Roll No. _____ [Total No. of Pages : 3

PGIS-021-A-22

M.Sc. I Semester (CBCS) Degree Examination

CHEMISTRY

Analytical Chemistry - I

Paper : SCT - 1.1

Time : 3 Hours Maximum Marks : 80

Instructions to Candidates:

i. Answer **All** the questions.

ii. All questions carry **equal** marks.

Answer any **Eight** questions. (8×2=16)

1. a. What is stratified sampling? What is its advantages over random sampling?

b. A sample of steel showed following set of results for nickel; 50.4; 50.8; 49.5; 49.8; 50.4 mg. Calculate the standard deviation for the set of measurements.

c. Differentiate between detection limit and quantification limit.

d. Mention the principle of HPTLC.

e. What is synergic extraction? Give an example.

f. List the properties of carrier gas in GC with an example.

g. Write the structure of Morphine sulphate. Mention its application.

h. A 5.0 g of food sample was charred to ash at 800°C. If the ash content is 0.2 g, find the percentage of inorganic content in the food sample.

i. Sketch the conductometric titration curve for :

i. H_3CCOOH and NaOH and

ii. HCl and NaOH.

j. Write the equation for half - wave potential and give its significance.

2. a. What is an error? Explain the steps to be adopted for minimization of errors.

b. What is the significance of t - test? A chemist analysed paracetamol in tablet using a newly developed method and obtained the following results : 100.6; 100.0; 100.2; 100.0 mg. If the theoretical value of calcium is 100.6 mg, find whether the newly developed method is having any significant difference from the standard method at 95% confidence level. (Given t value = 3.182).

c. What is six sigma concept? Explain its aim and importance. **(5+5+6=16)**

(OR)

What is quality assurance? Discuss the role and functions of Quality assurance.

3. a. State the distribution law. Derive the relationship between distribution coefficient and distribution ratio.

b. Illustrate the principle and application of ion exchange chromatography.

c. With the help of a neat schematic diagram, explain the principle and working of HPLC. **(5+5+6=16)**

(OR)

Describe the principle of gas chromatography. Explain the working of thermal conductivity detector.

4. a. Write the difference between drug and medicine. Explain the drug screening using gas chromatography.

b. Discuss the methods for the determination of ash, crude fibre and moisture contents of food.

c. Why are preservatives used and mention their side effects? Explain the procedure for the determination of sulphates and benzoic acid in food. **(5+5+6=16)**

(OR)

What do you mean by CNS stimulants? Write the structure and explain the chemical procedure for the determination of Fenfluramine hydrochloride.

5. a. What are reference electrodes? Explain the construction and working of glass electrode.

b. Write the principle and applications of potentiometric titrations.

c. Briefly explain constant current and control potential coulometry and its applications.

(5+5+6=16)

(OR)

Write a note on

i. Pulse polarography and

ii. Rapid scan polarography.

Roll No. _____ [Total No. of Pages : 2

PGIS-019-A-22

M.Sc. I Semester (CBCS) Degree Examination

CHEMISTRY

Inorganic chemistry - I

Paper - HCT - 1.1

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

i. Answer **All** questions.

ii. All questions carry **equal** marks.

Answer any **Eight** of the following. **(8×2=16)**

1. a. Write the expression for Kapustinskii's equation and give its significance.

b. The radii of Mg^{2+} and S^{2-} are 0.66 and 1.84A^0 respectively. Predict the most probable crystal structure of MgS.

c. Distinguish between p - type and n - type semiconductors.

d. Define Quadruple bond.

e. How can terminal and bridging carbonyl groups be distinguished by IR spectra? Give an example for each.

f. Calculate the spin only magnetic moment of a cobalt (III) complex if $\Delta_0 = 18,200 cm^{-1}$ and $P = 21,000\ cm^{-1}$.

g. Draw structures of isomers of following coordination species.

i. $[Fe(NH_3)_2(CN)_4]^-$.

ii. $K[Cr(H_2O)_2(C_2O_4)_2]$.

iii. $[Co(en)_3]Cl_3$.

iv. $[Pt(NH_3)_2Cl_2]$.

h. State Bronsted - Lowry definition of acid - base concept with an example.

i. Urea is an acid in liquid ammonia but base in glacial acetic acid. Why?

j. What are the limitations of non - aqueous titrations in chemical analysis?

2. a. Derive Born - Lande equation and discuss its limitations. (5)

b. What is VSEPR theory? Explain its application to predict the structure of covalent molecules taking BrF_3 and XeF_4 as an example. (5)

c. Depict a Walsh diagram for AH_2 molecule based on it explain the shapes of linear and bent triatomic molecule. (6)

(OR)

What are semiconductors and explain the defects involved in ionic solids with example.

3. a. Write the structures and calculate the number of metal - metal bonds in $Fe_3(CO)_{12}$ and $Ir_4(CO)_{12}$. (5)

b. Discuss briefly on tri - and tetra - nuclear clusters by taking suitable examples. (5)

c. Discuss the preparation, structure, bonding of dioxygen and dinitrogen metal complexes. (6)

(OR)

Write a note on

i. Chevrel phases and

ii. One dimensional solids.

4. a. What is spin - orbital coupling? How does this influence the magnetic properties of metal complexes? (5)

b. Describe the Jahn - Teller effect on octahedral complexes of Cr^{2+} and Cu^{2+}. (5)

c. Explain in detail about the temperature effect on

i. Diamagnetism.

ii. Para magnetism

iii. Ferromagnetism. (6)

(OR)

Explain optical isomerism in complexes with coordination number 4 and 6 with examples.

5. a. What are the postulates of HSAB concepts? Give its applications. (5)

b. Illustrate the applications of acid - base titrimetry in non - aqueous medium for the determination of phenols and amines. (5)

c. Write a note on

i. Role of solvents in acid base titration and

ii. Steric effects. (6)

(OR)

Explain with examples the types of reactions in liquid ammonia and acetic acid.

Roll No. _____ [Total No. of Pages : 2

PGIS-020-A-22

M.Sc. I Semester (CBCS) Degree Examination

CHEMISTRY

Physical chemistry

Paper - HCT - 1.3

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

i. Answer all questions.

ii. All questions carry equal marks.

Answer any **Eight** of the following: **(8×2=16)**

1. a. Differentiate classical and quantum mechanics with example.
   b. State Pauli's exclusion principle?
   c. Define buffer action.
   d. Why are ion - ion bonds in a supramolecule considered as secondary bonds?
   e. Define Z - average molecular weight of a polymer.
   f. Define glass transition temperature and melting temperature of polymers?
   g. Give dynamics of fast reactions?
   h. Give comparision of CST and TST.
   i. Give biomedical applications of polymers?
   j. Write short note on De - Broglie's hypothesis.

2. a. What are Eigen Value and Eigen Functions? Write their significance. **(5)**
   b. Discuss the postulates of quantum mechanics. **(5)**
   c. Derive the expression for the particle in a one dimensional box. **(6)**

(OR)

Derive the expression for particle in a ring.

3. a. State and discuss Debye - Huckel limiting law. **(5)**
   b. Write the importance of buffer solutions in biological solutions. **(5)**
   c. Give an account of the different types of bindings observed in a typical supramolecule. **(6)**

(OR)

Write a short note on rotaxane molecules.

4. a. Explain number average and weight average molecular weight of polymers. (5)

b. Discuss the determination of the molecular weight of a polymer employing the light scattering technique. (5)

c. Discuss the general classification of polymers. (6)

(OR)

Write notes on Interpenetrating networks and degree of polymerization in polymers.

5. a. Discuss transition state theory with example. (5)

b. What is relaxation time? Explain the relaxation method in the study of fast reaction kinetics. (5)

c. Give an account of Lindemann's theory of unimolecular reaction rates. (6)

(OR)

Explain, Maxwell's relations.

Roll No _____ [Total No. of Pages : 2

PGIS-018-A-22

M.Sc. I Semester (CBCS) Degree Examination

CHEMISTRY

ORGANIC CHEMISTRY - I

Paper : HCT 1.2

Time : 3 Hours Maximum Marks : 80

Instructions to Candidates:

i) Answer all questions

ii) All questions carry equal marks.

Answer any EIGHTof the followings. (8×2=16)

1. a) What is hybridisation index?

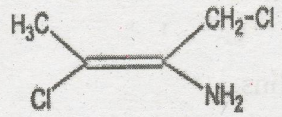
b) Illustrate hyperconjugation with an example.

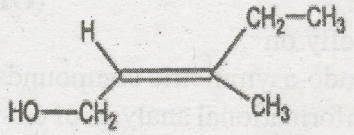
c) Give any one method for the generation of carbocations.

d) Define the terms order and molecularity of a reaction.

e) Define epimers with an example.

f) Write the E/Z nomenclature for the followings:

i. 

ii. 

g) What is Neber rearrangement? Write its mechanism.

h) Sketch the mechanism of Dakin's reaction

i) Write the most stable conformation of 1-methyl-3 tert. Butylcyclohexane.

j) Explain whether the following compounds are aromatic or non-aromatic:

i. 

ii. 

2. a) Write an account on alternant and non-alternant hydrocarbons.
   b) Explain with suitable examples conjugation, cross-conjugation and tautomerism.
   c) Discuss the aromaticity of benzenoid and non-benzenoid compounds.

(OR)

   c) Write notes on :
      i) Delocalised chemical bonding
      ii) Aromaticity of tropones and tropolones. **(5+5+6=16)**

3. a) Illustrate with suitable examples how the cross-over experiment is useful to determine the mechanism of a reaction.
   b) Give any two methods for the generation of carbenes. Explain with suitable example how the singlet and triplet state of carbene are differentiated.
   c) Write notes on:
      i) Stereochemistry of SN1 and SN2 reactions.
      ii) Generation, structure, stability and reactions of free radicals.

(OR)

   c) Write briefly on :
      i) Isotopic labelling in determining the reaction mechanism.
      ii) Yelides and enamines: generation and reactions. **(5+5+6=16)**

4. a) Write an account on R/S (CIP) nomenclature of compound containing more than one chiral centres.
   b) Discuss the conformational analysis of cyclohexane.
   c) Write notes on:
      i) Projection formulae.
      ii) Curtin-Hammett principle.

(OR)

   c) Write briefly on :
      i) Pseudo-asymmetric compounds.
      ii) Conformational analysis of cis-trans decalins. **(5+5+6=16)**

5. a) What is Wagner-Meerwein reaction? Explain its mechanism and mention its applications.
   b) Illustrate with appropriate example mechanism of Baker-Venkataraman rearrangement. Give its applications.
   c) Write notes on :
      i) Shapiro reaction.
      ii) Hofmann rearrangement.

(OR)

   c) Write briefly on:
      i) Wittig rearrangement
      ii) Pinacol-pinacolone rearrangement. **(5+5+6=16)**

Roll No. _____ [Total No. of Pages : 2

PGIS-019-A-22

M.Sc. I Semester (CBCS) Degree Examination

CHEMISTRY

Inorganic chemistry - I

Paper - HCT - 1.1

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

i. Answer **All** questions.

ii. All questions carry **equal** marks.

Answer any **Eight** of the following. **(8×2=16)**

1. a. Write the expression for Kapustinskii's equation and give its significance.

b. The radii of Mg^{2+} and S^{2-} are 0.66 and 1.84A^0 respectively. Predict the most probable crystal structure of MgS.

c. Distinguish between p - type and n - type semiconductors.

d. Define Quadruple bond.

e. How can terminal and bridging carbonyl groups be distinguished by IR spectra? Give an example for each.

f. Calculate the spin only magnetic moment of a cobalt (III) complex if $\Delta_0 = 18,200 cm^{-1}$ and P = 21,000 cm^{-1}.

g. Draw structures of isomers of following coordination species.

i. $[Fe(NH_3)_2(CN)_4]^-$.

ii. $K[Cr(H_2O)_2(C_2O_4)_2]$.

iii. $[Co(en)_3]Cl_3$.

iv. $[Pt(NH_3)_2Cl_2]$.

h. State Bronsted - Lowry definition of acid - base concept with an example.

i. Urea is an acid in liquid ammonia but base in glacial acetic acid. Why?

j. What are the limitations of non - aqueous titrations in chemical analysis?

2. a. Derive Born - Lande equation and discuss its limitations. (5)

b. What is VSEPR theory? Explain its application to predict the structure of covalent molecules taking BrF_3 and XeF_4 as an example. (5)

c. Depict a Walsh diagram for AH_2 molecule based on it explain the shapes of linear and bent triatomic molecule. (6)

(OR)

What are semiconductors and explain the defects involved in ionic solids with example.

3. a. Write the structures and calculate the number of metal - metal bonds in $Fe_3(CO)_{12}$ and $Ir_4(CO)_{12}$. (5)

b. Discuss briefly on tri - and tetra - nuclear clusters by taking suitable examples. (5)

c. Discuss the preparation, structure, bonding of dioxygen and dinitrogen metal complexes. (6)

(OR)

Write a note on

i. Chevrel phases and

ii. One dimensional solids.

4. a. What is spin - orbital coupling? How does this influence the magnetic properties of metal complexes? (5)

b. Describe the Jahn - Teller effect on octahedral complexes of Cr^{2+} and Cu^{2+}. (5)

c. Explain in detail about the temperature effect on

i. Diamagnetism.

ii. Para magnetism

iii. Ferromagnetism. (6)

(OR)

Explain optical isomerism in complexes with coordination number 4 and 6 with examples.

5. a. What are the postulates of HSAB concepts? Give its applications. (5)

b. Illustrate the applications of acid - base titrimetry in non - aqueous medium for the determination of phenols and amines. (5)

c. Write a note on

i. Role of solvents in acid base titration and

ii. Steric effects. (6)

(OR)

Explain with examples the types of reactions in liquid ammonia and acetic acid.
