

**INORGANIC CHEMISTRY - III**  
(Common with B.Sc. Biotechnology-Part-III) - Paper-A  
(Re-appear April-2013)

**Time Allowed : Three Hours**

**Maximum Marks : 75**

**Note :** The candidates are required to attempt at least one question each from Sections, A, B and C and not more than two questions carrying 15 marks each and the entire Section D consisting of 10 short answer type questions carrying 1½ marks. Attempt five questions in all.

**Section - A**

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|----|-----|---|---|
| 1. | (a) | Discuss the factors affecting the magnitude of CFSE.  | 5 |
|    | (b) | Compare crystal field theory and valence band theory.   | 5 |
|    | (c) | Discuss crystal field splitting of d-orbitals in case of Tetrahedral Complexes.                         | 5 |
| 2. | (a) | What is the origin of Paramagnetism and Diamagnetism.   | 5 |
|    | (b) | Calculate magnetic moments of following ions from spin only formula $Cr^{3+}$ , $Fe^{2+}$ , $Cu^{+1}$ . | 5 |
|    | (c) | What is magnetic susceptibility, how does it vary with Temp ?   | 5 |
| 3. | (a) | What is trans effect ? Explain taking suitable example.   | 5 |
|    | (b) | Explain Polarization Theory of Trans effect.  | 5 |
|    | (c) | What is difference between Thermodynamic and Kinetic stability.   | 5 |

**Section - B**

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|----|-----|---|---|
| 4. | (a) | Differentiate hard bases and soft bases.                          | 5 |
|    | (b) | Explain HSAB principle and its applications.                      | 5 |
|    | (c) | How electronegativity is related to hardness and softness ?       | 5 |
| 5. | (a) | Explain Biological role of $Ca^{2+}$ ion.                         | 5 |
|    | (b) | What is Nitrogen fixation ? Discuss Biological Nitrogen fixation. | 5 |
|    | (c) | Discuss the role of Haemoglobin and Myoglobin.                    | 5 |

**Section - C**

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|----|-----|---|---|
| 6. | (a) | What is EAN rule ? Give its significance in case of organometallics.<br>Calculate EAN for following :<br>$Fe(CO)_5$ , $Ni(CO)_4$ , $CH_3Mn(CO)_5$ . | 6 |
|    | (b) | Discuss bonding in metal Carbonyls.   | 6 |
|    | (c) | Give structures of $Fe_2(CO)_9$ and $Mn_2(CO)_{10}$ .   | 6 |
| 7. | (a) | Determine term symbols for $P^2$ config.  | 5 |
|    | (b) | Discuss L-S coupling.   | 5 |
|    | (c) | What are Orgel diagrams ? What information is conveyed by these diagrams ?  | 5 |
| 8. | (a) | Give structure of Zeise's salt.   | 5 |
|    | (b) | Explain Homogeneous Hydrogenation of Alkenes.   | 5 |
|    | (c) | Give applications of organotin compounds.   | 5 |

**Section - D**

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|----|--|--|--|
| 9. | Explain brief notes on the following : |  |  |
|    | (a)                                    | What are High Spin and Low Spin Complexes ?  |  |
|    | (b)                                    | Calculate CFSE for $[Fe(H_2O)_6]^{3+}$ .     |  |
|    | (c)                                    | What are inert and labile complexes ?        |  |
|    | (d)                                    | What are important properties of silicones ? |  |

- (e) What are ferromagnetic substances ?  
(f) What is spectrochemical series ?  
(g) Give biological role of  $\text{Na}^+$  and  $\text{K}^+$  ions.  
(h) What are  $\pi$  acid ligands ?  
(i) Why in Tetrahedral complexes subscript 'g' is not used in orbital notation ?  
(j) Crystal field splitting is lower in  $T_d$  complexes than  $O_h$  complexes

$1\frac{1}{2} \times 10 = 15$