

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
- Draw the structure of bis(dimethylglyoximate)nickel(II). Why is ammonium hydroxide added after the addition of dimethylglyoxime?
 - Predict the geometrical structure of the anion formed in the reaction between XeF_4 and CsF .
 - Write down two important uses of siloxane.
 - Give two coordination compounds having coordination number five and seven.
 - Write two important limitations of Werner's theory.
 - Give examples of the following ligands:
Organometallic, Sequestering, Non-classical and π -acidic.
 - Name one cationic and one anionic interhalogen compound.
 - What do you mean by Zone-refining?
2. Answer *any two* questions from the following: 5×2=10
- Write a brief account on preparation and structure of phosphazene with special reference to cyclic phosphazenes.
 - Mention one important property of polythiazyl. (2+2)+1
 - Write the preparation and structure of the following compounds:
Boron trifluoride and trisilylamine. 2.5×2
 - "Inner metallic ligand is essentially a chelating ligand but the reverse is not true." — Justify
 - 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
 - Write a procedure for the preparation of potassium perxenate and discuss its structure in the light of VSEPR theory.
 - 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) SF_6 is unreactive towards water but TeF_6 reacts readily with water.
 - (ii) NF_3 has no donor properties at all but PF_3 forms numerous coordination compounds with transition metals.
 - (iii) Molecular nitrogen N_2 is isoelectronic with CO but CO is better ligand than N_2 .
 - (iv) Stability of MX_4 tetrahalides of Gr-14 decreases from CCl_4 to PbCl_4 .
 - (v) There is no silicon analog of C_2H_4 although it forms SiH_4 like CH_4 .
- (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) ' BCl_3 cannot get dimerised but AlCl_3 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:

$$\text{Mg}_3\text{B}_2 \xrightarrow{\text{A}} \text{B}_2\text{H}_6 \xrightarrow{\text{B}} \text{B}_3\text{H}_6\text{N}_3 \xrightarrow{\text{C}} \text{B}_3\text{H}_9\text{N}_3\text{Cl}_3$$
- (ii) When $[\text{Ni}(\text{NH}_3)_4]^{2+}$ is treated with conc. HCl two compounds A and B having the same formula $\text{Ni}(\text{NH}_3)_2\text{Cl}_2$ are formed. 'A' reacts readily with $\text{Ag}_2\text{C}_2\text{O}_4$ to give a white precipitate, whereas 'B' does not. Identify A and B, explain the difference in reactivity towards $\text{Ag}_2\text{C}_2\text{O}_4$.
- (iii) 'BeO has high melting point.' — State why.
- (iv) Predict the sites of SCN^- ligand towards Fe^{3+} and Ag^+ during complexation. 3+3+2+2
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