TDC Even Semester Exam., 2019

CHEMISTRY

(Honours)

(4th Semester)

Course No. : CHMH–401

(Inorganic Chemistry)

Full Marks : 35

Pass Marks : 12

Time : 2 hours

The figures in the margin indicate full marks for the questions

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

Unit—I

1. *(a)* Write the stereochemistry and magnetic behaviour of $K_2[Ni(CN)_4]$. 1+1=2

(b) The spin only magnetic moment of $[MnBr_4]^{2}$ is 5·9 BM. Predict the geometry of the complex ion. 2

(c) Using CFT, calculate the number of unpaired electrons in octahedral complexes of Fe^{3} ion in the presence of *(i)* weak field ligand and *(ii)* strong field ligand. 1½+1½=3

2. *(a)* Write the role of CN ion in the detection of Cu and Cd ions in their mixture. 2

(b) Using VBT, explain the formation of $[CoF_6]^{3}$ and $[Fe(CN)_6]^{4}$ ions. Predict their magnetic properties and indicate them as low-spin and high-spin complexes. 3

(c) Draw the crystal field energy level diagram for $FeCl_4$ tetrahedral complex and predict the number of unpaired electrons. 2

Unit—II

3. *(a)* Write the electronic configuration of Ce^{3} ion and calculate its magnetic moment on the basis of 'spin-only' formula. 2

(b) Why is actinoid contraction greater from element to element than lanthanoid contraction? 2

(c) Furnish the reactions for the preparation of UO_2 and UOF_4. Predict their structures. 1½+1½=3

4. *(a)* Which one of the following is more basic and why? 4

$Lu(OH)_3$ and $La(OH)_3$

(b) "The actinoids exhibit a larger number of oxidation states than the corresponding members in the lanthanoid series." Explain with suitable examples. 3

UNIT—III

5. (a) Draw a general MO energy-level diagram for N_2. Compare the stability of N_2 molecule relative to N_2 and N_2 species. 2+2=4

(b) Schematically represent the bonding and antibonding overlaps of two $2p$ atomic orbitals for both and overlaps. 3

6. (a) What is LCAO? State the rules for LCAO. 1+2=3

(b) Explain the magnetic properties and bond order for NO molecule. How do they differ from NO and NO ? 3+1=4

UNIT—IV

7. (a) What are silicones? Write their general formula and two characteristic properties. 1+1+2=4

(b) Furnish the structure of P_4O_6 and P_4O_{10} cage compounds. What will be the product when P_4O_6 reacts with water? 1+1+1=3

8. (a) Write a note on 'clathrates'. 3

(b) What will happen when dimethyl dichlorosilane and trimethyl monochlorosilane are hydrolyzed? 4

UNIT—V

9. (a) What is Bohr magneton? Write the origin of paramagnetic moment. 1+2=3

(b) Write notes on the following : 2×2=4

(i) Diamagnetism

(ii) Ferromagnetism

10. (a) State Curie's law and Curie-Weiss law. Draw the X vs. T and $1/X$ vs. T plot for a ferromagnetic substance. 2+2=4

(b) What do you mean by 'spin-only' formula in magnetic moment calculation? Why does Co^2 ion show higher observed $_{obs}$ value than calculated $_s$ value? 1+2=3

★ ★ ★