



B.Sc. (Semester – V) Examination, October/November 2018
CHEMISTRY (6 Units)
Inorganic Chemistry (Paper – II)

Duration : 2 Hours

Total Marks : 80

- Instructions :** 1) **All** questions are **compulsory**, however **internal** choice is available.
2) Briefly answer sub-questions in Question No. 1 and 4.
3) Figures to the **right** indicate maximum marks.
4) Answers to the **two** Sections should be written in **separate** answer book.

SECTION – I

(40 Marks)

1. Answer **any four** of the following :

(4×4=16)

- Define crystal field stabilisation energy. Calculate CFSE for a metal ion with d^7 electronic configuration in a weak and strong octahedral field.
- Explain the role of calcium and magnesium in biological systems.
- Discuss the preparation of non-molecular solids by Shake n Bake technique.
- Give four limitations of valence bond theory with respect to metal complexes.
- Crystal field splitting in square planar complexes is less than that in Octahedral complexes. Justify.
- What is Fajan's Tschida Spectrochemical Series ? What is its application ?

2. A) i) Draw a neat labelled diagram to show the crystal field splitting of d-orbitals in square planar complexes. How does it differ from that of octahedral complexes ?

4

ii) What is the basis of Crystal field theory to explain bonding in metal complexes ?

2

OR

iii) Enumerate the steps involved in the distribution of electrons in the d orbitals of an octahedral complex, based on Hund's rule.

4

iv) How does the charge on the metal ion in an octahedral complex affect the magnitude of $10Dq$?

2



- B) i) Differentiate between haemoglobin and myoglobin with respect to their structure and function. 4
- ii) What are trace and essential elements ? 2
3. A) i) Give a neat labelled diagram showing crystal field splitting of d orbitals for $[\text{Co}(\text{NH}_3)_6]^{+3}$ and $[\text{CoF}_6]^{-3}$ complexes and explain their magnetic property. 6
- OR
- ii) Discuss the absorption spectrum of $[\text{Ti}(\text{H}_2\text{O})_6]^{+3}$ ion in aqueous solution and its application, giving suitable diagram. 6
- B) Explain conductivity of alkali and alkaline earth metals with the help of energy band diagrams. 6

SECTION – II

(40 Marks)

4. Answer **any four** of the following : (4×4=16)

- a) State the EAN and 18 electron rules. Show their validity for $\text{Cr}(\text{CO})_6$.
- b) Give reason :
 - 1) Why does the overall stoichiometry of the solid not affected by Schottky and Frenkel defect ?
 - 2) Why do the concentration of defects in solid increase with increase in temperature ?
- c) Give any two methods each for the preparation of alkyls and aryls of Li and Hg.
- d) Define organometallic compounds and briefly describe the classification of metal carbonyls.
- e) Formulate the following :
 - 1) Potassium tetraphenyl borate (III)
 - 2) Potassium carbonyl pentacyano ferrate (II)
 - 3) Bis (tetracarbonyl cobalt)
 - 4) Bis (η^5 – cyclopentadienyl) iron
- f) Give the structure and discuss the role of carboxy peptidase in biological systems.



5. A) i) Give the hydrolysis reactions of iron pentacarbonyl. 3
ii) Discuss the bonding and give the structure of Nickel tetracarbonyl. 3

OR

- i) Explain the structure of iron pentacarbonyl. 3
ii) With reference to ferrocene, give equations for 3
a) Friedel – Craft's reaction
b) Mannich reaction.
B) i) What are non-stoichiometric compounds ? Explain with reference to FeO. 3
ii) Mention the roles of calcium in biological systems (any three). 3
6. A) i) Explain the structure and bonding in ferrocene on the basis of MOT. 6

OR

- ii) With reference to ferrocene 6
a) What is the action of ferrocene on
1) Mercuric acetate
2) n-butyl lithium
b) Draw structures of ferrocene in crystalline and vapour state.
B) i) What is an F-centre ? Explain with any one example. 3
ii) What is the importance of Model systems in bioinorganic chemistry ?
Name two such systems. 3
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