72056

M. Sc. Chemistry 1st Semester CBCS Current Scheme Examination – December, 2024

INORGANIC CHEMISTRY - I

Paper : 16CHE21C1

Time : Three Hours] [Maximum Marks : 80

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting *one* question from each Unit. Question No. **1** is *compulsory*. All questions carry equal marks.

1. *Compulsory Question :* 8 × 2 = 16

   (a) Write Co. No. of each atom in Al_2O_3.

   (b) Explain $d\pi$-$p\pi$ bonding with example of NO_3^-.

   (c) What is spin-magnetic moment of the complex $[Cr(CN)_6]^{2+}$ ion ?
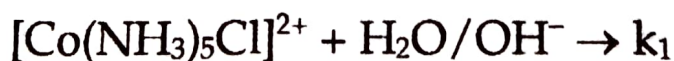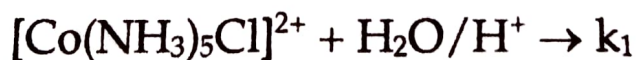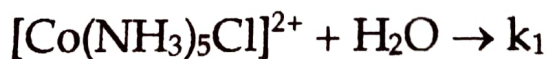
   (d) Write an example of Anation reaction.

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(e) Write Kurnakove's test to distinguish *Cis-* and *Trans* Isomers.

(f) What is Barry-Pseudorotation ? Give an example.

(g) Determine %age occupied of tetrahedral void in Spinal mineral ($MgAl_2O_4$).

(h) What is hybridization of N-atom into $CH_2=CH-CH_2-NH_2$ and $CH_2=CH-NH_2$?

UNIT – I

2. Discuss the Bend's rule and its applications. On the basis of this rule explain why the bond angle of axial F-S-f bond is 173° in SF_4 ? 16

3. Discuss briefly about the factors affecting the stability of complexes. Also discuss the relation between stepwise and overall formation constant. 16

UNIT – II

4. Explain the basic hydrolysis in octahedral complexes. Also compare the rate constants of following hydrolysis reactions : 16

$$[Co(NH_3)_5Cl]^{2+} + H_2O \rightarrow k_1$$

$$[Co(NH_3)_5Cl]^{2+} + H_2O/H^+ \rightarrow k_1$$

$$[Co(NH_3)_5Cl]^{2+} + H_2O/OH^- \rightarrow k_1$$

5. (a) How does the electrophilic attack on the ligands take which takes place without rupture of M-L bond ? Give suitable example. 8

(b) Explain the mechanism (with M-L bond breaking and without m-L bond breaking) by which trischelate optically active octahedral complexes undergo racemization. 8

UNIT – III

6. (a) Discuss the mechanisms of outer sphere electron transfer reactions with suitable examples. 8

(b) Calculate the 2nd order rate constant for the reaction of trans-$[PtCl (CH_3)(PEt_3)_2]$ with NO_2^-, for which $\eta_{Pt^{II}}$ is 3.22. For this I^- is ($\eta_{Pt^{II}}$ is 5.42) and N_3^- ($\eta_{Pt^{II}}$ is 3.58), react at 30°C with k is $40M^{-1}$ sec^{-1} and $7M^{-1}$sec^{-1} respectively. 8

7. (a) Discuss the factors affecting rate of substitution reactions in the square planar complexes with suitable examples of each. 8

(b) Discuss the Trans-effect and its various applications. in synthesis. 8

UNIT – IV

8. (a) Discuss the structure of Ilmenite and calculate the %age occupied tetrahedral and octahedral voids in spinal mineral $FeTiO_3$. 8

(b) Discuss the structure of β-crystobalite and Rutile type. 8

9. (a) Factors affecting structure of ternary ionic crystals. Also discuss about the tolerance factor regarding ternary ABX_3 type structure.

8

(b) Explain the preparation and structure of octamolybdate $[Mo_8O_{26}]^{4-}$ ion.

8

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M. Sc. Chemistry 1st Semester
CBCS Current Scheme
Examination – December, 2024
PHYSICAL CHEMISTRY-I

Paper : 16CHE21C2

Time : Three hours]   [Maximum Marks : 80

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting *one* question from each Unit. Question No. 1 is *compulsory*. All questions carry equal marks.

1. (a) Define Eigen value and Eigen function. $8 \times 2 = 16$

   (b) Describe quantum mechanically the shapes of 2p orbitals.

   (c) Entropy of the universe is increasing. Explain this statement.

   (d) Explain the term Chemical Potential. Is it extensive or intensive property ?

P. T. O.

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(e) Why reactions of higher order are not general ? Explain.

(f) Explain the effect of temperature on the rate of reaction.

(g) What is ionic strength ? Calculate ionic strength of 0.2 m $BaCl_2$ solution.

(h) What do you understand by mean ionic activity coefficient ? Explain.

UNIT – I

2. (a) Give an explanatory note on Max-Born interpretation of wave function and Heisenberg's uncertainty principle. 6

(b) What are Hermitian Operators ? Write Significance of this operator. Show that operator for linear momentum is Hermitian. 10

3. Solve Schrodinger wave equation for a particle in a one-dimensional box to find the expression for (i) wave function (ii) Energy. Also determine average position and momentum. 16

UNIT – II

4. (a) What do you understand by the term entropy ? Express variation of entropy with temperature and pressure. 8

(b) Derive Gibb's Duhem equation. Explain its physical significance. **8**

5. (a) Discuss the criteria of spontaneity with enthalpy and free energy functions. **8**

(b) What are partial molar properties ? Derive an expression for the variation of partial free energy with temperature and pressure. **8**

UNIT – III

6. (a) Derive rate equation for opposing reactions of second order. **8**

(b) Describe in detail double sphere model for ionic reactions in solutions. **8**

7. (a) Discuss Collision Theory of Reaction rate and its limitations. **8**

(b) What are consecutive reactions ? Derive rate expression for 1st order reaction. **8**

UNIT – IV

8. Discuss Debye-Huckel theory of ion-ion interaction. Derive expression for potential and excess charge density as a function of distance from the centra ion. **16**

9. (a) Discuss Huckel-Onsager treatment for aqueous solutions. Explain its limitations.

8

(b) Explain the effect of solvents and ion association on conductivity of the solution.

8

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M. Sc. Chemistry 1st Semester CBCS
Current Scheme
Examination – December, 2024

ORGANIC CHEMISTRY - I

Paper : 16CHE21C3

Time : Three Hours]   [Maximum Marks : 80

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting *one* question from each Unit. Question No. 1 is *compulsory*. All questions carry equal marks.

1. (a) What are cyclodextrins ?   2

   (b) Explain ring chain tautomerism with example.   2

   (c) Explain Prelog's rule.   2

   (d) Differentiate between cis and trans decalin.   2

   (e) How carbanions are generated ?   2

(f) What are soft bases ? Give example. 2

(g) Give example of each acidic and basic azo dye. 2

(h) What is the inversion of sugar ? 2

UNIT – I

2. Describe : 8, 8

   (i) Alternant and non alternant hydrocarbons

   (ii) Catenanes and rotaxanes

3. Explain : 8, 8

   (i) Inclusion compounds

   (ii) Crown ethers and cryptands

UNIT – II

4. (a) Describe Atropisomerism with examples. 10

   (b) Explain the chemical method of resolution of a racemic mixture. 6

5. (a) Illustrate the centre, plane and n-fold alternating axis of symmetry with example. 8

   (b) Explain Cram's rule of asymmetric induction. 8

UNIT – III

6. Describe the generation, stability and reactions of carbenes. 16

7. Explain :

    (i)   Curtin-Hammett principle   6

    (ii) Isotopic labelling   5

    (iii) Non-classical carbocations   5

UNIT – IV

8. (a) Describe the structural elucidation and synthesis of maltose.   10

    (b) Explain with example :   3, 3

       (i)   Mordant Dye

       (ii) Amino sugars

9. (a) Draw the structure of cellulose, amylose and amylopectin. Differentiate between them.   6

    (b) Describe the structural elucidation and synthesis of Indigo.   10

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M. Sc. Chemistry 1st Semester CBCS Current Scheme Examination – December, 2024

COMPUTER FOR CHEMISTS

Paper : 16CHE21F1

Time : Two Hours]   *[Maximum Marks : 40*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt any *five* questions. All questions carry equal marks.

1. Draw and explain block diagram of a computer system.   8

2. Explain various types of output devices available in computer system.   8

3. Explain various generations of computer languages.   8

4. Describe any *eight* DOS commands.   8

5. What do you mean by computer networks ? Discuss various pros and cons of computer networks. Also explain various types of computer networks. 8

6. Describe various applications of computers in field of Health Care, Engineering and Teaching. 8

7. Draw and explain different symbols of flowchart. Make a flowchart to print if the given number is positive or negative. 8

8. Explain various characteristics of algorithms. Write an algorithm to print the table of a given number. 8

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Master of Science (Chemistry)
1st Semester
Examination – December, 2024

INORGANIC CHEMISTRY-I
Paper : 24CHE201DS01

Time : Three Hours]   [Maximum Marks : 70

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting *one* question from each Unit. Question No. **1** is *compulsory*. All questions carry equal marks.

1. *Compulsory* question :

   (a) What is spectrochemcial series ?   2

   (b) Draw the structure of $Cr_3O_{10}^{2-}$.   2

   (c) What is John-Teller-Effect ?   2

   (d) Explain Berry Pseudo-rotation.   2

P. T. O.

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(e) What are coordination no. of each in structure of CdI_2.　　2

(f) Draw structure of the complex $[Pt(CN)_4]^{2-}$.　　2

(g) What is Anation reaction ? Give example.　　2

UNIT – I

2. Discuss the Molecular Orbital diagram of octahedral complex including both sigma and Pi-bonding.　　14

3. (a) Determine CFSE for low-spin and high-spin complex of d^3 and d^7 -species. Also tell about the applications of CFSE.　　7

(b) Explain the Crystal Field Theory and Ligand Field Theory.　　7

UNIT – II

4. (a) Discuss the mechanism for ligand displacement in octahedral complexes.　　7

(b) Explain racemization of tris chelate complexes with suitable example.　　7

5. (a) Explain inert and labile complexes with example. 7

(b) Explain the mechanism of base hydrolysis in octahedral complexes taking suitable example.　　7

UNIT – III

6. (a) What are inner sphere electron transfer reactions ? Give account of mechanisms involved in these reactions wit suitable examples.　　7

(b) Discuss various factors affecting rate of electron transfer reactions.   7

7. (a) What are electron transfer reactions. Discuss the role of non-bridging complex on the rate of electron transfer reaction.   7

(b) Discuss the rate of outer sphere electron transfer mechanism in following reactions :   7

$$[Fe(CN)_6]^{4-} + [*Fe(CN)_6]^{3-} \rightarrow [Fe(CN)_6]^{3-} + [*Fe(CN)_6]^{4-}$$
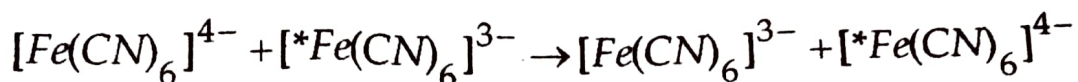
UNIT – IV

8. (a) Draw and discuss crystal structure of Fluorite or Ilmenite mineral.   7

(b) Discuss the Factors Affecting Structure of Ternary Ionic crystals with help of Well equation and Tolerance factor.   7

9. (a) Give preparation and properties of describe structure of Paramolybdate isopoly acid.   7

(b) Discuss preparation and Kegging's structure of 1 : 6 Heteropoly acid $[Te\,Mo_6\,O_{24}]^{6-}$.   7

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86062

Master of Science (Chemistry)
1st Semester
Examination – December, 2024
PHYSICAL CHEMISTRY- I
Paper : 24CHE201DS02

Time : Three hours]   [Maximum Marks : 70

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt any *five* questions, selecting *one* question from each Unit. Question No. **1** is *compulsory*. All question carry equal marks.

1. (a) What are photochemical reactions ? Explain.

$$7 \times 2 = 14$$

   (b) Entropy is the measure of randomness. Explain.

   (c) Explain reduced phase rule. Write its applicability.

   (d) Why does quantum mechanics lead to the concept of orbital ?

P. T. O.

(e) What do you understand by quantization of energy ?

(f) What is ionic strength ? Calculate ionic strength of 0.1 MAl $(NO_3)_3$ solution.

(g) What is meant by excess charge density in an electrolyte solution ?

UNIT – I

2. (a) Solve Schrodinger wave equation for a particle in a one dimensional box to find the expression for :   10

    (i) wave function

    (ii) Energy

   (b) What do you understand by concept of degeneracy ?   4

3. (a) Discuss Schrodinger wave equation for a linear harmonic oscillator with its solution by polynomial method.   10

   (b) Give an explanatory note on zero point energy for a linear harmonic oscillator.   4

UNIT – II

4. (a) Discuss law of mass action with its thermodynamic derivation.   7

   (b) Discuss Clasius - Clayperon equation and its applications in brief.   7

5. What are Eutectic systems ? How eutectic point is calculated. Discuss system forming solid compounds AxBy with congruent and incongruent melting points. 14

UNIT – III

6. (a) What are ionic reactions ? Discuss double sphere model for ionic reactions. 7

   (b) Discuss Rice-Herzfeld mechanism for decomposition of acetaldehyde. 7

7. (a) Discuss enzyme kinetics in terns of Michaelis-Menton treatment. Explain Lineweaver-Burk plot and Eadie-Hofstee methods. 10

   (b) Explain competitive and non-competitive inhibition. 4

UNIT – IV

8. (a) Discuss the Debye Huckel Onsager treatment for aqueous solutions and its limitation. 7

   (b) Give an explanatory note on ionic movement under the influence of electric field. Express the relationship between ionic drift velocity and current density. 7

9. (a) Derive the following relations

5, 5

    (i) Stokes Einstein relation

    (ii) Nernst-Einstein relation

(b) Discuss Explain the effect of solvents and ion association on conductivity of the solution.   4

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Master of Science (Chemistry) 1st Sem. Examination – December, 2024

ORGANIC CHEMISTRY – I

Paper : 24CHE201DS03

Time : Three Hours]　　　　　　　　　　[Maximum Marks : 70

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting *one* question from each Unit. Question No. 1 is *compulsory*. All questions carry equal marks.

1. (a) What is homoaromaticity ? Give examples.　　2

   (b) What are diatropic compounds ? Give example.　2

   (c) Explain Prelog's rule.　　2

   (d) What is enantiomeric excess ?　　2

   (e) What is the Taft equation ?　　2

P. T. O.

(f) Explain Wagner-Meerwein rearrangement.   2

(g) Explain E1cB mechanism of elimination.   2

UNIT – I

2. (a) Differentiate between :   4, 4

   (i) Cross conjugation and hyperconjugation

   (ii) Alternant and non-alternant hydrocarbons

   (b) Write a note on cyclodextrins.   6

3. (a) Describe inclusion compounds and their applications.   7

   (b) Discuss the aromaticity of non-benzenoid aromatic compounds.   7

UNIT – II

4. (a) Illustrate various symmetry elements with examples.   9

   (b) Describe optical activity in allenes.   5

5. (a) Differentiate between enantiotopic and diastereotopic groups and faces with examples.   9

   (b) What is asymmetric induction ? Describe the Crams rule of asymmetric induction.   5

UNIT – III

6. Describe :

   (i) Kinetic and thermodynamic control of reaction. 7

   (ii) Curtin-Hammett principle. 7

7. Discuss the generation, stability and reactions of carbanions. 14

UNIT – IV

8. Explain with mechanism and examples :

   (i) E2 elimination reactions 7

   (ii) Pyrolytic eliminatiori reaction 7

9. Describe :

   (i) Sharpless asymmetric epoxidation 7

   (ii) Hydroboration 7

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