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 $(SN)_x$ $[x = 4]$. 3

Unit-III

5. (a) Write the IUPAC Nomenclature of $[(NH_3)_5Cr - OH - Cr(NH_3)_5]Cl_5$ and formula for bromopentanitratocobalt (II) sulphate. 1+1

(b) Chromium (III) chloride forms three different hydrates of the same mole ratio $Cr : Cl : H_2O = 1 : 3 : 6$. 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 $[Co(en)_2(NCS)(NH_3)]^{2+}$ 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 $[Cr(ox)_3]^{3-}$. 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 $[Pt(NH_3)_2Cl_2]$? 2

(d) Between $K_4[Fe(CN)_6]$ 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

——x——