

5. (a) What are correlation diagram ? Draw and discuss the qualitative correlation diagrams of d^1 octahedral and d^9 tetrahedral system.

OR

- (b) Discuss the crystal field approach to explain magnetic behaviour of transition metal complexes.
6. (a) Write note on artificial radioactivity. Distinguish between natural and artificial radioactivity.

OR

- (b) Discuss the use of radioisotopes in agriculture and industry.



2016
(January)

Time : 3 hours

Full Marks : 80

The figures in the right-hand margin indicate marks.

Answer from both the Sections as per direction.

(BASIC INORGANIC CHEMISTRY)

Section – A

1. Answer any **four** of the following : 4×4 = 16
- (a) On the basis of hybridisation, discuss the geometry of the following molecule :
- (i) ClO_4^-
- (ii) IF_7
- (b) Discuss the various functions that influence the magnitude of crystal field splitting.
- (c) Discuss the drawback of valence bond theory.

- (d) Write note on Pragmatism.
- (e) Differentiate between nuclear fusion and nuclear fission reactions.
- (f) Write note on Nephelauxetic Series.

OR

2. Answer all questions from the following :

$$2 \times 8 = 16$$

- (a) Calculate magnetic moment for Cr^{+3} and Cu^{+} ion.
- (b) Which of the following complexes have larger crystal field splitting of d orbitals and why $[\text{Co}(\text{H}_2\text{O})_6]^{+2}$ or $[\text{Co}(\text{H}_2\text{O})_6]^{+3}$?
- (c) What is radioactivity ? In what unit radioactivity is measured ?
- (d) Explain the term mass defect and binding energy ?
- (e) What is magnetic susceptibility ?
- (f) Define CFSE
- (g) What type of Geometry is possible for the following type of hybridisation ?
 - (i) d^2sp^3

(ii) dsp^2

- (h) Why He_2^+ exist whereas He_2 does not ?

Section – B

Answer all questions :

$$16 \times 4 = 64$$

- 3. (a) Explain how the atomic orbitals combine to form bonding and antibonding molecular orbitals. What are the limitations of such combination ?

OR

- (b) Discuss with the help of MO theory the formation of N_2 and F_2 molecule. How does the theory explain the difference in reactivity of N_2 , O_2 , F_2 ?

- 4. (a) Discuss the Sigma and Pi metal ligand bonding in transition metal complexes with reference to tetrahedral transition metal complexes.

OR

- (b) Discuss Sigma and Pi bonding in square planar complexes by constructing a MO diagram for $[\text{PtCl}_4]^{-2}$.