PG Even Semester (CBCS) Exam., May—2017

CHEMISTRY

(2nd Semester)

Course No. : CH–201 (C)

(Inorganic Chemistry—II)

Full Marks : 75
Pass Marks : 30

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer **five** questions, taking **one** from each Unit

UNIT—I

1. *(a)* Do 'diamagnetism' mean lack of any magnetic behaviour? Explain giving suitable examples. 4

(b) Work out the ground state term symbols of Mn^2 , Mn^3 , Mn^7 . 6

(c) For Co^2 complexes in octahedral environment, the observed magnetic moment ( ) value is higher than that expected from spin-only contribution. Explain. 5

2. *(a)* Magnetic moments of $[FeF_6]^3$ and $[Fe(CN)_6]^3$ are 5·92 BM and 1·73 BM respectively. Rationalize. 4

(b) The *A* and *E* states do not contribute to orbital moment but a *T*-state does. Explain with suitable example. 5

(c) Write short notes on the following : 6

(i) Ferrimagnetism

(ii) TIP

UNIT—II

3. *(a)* $[Co(NCS)_4]^2$ exhibits only two UV-vis transition peaks rather than three as would be expected of such system. Explain. 5

(b) Write short notes on the following : 6

(i) Nephelauxetic parameter ( )

(ii) Laporte forbidden transition

(c) Show the possible electronic transition for a d^2-system in an octahedral field. 4

4. *(a)* The CO ligand causes greater crystal field splitting than OH . Explain. 4

(b) Work out the term symbol for a d^1-system and assign the electronic transition in its octahedral and tetrahedral environments. 6

(c) Aqueous Mn^{2} is colourless or pale pink whereas MnO_4 is intense in colour. Explain. 3

(d) Tetrahedral complexes are more intense compared to octahedral complexes. Explain. 2

UNIT—III

5. *(a)* The experimental magnetic moment values for Sm^{3} and Eu^{3} are much deviated from the calculated values. Explain. 4

(b) Discuss the stability of different oxidation states in first row transition series. 5

(c) Explain—

(i) the lanthanides show fixed colour irrespective of ligands;

(ii) the colour fades away in the series MnO_4 TeO_4 ReO_4. 6

6. *(a)* Discuss the chemistry of molybdenum w.r.t. metal-metal bonding and oxidation state stability. 6

(b) Draw the *f*-orbital diagram and show their splitting octahedral ligand field. 6

(c) Write a note on 'magnetic properties of actinides'. 3

UNIT—IV

7. *(a)* Predict the products (show structure) : 6

(i) $Mn_2(CO)_{10} + 2\ Li \xrightarrow{THF} ?$

(ii) $Fe(CO)_5 + Py \longrightarrow ?$

(iii) $Cr(CO)_6 \xrightarrow[reflux]{CH_3CN} ?$

(b) Using Wade's rule, find the structure of $Os_5C(CO)_{15}$. 5

(c) Draw the structure, and check if the following obey EAN rule or not : 4

$Ir_4(CO)_{12}$; $Cr(dien)(CO)_3$

8. *(a)* Metal—N_2 complexes are much less stable than their carbonyl counterparts. Elaborate. 4

(b) Explain $_{CO}$ trend in the IR spectra of

$CO\,(2143\ cm^{-1})$, $Mn(CO)_6\,(2090\ cm^{-1})$,

$Cr(CO)_6\,(2000\ cm^{-1})$, $[Ti(CO)_6]^{2-}\ (1750\ cm^{-1})$ 7

(c) Check if the following obey 18-c rule or not : 4

$[IrBr_2(CH_3)(CO)(PPh_3)_2]$, $V(CO)_6$

UNIT—V

9. *(a)* Describe different oxidation levels for $[Fe_4S_4]$ protein. Comment on their occurrence in biological system. 6

(b) Discuss the active site structure in hemocyanin. 4

(c) Give an account of 'trigger effect' in hemoglobin. 5

10. *(a)* What is Reiske protein? Draw the active site structure and mention its role in biological system. 5

(b) What is the composition and active site structure of ferritin? 5

(c) Compare the binding affinities of O_2 by Mb and Hb. Which of the two proteins does not exhibit 'cooperative' effect? 5

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