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3 (Sem-4/CBCS) CHE HC 1

2021

CHEMISTRY

(Honours)

Paper : CHE-HC-4016

(Inorganic Chemistry-III)

Full Marks : 60

Time : Three hours

***The figures in the margin indicate
full marks for the questions.***

GROUP-A

1. Answer the following questions : 1×5=5

(i) What are ionophores ?

Contd.

(ii) In biological systems, the metal ion involved in the dioxygen transport besides Fe is,

(a) Co

(b) Zn

(c) Mg

(d) Cu

(iii) $La^{3+}, Lu^{3+}, Yb^{2+}, Ce^{4+}$ are diamagnetic, while Sm^{3+} exhibits low paramagnetic behavior. Why ?

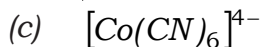
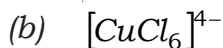
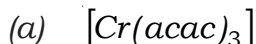
(iv) Determine the spin only magnetic moment (μ_s) of the compound, $Hg[Co(SCN)_4]$.

(v) The number of moles of $KMnO_4$ that will be needed to react completely with one mole of $Fe(II)$ oxalate in acidic solution is _____.

2. Answer the following :

2×5=10

(i) Which of the following are expected to show Jahn-Teller distortion and why ?



(ii) The complex $[NiCl_4]^{2-}$ contains two unpaired electrons while $[Ni(CN)_4]^{2-}$ is diamagnetic in nature. Propose structures for these two complex ions on the basis of CFT.

(iii) Why does the separation of lanthanide difficult ?

(iv) What are carboxypeptidases ? Give their structural features.

(v) Transition metals are less reactive than alkali and alkaline earth metals. Explain.

3. Answer the following : $5 \times 3 = 15$

(i) How the energy level of d -orbital changes during distortion of an octahedral Cu(II) complex ? Discuss.

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(ii) What is trigger mechanism for the cooperativity of oxygenation of hemoglobin ? Explain.

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(iii) What is lanthanide contraction and what is its cause ? How the lanthanide contraction affects the basicity of ions ?

$2 + 1 + 2 = 5$

GROUP-B

4. Answer **any three** of the following :

$10 \times 3 = 30$

(i) (a) Discuss the crystal field splitting pattern for a complex with a linear ligand environment. Assume that the ligands lie on the z -axis.

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(b) Draw a qualitative crystal field splitting diagram in a cubic environment of ligands in reference to a tetrahedral field.

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- (ii) Explain the molecular mechanism of ion transport across membrane. 10
- (iii) (a) Give the important oxidation states of lanthanides. How would you account for them ? Why M^+ and M^{2+} are less stable than M^{3+} in lanthanide series ?
1+2+3=6
- (b) Discuss the +4 oxidation state of Cerium. 4
- (iv) (a) Describe the preparation, properties and structure of chromium acetate monohydrate. Comment on its magnetic behavior. 1+2+2+2=7
- (b) How is $VOCl_2$ obtained from $VOCl_3$? Give appropriate chemical reactions. 3
- (v) Discuss how the following metal ions cause toxicity :
As, Cd, Hg, Pb 2½×4=10
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