B.Sc. 4th Semester (Honours) Examination, 2022 (CBCS)

Subject: Inorganic Chemistry

Paper: CC-9

Time- 2 Hours **Full Marks: 40**

(*Candidates are required to give their answers in their own words as far as practicable)*

1. Answer *any five* questions from the following: 5 x 2 = 10

(a) Indicate the coordination number of the following metal complexes: i. $[Fe(\eta^5\text{-}C_5H_5)_2]$, ii. $K_2[Pt(\eta^2\text{-}C_2H_4)Cl_3]$, iii. $[Ir(CO)Cl(PPh_3)_2(O_2)]$, iv. $[Ru(CO)(NH_3)_2(PPh_3)_2Cl]$

(b) Give one suitable example of each of the following: i. Trans-chelating ligand, ii. Pentadentate ligand.

(c) Write down with proper structure of a square planar complex compound which shows optical isomerism.

(d) Write the IUPAC nomenclature of following metal-complexes

i. $[Cl_2(NH_3)_2Co(OH)_2Co(NH_3)_2Cl_2]$, ii. $[Pt(NH_3)(CO)(Cl)(NO_3)]$

(e) Give examples of the ores of following elements: i. Nickel, ii. Lead

(f) What is Clathrate compound? Give its example.

(g) "π-complexing ligand is essentially a π-acidic ligand but the reverse is not true."-Justify.

(h) Write down the main points to distinguish the term allotropy and catenation.

2. Answer *any two* questions from the followings: 2x5=10

(a) Explain with proper reason:
i. $(CH_3)_2CO$ is a volatile liquid while $(CH_3)_2SiO$ is not.
ii. $(CH_3)_3SiOH$ is a stronger acid than its carbon analog. 2x2.5=5

(b) Write brief explanatory notes of the following compounds, based on their synthesis, structure and applications: i. Borazine, ii. Silicones. 2x2.5=5

(c) Predict the sites of SCN^- ligand suitable for complexing with Fe^{3+} and Ag^+, respectively. -Justify your answer. 2x2.5=5

(d) What do you mean by chelate effect? Why it is called entropy effect? 2+1+2 =5

3. Answer *any two* questions of the followings: 2x10=20

(a) i. Outline a definite structure from the VSEPR theory of the following compounds: XeF_4O_2, XeF_6 and XeO_2F_2.

ii. Give the actual bonding nature by using M.O. diagram of the following Xenon compounds: XeF_2 and XeF_4. 3x2+4=10

(b) Suggest preparatory method and draw the structures of the followings:

i. Caro's acid, ii. Potassium bi-iodate, iii. Hyponitrous acid, iv. Hydrazine. 4x2.5=10

(c) Explain the following observations:

i. PCl_3 and $SbCl_3$ behave differently with water.

ii. Molecular N_2 is isoelectronic with CO but CO is better ligand than N_2.

iii. NaN_3 is more stable than HN_3.

iv. SF_6 can exist but SH_6 or SCl_6 do not.

v. Neither BrF_5 nor AsF_5 are good conductors of electricity but a mixture of two makes a good conductor. 5x2=10

(d) Answer the following:

i. Compare the halides and pseudo halides.

ii. Point out the actual reason about the increase in acidic property of boric acid in presence of glycerol.

iii. Iodine is soluble in water in presence of KI salt among all the halogens.-Justify with proper reason.

iv. Give two important uses of sulphur-nitrogen compound.

3+2+3+2=10

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