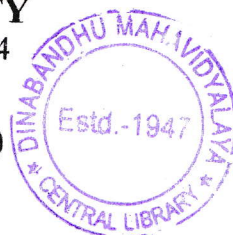




WEST BENGAL STATE UNIVERSITY
B.Sc. Honours 4th Semester Examination, 2024

CEMACOR09T-CHEMISTRY (CC9)

INORGANIC CHEMISTRY-III



Time Allotted: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.*

Answer any three questions taking one from each unit

Unit-I

1. (a) Write down the name of one ore from which Ti metal can be extracted. How would you extract Ti metal from this ore by Kroll process? 1+3
- (b) Mention the differences between roasting and calcination. 2
- (c) Using Ellingham diagram explain the nature of stability of the metal oxides at high temperature. 2
- (d) What is the role of fluorspar and cryolite during the extraction of Al from Bauxite by Baeyer's Process? 2
2. (a) Describe the principle of refining nickel by Mond's process. 4
- (b) What is the principle of hydrometallurgy? Mention one advantage of using this process. 2
- (c) What is leaching? Name one basic leaching reactor. 2
- (d) Which metals are generally extracted by electrolytic reduction and why? 2

Unit-II

3. (a) Compare and contrast the chemistry of N, P, As, Sb and Bi with special references to: 6
 - (i) Oxidation states
 - (ii) Hydrides
 - (iii) Halides.
- (b) Explain the structure and bonding of polyphosphazenes. 3
- (c) The acidity of boric acid may be enhanced in presence of polyhydric alcohols. — Explain. 3
- (d) PbO_2 is an oxidizing agent whereas SnO_2 , GeO_2 , SiO_2 are not. — Explain. 2

- (e) Discuss the hydrolytic behaviour of xenon fluorides by mentioning the balanced chemical equations. 3
- (f) What are polyhalides? Why do they form? Mention one example each for homo and hetero nuclear polyhalide. 1+1+1
4. (a) How would you prepare borazine? Why is it called inorganic benzene? Indicate the hybridisation of B and N in this compound. 2+2+1
- (b) AlCl_3 is covalent but AlF_3 is ionic. — Why? 2
- (c) Freons deplete the ozone layer of upper atmosphere. — Explain. 2
- (d) Among the so called inert gases, Xenon is most suitable to form chemical compounds. — Explain. 2
- (e) Give one example each to show that hydroxylamine acts both as oxidizing and reducing agent. 2
- (f) Discuss the structure and bonding of the following compounds: 4
- (i) XeO_3 (ii) XeF_2
- (g) Discuss the structure and bonding of $(\text{SN})_x$ [$x = 4$]. 3

Unit-III

5. (a) Write the IUPAC Nomenclature of $[(\text{NH}_3)_5\text{Cr} - \text{OH} - \text{Cr}(\text{NH}_3)_5]\text{Cl}_5$ and formula for bromopentanitrato cobalt (II) sulphate. 1+1
- (b) Chromium (III) chloride forms three different hydrates of the same mole ratio $\text{Cr} : \text{Cl} : \text{H}_2\text{O} = 1 : 3 : 6$. A violet form does not lose water over concentrated H_2SO_4 and gives 3 equivalents of AgCl on treatment with AgNO_3 . Two other forms, both green, lose 1 and 2 mols of H_2O over concentrated H_2SO_4 and give 2 and 1 equivalents of AgCl respectively with AgNO_3 . 3
- Write the coordination structures of three isomeric complexes.
- (c) Draw the possible geometrical isomers of $[\text{Co}(\text{en})_2(\text{NCS})(\text{NH}_3)]^{2+}$ and hence predict which of them would be optically active. 3
- (d) Mention two major drawbacks of Werner's theory. 2
6. (a) Write down the structures of different isomeric forms of $[\text{Cr}(\text{ox})_3]^{3-}$. 2
- (b) The solubility of the first-order inner metallic complex is very poor in water. Explain with example. 2
- (c) How will you chemically distinguish between *cis* and *trans* isomer of $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$? 2
- (d) Between $\text{K}_4[\text{Fe}(\text{CN})_6]$ and KCN , mention which one is toxic and which one is not. — Explain. 2
- (e) Why metal chelates are more stable than non-chelated complexes? 2

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