

B.Sc. 4th Semester (Honours) Examination, 2023 (CBCS)**Subject : Chemistry****Course : CC-IX****Time: 2 Hours****Full Marks: 40***The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words
as far as practicable.***1. Answer any five questions from the following: 2×5=10**

- (a) Draw the structure of bis(dimethylglyoximato)nickel(II). Why is ammonium hydroxide added after the addition of dimethylglyoxime?
- (b) Predict the geometrical structure of the anion formed in the reaction between XeF_4 and CsF .
- (c) Write down two important uses of siloxane.
- (d) Give two coordination compounds having coordination number five and seven.
- (e) Write two important limitations of Werner's theory.
- (f) Give examples of the following ligands:
Organometallic, Sequestering, Non-classical and π -acidic.
- (g) Name one cationic and one anionic interhalogen compound.
- (h) What do you mean by Zone-refining?

2. Answer any two questions from the following: 5×2=10

- (a) (i) Write a brief account on preparation and structure of phosphazene with special reference to cyclic phosphazenes.

(ii) Mention one important property of polythiazyl. (2+2)=1
- (b) Write the preparation and structure of the following compounds:
Boron trifluoride and trisilylamine. 2.5×2
- (c) (i) "Inner metallic ligand is essentially a chelating ligand but the reverse is not true." — Justify

(ii) Draw the all possible isomers of the following coordination compounds:
$$\left[\text{Fe}\left(\text{C}_2\text{O}_4^{2-}\right)_2(\text{Cl})(\text{Br})\right]^{3-}$$
 and $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$ 2+3
- (d) (i) Write a procedure for the preparation of potassium perxenate and discuss its structure in the light of VSEPR theory.

(ii) Give the IUPAC name of $[\text{Pt}(\eta^2-\text{C}_2\text{H}_4)(\text{Cl})(\text{NH}_3)]\text{Cl}$. (2+2)=1

3. Answer *any two* questions from the following: 10×2=20

(a) Explain — 2×5

- (i) SF₆ is unreactive towards water but TeF₆ reacts readily with water.
- (ii) NF₃ has no donor properties at all but PF₃ forms numerous coordination compounds with transition metals.

(iii) Molecular nitrogen N₂ is isoelectronic with CO but CO is better ligand than N₂.

(iv) Stability of MX₄ tetrahalides of Gr-14 decreases from CCl₄ to PbCl₄.

(v) There is no silicon analog of C₂H₄ although it forms SiH₄ like CH₄.

(b) (i) Write name of one important titanium ore. Briefly describe the extraction of pure titanium by Kroll process from their ores.

(ii) 'Boron nitride has a structure similar to graphite. Yet, graphite is a good conductor of electricity whereas boron nitride is not so.' — Account for this difference.

(iii) 'BCl₃ cannot get dimerised but AlCl₃ can.' — Explain. (1+4)+2.5+2.5

(c) Write short notes based on the synthesis, structure and uses of the following compounds: 2.5×4
Diborane, Freon, Sulphur-nitrogen and Marshall acid

(d) (i) For the following conversion identify the suitable reagents:



(ii) When [Ni(NH₃)₄]²⁺ is treated with conc. HCl two compounds A and B having the same formula Ni(NH₃)₂Cl₂ are formed. 'A' reacts readily with Ag₂C₂O₄ to give a white precipitate, whereas 'B' does not. Identify A and B, explain the difference in reactivity towards Ag₂C₂O₄.

(iii) 'BeO has high melting point.' — State why.

(iv) Predict the sites of SCN⁻ ligand towards Fe³⁺ and Ag⁺ during complexation. 3+3+2+2

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