Reg. No. : ....

Name : ....

Second Semester M.Sc. Degree Examination, September 2022

Chemistry / Analytical Chemistry / Polymer Chemistry

CH/CL/PC 221- INORGANIC CHEMISTRY -II

(2020 Admission Onwards)

Time : 3 Hours   Max. Marks : 75

SECTION – A

Answer **any two** sub-questions among (a), (b), or (c) from each question.
Each sub-question carries **2** marks

1.   (a)   What is d-d transition? What is its impact?

     (b)   What is difference between Orgel diagram and Tanabe Sugano diagram?

     (c)   What is meant by spin state cross over?

2.   (a)   Discuss the reciprocal lattice concept.

     (b)   What are different types of voids formed in close packed structures?

     (c)   What is the reason for Schottky defect?

3.   (a)   Describe the band theory of solids.

     (b)   Differentiate between the properties of intrinsic and extrinsic semiconductors.

     (c)   What is photovoltaic effect? What are its uses?

4.   (a)   What is Styx number? What is its significance?

     (b)   Discuss the synthesis and applications of phosphorus sesquisulfide.

     (c)   What are carboranes? Where do you find applications for carboranes?

5. (a) Discuss the uses of lanthanide complexes as reagents.

   (b) Discuss the splitting of 'f' orbital in cubic ligand field.

   (c) What are the main components obtained from the beaches of Kerala? Discuss.

(10 × 2 = 20 Marks)

SECTION – B

Answer either (a) or (b) of each question. Each question carries **5** marks

6. (a) Describe the Gouy's method for the determination of magnetic moment.

   (b) Briefly explain the temperature dependence of magnetism of metal complexes.

7. (a) Describe the rotating crystal X-ray diffraction method. Discuss its applications.

   (b) Discuss the colour centres in alkali halide crystals.

8. (a) Briefly explain the effect of temperature on conductivity of solids.

   (b) What is meant by doping? How is carried out? What are its advantages?

9. (a) What are phosphazines? Discuss the various types of phosphazines.

   (b) Discuss the topological approach to boron hydride structure?

10. (a) Discuss the separation techniques used in the extraction of lanthanides

    (b) Compare the properties of lanthanides and actinides.

(5 × 5 = 25 Marks)

SECTION – C

Answer **any three** questions. Each question carries **10** marks.

11. Explain the magnetic properties of coordination compounds.

12. Explain the crystal structures of Zinc blend and Wurtizite.

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13. What is piezoelectricity? How is it differing from pyroelectricity? Discuss the applications of piezoeolectric and pyroelectrics.

14. Explain the structure, bonding and reactions of diborane.

15. Explain the occurrence, extraction and general properties of actinides.

(3 × 10 = 30 Marks)

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Second Semester M.Sc. Degree Examination, September 2022

Chemistry/Analytical Chemistry/Polymer Chemistry

CH/CL/PC 222 — ORGANIC CHEMISTRY – II

(2020 Admission onwards)

Time : 3 Hours   Max. Marks : 75

SECTION – A

Answer **any two** sub-questions among (a), (b), or (c) from each question. Each sub-question carries **2** marks.

1. (a) Discuss the applications of chromatographic techniques.

    (b) Discuss the characteristics of the developing agents used in chromatography.

    (c) Discuss the Crag's technique of liquid — liquid extraction.

2. (a) How does the ortho effect influence the basicity and acidity of aromatic compounds?

    (b) What is Curtin — Hammett principle? What is its significance?

    (c) What are the significances of salt effects in SN reactions?

3. (a) What is Stevens' reaction?

    (b) What is Fischer—Hepp rearrangement?

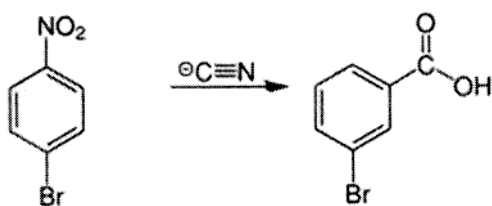   (c) Discuss the mechanism of Wolff rearrangement.

4. (a) What is the Huckel theory of cyclo-addition reactions?

   (b) Why is aromaticity important?

   (c) What is the difference between Cope and Claisen rearrangements?

5. (a) Describe the photochemistry of vision.

   (b) What is the difference between sensitization and quenching?

   (c) What is the chemistry of chemiluminescence?

(10 × 2 = 20 Marks)

SECTION – B

Answer either (a) or (b) of each question. Each question carries **5** marks.

6. (a) Distinguish between adsorption and partition chromatography techniques.

   (b) What is Gel electrophoresis? Discuss its applications.

7. (a) Discuss the various methods for the isolation and detection of reaction intermediates.

   (b) Distinguish between primary and secondary kinetic isotope effects.

8. (a) Discuss the mechanism of conversion of a hydroxamate ester to an isocyanate

   (b) Discuss the mechanism of conversion of:

9. (a) What is Huisgen reaction? Discuss its mechanism.

   (b) Discuss the classification of sigmatropic rearrangements.

10. (a) Discuss the mechanisms of Norrish Type I and Type II reactions.

    (b) Discuss the applications of photochemistry.

(5 × 5 = 25 Marks)

SECTION – C

Answer **any three** questions. Each question carries **10** marks.

11. Explain the principle, instrumentation and applications of GC-MS.

12. Explain the Hammett equation. What are its applications? What is mean by abnormal Hammett plot?

13. Explain the mechanism, variations and applications of Hoffmann rearrangement.

14. Explain the Diels — Alder reaction, its stereochemistry and applications?

15. Explain the mechanisms of Patterno-Buchi and Barton reactions.

(3 × 10 = 30 Marks)

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Second Semester M.Sc. Degree Examination, September 2022

Chemistry / Analytical Chemistry/Polymer Chemistry

CH/CL/PC 223 – PHYSICAL CHEMISTRY - II

(2020 Admission Onwards)

Time : 3 Hours

Max. Marks : 75

SECTION – A

Answer **two** sub questions among (a) (b) and (c) from each question each sub question carries **2** Marks

1. (a) What are spherical harmonics?

    (b) Distinguish between radial and angular distribution functions

    (c) Discuss Pauli's Anti-symmetric principle.

2. (a) Give any one application of stark effect in rotational spectrum

    (b) For polyatomic molecules like OCS or NH_3 knowledge of one moment of inertia is insufficient to deduce the bond length and bond angles from line spacing in the Rotational spectra, how will you overcome this difficulty?

    (c) What is the condition for a molecule to give rise to rotational Raman scattering?

3. (a) What is the origin of residual entropy?

    (b) Discuss the concept of ensemble.

    (c) State the principle of equi-partition of energy?

4. (a) Distinguish between Fermions and Bosons

   (b) What is Dulong and Petit's Law?

   (c) Discuss the anomalous heat capacity of hydrogen.

5. (a) What are the significance of Tafel plot?

   (b) What is over voltage? What is its application?

   (c) What are fuel cells? What are its uses?

(10 × 2 = 20 Marks)

SECTION – B

Answer either (a) or (b) from each question, each sub question carries **5** marks.

6. (a) Discuss the spin – orbital coupling.

   (b) Discuss the separation of variables in the wave equation of Hydrogen like systems.

7. (a) Give a brief account on P,Q, and R branches of vibrational rotational spectrum

   (b) Briefly explain Mutual exclusion principle

8. (a) Derive Sachur – Tetrode relation using Partition function

   (b) Derive the relation to show how thermodynamic functions internal energy and entropy related to partition function?

9. (a) Discuss Debye theory of specific heat capacity of solids

   (b) Deduce Fermi – Dirac Distribution Law.

10. (a) Discuss the principle and applications of polarography.

    (b) Briefly explain Debye-Falkenhagen effect.

(5 × 5 = 25 Marks)

SECTION – C

Answer any **three** questions, each question carries **10** Marks

11. Elaborate Vector atom model.

12. (a) Discuss the fundamentals of rotational spectroscopy and how it is used in the elucidation of molecular structure.

    (b) The rotational spectrum of $H^{35}Cl$ has lines equally separated by 6.26 x 10^{11} Hz. Calculate the bond length of $H^{35}Cl$. **(6+4)**

13. Derive the expression for Maxwell Boltzmann distribution of particles

14. Discuss Einstein theory of heat capacity of solids. What are the limitations of Einstein's theory of heat capacity?

15. Derive Debye- Huckel Onsager equation and discuss.

(3 × 10 = 30 Marks)

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