

CHOICE BASED CREDIT SYSTEM
M.Sc. SECOND SEMESTER DEGREE EXAMINATION AUGUST 2022
P.G. CHEMISTRY
Inorganic Chemistry Theory - II

Duration:3 Hours

Max Marks:70

PART - A**1. Answer any TEN of the following : (10×2= 20)**

- Justify that graphite electrodes require frequent replacements when used in oxo acids.
- What is the basic unit of pyrosilicate?
- How does Al react with alkali? Give equation.
- SO₂ is a reducing agent where as TeO₂ is an oxidising agent. Justify.
- What is the basicity in pyro sulphuric acid?
- Give one method of preparation of hypophosphorous acid.
- Give the geometry and structure of chlorate ion.
- Give any one method of preparation of HClO₂.
- Complete the reaction: XeF₄+ H₂O→
- All transition elements show variable oxidation states. Give reason.
- Define coordination position isomerism. Give example.
- Which is stronger reducing agent Fe²⁺ or Cr²⁺? Why?

PART - B**Answer any Five questions selecting at least one question from each unit. (5×10= 50)****UNIT - I**

- Explain the bonding in hexaborane & decaborane and give their Styx number.
 - Give the structure of boranes with styx number 4120 & 4620. (6+4)
- Explain Wade's rule. Classify the following boranes and carboranes:
B₈H₁₆, B₂H₇⁻, B₁₀H₁₅⁻, CB₇H₁₅, C₂B₈H₁₃⁻
 - Explain the structure & any one preparation and property of borazole. (6+4)

UNIT - II

4. a) Explain the anomalous properties of water.
b) How does hydride of oxygen differ from hydride of sulphur? Explain. (6+4)
5. Name the elements of group 15 of the periodic table. How do the following properties vary in the group: (10)
- i) Ionization energy ii) Catenation iii) Metallic character iv) Electronegativity
v) Oxidation state

UNIT - III

6. a) Account for the oxidising power of hydrogen halides.
b) The electronegativity difference is maximum in case of HF and minimum in case of HI. But, HF is the weakest and HI is the strongest halogen hydracids. Explain. (6+4)
7. a) Explain the preparation, properties and structure of FClO_3 .
b) Compare the geometries of F_3ClO and FClO_2 with the help of VSEPR theory. (6+4)

UNIT - IV

8. a) Compare the properties of lanthanides and actinides.
b) Discuss the principle involved in the separation of lanthanides by ion exchange chromatography. (6+4)
9. a) Name the isomerism exhibited and draw the structures for following compounds:
1. $[\text{CoCl}_2(\text{py})_2(\text{H}_2\text{O})_2]\text{Cl}$ and $[\text{CoCl}_3(\text{py})_2(\text{H}_2\text{O})]\cdot \text{H}_2\text{O}$
 2. $[\text{PtBr}_2(\text{NH}_3)_4]\text{Cl}_2$ and $[\text{PtCl}_2(\text{NH}_3)_4]\text{Br}_2$
 3. $[\text{Co}(\text{NO}_2)(\text{NH}_3)_5]\text{Cl}_2$ $[\text{Co}(\text{ONO})(\text{NH}_3)_5]\text{Cl}_2$
- b) Give examples and illustrate all types of isomers possible for an octahedral complex containing $\text{Co}(\text{III})$, containing two en molecules, two Cl^- ions and one NO_2^- ion. (6+4)

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M.Sc. SECOND SEMESTER DEGREE EXAMINATION AUGUST 2022

P.G. CHEMISTRY

Organic Chemistry Theory - II

Duration: 3 Hours

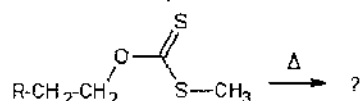
Max Marks: 70

PART - A

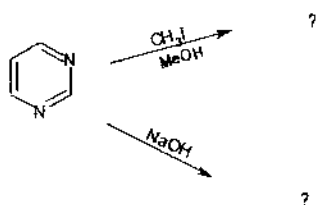
1. Answer any TEN of the following:

(10×2= 20)

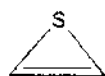
- What is meant by Ipso attack? Give an example.
- What is Smiles rearrangement? Give an example.
- What are meta directing and deactivating groups? Give examples.
- Give any two methods of generation of free radicals.
- Predict the product in the following:



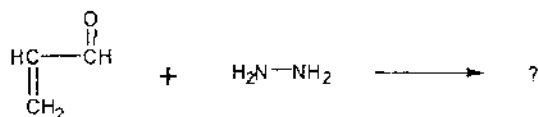
- Give evidence to prove that E2 reactions are predominantly anti-eliminations and there is relation between conformation and reactivity.
- Write a note on B_{AC}2 mechanism.
- Account for the following- Imidazole has higher boiling point than that of 1-methyl imidazole.
- Write any two applications of Reformatsky reaction.
- Predict the products and explain.



- Give names for following according to Hantzsch-Widmann nomenclature.



- Complete the following reaction:



PART - B

Answer any Five questions selecting at least one question from each unit.

(5×10= 50)

UNIT - I

2. a) Explain the bimolecular mechanisms involved in aliphatic electrophilic substitution reaction.
b) Discuss the electrophilic substitution reactions accompanied by double bond shifts. (6+4)
3. a) Discuss mechanism of S_N1 and S_N2 reactions. Comment on stereochemistry of the products.
b) Explain the neighbouring group participation in the nucleophilic substitution reactions. (6+4)

UNIT - II

4. a) Explain mechanism for free radical substitution reactions of aliphatic and aromatic substrate.
b) Discuss the effect of solvent on free radical reaction. (6+4)
5. a) Explain E1cb reaction with mechanism.
b) Discuss the effect of substrate, leaving group, base and solvent on elimination reaction. (6+4)

UNIT - III

6. a) Explain the mechanism of electrophilic addition and discuss the stereochemistry of the reaction.
b) State and explain Markovnikov's rule with suitable example. (6+4)
7. a) Discuss the addition of halogens and hydrogen halides to carbon carbon multiple bonds.
b) Write a note on addition reactions undergone by cyclopropane ring with suitable examples. (5+5)

UNIT - IV

8. a) Explain the reactions of episulphides.
b) Write the mechanism for the conversion of tetra methyl alkene to 2, 2, 3, 3-tetramethyl aziridines. (5+5)
9. a. Explain the synthetic methods for the preparation of Pyrrole and Furan.
b. Discuss the electrophilic substitution reactions of Indole. (6+4)

19MCHES203

Reg No :

CHOICE BASED CREDIT SYSTEM

M.Sc. SECOND SEMESTER DEGREE EXAMINATION AUGUST 2022

P.G. CHEMISTRY

Physical Chemistry Theory - II

Duration:3 Hours

Max Marks:70

PART - A

1. Answer any TEN of the following :

(10×2= 20)

- a) What are plait point and tie lines ?
- b) State the success of theory of Homogenous catalysis.
- c) Write any two advantages of phase rule.
- d) How does the catalyst affect the rate of the reaction?
- e) Define negative catalyst. Give any two examples.
- f) What is catalyst deactivation? Give any two examples.
- g) What is type I adsorption isotherm?
- h) Differentiate between physisorption and chemisorption. (any two)
- i) Write Michaelis-Menten equation and explain the terms.
- j) Mention the factors influencing fluorescence efficiency.
- k) What is quenching reaction? Mention different types.
- l) What is the difference between singlet and triplet states?

PART - B

Answer any Five questions selecting at least one question from each unit.

(5×10= 50)

UNIT - I

2. a) Discuss the prototropic mechanism of acid-base catalysis.
b) Explain the specific acid-base catalysis with an example. (6+4)
3. a) Explain function of Catalyst in terms of Gibbs Free energy of activation.
b) Classify catalysts and give examples. (6+4)

UNIT - II

4. a) Discuss the structure of zeolites. Describe three applications of it by taking suitable examples.
b) Explain the structure of silica. (6+4)
5. a) What are surface active reagents? Explain their classification with suitable examples.
b) Give an account on the structure of surfactants at different polar and non polar regions. (6+4)

UNIT - III

6. a) Discuss the effect of pH and temperature on the rates of enzyme catalysed reactions.
b) Write a note on industrial applications of catalysis. (6+4)
7. a) State the assumptions and deduce the expression for Langmuir adsorption isotherm and show that Freundlich adsorption isotherm is a special case of Langmuir adsorption isotherm.
b) Explain adsorption isobar and isostere. (6+4)

UNIT - IV

8. a) Define quantum efficiency of a photochemical reaction. Describe the experimental method for its measurement.
b) A sample of gaseous HI was irradiated by light of wave length 253.7 nm when 307 J of energy was found to decompose 1.30×10^{-3} mole of HI. Calculate the quantum yield for the dissociation of HI. (6+4)
9. a) Explain the reasons for high quantum yield and low quantum yield.
b) Using Jablonski diagram, explain the various photophysical processes which occur on the absorption of light. (5+5)

19MCHEE215

Reg No :

CHOICE BASED CREDIT SYSTEM

M.Sc. SECOND SEMESTER DEGREE EXAMINATION AUGUST 2022

P.G. CHEMISTRY

Chemistry in Everyday Life

Duration:3 Hours

Max Marks:70

PART - A

1. Answer any SEVEN of the following :

(2×7= 14)

- a) Give some examples of fixatives.
- b) What is the role of fluoride in our toothpaste?
- c) What are acidic amino acids?
- d) Explain significance of Maillard reaction.
- e) Give two examples for the pigments used in lipstick.
- f) Give two examples for each of compound and derived lipids.
- g) What are acidulants? Give examples.
- h) What are cement paints?
- i) Define an amino acid.

PART - B

Answer any Four questions selecting at least one question from each unit.

(14×4 = 56)

UNIT - I

- 2)
 - a) Write a short note on fixatives.
 - b) Classify perfumes based on their sources. (7+7)
- 3)
 - a) Describe flavours in flavoured milk and yogurts.
 - b) Classify flavours and explain with examples. (8+6)

UNIT - II

- 4)
 - a) Describe the methods of manufacturing of soaps.
 - b) What are detergents? How are they classified?
 - c) Explain micelle's cleaning mechanism in detergents. (5+4+5)

- 5) a) Give an account on the method of preparation of fatty acids and glycerol.
b) What is the function of detergent builder? Explain.
c) Write an account on liquid soaps. (5+4+5)

UNIT - III

- 6) Explain the classification of carbohydrates. (14)
- 7) a) Explain ring structure of lactose.
b) Explain the open chain structure of glucose. (8+6)

CHOICE BASED CREDIT SYSTEM

M.Sc. FOURTH SEMESTER DEGREE EXAMINATION AUGUST 2022

P.G. CHEMISTRY

ORGANOMETALLIC AND BIOINORGANIC CHEMISTRY

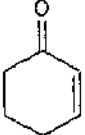
Duration:3 Hours

Max Marks:70

PART - A

1. Answer any TEN of the following :

(10×2= 20)

- Give any two synthetic methods of metal – arene complexes.
- Illustrate pentahapto ligand by taking suitable examples.
- Give the IUPAC name of the organometallic compounds $[\text{Mn}(\text{CO})_5\text{CH}_3]$ and $\text{K}[\text{PtCl}_3(\eta^2\text{-C}_2\text{H}_4)]$.
- What are organocuprates? Give examples.
- Predict the products in the following:
 - $\text{H}_2\text{C}=\text{O} + \text{H}_3\text{C}_2\text{-Li} \xrightarrow{\text{H}_3\text{O}^+} ?$
 - ii)  $\xrightarrow[\text{H}^+]{(\text{CH}_3)_2\text{CuLi}} ?$

- Define oxidative addition with an example.
- What are ionophores? Give examples.
- What is meant by prosthetic group? Give examples.
- Give reason : Non essential metals are very toxic .
- Why is biomineralization important? Give examples.
- Why is high concentration of Cu is toxic to the living system?
- Give any two examples for metals in medicine.

PART - B

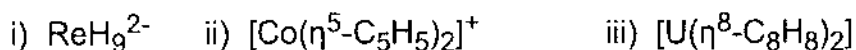
Answer any Five questions selecting at least one question from each unit.

(5×10= 50)

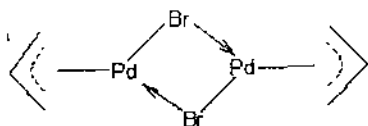
UNIT - I

- Explain the methods of preparation of Ferrocene and discuss its structural features and nature of bonding.

b) Check the stability of following organometallic compounds. (6+4)



iv)



3. a) Write a note on preparation, structure and nature of bonding in Butadiene – Metal complexes.

b) State EAN rule and give three examples. (6+4)

UNIT - II

4. a) Explain the mechanism of water gas shift reaction.

b) Discuss the steps involved in isomerisation of alkene. (5+5)

5. a) Explain mechanism of hydrogenation of olefins using Wilkinson's catalyst.

b) Discuss the steps involved in Oxo process . (5+5)

UNIT - III

6. a) Explain the structural features and biological functions of cytochrome P450 .

b) Describe the role of catalase in biological process. (5+5)

7. a) What is rubredoxin? Discuss its structural features and function in biological system.

b) Discuss the types of blue copper protein. (5+5)

UNIT - IV

8. a) Point out the salient features of binding site of molecular oxygen in hemoglobin. How does it help in oxygen transport and storage?

b) Write a note on transport of Iron and structure of transferrin. (5+5)

9. a) What is Cytochrome C? Explain the structure of Cytochrome and its role in transfer of electrons.

b) Write a note on oxygen transfer by hemerythrin. (6+4)

CHOICE BASED CREDIT SYSTEM

M.Sc. FOURTH SEMESTER DEGREE EXAMINATION AUGUST 2022

P.G. CHEMISTRY

SYNTHETIC METHODS IN ORGANIC CHEMISTRY

Duration: 3 Hours

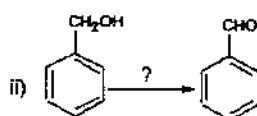
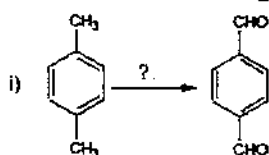
Max Marks: 70

PART - A

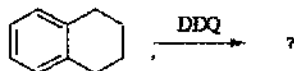
1. Answer any TEN of the following :

(10×2= 20)

a) Write suitable reagent for the following conversions:



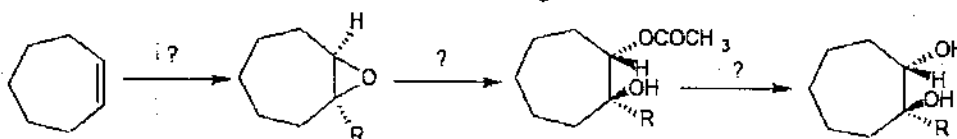
b) Complete the following reaction:



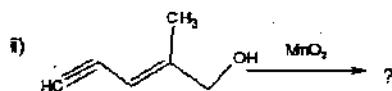
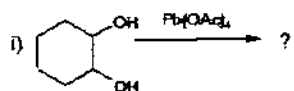
c) How is 1,3-dithiane prepared?

d) What is Jones reagent? Give an example.

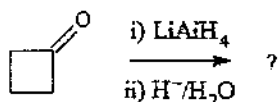
e) Suggest the reagents for the following conversion:



f) Complete the following:

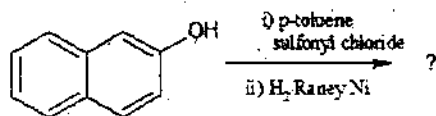


g) Predict the products in the following:



h) Give any two synthetic utility of Birch reduction.

i) Predict the products in the following:



- j) Give any two examples for hydroxyl protecting reagents.
- k) Give any two examples for synthons and corresponding synthetic equivalents.
- l) Give the retrosynthesis of p-methoxyacetophenone.

PART - B

Answer any Five questions selecting at least one question from each unit. (5×10= 50)

UNIT - I

2. a) Discuss the applications of phase transfer catalyst in permanganate oxidation.
b) Illustrate the reaction of trimethyl silyl iodide reagent in α,β -unsaturated compound and epoxides. (5+5)
3. a) Explain the reaction of Lithium dialkyl cuprate with the following: i) Nucleophilic displacement of halides ii) Conjugate addition reactions
b) Discuss any two methods for the preparation of DCC. Give its synthetic application in peptide synthesis. (6+4)

UNIT - II

4. a) Write the mechanism of addition of bromine to symmetrical and unsymmetrical alkenes. Comment on the major products formed.
b) Write briefly on allylic halogenation and dehalogenation. (6+4)
5. a) Discuss the ozonolysis of i) Cyclohexene ii) 3-methyl-2-pentene
b) Explain the oxidation of vicinal diols with HIO₄ and give its mechanism. (6+4)

UNIT - III

6. a) What are homogeneous catalytic hydrogenations? Write the mechanism for reduction of alkenes with Wilkinson's catalyst.
b) Discuss the synthetic application of sodium borohydride in organic synthesis taking suitable examples. (5+5)

7. a) Discuss heterogenolysis taking suitable examples.
b) Explain the catalytic hydrogenation of alkynes and aromatic compounds. (6+4)

UNIT - IV

8. a) Illustrate the C-X disconnection approach for the synthesis of 1,2 and 1,3 – difunctionalised compounds.
b) Explain retrosynthetic analysis of benzocaine. Illustrate its synthesis. (6+4)
9. a) What is chemoselectivity? Suggest a synthetic scheme for Juvabione.
b) Outline the principle of protection of carbonyl and carboxyl group. (6+4)

CHOICE BASED CREDIT SYSTEM

M.Sc. FOURTH SEMESTER DEGREE EXAMINATION AUGUST 2022

P.G. CHEMISTRY

PHYSICAL CHEMISTRY THEORY- III

Duration:3 Hours

Max Marks:70

PART - A

1. Answer any TEN of the following :

(10×2= 20)

- a) How do you interpret the graph of the plot $-\log \gamma_{\pm}$ Vs \sqrt{I} for uni- bivalent and uni -trivalent electrolyte?
- b) State Oswald's dilution law.
- c) How is electrolytic cell different from galvanic cell?
- d) Distinguish between p-type and n-type semiconductors.
- e) What is meant by action potential?
- f) How electrolyte- concentration cells are different from electrode- concentration cells?
- g) What are inner Helmholtz plane and outer Helmholtz plane in an electrical double layer?
- h) What do you mean by cyclic voltammetry?
- i) Construct the mercuric-oxide zinc cell.
- j) Explain the term exchange current density.
- k) Anodic coatings are sacrificial coatings. Justify.
- l) Give the equation to measure corrosion rate by the EIS method.

PART - B

Answer any Five questions selecting at least one question from each unit.

(5×10= 50)

UNIT - I

2. a) Explain how electrophoretic and relaxation effect, affects the mobility of an ion in solution.
- b) Derive Debye Huckel Onsagar equation. (5+5)

3. a) How electrosomosis is different from electrophoresis?
b) What do you mean by Zeta potential? What are the factors that affect Zeta potential?
c) Write a short note on ion solvent interaction. (4+3+3)

UNIT - II

4. a) Describe the phenomena of volcano in electrocatalysis.
b) Discuss the importance and consequences of electrogrowth of metals on electrodes. (5+5)
5. a) What are photogalvanic cells? Explain its working principle and importance.
b) Write a note on the capacity of space charge. (5+5)

UNIT - III

6. a) The standard reduction potential for a half cell $\text{NO}_3^-_{(\text{aq})} + 2\text{H}^+ + \text{e}^- \rightarrow \text{NO}_{2(\text{g})} + \text{H}_2\text{O}$ is 0.78 V. Calculate the reduction potential in 8M H^+ .
b) Explain the principle and working of $\text{H}_2\text{-O}_2$ fuel cell. (5+5)
7. a) Explain the principle and technique of polarography.
b) Discuss the applications of polarography. (6+4)

UNIT - IV

8. a) Write a note on corrosion inhibitors.
b) Differentiate between cathodic and anodic protection. (5+5)
9. Justify the following:
- Zinc in contact with silver undergoes corrosion faster than zinc in contact with copper
 - Though aluminium is with lower electrode potential than iron, iron has higher corrosion resistance than aluminium in oxidizing environments
 - Ruptured tin coating on iron is more disastrous than not having the coating at all
 - Part of the nail inside the frame undergoes corrosion but the exposed part does not
 - Ocean-going ships undergo differential aeration corrosion but ships sunk under sea do not (10)

CHOICE BASED CREDIT SYSTEM

M.Sc. FOURTH SEMESTER DEGREE EXAMINATION AUGUST 2022

P.G. CHEMISTRY

POLYMER AND SOLID STATE CHEMISTRY

Duration:3 Hours

Max Marks:70

PART - A

1. Answer any TEN of the following : (10×2= 20)

- a) Determine the molecular weight of polystyrene molecule which has $\alpha=0.6$, $K=1.6$ and intrinsic viscosity=0.04dL/g.
- b) Evaluate the principle of the vapour phase osmometric method of determination of molecular weight of polymer.
- c) Give Poiseuille equation.
- d) Give the mathematical expression for the rate of non-catalysed polycondensation reaction.
- e) Give the equation for kinetic chain length for free radical polymerisation.
- f) Why does HDPE have higher strength than LDPE?
- g) What are the drawbacks of free electron theory?
- h) Define conditional glass formers with suitable example.
- i) What is meant by critical temperature of superconductors?
- j) Wavelength of x-ray 10^{-10} m is used for the first order reflection at an angle of 30° . Calculate the interplanar distance.
- k) Write any two limitations of electron diffraction technique.
- l) Give the significance of 'Systematic Absences' in x-ray diffraction pattern.

PART - B

Answer any Five questions selecting at least one question from each unit. (5×10= 50)

UNIT - I

2. a) How are polymers classified based on origin and structure?
- b) Write the structural formula for monomer units of following polymers:
 - i) Orlon ii) Nylon 6,6 iii) Polystyrene iv) PTFE v) PMMA (5+5)

3. a) Outline the working principle & method of fractionation of polymer by gel permeation chromatography.
b) How do you fractionate polymer by precipitation fractionation method. (6+4)

UNIT - II

4. a) Explain the mechanism of cationic polymerization.
b) How do you distinguish cationic and anionic polymerization?
c) Explain with examples, the generation of initiators in free radical polymerization. (4+3+3)
5. a) Derive copolymer equation.
b) Explain the Q-e scheme of Alfrey and Price. (6+4)

UNIT - III

6. a) Describe the structure of Perovskites with examples and comment on their applications.
b) What is Hall Effect? Explain its theory and applications. (5+5)
7. a) Discuss the band theory of solids.
b) Give an account of the physical properties and industrial applications of garnets. (5+5)

UNIT - IV

8. a) How do you prepare thin films using cathode sputtering and vacuum evaporation?
b) Describe electroless plating. (5+5)
9. a) Explain the chemical vapor deposition method for the preparation of solid state compounds and comment on their applications.
b) Write a note on the preparation of solid state materials using ceramic method. (5+5)
