CHEMISTRY (Optional) B.Sc. IV SEMESTER 2019-2020

INORGANIC CHEMISTRY

Unit 1. Chemistry of d and f block elements:

1. Write a note on the general characteristics of d-block elements. (5 Mark)
2. Explain the following properties of d-block elements (2Marks each)
   a) Electronic configuration, b) Oxidation states, c) Metallic property, d) Colour, e) Reactivity, f) Reducing property, g) Magnetic, h) Catalytic, i) complex formation properties.
3. Write a note on the General characteristics of f block elements. (5 Mark)
4. Electronic configuration of f-block elements. (2Marks)
5. Explain the cause and consequences of lanthanide contraction. (5 Mark)
6. Give the general features electronic configuration of actinide elements. (2Marks)
7. Give the general features oxidation state of actinide elements. (2Marks)
8. How is uranium extracted from pitchblende ore? (5 Mark)

Unit 2. Bioinorganic Chemistry:

1. Define the Bioinorganic molecules. (2Marks)
2. Name the essential and trace elements in biological process. (2Marks)
3. What are metalloporphyrin? Give an example. (2Marks)
4. Explain are structure and biological functions of Haemoglobin. (5 Mark)
5. Explain are structure and biological functions of Chlorophyll. (5 Mark)
6. Mention any two biological functions of Na and K. (2Marks)
7. Mention any two biological functions of Fe and Zn. (2Marks)
8. Write a note on biological functions of metal ions in the human body. (5 Mark)

Unit 3. Environmental Chemistry:

Air pollution:

1 What are air pollutants? Sources, causes and control of following air pollutants a) CO, b) CO_2, c) SO_x, d) NO_x, e) H_2S, f) hydrocarbons, g) CFC's.
2. Adverse effect of air pollution.
3. Sources of air pollutants.
4. Define the particulates and their adverse effects.
5. Define the Pesticides and their adverse effects.

Water pollution:

1. Write note on water pollutants & there Adverse effects.
2. Sources of water pollutants.
3. What are sources and adverse effects of sewage.
4. What are sources and adverse effects of infectious agent.
5. What are sources and adverse effects of organic chemicals and inorganic mineral.
6. What are sources and adverse effects of oils and sediments.
7. Write the Parameters of water pollution
8. Explain with reactions Winkler's method of determination of Dissolved Oxygen.
9. What is Dissolved Oxygen (DO)? Mention its importance.
10. What is Biological Oxygen Demand (BOD)? How it is determined experimentally?
11. What is Chemical Oxygen Demand (COD)? How it is determined.

12 What is preliminary, primary and secondary treatment of sewage and industrial influents.

13. What is surface aerated basins (lagoons), trickling filters and activated sludge.

ORGANIC CHEMISTRY

Unit 1. Aldehydes and Ketones

1. What are carbonyl compounds? Mention the difference in the functional group of **aldehyde** and **ketones** with example. (2marks)
2. Discuss the mechanisms nucleophillic addition reactions of hydrogen cyanide. (5marks)
3. Discuss the mechanisms nucleophillic addition reactions of hydroxyl amine. (5marks)
4. What is hemiacetal? (2marks)
5. Write the mechanisms of Acetal formation reaction–with ethanol. (5marks)
6. Write the mechanisms of Acetal formation reaction–with ethylene glycol. (5marks)
7. Write the mechanism of the following reactions. (5marks each)

a) Aldol condensation. b) Cannizzarro's reaction.
c) Claisen-Schmidt reaction. d) Perkin's reaction.
e) Benzoin condensation. f) Baeyer-Villiger oxidation of ketones.
g) Mannich reaction.

8. Write the Synthesis of Coumarin. (2marks)
9. Write the Synthesis of Vanillin. (2marks)

Unit 2 Carboxylic Acids:

1. Discuss the structure and bonding in Carboxylic Acids
2. Explain the acidic strengths of mono, di and trichloroacetic acids.
3. Explain why o-nitrobenzoic acid is more stronger than m-nitrobenzoicacid.
4. Explain the acidic strength among chlorobenzoic acid.
5. Explain the acidic strength among hydroxybenzoic acid.
6. Explain the mechanism of hydrolysis of ester by AaC_2 reaction.
7. Explain the mechanism of hydrolysis of ester by BaC_2 reaction.
8. How is carboxylic acids converted into acid chlorides?
9. How is carboxylic acids converted into amides?
10. How is carboxylic acids converted into esters?
11. How is carboxylic acids converted into anhydrides?
12. What is curtius rearrangement? Write its mechanism with example.
13. Carboxylic acids reaction with organometallic compounds with example.
14. Write the mechanism of Hell-Volhard-Zelinsky reaction with example.

Unit 3 Aromatic Amines :

1. Write distinction between primary, secondary and tertiary amines by nitrous acid test.
2. Compare the basic character of methyl amine, aniline and cyclohexylamine.
3. Discuss the use of Quaternary ammonium salts in phase transfer catalyst.
4. Write the mechanism of Hoffmann rearrangement.with an example.
5. Explain Grabiel phthalimide reaction diazotisation.with an example.

6 Write the synthetic applications of diazonium salts.

a) Reduction, b) Sandmeyer's reaction, and c) coupling reactions.

Unit 4 Ethers and Epoxides :

Ethers:

1. Explain Williomson's ether synthesis reaction with example.
2. Synthesis of ether by the help of dehydration of alcohols reaction with example.
3. Write reaction between alkahalides with dry Ag_2O.
4. How does ethers reacts with HI?
5. Write the preparation of symmetric and unsymmetrical ethers.

Crown ethers:

1. Write the Definition of Crown ethers?
2. Write the structure of a) 18-Crown-6, b) 15-Crown-5
3. Give an account of crown ethers and their use as phase transfer catalysts.

Epoxides:

1. Write the synthesis of 1,2-epoxy ethane?
2. Write the synthesis of 1,2-epoxycyclopentane?
3. Write the reaction of acid catalysed ring opening of 1,2-epoxycyclopentane in aqueous solution?

PHYSICAL CHEMISTRY

Unit 1.Electrochemistry :

1) Define the Debye-Huckel's theory.
2) Write a note on Debye–Huckel equation for strong electrolytes (no derivation).
3) Write a note on asymmetric effect and relaxation time.
4) Describe conductometric determination of solubility product of sparingly soluble salts?
5) Define Solubility and solubility product with example.
6) Explain conductometric titrations with graph.
a) Titrations of a Strong acid with a Strong base.
b) Titrations of a Strong acid with a Weak base.
c) Titrations of a Weak acid with a Strong base.
d) Titrations of a Weak acid with a Weak base.
e) Titrations of a Mixture of a Strong acid and a Weak acid with a Strong base.
$(HCl+CH_3COOH) + NaOH \longrightarrow NaCl + H_2O \ \& \ CH_3COONa \ \& \ H_2O.$
7) Explain the determination of degree of dissociation of weak electrolytes.
8) What is Ionic mobility and how it is related to equivalent conductivity?
9) What is transport number and its determination by Hittorff's method.

Unit 2.Chemical Kinetics:

1) Define second order reaction with examples.
2) Derivation of rate constant equation of second order reaction when concentration of the reactions are equal (a=b).
3) Determination of order of reaction by differential equation method.
4) Determination of order of reaction by Half-life method.
5) Write the important postulates of simple collision theory of reaction rates.
6) Write note on steric factor or probability factor.
7) Write the expression for rate constants of unimolecular reaction based on collision theory (Lindemann's hypothesis).
8) Write the expression for rate constants of bimolecular reaction based on collision theory.
9) Write the limitations of collision theory.
10) Write the short notes on Transition state theory.
11) Write the short notes on thermodynamics treatments of Transition state theory
12) Write the comparison of transition state theory and collision theory.
13) Derive the rate constant expression for chemical kinetics of complex reactions-first order reaction.
14) Derive the rate constant expression for chemical kinetics of complex reactions opposing.
15) Derive the rate constant expression for chemical kinetics of complex reactions consecutive.
16) Derive the rate constant expression for chemical kinetics of complex reactions parallel reactions.