

B. Sc. 4th Semester (Honours) Examinations, 2021

CHEMISTRY

[Inorganic Chemistry III (T9)]

Paper : SHCHE/402/C9

Course ID: 41412

Time: 1 Hour 15 Minutes

Full Marks: 25

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: 1×5=5
- a) Why does solubility of iodine in water increase in presence of potassium iodide?
 - b) Write down the equation for the self-ionization of ICl.
 - c) Why BH₃ exists as dimer but BF₃ as monomer?
 - d) Draw the structure of XeO₂F₂ considering VSEPR theory.
 - e) Write down the IUPAC name of [CoCl(H₂O)₂(NH₃)₃]Cl₂ and [(CO)₃Fe(CO)₃Fe(CO)₃].
 - f) Why are the diatomic interhalogens more reactive than the halogens?
 - g) State the stereochemistry of [VO(acac)₂] with diagrams.
 - h) Cite one example for 'Coordination position isomerism'.
2. Answer *any two* questions: 5×2=10
- (a)(i) How do you separate copper from gold by Parting Process.
 - (ii) The stability of [Ni(en)₃]²⁺ (en = ethylenediamine) is much greater than that of [Ni(NH₃)₆]²⁺, although both contain six Ni-N bonds. – Explain. 3+2=5
 - (b) (i) Cite evidence in favor of following: Hydroxylamine can act as both oxidizing and reducing agent
 - (ii) How do you explain the inertness of fluorocarbons? 3+2=5
 - (c) (i) State the stereochemistry of the following complexes with suitable drawings: [Ni(CO)₄], [Cr(en)₃]³⁺.
 - (ii) Write a brief account of the preparation of XeF₂. 3+2=5

Please Turn Over

(d) (i) What are facial and meridional isomers in coordination complexes? Give example.

(ii) What is purely inorganic optically active compound? Give one example. 3+2=5

3. Answer *any one* question: 10×1=10

(a) (i) What do you mean by inorganic polymers? How do you compare inorganic polymers with organic polymers?

(ii) Although hydrazine contains more than one donor atoms but does not form chelate. Why?

(iii) Provide experimental observations in order to establish non-equivalent nature of two Sulphur atoms in sodium thiosulphate.

(iv) Give one physical method which could be used to distinguish between *cis*- and *trans*-isomers of a complex compound.

(v) 'Borazine' is more reactive than benzene towards addition of HX – explain.

(1+2)+2+2+1+2=10

(b) (i) Draw the enantiomers of the following complexes : $[\text{Cr}(\text{ox})_3]^{3-}$ and $[\text{RhCl}_2(\text{NH}_3)_4]^{1+}$.

(ii) When $[\text{Ni}(\text{NH}_3)_4]^{2+}$ is treated with concentrated HCl, two products having the formula $[\text{Ni}(\text{NH}_3)_2\text{Cl}_2]$ (designated I and II) are formed. (I) can be converted into (II) by boiling in dilute HCl. A solution of (I) reacts with oxalic acid to form $[\text{Ni}(\text{NH}_3)_2(\text{C}_2\text{O}_4)]$, (II) does not react with oxalic acid. Deduce the configuration of (I) and (II) and the geometries of nickel (II) complexes.

(iii) Explain the dimeric structure of copper (II) acetate dihydrate.

(iv) Why $(\text{CH}_3)_3\text{N}$ is alkaline but $(\text{CF}_3)_3\text{N}$ is not?

2+4+3+1=10