as _____.
   a) $d \ln k / dt = E_a / RT$ b) $d \ln k / dt = E_a / RT^2$
   c) $d \ln k / dt - E_a / RT$ d) $d \ln k / dt - E_a / RT^2$

4) If $E_a > E_b$ (Where $E_a$ and $E_b$ are the energies of activation for forward and reverse reaction respectively) then the reaction is _____.
   a) exothermic b) endothermic
   c) explosive d) chain

5) Which one of the following is not a biological catalyst?
   a) washing powder enzyme b) catalyase
   c) yeast d) hydrogen per oxide

6) The rate determining step for a consecutive reaction is the one which is _____.
   a) fastest b) slowest
   c) last in sequence d) first in sequence

7) The mechanism which explains, under some conditions the bimolecular reactions shows first order kinetics is called as _____ mechanism.
   a) Eyering b) Boltzmann
   c) Lindemann d) Grotthus

8) The general mechanism for an enzyme - catalyzed reaction was first proposed by the scientist _____.
   a) Michaelis and Menten b) Eyering and Grotthus
   c) Grotthus and Boltzmann d) Lindemann and Grotthus

9) 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

10) The reactions having smaller values of energy of activation are _____.
a) fast b) slow
c) steady d) both (a) and (b)

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

1) Enzyme catalyzed reaction is faster than a metal catalyzed reaction.
2) The activation energy for the first propagation step of $H_2$-$I_2$ reaction is very high compared to that of $H_2$-$Br_2$ and $H_2$-$Cl_2$ reaction.
3) During decomposition of an activated complex energy is always absorbed.
4) Nuclear disintegration follows first order kinetics.
5) Minimum energy required for molecule to react is called activation energy.
6) $E_a$ is not affected by catalyst.

**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.** **16**

**a)** Illustrate the kinetics of first order reaction opposes by second order reaction.
**b) Solve the problems:**
1) The velocity constant for decomposition of nitrogen pentoxide at 338K is $4.87 \times 10^{-3}$
Calculate the velocity constant at 298K if the energy of activation is 103583.86 Joules. (R = 8.314 J/K/mol)
2) Calculate $\Delta G^*$ for dimerisation reaction at 399°C having velocity constant k =1.9 2 x $10^{-2}$ $dm^3$/mol/sec. ($h=6.626 \times 10^{-34}$Js, Boltzmann constant $k=1.38 \times 10^{-23}$ J/K R = 8.314 J/K/mol)

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

**a)** Explain the kinetics and mechanism for parallel reaction giving suitable example.
**b)** Explain the use of potential energy surfaces in the study of chemical reaction.

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

**a)** Obtain an expression for the Michaelis-Menten equation. Explain the features of the Michaelis-Menten plot.
**b)** What is the significance of partition function in activated complex theory?

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

**a)** Discuss the Lindemann's mechanism of unimolecular reaction.
**b)** Discuss in detail about acid-base catalysis reactions.

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

**a)** What is an autocatalyzed reaction? Explain its kinetics with a suitable example.
**b)** Discuss the kinetics of branching chain reactions and explosion limits.

**SLR-GF-58**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - IV) (New) (CBCS) Examination: Oct/Nov-2022
## (PHYSICAL CHEMISTRY)
## Molecular Structure- II

Day & Date: Wednesday, 22-02-2023 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) Debye equation is applicable for only _____.
   a) Polar molecule b) Non-polar molecule
   c) Linear molecule d) Complex molecule

2) The magnetic moment of material can be determined by knowing number of _____.
   a) paired electrons b) protons
   c) unpaired electrons d) neutrons

3) Chemical shifts originate from _____.
   a) magnetic momentum b) electron shielding
   c) free induction decay d) scalar coupling (J -coupling)

4) The ESR frequency of unpaired electron in magnetic field depends on its _____.
   a) magnetic moment b) degeneracy
   c) spin quantum no d) line width

5) The most commonly used reference material for NMR spectroscopy is _____.
   a) TMS b) DSS
   c) TDS d) TSS

6) The Mossbauer Spectroscopy uses _____ radiation.
   a) $\gamma$-radiation b) $\beta$-radiation
   c) $\alpha$-radiation d) x-ray radiation

7) The diamagnetic contribution of atoms and bonds in a molecule is called as _____ constant.
   a) Debye b) Curie
   c) Pascal d) Weiss

8) Dipole moment of para-dichlorobenzene is _____.
   a) One b) Zero
   c) Fraction d) Infinite

9) The natural abundance of $^{13}C$ is about _____.
   a) four times less than 1H b) 0.11% of total carbon
   c) 1.1 % of total carbon d) 99% of total carbon

10) The molecule having zero dipole moments are _____.
   a) $CH_4$, $CHCl_3$, $C_6H_6$ b) $CH_4$, $CCl_4$, $C_6H_6$
   c) $CH_4$, $CCl_4$, $C_6H_5OH$ d) $CClH_3$, $CCl_4$, $C_6H_6$

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

1) The temperature at which paramagnetic substance is converted in to ferromagnetic substance is called as _____ temperature.
2) The product q x d is called as _____.
3) ESR Spectroscopy uses _____ radiation.
4) If the relative permeability is less than one, then the substance is ___.
5) If "n" equivalent protons interact with the protons of an adjacent Carbon atom, then the peak is split into _____ peaks.
6) When a moving body emits radiation, a stationary observer sees a shifted frequency; this is called _____.

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

**a)** Why a substance is a paramagnetic or diamagnetic?
**b)** Factors affecting the 'g' value in ESR.
**c)** Nuclear overhauser effect.
**d)** Explain the Lennard-Jones potential.

**Q.3 Answer the following.**

**a)** Discuss determination of dipole moment from dielectric measurements in pure liquids and in solutions. **08**
**b)** Describe the experiment and instrumentation setup in NMR spectrometer. **08**

**Q.4 Answer the following.**

**a)** Discuss in detail the principle of Mossbauer spectroscopy. **08**
**b)** Explain the terms magnetic permeability and magnetic susceptibility. **08**

**Q.5 Answer the following.**

**a)** Distinction between polar and non-polar molecules. Describe the Clausius – Mossotti equation of molar polarization. **10**
**b)** Define the term coupling constant in NMR. Discuss the factors influencing the coupling constant. **06**

**Q.6 Answer the following.**

**a)** Describe Langevin's classical theory of diamagnetism and paramagnetism. **10**
**b)** The half-life of the first excited state of $Fe^{57}$ is $1.58 \times 10^{-7}$ s. What is the line width of resonance? ($h = 6.626 \times 10^{34}$ Js, $\pi = 3.141$) **06**

**Q.7 Answer the following.**

**a)** Define chemical shift. Describe the factors affecting the chemical shift in NMR. **08**
**b)** Discuss applications of ESR spectroscopy. Calculate the frequency for an unpaired electron in a magnetic field of strength 0.35 T. ($g=2$, $h= 6.626 \times 10^{-34}$ Js) **08**

**SLR-GF-59**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - IV) (New) (CBCS) Examination: Oct/Nov - 2022
## (PHYSICAL CHEMISTRY)
## Surface Chemistry

Day & Date: Thursday, 23-02-2023 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) During wetting of solids, adhesive forces are _____ cohesive forces.
   a) Lesser than b) Equal to
   c) Very very less than d) Greater than

2) If common salt is dissolved in water, then the surface tension of saltwater is _____.
   a) Increased b) Decreased
   c) Not changed d) First increases then decrease

3) Which of the following is true for chemisorption?
   a) It is reversible in nature
   b) It exists in the form of monolayer
   c) It is not specific in nature
   d) It occurs at low temperature

4) Among the following _____ is not used as solid lubricant.
   a) Tungsten disulfide b) Molybdenum disulfide
   c) Boron nitride d) Benzene

5) One end of a towel dips into a bucket full of water and other end hangs over the bucket. It is found that after some time the towel becomes fully wet. It happens _____.
   a) Because viscosity of eater is high
   b) Because of the capillary action of cotton threads
   c) Because of gravitational force
   d) Because of evaporation of water

6) Cohesive forces are the forces acting _____.
   a) Between molecules of different materials
   b) Between molecules of same material
   c) Between water and glass capillary tube
   d) Due to gravity

7) When there are no external forces, the shape of a liquid drop is determined by _____.
   a) Surface tension of the liquid
   b) Density of liquid
   c) Viscosity of liquid
   d) Temperature of air only

8) The extent of adsorption of a gas on a solid depends on _____ of the gas.
   a) temperature b) pressure
   c) nature d) All of these

9) _____ adsorption isotherm is useful for multiple adsorption system.
   a) Langmuir b) Freundlich
   c) BET d) Gibbs'

10) The surface tension of water at 25°C is _____.
   a) 90.0 dynes/cm b) 45 dynes/cm
   c) 82 dynes/cm d) 72 dynes/cm

**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) Does the ratio of surface area to volume affects the shape of the particles in sintering? Indicate yes or no.
3) At critical micelle concentration, all properties of solutions of surfactants undergo dramatic change. (True/False)
4) Composite material are solid bodies made up of at least two similar materials. (True/False)
5) The extent of adsorption depends upon the nature of adsorbent. (True/False)
6) One can synthesis two dimensional nanoparticles.

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

**a)** State and explain Trube's rule.
**b)** Describe maximum bubble pressure method of determination of surface tension of liquids.
**c)** Explain micelle and reverse micelle.
**d)** Write a note on sintering and sintering mechanism.

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

**a)** What is critical micelle concentration? Discuss surface tension method of determination of cmc of given surfactant.
**b)** Discuss re-precipitation method of preparation of aqueous suspension of organic nanoparticles.

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

**a)** Describe tilting plate method of determination of contact angle.
**b)** Discuss theory and energetic of micellization.

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

**a)** Derive an equation for Langmuir adsorption isotherm. Discuss experimental verification this equation for the given system of adsorbate and adsorbent.
**b)** Derive an equation for the spreading coefficient for the spreading of liquid B on the surface of liquid A.

At 20°C surface tension of water mercury are $72.8 \times 10^{-3}$ N/m and $483 \times 10^{-3}$ N/m respectively while interfacial tension between them is $375 \times 10^{-3}$ N/m. Calculate spreading coefficient of mercury on the surface of water. State whether mercury spreads on the surface of water.

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

**a)** Write in detail on Langmuir-Blodget films.

**b)** Mention emulsion types and methods of identification of emulsion types.

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

**a)** Give an account of volumetric method of measuring gas adsorption.

**b)** Derive Kelvin equation for the vapour pressure inside and outside the liquid.

**SLR-GF-66**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - III) (New) (CBCS) Examination: Oct/Nov - 2022
## ANALYTICAL CHEMISTRY
## Advanced Separation Techniques

Day & Date: Monday, 13-02-2023 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) In paper chromatography, usually stationary phase is a strip of paper which is also called _____.
   a) TLC b) chromatogram
   c) chromosome d) ecg

2) Reversed phase chromatography uses stationary phase which is _____ in nature.
   a) Hydrophilic b) Lipophilic
   c) Polar d) Hydrophobic

3) The capillary action is performed in _____.
   a) Liquid chromatography b) Gas chromatography
   c) Ion chromatography d) Paper chromatography

4) _____ factor does not influence on electrophoretic mobility.
   a) Molecular weight b) Shape of molecule
   c) Size of molecule d) Stereochemistry of molecule

5) In electrophoresis cell, the pressure is about _____.
   a) 2 $Kg/m^2$ b) 3 $Kg/m^2$
   c) 5-6 $Kg/m^2$ d) 10 $Kg/m^2$

6) Solvent extraction is also called _____ extraction.
   a) Liquid-liquid b) Solid-liquid
   c) Liquid-Solid d) Liquid-Gas

7) The simplicity of extraction process in decided by _____.
   a) Gravity b) Boiling point
   c) Partition Coefficient d) None of these

8) In excretion, ultrafiltration retains the _____.
   a) Blood plasma b) Solid molecule
   c) Water d) Small molecules

9) Blood pressure required for ultrafiltration is provided through _____.
   a) Simple mechanical process b) Afferent arteriole
   c) Efferent arteriole d) Heart beat

10) _____ is used for ultrafiltration.
   a) Permeable membrane
   b) Highly permeable membrane
   c) Semi-permeable membrane
   d) Non-permeable membrane

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

1) Whatman filter paper commonly used for chromatographic purpose has a content of _____.
2) An electrophoresis technique which used in isoelectric focusing is _____.
3) Electrophoresis is not suitable for the separation of _____.
4) Electrophoresis was developed by the scientist _____.
5) The extraction of _____ is carried out with 8-Hydroxyquninoline inchloroform.
6) Ultrafiltration is the best techniques used for the separation and purification of _____.

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

**a)** Write a short note on peritoneal dialysis.
**b)** Write a short note on electro osmotic flow.
**c)** Explain the elusion methods used in affinity chromatography.
**d)** Explain the factors affecting on solvent extraction.

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

**a)** Explain in details the technique of ultra filtration.
**b)** Explain the principle, experimental procedure and application of capillary electrophoresis.

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

**a)** What is the principle of zone refining? Explain the process of zone refining.
**b)** Define electrophoresis and theory and application.

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

**a)** Which gels are commonly used in gel permission chromatography? What are the roles of ligand and spacer arms in gel permission chromatography?
**b)** Explain in detail the techniques of solvent extraction.

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

**a)** What is the principle of affinity chromatography? Describe components involved in affinity medium.
**b)** Give the principle and classification of extractors.

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

**a)** i) Give the application of dialysis.
ii) Write short note on zone electrophoresis.

**b)** i) Write short note on two dimensional chromatography.
ii) Explain in brief extraction by chelation.

**SLR-GF-67**

| Seat No. | |
|---|---|

**Set P**

## M.Sc. (Semester - III) (New) (CBCS) Examination: Oct/Nov - 2022
## (ANALYTICAL CHEMISTRY)
## Instrumental Methods of Chemical Analysis - I

Day & Date: Tuesday, 14-02-2023 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) An example of the electrode in solid-state ion selective electrode for F-determination is _____.
   a) $BF_3$ b) $LaF_3$
   c) $PF_5$ d) NaF

2) Which of the following is not a type of radiation detectors?
   a) Geiger Muller counter b) Proportional counter
   c) Semiconductor detector d) Flame emission detector

3) High frequency titration technique was introduced by _____.
   a) Hall b) Jensen and Parrack
   c) Adams d) Hyrosky

4) Glass electrode contains the solution of _____.
   a) 1N KCl b) Saturated KCl
   c) 0.1N HCl d) 1N HCl

5) The DTA plot of calcium oxalate in air shows an upward peak due to _____.
   a) Formation of calcium oxide
   b) Formation of calcium carbonate
   c) Burning of CO
   d) Elimination of water

6) Which of the following is not the characteristic of ion selective electrodes?
   a) It is fragile
   b) Easy to use
   c) Available in different sizes and shapes
   d) it is insensitive to many ions

7) In amperometric titration platinum electrode is rotated at _____.
   a) 700 rpm b) 600 rpm
   c) 800 rpm d) 100 rpm

8) High frequency titrimetry is closely related to _____.
   a) Amperometry b) Potentiometry
   c) pH metery d) Conductometry

9) Becquerel discovered radioactivity by using _____.
   a) Photographic film b) Radiations damages on skin
   c) GM-Counter d) Cloud chamber NaF

10) Radioactive disintegration follows _____ order kinetics.
a) Third b) Second
c) Zero d) First

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

1) The self-sustaining nuclear fission reaction depends on the release of neutrons.
2) TGA is most appropriate to study polymorphism.
3) Radioactive emission of alpha does not change the atomic number.
4) In solid state membranes, the body of the electrodes are made of Teflon.
5) The limiting current in a linear sweep voltammogram is related to the standard reduction potential for the redox couple under investigation.
6) The penetrating power of the gamma rays is highest among the nuclear radiations.

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

**a)** Describe the cells used in high frequency titrations.
**b)** With schematic diagram describe heat flux DSC.
**c)** Describe radiochromatography technique.
**d)** Write a short note on typical amperometric titration curves.

**Q.3 Answer the following**

**a)** Explain how isotope dilution analysis is used in various biomedical investigations. **08**
**b)** What do you mean by tracer technique? Describe applications of this in agriculture and industry. **08**

**Q.4 Answer the following**

**a)** Discuss principle and technique of electrogravimetry. **08**
**b)** Describe neutron activation analysis. Mention various applications of it. **08**

**Q.5 Answer the following**

**a)** Describe with suitable example solid state electrodes. **08**
**b)** What are different types of ion selective electrodes? Explain glass electrode. **08**

**Q.6 Answer the following**

**a)** Write a detailed note on electrolytic separation of metals. **08**
**b)** Describe various applications of DTA. **08**

**Q.7 Answer the following**

**a)** What are the main material components needed in the design of a polymer-based ion selective membrane? What is the role of each of these components in the membrane? **08**
**b)** Discuss various factors that affect the results of thermo gravimetric analysis. **08**

**SLR-GF-68**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - III) (New) (CBCS) Examination: Oct/Nov-2022
## (ANALYTICAL CHEMISTRY)
## Applied Analytical Chemistry

Day & Date: Wednesday, 15-02-2023 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) _____ method is used for estimation of phosphorous.
   a) Conductometric b) Potentiometric
   c) Polarographic d) Colorimetric

2) The chemical formula of hematite is _____.
   a) $Fe_3O_4$ b) $FeSO_4$
   c) $FeO_4$ d) $Fe_2O_3$

3) Bronze contains _____ as main elements.
   a) $B \ \& \ Zn$ b) $Fe \ \& \ Cu$
   c) $Cu \ \& \ Zn$ d) $B \ \& \ N$

4) Creams are normally _____.
   a) Solids b) Liquids
   c) Emulsions d) Suspensions

5) Generally, $P^H$ of the soil lies between _____.
   a) 4-5 b) 8-9
   c) 6.5-7.5 d) 11-12

6) The major constituent of solder alloy are _____ & _____.
   a) $Sn$ b) $Sn \ \& \ Pb$
   c) $Pb$ d) $Fe \ \& \ Pb$

7) Mainly bauxite contains _____.
   a) $Al \ \& \ Si$ b) $B \ \& \ N$
   c) $Fe \ \& \ Zn$ d) $C \ \& \ H$

8) Indicator used in acid-base titration is _____.
   a) Phenolphthalein b) EBT
   c) Potassium chromate d) Methyl red

9) _____ of soil is increased by ammonium sulphate.
   a) Basicity b) Acidity
   c) Neutrality d) None

10) Urea contains _____% of nitrogen.
   a) 46 b) 60
   c) 76 d) 90

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

1) Silica is estimated by _____ acid treatment.
2) In gravimetric estimation of calcium, calcium is precipitated as _____ by adding ammonium oxalate.
3) Electrical conductance of soil is measured by _____.
4) Catalyst used for estimation of nitrogen by kjeldahls method is ____.
5) Type of rock contains minerals & metals that can be economically extracted from rock is _____.
6) _____ acid is generated at armpit which has bad odour.

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

**a)** What is $P^H$? Give in detail $P^H$ determination of soil.
**b)** Define pesticide, insecticide, herbicide & fungicide.
**c)** Write the process to extract iron from hematite.
**d)** How will you estimate propylene glycol, sulphate, chlorides & zinc oxide from cosmetic?

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

**a)** Explain Kjeldahl's method for estimation of nitrogen.
**b)** Explain different factors that effects on soil temperature.

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

**a)** What is sample? Explain its type in detail.
**b)** Write note on Fertilizer? Explain alkalimetric ammoniummolybdophosphate method for estimation of phosphoroces.

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

**a)** Explain the process to analyse tin & lead from alloy.
**b)** Explain the process to analyse copper & nickel from copper- nickel alloy.

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

**a)** Explain the process to determine calcium & magnesium from face powder.
**b)** Give the difference between antiperspirant & deodorant.

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

**a)** How will you estimate iron & nickel from alloy?
**b)** How will you estimate aluminium & boric acid from deodorant?

**SLR-GF-70**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - IV) (New) (CBCS) Examination: Oct/Nov-2022
## (ANALYTICAL CHEMISTRY)
## Advanced Analytical Techniques

Day & Date: Monday, 20-02-2023 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) Ion chromatographs method is used to separate and analyze the _____.
   a) simple mixture b) complex mixture
   c) viscous mixture d) metals

2) $Na_2CO_3$ is used as eluents in _____ chromatography.
   a) ion exchange b) TLC
   c) GC d) HPLC

3) Hyphenated HPLC-MS is also known as _____.
   a) GC-MS b) LC-MS
   c) GC-AES d) EC-MS

4) Which of the following systems GC- MS has been developed?
   a) Packed column b) Open tubular column
   c) Capillary column d) Porous layer column

5) The term hyphenation was first introduced by _____.
   a) Hirschfield b) Hansen
   c) Stewart d) Ruzieka

6) Which of the followings are not advantages of automated analyzer?
   a) Saving in labor costs b) Speed of production
   c) Human interventions d) Analysis of toxic samples

7) In Flow Injection Analysis (FIA), detector is continuously records the suitable physical properties such as _____.
   a) absorbance b) electrode potential
   c) electrical conductivity d) all of the above

8) Which of the following detector not used in Flow injection analysis?
   a) Spectrophotometer b) Ion-selective electrode
   c) Biosensor d) Fluorescence detector

9) In order to improve an efficiency of isolation of highly polar solvents, methanol is used as _____ in SFC chromatography.
   a) stationary phase b) mobile phase
   c) modifier d) substitute

10) _____ technique is used to study the molecular mass distribution of a polymer.
   a) Low-Angle Laser light scattering
   b) Dynamic light scattering
   c) Photo-sedimentation
   d) Calorimetry

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

1) The packed and open tabular columns are used in _____.
2) Automation means _____.
3) In mass spectrometry, the separation of ions is take place on the basis of _____.
4) _____ channel auto-analyzer used for blood urea nitrogen analysis.
5) IR Spectroscopy shows _____ type of energy transitions.
6) _____ source is used for monitoring photo-sedimentation.

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

**a)** Describe the suppressor columns in ion chromatography.
**b)** Explain the determination of molecular weight of biopolymer using HPLC-MS technique.
**c)** Write a note on stopped flow methods of analysis.
**d)** Explain the characteristic properties of SCF.

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

**a)** Explain detectors used in ion chromatography and give their applications.
**b)** Describe the GC-MS technique of separation of mixture with suitable example.

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

**a)** What is automated analysis? Give the advantages and disadvantages of automated analysis.
**b)** Describe supercritical fluid chromatography with suitable diagram.

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

**a)** Describe the instrumentation in ion chromatography.
**b)** What is mean by hyphenated techniques? Explain hyphenated techniques for NMR and Mass detection.

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

**a)** Explain the principle and instrumentation of centrifugal fast scan analyzer.
**b)** Explain photo-sedimentation with the help of suitable diagram.

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

**a)** Explain the principle, working and applications of HPLC-MS.
**b)** Describe low angle laser light scattering instrumentation with suitable diagram.

**SLR-GF-71**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - IV) (New) (CBCS) Examination: Oct/Nov-2022
## (ANALYTICAL CHEMISTRY)
## Instrumental Methods of Analysis – II

Day & Date: Tuesday, 21-02-2023 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 absorption of X-rays in a material governed by _____.
   a) Bragg's law b) Beer Lambert's law
   c) Stefan's law d) Planck's law

2) The hottest flame in $O_2$ is produced by _____.
   a) acetylene b) cyanogens
   c) butane d) hydrogen

3) 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) $d_{hkl} = n/4$

4) X-rays are produced following photoelectric process while continuous X-rays are produced as a result of _____ process.
   a) Bremsstrahlung b) diffraction
   c) interference d) Daune Hunt

5) For very dilute suspensions, the most sensitive technique is _____.
   a) Turbidimetry b) Nephelometry
   c) Colorimetry d) Photometry

6) The good oxidants to excite metals in the flame is _____.
   a) Oxygen b) cyanogens
   c) butane d) hydrogen

7) _____ is the non- radiative transition.
   a) fluorescence b) phosphorescence
   c) Delayed fluorescence d) Internal conversion

8) For triplet states, the spin multiplicity is _____.
   a) 1 b) 2
   c) 3 d) ½

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

10) X-ray was discovered by _____.
   a) Bohr b) Einstein
   c) Rotengen d) Compton

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

1) The Bragg's equation is written as $n\lambda$ = _____.
2) The wavelength of Cu K$\alpha$ line is _____ A (Angstrom).
3) Elements having atomic number less than 23 produce only _____ series.
4) The expression of Snell's law is _____.
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)** Write on applications of fluorimetry.
**b)** Write on chemiluminescence phenomenon.
**c)** Illustrate the principle and working of Abbe's refractometer.
**d)** Explain how X-rays can be produced.

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

**a)** Discuss various components encountered in spectrofluorometer.
**b)** Through a light on general techniques utilized in surface spectroscopy.

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

**a)** Mention different types of emission spectra. Briefly explain them.
**b)** Factors influencing the intensity of radiation in flame photometry.

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

**a)** Write on an interferences encountered in flame photometry.
**b)** Write on applications of turbidimetery.

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

**a)** With schematic block diagram, explain the instrumentation of Nephelometer.
**b)** Discuss X-ray powder diffraction method.

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

**a)** Give an account of X-ray fluorescence technique.
**b)** With the help of energy level diagram, illustrate various photophysical pathways.

**SLR-GF-72**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - IV) (New) (CBCS) Examination: Oct/Nov-2022
## (ANALYTICAL CHEMISTRY)
## Biochemicals And Food Analysis

Day & Date: Wednesday, 22-02-2023 Max. Marks: 80
Time: 03:00 PM To 6:00 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 diagram wherever necessary.

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

1) Triglycerides on saponification gives _____.
   a) glycerol b) aldehyde
   c) ketone d) alkali

2) The normal blood glucose in human being ranges between _____ mg.
   a) 40-70 b) 70-110
   c) 110-150 d) above 150

3) Excess of calcium causes _____.
   a) B.P. b) Blood clotting
   c) Kidney stone d) Heart block

4) Citrous foods are sources of vitamin _____.
   a) D b) A
   c) B d) C

5) Pleasant odour is given by _____ oil.
   a) essential b) mineral
   c) coconut d) paraffin

6) Haemoglobin in blood carries _____.
   a) Oxygen from lungs b) releases oxygen
   c) provide energy d) all of these

7) _____ is example of barbiturate family.
   a) Ephedrine b) Phenobarbital
   c) Diazepam d) hydrochlorothiazide

8) Ascorbic acid is known as vitamin _____.
   a) B b) A
   c) C d) D

9) _____ element is present in haemoglobin.
   a) Fe b) Na
   c) K d) Ca

10) The dose LD stands for lethal _____.
   a) conversion b) concentration
   c) composition d) cementation

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

1) Amount of milligrams of KOH required to saponify 1 gm oil is _____.
2) Contents in haemoglobin are _____.
3) Substance used to prevent, treat, cure disease is known as _____.
4) Composition of milk are _____.
5) CNS drug affects on _____.
6) Vitamin A is called as _____.

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

**a)** Write four properties of purpose of colouring.
**b)** Write note on CNS.
**c)** How will you estimate cholesterol from blood?
**d)** Write short note on snake venom.

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

**a)** How will you estimate saponification and acid value of an oil?
**b)** How will you estimate R M value and Polenske value of oil?

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

**a)** How will you estimate Ca, Uric acid and Na from Urine?
**b)** Discuss sample collection. Preservation of physiological fluids.

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

**a)** Explain classification of Drug.
**b)** Explain analysis of diazepam and chloromazinc.

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

**a)** Write an essay on Vitamin A.
**b)** How will you determine chloride from milk?

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

**a)** How will you estimate non – protenous nitrogen by Kjeldahl's method?
**b)** How will you estimate blood glucose? Explain its clinical interpretation.

**SLR-GF-74**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - IV) (New) (CBCS) Examination: Oct/Nov - 2022
## (ANALYTICAL CHEMISTRY)
## Pharmaceutical Analysis

Day & Date: Thursday, 23-02-2023 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) Tetanus toxin is prepared from sterile filtrate of _____ culture.
   a) Escherichia coli b) Clostridium tetani
   c) Staphylococcus aureus d) Salmonella

2) To avoid microbial contamination _____ process is used.
   a) sterilization b) disintegration
   c) distillation d) none of these

3) *Invitro* study is _____.
   a) Study inside the body b) Study outside the body
   c) Both a and b d) None of these

4) Administration of the drug with injection under the skin is called _____.
   a) S.C b) I.M
   c) I.V d) I.S

5) Drug is developed from _____.
   a) synthetic method b) natural source
   c) a & b d) none of these

6) The limit test is _____ test used to identify small number of impurities.
   a) qualitative b) quantitative
   c) semiquantitative d) both b & c

7) The dry sterilization process is carried out in _____.
   a) incubator b) oven
   c) cooker d) thermostat

8) FDA visits to _____.
   a) store b) quality control lab
   c) product and packing d) all of these

9) Arsenic is converted into arsine gas when passed over _____.
   a) starch paper b) chloride test paper
   c) turmeric paper d) pH paper

10) Ash is remaining residue after _____.
   a) ignition b) sterilization
   c) incubation d) drying

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

1) FDA stands for _____.
2) GLP stands for _____.
3) Rh means _____.
4) IRB Stand for _____
5) Syrup is saturated solution of _____.
6) Ointments are used for external applicant to _____.

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

**a)** Explain the pills in detail.
**b)** Discuss the sampling of vegetable drug.
**c)** Discuss GMP in brief.
**d)** Discuss the term injection with suitable examples.

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

**a)** Explain in detail ophthalmic preparation in dosage form.
**b)** Explain control of pharmaceutical industries by FDA.

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

**a)** Discuss in detail protolytic activity.
**b)** What is tablet? Describe different types of tablets with suitable example.

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

**a)** Explain in brief particulate and microbiological contamination.
**b)** Discuss in detail different dosage forms.

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

**a)** Explain loss on drying and loss on ignition. How personal error is controlled?
**b)** What is sterilization? Explain dry heat sterilization.

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

**a)** Write a note on visit to quality control.
**b)** Discuss in detail clinical study in development of new drug.

**SLR-GF-80**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - III) (New) (CBCS) Examination: Oct/Nov -2022
## (INORGANIC CHEMISTRY)
## Inorganic Chemical Spectroscopy

Day & Date: Monday, 13-02-2023 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 introduction of electronegative group results in _____vibrational frequency.
   a) increased b) decreased
   c) constant d) zero

2) Analysis of surfaces can be achieved by _____
   a) UV-PES b) ESCA
   c) AES d) All of these

3) PAS is comparable to _____.
   a) NMR b) Phosphorescence
   c) Fluorescence d) IR

4) An acoustical resonant frequency depends upon _____.
   a) Cell length b) Tunable dye laser
   c) Photoacoustic cell d) Chopper

5) PAS provides a means for obtaining UV, visible and IR absorption spectra of _____.
   a) Solids b) Semi solids
   c) Liquids d) All of these

6) The simplest molecule with a low potential barrier to inversion is ____.
   a) HCl b) OCS
   c) HCN d) $NH_3$

7) The inversion frequency rapidly decreases as the barrier height is ____.
   a) Increased b) Decreased
   c) Identical d) None of these

8) Transitions involving d-orbitals (d-d transitions) is _____.
   a) laporte allowed b) laporte forbidden
   c) spin forbidden d) spin allowed

9) Orgel diagram apply to _____.
   a) high spin complexes b) spin allowed transitions
   c) both a & b d) low spin complexes

10) The fundamental vibrational modes for $H_2O$ molecule are _____.
   a) 5 b) 3
   c) 8 d) 1

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

1) The term symbol for $Cr^{+3}$ ion is _____.
2) The experimental and theoretical aspects of PES were first pioneered by _____.
3) Scalar coupling is also termed as _____.
4) The energy separation of spectroscopic terms is expressed as _____.
5) Unsaturation causes _____ effect on the chemical shift.
6) In laser spectrometers _____detector is used.

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

**a)** Applications of IR spectroscopy
**b)** Spin spin coupling
**c)** Orthogonality theorem
**d)** Electronic transitions

**Q.3 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.

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

**a)** Explain the Principle of photoacoustic spectroscopy (PAS)
**b)** Explain the effect of isotopic substitution in microwave spectrum.

**Q.5 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.6 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.7 Answer the following** **16**

**a)** Construct and explain the character table for C2v point group.
**b)** Explain the Morse potential energy diagram.

**SLR-GF-81**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - III) (New) (CBCS) Examination: Oct/Nov - 2022
## (INORGANIC CHEMISTRY)
## Co-ordination Chemistry – I

Day & Date: Tuesday, 14-02-2023 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) Acetic acid is produced by _____.
   a) Olefin hydrogenation
   b) Olefin Polymerization
   c) Monsanto acetic acid process
   d) None of these

2) Wilkinson's catalyst is _____.
   a) $TiCl_4 + AlEt_3$ b) $ZrO_4$
   c) $[Rh(PPh_3)_3Cl])$ d) $TiO_4$

3) Which magnetic have negative susceptibility?
   a) Diamagnetic materials b) Paramagnetic materials
   c) Ferromagnetic materials d) All of the above

4) Under conditions of _____ heating, decomposition usually take place in thermogravimetry.
   a) First order b) Second order
   c) Third order d) Dynamic

5) One of the following TA instrument.
   a) TGA 2950 b) UV-3600
   c) FTIR d) Spectrum 100

6) 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) $-1.2\Delta_{oct}$

7) Which calibrant is used in DTA?
   a) Glass beads b) Silicon carbide
   c) Alumina d) All of these

8) 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) $[Cr(bpy)_3]^{2+}$

9) 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

10) The substance that increases the rate of reaction but is not itself consumed is _____.
   a) Element  b) Catalyst
   c) Copolymerizer  d) None of above

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

1) Oxidation of ethylene to acetaldehyde is carried out by _____.
2) Zigler-Natta catalyst is _____.
3) Transition metals are complexes act as _____.
4) Nickel (II) ion has _____ unpaired electrons.
5) In industrial processes, transition elements and their oxides are used as _____.
6) Basic source of magnetism _____.

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

**a)** Spectrochemical series
**b)** Factors affecting DTA curve
**c)** Diamagnetism.
**d)** Decarboxylation of B keto acids

**Q.3 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.4 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.5 Answer the following** **16**

**a)** Explain the structure of $[\mathrm{Ni(CN)_4}]^{2-}$ on the basis of VBT.

**b)** Explain in brief diamagnetism and paramagnetism with suitable example.

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

**a)** Explain the determination of magnetic susceptibility by Gouy method.
**b)** Explain the factors affecting TGA curve.

**Q.7 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.

**SLR-GF-82**

| Set No. | | Set | P |
|---|---|---|---|

# M.Sc. (Semester - III) (New) (CBCS) Examination: Oct/Nov-2022
## (INORGANIC CHEMISTRY)
## Nuclear Chemistry

Day & Date: Wednesday, 15-02-2023 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) The unit of reaction cross-section is _____.
   a) $cm^3$ b) Barn
   c) N/m d) Joule $m^2$

2) Nuclear fusion reaction is also known as _____ reaction.
   a) Thermonuclear b) elastic scattering
   c) stripping reactions d) None

3) 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

4) The act of measuring or estimating radiation doses is known as _____.
   a) Dosimetry b) Colorimetry
   c) Photometry d) none of these

5) 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

6) In fast breeder nuclear reactor, the fuel used is _____.
   a) U-239 b) Th-231
   c) Th-232 d) Pu-232

7) The Liquid drop model of nucleus was developed by _____.
   a) Bohr, Wheeler b) Fermi
   c) Chadwick d) Rutherford

8) The commonly used material for shielding is _____.
   a) lead or concrete b) lead and tin
   c) Graphite d) thick galvanized sheets

9) 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.

10) 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

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

1) The packing fraction of 7N14 isotope whose mass is 14.003 a.m.u. is _____.
2) _____ model corresponds to the magic numbers.
3) Nuclear reactions induced by X-rays or g-photons of high energy are referred as _____ reactions.
4) Even-even nuclides (both Z and A even) have zero intrinsic spin and _____ parity.
5) The range of N/Z ratio for stable nuclei is _____.
6) The first plant set up in India for the production of heavy water is at _____.

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

**a)** What is Packing fraction?
**b)** Write about nuclear reactors in INDIA.
**c)** Write a note on magnetic moments of odd mass numbers nuclei.
**d)** Explain radiolysis of aqueous solution with suitable examples.

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

**a)** Explain the stability of nucleus w.r.t mass defect, B.E, N/Z ratio.
**b)** Explain Liquid drop model. Derive semi-empirical mass equation.

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

**a)** What is threshold energy of a nuclear reaction? Give Bohr's hypothesis of compound nucleus for nuclear reaction.
**b)** Explain the construction and working of pressurized water reactor.

**Q.5 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.6 Answer the following.** **16**

**a)** Write nuclear configuration, spin and parity of $_{29}Cu^{63}$ and $_{78}Pt^{195}$
**b)** Discuss about the heavy water manufacturing in India.

**Q.7 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.

**SLR-GF-99**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - III) (New) (CBCS) Examination: Oct/Nov - 2022
## PHARMACEUTICAL CHEMISTRY
## Advanced Organic Chemistry - I

Day & Date: Monday, 13-02-2023 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) The intermediate used in Smiles rearrangement is _____.
   a) Carbanion b) Carbene
   c) Carbocation d) Carbon free radical

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

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

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

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

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

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

8) The reaction in which ketoxime is converted into an $\alpha$-amino ketone called as _____.
   a) Brook rearrangement b) Neber rearrangement
   c) Wittig rearrangement d) Hofmann rearrangement

9) The reaction in which exchanges the groups attached to the double bond of alkenes is _____.
   a) Corey-Winter olefination b) Coupling reaction
   c) Grubb's metathesis d) McMurry reaction

10) The formula of periodic acid is _____.
   a) $HI_4O_4$ b) $H_2I_2O_4$
   c) $HIO_2$ d) $HIO_4$

**B) Write the answer with one answer** **06**

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

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

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

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

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

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

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

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

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

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

**a)** Explain semipinacol rearrangement and Wittig rearrangement reaction.
**b)** Explain Darzen reaction and Bamford-Steven reaction.

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

**a)** Explain Pummerer rearrangement and Hofmann rearrangement.
**b)** Explain Strecker amino acid synthesis and Henry reaction.

**SLR-GF-100**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - III) (New) (CBCS) Examination: Oct/Nov - 2022
## (PHARMACEUTICAL CHEMISTRY)
## Chemistry of Bioactive Heterocycles

Day & Date: Tuesday, 14-02-2023 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.

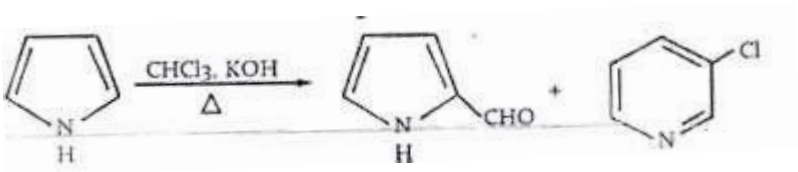
**Q.1 A) Fill in the blanks by choosing correct alternatives given below.** **10**

1) Piperazine is prepared by reaction of ethanolamine with _____.
   a) Ammonia b) Ethyl alcohol
   c) Water d) Piperyl alcohol

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

3) Molecular formula of tetrazine is _____.
   a) $C_4H_2N_4$ b) $C_2H_2N_4$
   c) $C_4H_4N_2$ d) $C_4H_4N_4$

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 KMnO4 gives _____ as one of the products.
   a) Benzoic acid b) Pyridine
   c) Phthalic acid d) Salicylic acid

6) In coumarin one of the ring is having _____ functional group.
   a) Acid b) Alcohol
   c) Ester d) Phenol

7) 2- Aza naphthalene is the name of _____.
   a) Pyridine b) Quinoline
   c) Isoquinoline d) Indole

8) Indole is prepared by fusion of benzene ring to pyrrole ring at _____.
   a) 1,2 position b) 1,4 position
   c) 2,3 position d) 1,3 position

9) Thiophene cannot be prepared from _____.
   a) Acetylene b) n-butane
   c) Ethylene d) Sodium succinate

10) Aziridine is a _____.
   a) Three membered ring  b) Four membered ring
   c) Five membered ring  d) Six membered ring

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

1) Quinazoline is prepared by condensation of two ring _____ and _____.
2) Number of double bonds present in Pyran is _____.
3) Thiophene is _____ membered heterocyclic compound.
4) Isoquinoline is a structural isomer of _____.
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)** Write synthesis and medicinal importance of Benzothiophene.
**b)** Write any two methods of preparation of furan.
**c)** Write synthesis and aromatic character of Pyridine.
**d)** Write a note on morphine.

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

**a)** Discuss the synthesis of thiophene and pyrrole with mechanism.
**b)** Write synthesis, reactivity and medicinal importance of Azeridine.

**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)** Write synthesis, reactivity and medicinal importance of Oxirane.
**b)** What is quinolone and isoquinoline? Write synthetic methods with examples.

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

**a)** Write synthesis, reactivity and medicinal importance of Piperazine.
**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 synthesis, reactivity and medicinal importance of Pyrrolidine.

**SLR-GF-101**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - III) (New) (CBCS) Examination: Oct/Nov-2022
## (PHARMACEUTICAL CHEMISTRY)
## Drug Development

Day & Date: Wednesday, 15-02-2023 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 drug concentration between Minimum Effective Concentration and Maximum safe concentration is called as _____.
   a) Therapeutic range b) Area under curve
   c) Peak response d) Pharmacological response

2) The most significant protein involved in the binding with the drug is _.
   a) Albumin b) Glycoprotein
   c) Lipoprotein d) Globulin

3) The computational methodology that tries to find the best matching between two molecules, a receptor and ligand are called _____.
   a) Molecular fitting b) Molecular matching
   c) Molecular docking d) Molecular affinity checking

4) Among the following _____ is a source for obtaining drugs.
   a) Animals and plants b) Micro-organisms
   c) Synthetic origin d) All of the above

5) The identification of drugs through the genomic study is called _____.
   a) Genomics b) Pharmacogenomics
   c) Pharmacogenetics d) Cheminformatics

6) Among the following _____ compounds has desirable properties to become a drug.
   a) Fit drug b) Lead
   c) Fit compound d) All of the above

7) In pharmacokinetics, the acronym ADME stand for _____.
   a) Absorption, Distribution, Metabolism and Excretion
   b) Administration, Differentiation, Metabolism and Excretion
   c) Absorption, Disintegration, Metabolism and Efficacy
   d) Administration, Distribution, Metabolism and Efficacy

8) The protein structures that are expressed within the cell membranes and interact with endogenous signaling molecules or some drugs to initiate an intracellular response are called as _____.
   a) Enzymes b) Hormones
   c) Ligands d) Receptors

9) The science which deals with the drug and their action on human body is called _____.
   a) Physiology b) Pathology
   c) Pharmacology d) Microbiology

10) The volume of distribution (Vd) relates _____.
   a) The amount of drug in the body to the concentration of drug in plasma
   b) An unchanged drug reaching to the systematic circulation.
   c) Daily dose of an administered drug
   d) An administered dose to a body weight

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

1) _____ software programme is used to determine the Verloop steric parameter.
2) _____ refers to the study of the entire set of expressed proteins in the cell.
3) In medicinal chemistry, a compound that acts as the starting point for drug design and development _____ compound.
4) The symbol 'P' is QSAR equation represent _____.
5) _____ is a measure of the fraction of administered dose of a drug that reaches the systematic circulation in the unchanged form.
6) The combined effect of two drug effect is higher than either individual effect is called as _____.

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

**a)** Explain Lipinski rule of 5.
**b)** Discuss the types of molecular descriptors.
**c)** What are pro-drugs and soft drugs?
**d)** Explain the terms: LD50, ED50, IC50, MIC.

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

**a)** Explain bioavailability of drug and major factors affecting drug bioavailability.
**b)** What is dose-response relationship? Explain the potency and efficacy of the drug.

**Q.4 Answer the following.**

**a)** What are molecular descriptors? Explain the methods of molecular descriptor selection. **10**
**b)** Explain in detail the combined effect of drugs administered together in the body. **06**

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

**a)** Explain the development of Cemetidine on the basis of physico-chemical properties.
**b)** What is pharmacokinetics? Explain in detail the process of drug absorption.

**Q.6 Answer the following**

**a)** Define and classify molecular docking and discuss various steps involved in the flexible docking. **10**
**b)** Write an account on metabolism for the drug administered in the body. **06**

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

**a)** What are receptors? Explain the types of receptors in detail.
**b)** What are the principles of drug action? Discuss the mechanism involved in drug action.

**SLR-GF-103**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - IV) (New) (CBCS) Examination: Oct/Nov-2022
## (PHARMACEUTICAL CHEMISTRY)
## Photochemistry and Pericyclic Reactions

Day & Date: Monday, 20-02-2023 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 photochemical reactions, absorption of _____ radiations takes place.
   a) ultraviolet and visible b) radio
   c) only visible d) visible and x-rays

2) The reactant of cope rearrangement is _____.
   a) 1,5 diene b) 1,3 diene
   c) 1,4 diene d) 1,6 diene

3) The _____ species in the excited state is termed as the excimer.
   a) heterodimeric b) homodimeric
   c) heterotrimeric d) Homotrimeric

4) The oxygen molecule is paramagnetic. It can be explained by _____.
   a) Resonance b) Hybridization
   c) Valence bond theory d) Molecular orbital Theory

5) Which one is correct as per selection rule of Electrocyclic reactions?
   a) 4n, Thermally → Conrotatory
   b) 4n, Thermally → Disrotatory
   c) 4n+2, Thermally → Conrotatory
   d) 4n+2, Photo chemically → Disrotatory

6) Diel's Alder reaction is _____.
   a) [2+2]-Cycloaddition reaction
   b) [4+2]-Cycloaddition reaction
   c) [4+4]-Cycloaddition reaction
   d) [6+2]-Cycloaddition reaction

7) Formation of polycyclic compound in presence of oxygen is an example of _____.
   a) Photo dissociation b) Photo oxidation
   c) Photo cyclization d) Photo dimerization

8) In the Claisen rearrangement, vinyl allyl ether is heated to give a gamma, _____ unsaturated carbonyl.
   a) $\alpha, \beta$ b) $\gamma, \delta$
   c) $\beta, \delta$ d) $\alpha, \delta$

9) Combination of two atomic orbitals results in the formation of two molecular orbitals namely _____.
   a) one bonding and one non-bonding orbital
   b) two bonding orbitals
   c) two non-bonding orbitals
   d) two bonding and non-bonding oirbitals

10) Product of Patemo-Buchi reaction is _____.
   a) Four membered oxirane ring
   b) Five membered oxazole
   c) Five membered thiazole
   d) Four-membered oxetane rings

**B) Answer in one sentence.** **06**

1) What is Norrish type I reaction?
2) Why do anti-bonding orbitals have higher energy?
3) How Many pi electrons are present in allyl radical?
4) What we can name for heterodimeric species in exicted state?
5) During conrotatory process which symmetry is maintained?
6) How many electrons can a molecular orbital hold?

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

**a)** Explain Diels-Alder reaction with mechanism.
**b)** Explain Photo cycloaddition, photodimerisation of conjugated olefins.
**c)** What are Woodward-Hoffmann selection rules for cycloaddition reactions?
**d)** Explain Norrish type II reaction in ketones and esters.

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

**a)** Write calculation of energies of orbitals in cyclic and acyclic systems.
**b)** Explain for the mechanism of cycloaddition reactions by Conservation of orbital symmetry and orbital symmetry correlation diagrams.

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

**a)** Explain photo substitution reactions of aromatic compounds and Photo Fries rearrangement.
**b)** Write calculation of charge densities. Explain PMO theory and reactivity index.

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

**a)** Explain nodes and symmetry properties of molecular orbital in ethylene and 1, 3-butadiene.
**b)** Explain Cope rearrangement and Claisen rearrangement.

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

**a)** Explain photochemistry of azo compounds, diazo compounds and azides.
**b)** What is Con-rotation and dis-rotation? Explain electrocyclic closure and opening in 4n and 4n+2 systems.

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

**a)** Explain the mechanism of electrocyclic reactions by Huckel-Mobius aromatic and anti-aromatic transition state method.
**b)** Explain Patemo-Buchi reaction and Chemiluminescent reactions.

| Seat No. | |
|---|---|

Set **P**

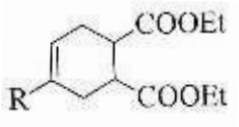
# M.Sc. (Semester - IV) (New) (CBCS) Examination: Oct/Nov-2022
## (PHARMACEUTICAL CHEMISTRY)
## Advanced Organic Chemistry-II

Day & Date: Tuesday, 21-02-2023 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.

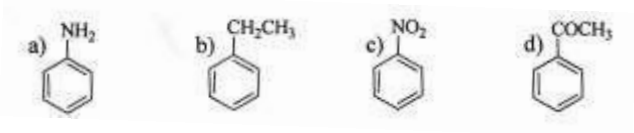
**Q.1 A) Choose correct alternative.** **10**

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



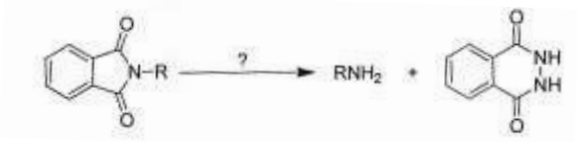

a) Ene reaction b) Aldol condensation
c) Claisen rearrangement d) Diels-Alder reaction

2) Which of (a)-(d) is the most suitable starting for the synthesis of m-ethylaniline?




3) The selectivity of a reaction towards one of a pair of enantiomers is called _____.
a) Stereoselectivity b) Regioselectivity
c) Enantioselectivity d) All of these

4) Mention the conditions for deprotection of following protected amine?

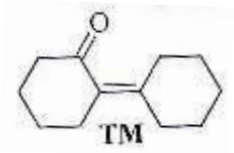


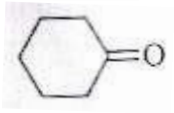

a) HCl b) $NH_2NH_2$ / EtOH
c) NaOH d) None of these

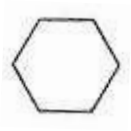
5) Which combination of reagents is appropriate for following transformation?

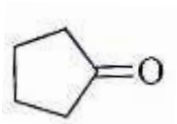

a) 1) $HO\text{-}CH_2\text{-}CH_2\text{-}OH$, $H^+$ 2) $LiAlH_4$, $Et_2O$, $H_3O^+$
b) 1) $NaBH_4$, MeOH 2) $LiAlH_4$, $Et_2O$, 3) $H_3O^+$
c) 1) $LiAlH_4$, $Et_2O$, 2) $H_3O^+$
d) 1) $NaBH_4$, MeOH

6) The synthetic equivalent for following Target molecule is?




a) 

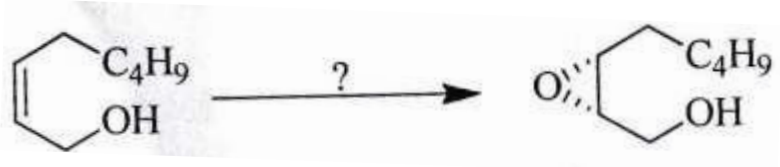

b) 

c) 


d) 

7) Conversion of one functional group into another functional group is known as _____.
   a) Functional group interconversion
   b) Oxidation
   c) Reduction
   d) None of these

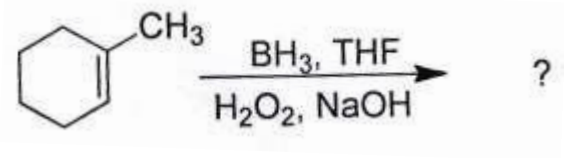
8) Choose correct reagents for following asymmetric synthesis.

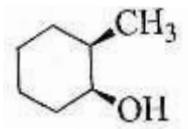


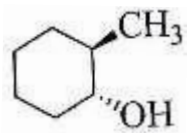

   a) $Ti(O^iPr)_4$, (-) DET, TBHP
   b) $Ti(O^iPr)_4$, (+) DET, TBHP
   c) $H_2O_2$
   d) None of these

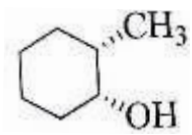
9) In cis-Decalin, two rings are fused through _____ bonds.
   a) a,e
   b) e,e
   c) a,a
   d) none of these

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




a) 


b) 


c) 


d) none of these

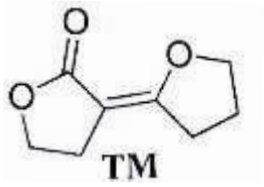
**B) Fill in the blanks.** **06**

1) The cyclohexane units in both cis and trans decalins exist in _____ conformation.
2) The site of disconnection is shown by _____.
3) 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 _____ carbon.
4) The molecule to be synthesised is known as _____.
5) An imaginary bond breaking corresponding to the reverse of real reaction is known as _____.
6) Addition of borane to alkene follow _____ rule.

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

**a)** Explain asymmetric epoxidation.

**b)** Outline the retro synthetic analysis and design synthesis of the following target molecule.




TM

**c)** Discuss the guidelines for choosing suitable disconnections.

**d)** Discuss the principle of protection of alcohols.

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

**a)** Discuss the principle of protection of carbonyl compounds with suitable examples.

**b)** What is stereoselective synthesis? Describe with suitable examples.

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

**a)** Explain role of boranes in organic synthesis.

**b)** Explain various protecting groups for alkynes.

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

**a)** Explain Bredts rule with suitable examples.

**b)** Suggest synthesis for the following compounds, using disconnection approach.


TM TM TM TM

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

**a)** What is umpolung? Explain with suitable examples.

**b)** Draw the conformations of cis/trans 9- methyl decalins and comment on their stability and optical activity.

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

**a)** Explain enantiomeric excess (ee) with example.

**b)** Draw different conformations of perhydrophenanthrene and explain its stability.

**SLR-GF-105**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - IV) (New) (CBCS) Examination: Oct/Nov-2022
## (PHARMACEUTICAL CHEMISTRY)
## Pharmaceutical Dosage Forms

Day & Date: Wednesday, 22-02-2023 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 route is adopted by the physician for sensitivity screening of potent drugs?
   a) Intramuscular b) Enteral
   c) Subcutaneous d) Intradermal

2) What is the drawback of parental controlled release system?
   a) Injecting is a difficulty
   b) The drug cannot be easily removed once administered
   c) Can get easily precipitated in the injection site
   d) rapid onset but fast excretion

3) Posology is a branch of pharmacy which deals with _____.
   a) study of dosage forms b) study of dosage
   c) study of drug interaction d) all of these

4) Rate of sedimentation is high in _____ suspension.
   a) flocculated b) deflocculated
   c) both a) and b) d) none of these

5) Elexirs are _____.
   a) aqueous b) viscous
   c) hydroalcoholic liquids d) semisolid

6) Which of the following is an ideal characteristic of any pharmaceutical drug/excipient?
   a) Non-toxic b) Chemical inertness
   c) Water soluble d) All of the above

7) _____ is most commonly used dosage form.
   a) Liquid b) Solid
   c) Semisolid d) Gaseous

8) Drug is _____.
   a) Any chemical compound
   b) Substance which alter physiological function
   c) Substance which cure disease
   d) All of these

9) Which drug delivery system has longest duration of action?
   a) Nasal preparation b) Implants
   c) Depot injection d) Transdermal patch

10) Which of the following is/are types of modified drug release?
a) Slow-release b) delayed release
c) Self-regulating release d) All of these

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

1) Excessive moisture can be responsible for mottling during tablet compression.
2) To provide delayed repeat action of drugs enteric coated tablets are used.
3) Upward creaming is observed in W/O emulsion.
4) The prescription is an order written by a registered medical practitioner to pharmacist.
5) Clonidine patches have been used for moderate hypertension.
6) Transdermal drug delivery system can be programmed to deliver a drug for delayed action.

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

**a)** Describe the steps involved in sugar coating.
**b)** What are emulsifying agents? Give its classification.
**c)** Classify semisolid dosage forms.
**d)** Write a note on rationale of sustained release formulations.

**Q.3 Answer the following.**

**a)** Explain different types of Ophthalmic preparations. Write formulation of eye ointment. **10**
**b)** Describe recently design Occular dosage form. **06**

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

**a)** Write excipients used in formulation of tablets.
**b)** Write a detailed note on types of tablets.

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

**a)** Write in detail formulation considerations of suspension.
**b)** Describe quality control methods and measurements of tablet properties.

**Q.6 Answer the following.**

**a)** Describe routes of drug administrations. **10**
**b)** Write a note on design of transdermal drug delivery system. **06**

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

**a)** Explain stability testing protocol.
**b)** Explain oral drug delivery system.

**SLR-GF-106**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - IV) (New) (CBCS) Examination: Oct/Nov - 2022
## (PHARMACEUTICAL CHEMISTRY)
## Pharmaceutical Technology

Day & Date: Thursday, 23-02-2023 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) 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

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

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) 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

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

1) ICH stands for _____.
2) GLP stands for _____.
3) API stands for _____.
4) IRB Stand for _____.
5) IP stands for _____.
6) FDA stands for _____.

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

**a)** Describe level of screening.
**b)** Draw a unit process diagram for monochloroacetic acid.
**c)** Give details about qualification phases according to WHO.
**d)** Give the difference between calibration and validation.

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

**a)** Explain unit process of vinyl chloride.
**b)** Write a note on granulation method.

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

**a)** Describe sampling techniques in cleaning validation.
**b)** What are the types of process validation?

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

**a)** Discuss the typical industrial chlorination process for the preparation of monochlorobenzene.
**b)** Discuss compression method.

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

**a)** Discuss the typical industrial nitration process for the preparation of α-Nitronaphthalene.
**b)** Explain validation of standard method in analytical method validation.

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

**a)** Write a brief note on reactors used in API manufacturing unit.
**b)** Discuss the factors affecting on chemical process.

**SLR-GF-108**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - III) (New) (CBCS) Examination: Oct/Nov-2022
## (MEDICINL CHEMISTRY)
## Advanced Organic Chemistry – I

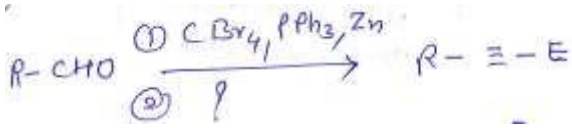
Day & Date: Monday, 13-02-023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

**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**

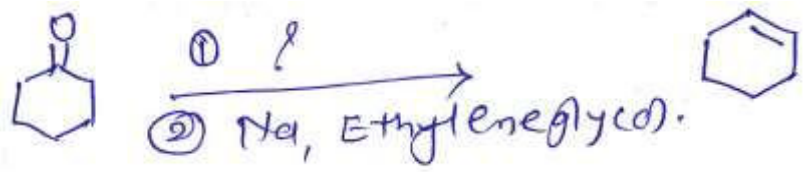
1) In Eschenmoser fragmentation $\propto, \beta$ −epoxy ketones and aryl sulphonyl hydrazine give _____ and _____.
   a) alkenes and carbonyl compounds
   b) alkynes and carbonyl compounds
   c) alkanes and carbonyl compounds
   d) alcohols and carbonyl compounds

2) The base catalyzed [2,3] – witting rearrangement of _____ occur at low temperature.
   a) Ethers b) Allyl alcohols
   c) Allylethers d) All three

3) 

   a) $E^{\oplus}$ b) $n$ −Buli then $E^{\oplus}$
   c) $E^{\oplus}$ then $n$ −Buli d) $n$ −Buli + $E^{\oplus}$

4) Julia Olefination can be used to prepare _____ alkenes.
   a) Monosubstituted b) Disubstituted
   c) Trisubstituted d) All three

5) 

   a) KCN b) $NH_2NH_2$
   c) $TsNHNH_2$ d) All three

6) Ozone is a very electrophilic _____ molecule.
   a) 1, 3-dipolar b) 1,3-polar
   c) Non polar d) None of these

7) Organocopper reagents are _____ and give _____ addition reaction in Michael Addition.
   a) Soft nucleophile and 1,4 addition
   b) Soft nucleophile and 1,2 addition
   c) Hard nucleophile and 1,4 addition
   d) Hard nucleophile and 1,2 addition

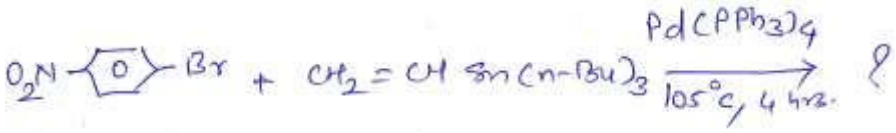
8) Factor/s favouring the formation of the kinetic enolate is/are _____.
   a) Aprotic solvent
   b) Strong base
   c) Oxophilic cations and low temperature
   d) All three

9) Secondary and tertiary leaving groups should not be used as alkylating agents in alkylation of ketone enolates because of _____.
   a) their poor reactivity
   b) possible competition with elimination reaction
   c) their high reactivity
   d) both a) & b)

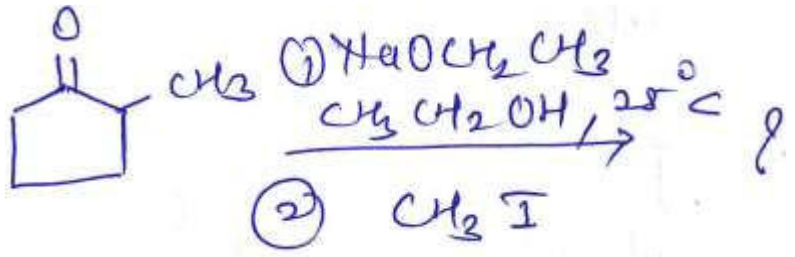
10) The ideal use of Tiffeneau- Demjanove rearrangement reaction is for the synthesis of _____ membered rings.
   a) Four
   b) Eight
   c) Five
   d) Three

**B) Predict the product.** **06**

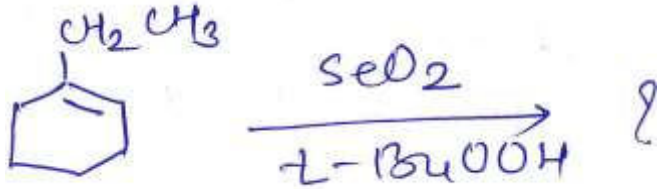
1)



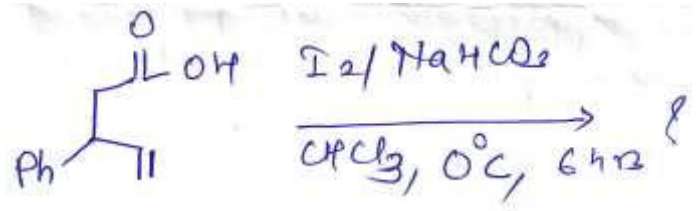
2)



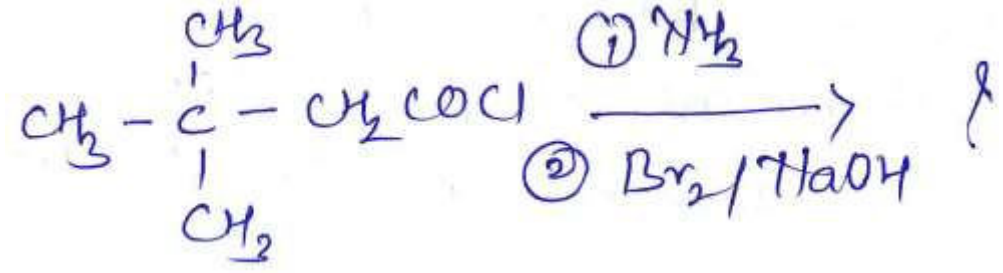
3)



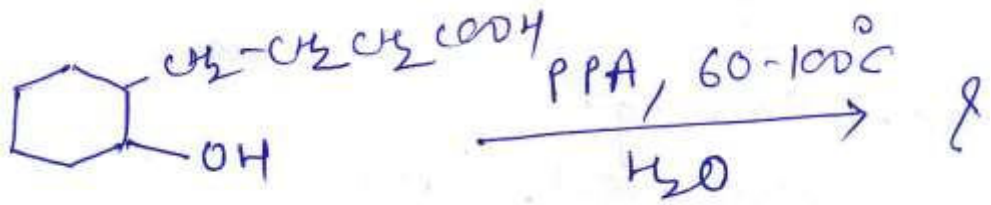
4)



5)



6)




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

**a)** Explain the mechanism of Shapiro reaction with suitable example.
**b)** Explain the reaction mechanism of Brook rearrangement reaction.
**c)** Discuss alkylation of enolates stabilized by two functional groups.
**d)** Give the synthetic applications of polyphosphoric acid.

**Q.3 Answer the following**

**a)** Discuss with suitable examples application of complex metal hydride reagents. **08**
**b)** Explain reaction mechanism of Hofmann rearrangement and give its various applications. **08**

**Q.4 Answer the following**

**a)** Explain with suitable examples generation of specific enolates by different methods other than deprotonation method. **08**
**b)** Discuss various applications of periodic acid with suitable examples & give its mechanism. **08**

**Q.5 Answer the following**

**a)** Discuss with suitable examples reaction mechanism and applications of peracids. **08**
**b)** Give reaction mechanism and applications of Mistunobu reaction. **08**

**Q.6 Answer the following**

**a)** Discuss reaction mechanism and applications of Wagner-Meerwien rearrangement reaction. **08**
**b)** Explain generation & alkylation of dianions with suitable examples. **08**

**Q.7 Answer the following**

**a)** Explain reaction mechanism of Negeshi and Kumada reaction. **08**
**b)** Discuss applications and reaction mechanism of DCC. **08**

**SLR-GF-109**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - III) (New) (CBCS) Examination: Oct/Nov-2022
## (MEDICINL CHEMISTRY)
## Chemistry of Bioactive Heterocycles

Day & Date: Tuesday, 14-02-2023 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

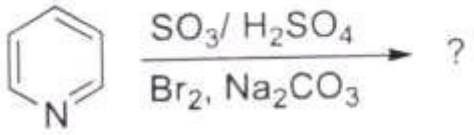
**Instructions:** 1) Question Nos.1 and 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7.
3) Figure to right indicate full marks.

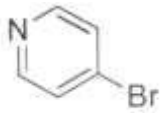
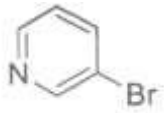
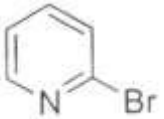
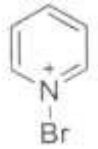
**Q.1 A) Choose correct alternative (MCQ).** **10**

1) The IUPAC nomenclature for the given heterocycle is _____.

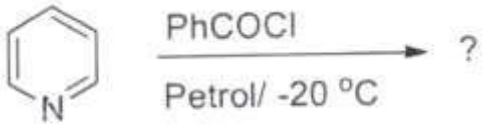
a) Oxarane b) Oxorane
c) Oxane d) Oxirane

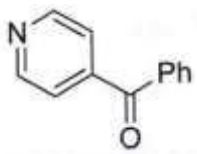
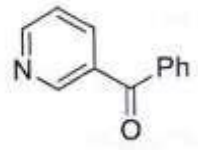
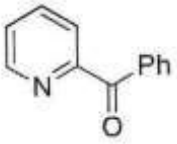
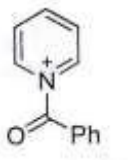
2) The major product formed in the following reaction is _____.



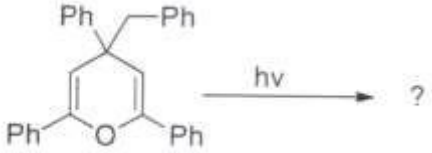

a) 
b) 
c) 
d) 

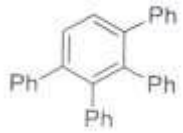
3) The major product formed in the following reaction is _____.

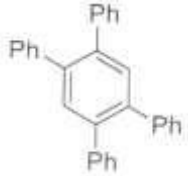


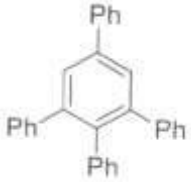

a) 
b) 
c) 
d) 

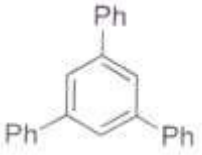
4) The product formed in the following reaction is _____.



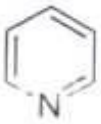

a) 

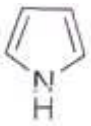
b) 

c) 

d) 

5) Which compound is most basic?

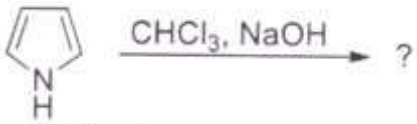
a) 

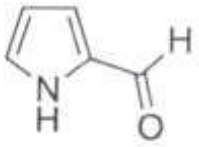
b) 

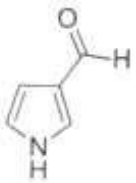
c) 

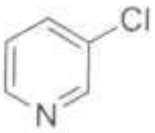
d) 

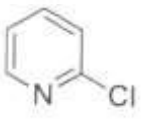
6) The major product formed in the following reaction is: _____.



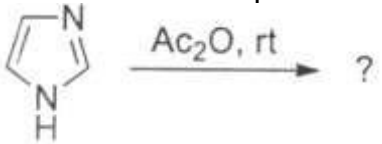

a) 

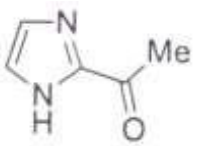
b) 

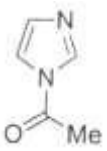
c) 

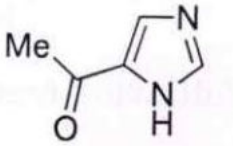
d) 

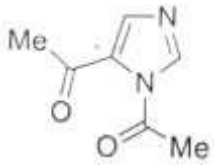
7) Which is the main product of the following reaction?



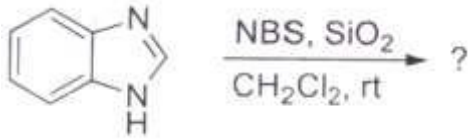

a) 

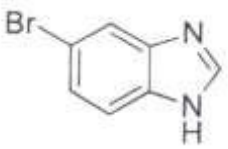
b) 

c) 

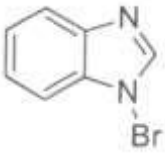
d) 

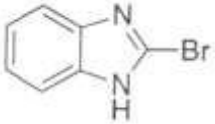
8) Which is the most probable main product of the following reaction?




a) 

b) 

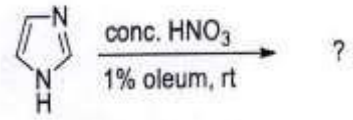
c) 

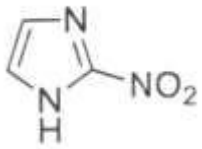
d) 

9) Piperazine is an organic compound that consists of a _____ membered ring containing two _____ atoms at opposite positions in the ring.

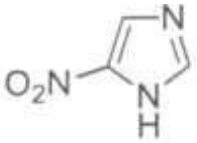
a) four, nitrogen
b) four, oxygen
c) six, nitrogen
d) six, oxygen

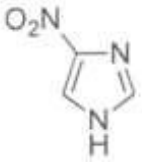
10) Which is the main product of the following reaction?




a) 

b) 

c) 

d) 

**B) a) Fill in the blanks.** **03**

1) 1,4-diazine is also known as _____.
2) The number of nitrogen atoms in the pyrazine heterocyclic moiety are _____.
3) Azetidine is _____ liquid having _____ structure.

**b) True or False.** **03**

1) The base catalysed cyclocondensation of malonamides with carboxylic esters leads to 6-hydroxypyrimidin-4(3*H*)-ones is known as Remfry-Hull synthesis.
2) The suffix 'ole' is used for six membered unsaturated ring.
3) The reaction of 4-chloropyridine with sodium ethoxide is an example of addition reaction.

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

**a)** How are 1,3-dicarbonyl compounds used for the synthesis of isoxazoles and pyrazoles?

**b)** How could one prepare 2-bromo-, 3-bromo- and 3,4-dibromothiophenes?

**c)** Name three types of compound which will react with 4,5-diamino-pyrimidines to produce purines. Explain reactions of each for synthesis of purines.

**d)** Discuss different methods for synthesis of aziridines and thiiranes.

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

**a)** What is the regeoselectivity of nitartion, halogenations and sulphonation reactions of indoles?

**b)** At which positions do benzofuran and benzothiophene reacts most readily with electrophiles? Give reason of each.

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

**a)** Which ring synthesis method and what reactants would be appropriate for the synthesis of a pyrrole, unsubstituted on the ring carbons, but carrying CH(Me)($CO_2$ Me) on nitrogen?

**b)** How one can prepare imidazoles and thiazoles from α-halo-carbonyl compounds? Give mechanism in details.

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

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

**b)** What is the reactivity of pyridine towards nucleophilic substitution reaction? Discuss regioselectivity?

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

**a)** At which positions do quinoline and isoquinoline react most readily with nucleophiles? Why these positions?

**b)** How could one convert.

1) isoquinoline into 2-methyl-1-isoquinolone
2) quinoline into 2-cyanoquinoline?

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

**a)** What are the different methods for synthesis of pyrimidine?

**b)** Discuss Baldwin ring closure rules for the formation of 3, 4, 5 and 6 membered rings.

**SLR-GF-111**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - III) (New) (CBCS) Examination: Oct/Nov-2022
## (MEDICINAL CHEMISTRY)
## Drug Development

Day & Date: Wednesday, 15-02-2023 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) Drug abuse is the use of a substance for _____.
   a) Non-medicinal b) Medicinal
   c) Curing disease d) Treating virus

2) Lipinski's rule of five says the number of hydrogen bond acceptors in a drug should be _____.
   a) <5 b) <10
   c) >12 d) >5

3) Phamacodynamics involves the study of following except _____.
   a) Biological and therapeutic effect of drug
   b) Absorption and distribution of drug
   c) Mechanism of drug action
   d) Drug interaction

4) The concentration of a drug required to produce 50% of that drug's maximal effects is termed as _____.
   a) Efficacy b) Potency
   c) Affinity d) Bioavailability

5) LD stands for _____.
   a) Legal dose b) Lethal Dose
   c) Lateral Dose d) Less Dose

6) The first step in the drug discovery process is _____.
   a) Lead Modification b) Lead Validation
   c) Target Identification d) Lead Optimization

7) QSAR method involves _____.
   a) Target structure b) Ligand X ray structure
   c) Target property d) Ligand property

8) The study of drug and their action on the human body is called _____.
   a) Physiology b) Pharmacology
   c) Biotechnology d) Microbiology

9) _____is not a docking tool.
   a) Hex b) BLAST
   c) AutoDock d) SwissDock

10) Drugs are majorly excreted from the body through _____ organ.
   a) Saliva b) Kidney
   c) Intestine d) Sweat

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

1) Protein 3D structures are deposited in _____ database.
2) Ligand based drug design is an approach used in the absence of the _____ structure
3) _____ is an approach to find correlations between chemical structure and properties.
4) _____ route of drug administration bypasses the drug absorption barriers.
5) _____ is a drug substance that is administered inactive in the intended pharmacological actions.
6) _____ is the minimum plasma concentration of a drug needed to achieve sufficient drug concentration at the receptors to produce the desired pharmacologic response. Minimum effective concentration.

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

**a)** Write a note on types of receptors.
**b)** Describe different sources of drugs.
**c)** Write a note on drug elimination and drug toxicity.
**d)** Explain the methods of molecular descriptor selection.

**Q.3 Answer the following.**

**a)** Explain the Structure and ligand-based drug designing. **10**
**b)** Explain the Lipinski rule of 5 in detail. **06**

**Q.4 Answer the following.**

**a)** Explain LD50, ED50, IC50, MIC, MEC and Ki in brief. **10**
**b)** Describe the development of QSAR. **06**

**Q.5 Answer the following.**

**a)** Explain the mechanism of drug absorption. **10**
**b)** Describe RCSB-PDB database in detail. **06**

**Q.6 Answer the following.**

**a)** Explain the physico chemical properties of molecules. **10**
**b)** Explain the factors affecting bioactivity. **06**

**Q.7 Answer the following.**

**a)** Explain the Pharmacokinetic parameters. **10**
**b)** Describe the concept of pro-drug and soft drug. **06**

**SLR-GF-112**

| Seat No. | |
|---|---|

**Set P**

# M.Sc. (Semester - IV) (New) (CBCS) Examination: Oct/Nov-2022
## (MEDICINL CHEMISTRY)
## Pharmaceutical Dosage Forms

Day & Date: Monday, 20-02-2023 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 diagram wherever necessary.

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

1) Nitroglycerin is _____ tablet.
   a) chewable b) effervescent
   c) enteric coated d) buccal

2) _____ are the systemic route of drug administration.
   a) oral b) rectal
   c) sublingual d) all of these

3) Suspensions are classified into _____ main classes according to its pharmaceutical use.
   a) oral suspensions b) parenteral suspensions
   c) ophthalmic suspension d) all of these

4) _____ methods are commonly used for evaluating the physical stability of suspension.
   a) sedimentation method b) micrometric method
   c) electrokinetic method d) all of these

5) _____ are the main types of delivery system for respiratory dosage forms.
   a) metered dose inhalers b) dry powder inhalers
   c) nebulizers d) all of these

6) 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

7) With organic compound, an increase in the number of _____ groups seem to increase the sweetness of the compound.
   a) carbonyl b) methyl
   c) hydroxyl d) ethyl

8) Noyes Whitney equation gives the relation between _____ and the aqueous solubility.
   a) dissolution rate b) reaction
   c) compound d) molecule

9) Rate - limiting steps in the bioavailability of dosage form is/are _____.
   a) release from the dosage form
   b) dissolution of the drug
   c) absorption through the gastrointestinal mucosa
   d) all 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 the above

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

1) Dusting powders should be passed through a _____ sieve to enhance their _____.
2) The isotonicity of sterile solution may be adjusted by adding _____.
3) LAL stands for _____.
4) Before the formulation of a drug substance into a dosage form, it is essential that it be _____ and _____ characterized.
5) Noyes Whitney equation is _____.
6) Matrix systems are also called as _____ because the drug is homogeneously dispersed throughout a rate-controlling medium.

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

**a)** Write the importance of dosage forms.
**b)** What do you mean by 'Parenteral Products'? Describe the different routes of administration of parenteral products.
**c)** Define and give example of following ingredients.
   1) Buffering agents
   2) Chelating agent
   3) Humectant
   4) Surfactant
**d)** Write the classification of control release system and list the advantages and disadvantages of such a system.

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

**a)** What are 'Monophasic liquid dosage form'? Write in detail about syrups, Elixirs and Linctues.
**b)** Define the term 'suspension'. Discuss about the formulation of suspension.

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

**a)** Explain different steps involved in sugarcoating of tablets.
**b)** What are the various ingredients used in the preparation of semisolid dosage form with suitable examples?

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

**a)** Write down the factors affecting on designing of dosage forms and comment on Accelerated stability studies.
**b)** How will you increase drug solubility and absorption in topical ophthalmic preparation, also mention sterility of ophthalmic preparations.

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

**a)** Explain in brief about excipients used in parenteral drug delivery system.

**b)** 1) Define excipient and explain selection and mode of action of preservatives.

2) Define chelating agent and explain the mechanism of drug degradation.

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

**a)** What are 'Ointments'? Classify different ointment bases used in the preparation of ointments. Describe briefly each base.

**b)** Explain wet granulation method of tablet manufacturing.

**SLR-GF-114**

| Seat No. | | Set | P |
|---|---|---|---|

# M.Sc. (Semester - IV) (New) (CBCS) Examination: Oct/Nov-2022
## (MEDICINAL CHEMISTRY)
## Drug Regulatory Affairs

Day & Date: Wednesday, 22-02-2023 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) A competitor can file for ANDA before its expiry under _____ Clause of ANDA certification clause.
   a) Para I b) Para II
   c) Para III d) Para IV

2) cGMP regulations for pharmaceutical manufacturing comes under which organisation domain of USFDA.
   a) Centre for biologics evaluation and research
   b) Centre for food safety and applied nutrition
   c) Office of Regulatory Affairs (ORA)
   d) Centre for Drug Evaluation and Research (CDER)

3) The formal ICH procedure is a stepwise procedure consisting of _____ steps.
   a) 3 b) 4
   c) 5 d) 6

4) Intellectual Property Rights (IPR) protect the use of information and idea that are of _____.
   a) Social value b) Moral value
   c) Commercial value d) Ethical value

5) A company wishes to ensure that no more else can use their logo is _____.
   a) Copy rights b) Trade Mark
   c) Patent d) Geographical indications

6) Schedule _____ of the D & C Act 1940 and rules 1945 deals with the guidelines for good manufacturing practices.
   a) Y b) P
   c) M d) X

7) Animal studies, clinical trials, bioavailability studies are part of _____ application process.
   a) IND b) NDA
   c) ANDA d) BLA

8) List of approved drugs and their associated IPR is available in _____.
   a) Pink book b) Orange book
   c) Red book d) Black book

9) The guidelines for good manufacturing practice in India is _____.
   a) Schedule M  b) 21 CFR part 4
   c) 21 CFR part 21  d) None of these

10) Which of the following is an international regulatory authority for drug regulation?
   a) CDSCO  b) US-FDA
   c) WHO  d) EMA

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

1) _____ is the long form of FIFO.
2) MedDRA stands for _____.
3) _____ with GMP is a necessary condition for the marketing authorization to sell the product.
4) _____ is a right obtained by a person for his innovation.
5) CDSCO stand for _____.
6) The headquarter of the WTO is located at _____.

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

**a)** Write definitions of following.
   1) AHU
   2) Clean room
   3) Contaminations
   4) Controlled area

**b)** Explain the Exclusive market right (EMR).

**c)** What is BMR explain in brief?

**d)** What is import licences and describe import of drugs for examination, test or analysis?

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

**a)** Write a short note on packaging and labelling management system as per GMP.

**b)** Explain in details about material management and good storage practices as per WHO and GMP.

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

**a)** What is patent? What are types of patent? Why one should go for patent?

**b)** Give the salient features of Indian patent law amendment (2005).

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

**a)** Write an overview on quality assurance department in pharmaceutical industry and discuss in brief about quality assurance in regulatory affairs of pharmaceutical industry.

**b)** Discuss in brief about USFDA and FDA mission. Explain what FDA regulates and does not regulates.

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

**a)** Discuss in details about Drug regulatory agency in India (CDSCO).

**b)** Explain in details about requirement and guidelines of Drug and cosmetics act (Schedule Y).

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

**a)** Write a note on Geographical indices and Trademarks.

**b)** Discuss in details about quality assurance and quality control and write difference between responsibilities of quality assurance and quality control department.

**SLR-GF-115**

| Seat No. | | Set | P |
|---|---|---|---|

# M.Sc. (Semester - IV) (New) (CBCS) Examination: Oct/Nov-2022
## MEDICINAL CHEMISTRY

Day & Date: Thursday, 23-02-2023 Max. Marks: 80
Time: 03:00 PM To 6:00 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) Antineoplastic agents are classified into _____.
   a) Alkylating agents
   b) Antimetabolites
   c) Alkylating agents & Antimetabolites
   d) None of these

2) Tolbutamide gets oxidized extensively to the corresponding _____ and carboxylic acid.
   a) Amine b) Thiol
   c) Aldehyde d) Alcohol

3) An Acyclovir is _____ drug.
   a) Anti-inflammatory b) Antiviral
   c) Antidiabetic d) Anti-histamine

4) Antimetabolites usually employed in the treatment of_____.
   a) Cancer b) Hepatitis
   c) Covid d) Fever

5) _____ is caused by genus plasmodium.
   a) Jaundice b) Fever
   c) Cancer d) Malaria

6) Phenelzine is a drug which shows _____ activity.
   a) Antidepressant b) Antineoplastic
   c) Antihistamine d) Antiviral

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

8) The penicillins are all strong _____ acids.
   a) Monobasic b) Dibasic
   c) Tribasic d) none of these

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

10) _____ is used in the treatment of rheumatoid pains.
   a) Lidocaine b) Diclofenac
   c) Aspirin d) Insulin

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

1) All the penicillins gives the different amines and same aldehyde.
2) Halothane and Thiopental are local anaesthetics.
3) Abbreviation of NSAIDs is Non-steroidal Anti-inflammatory drugs.
4) Penicillin and Cephalosporin are classified under broad spectrum antibiotics.
5) Clotrimazol is in the class of antifungal medication.
6) Tolbutamide and Glipizide are oral hypoglycaemic agents.

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

**a)** Explain the mechanism of action of metformin.
**b)** Explain classification of penicillin.
**c)** Explain the synthesis of sulfaoxazole.
**d)** Explain antianginal activity of Nifedipine.

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

**a)** Explain the SAR and synthesis of chloroquine.
**b)** Explain the SAR and synthesis of captopril.

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

**a)** Explain the synthesis and mechanism of action of sulfacetamide.
**b)** Explain synthesis and mechanism of action of Ibuprofen.

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

**a)** Explain classification of antimetabolites.
**b)** Explain the synthesis and mechanism of action of propranolol.

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

**a)** Explain the SAR and mechanism of action of diphenylhydramine
**b)** Explain the SAR and mechanism of action of Ampicillin.

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

**a)** Explain anaesthetic activity for halothane and thiopental.
**b)** Define and classify the NSAIDs.