B.Sc. Part III
Inorganic Chemistry

Multiple Choice

1. $[RhCl(PPh_3)_3]$ is known as-

   (a) Zeise salt (b) Wilkinson's catalyst

   (c) Zieglar Natta catalyst (d) None of the above

2. What is the state of hybridisation of metal in the $Fe(CO)_5$ compound.

   (a) dsp^2 (b) sp^3d (c) dsp^3 (d) sp^3

3. Silicone is an example of:

   (a) Organic polymer (b) Inorganic polymer

   (c) Both (a) & (b) (d) None of the above

4. Magnetic moment of transition metal complexes is calculated by-

   (a) $\mu = \sqrt{n(n+1)}$ B.M. (b) $\mu = \sqrt{n(n+2)}$ B.M.

   (c) $\mu = \sqrt{(n+1)(n+2)}$ B.M. (d) None of the above

5. Which is hard acid:-

   (a) Li^+ (b) N_2 (c) H^- (d) Pd^{2+}

6. Which is hard base:-

   (a) Na^+ (b) Cu^+ (c) NO_3^- (d) C_2H_4

7. The number of unpaired electron present in $[Fe(H_2O)_6]^{2+}$ is : -

   (a) 0 (b) 3 (c) 4 (d) 2

8. Paramagnetic substances have: -

   (a) Paired electron (b) Unpaired electron

   (c) Zero electron (d) None of the above

9. Strong field ligand is:-

(a) CN^- (b) H_2O (c) Cl^- (d) F^-

10. Example of Sandwich compound: -

(a) Zeise salt (b) Ferrocene

(c) Silicones (d) Wilkinson's catalyst

Short Answer Questions:-

1. Give limitation of HSAB concept.
2. Write short note on symbiosis.
3. Write limitations of VBT.
4. Discuss crystal field splitting in octahedral complexes.
5. Find out the crystal field stabilization energy of d^4 configuration in an octahedral field.
6. What is magnetic susceptibility? Explain it.
7. Explain ferromagnetism and antiferromagnetism.
8. What is charge transfer spectra ?
9. How do the steric effect of ligands affect the stability of complexes?
10. What is trans effect? Explain it.
11. Explain covalent organometallic compounds with example.
12. Give two methods of preparation of organometallic compounds of tin.
13. Which elements are essential for our life?
14. Explain nitrogen fixation.
15. What are phosphazenes? Write uses of phosphazenes.

Long answer questions:

1. Explain theoretical basis of hardness and softness.
2. Explain with reason:

   (i) BH_3 is a soft acid whereas BF_3 is hard acid.

   (ii) AgI_2^- is stable but AgF_2^- is not.

   (iii) HgO is soluble in HCl whereas HgS is insoluble.
3. What is crystal field theory? How does it account for the fact that $[CoF_6]^{3-}$ is paramagnetic but $[Co(NH_3)_6]^{3+}$ is diamagnetic through both are octahedral.
4. What do you understand by spin only formula? How is it related to number of unpaired electron?
5. Explain –

   (i) Heavy atom effect

   (ii) $KMnO_4$ solutions is dark violet, whereas the solutions of common compounds of mangenese are light coloured.

   (iii) d-d transitions are observed in the solution of which of the following compound-

   (1) $KMnO_4$ (2) $[Ti(H_2O)_6]Cl_3$ (c) $K_2Cr_2O_7$
6. What do you understand by mechanism of a reaction? Discussing the mechanism of nucleophilic substitution in complexes, explain ligand substitution in square planar complexes.
7. (a) Describe the preparation methods and properties of iron carbonyl

   (b) Write down the structures of following carbonyls-

   (i) $Fe(CO)_5$ (b) $Ni(CO)_4$ (c) $Cr(CO)_6$ (d) $V(CO)_6$

8. Describe the methods of preparation and properties of organometallic compounds of lithium. Discuss the importance of these compounds in synthetic chemistry.

9. Explain the work of molybdenum (Mo) for nitrogen fixation in nature.

10. Explain structure of the following-

    (i) Hexachloro cyclotriphosphagene

    (ii) Octachloro cyclotethaphosphagene

    (iii) Silicons