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(6th Semester)

CHEMISTRY

TENTH PAPER (CHEM-362)

(Inorganic Chemistry—III)

Full Marks : 55

Time : 2½ hours

(PART : A—OBJECTIVE)

(Marks : 20)

The figures in the margin indicate full marks for the questions

SECTION—A

(Marks : 5)

Tick (✓) the correct answer in the brackets provided :

1×5=5

1. The most common oxidation state of lanthanides is

- (a) +2 ()
- (b) +3 ()
- (c) +4 ()
- (d) +5 ()

2. Which of the following metalloenzymes contains zinc?

- (a) Carbonic anhydrase ()
- (b) Carboxy peptidase ()
- (c) Alcohol dehydrogenase ()
- (d) All of the above ()

3. Which of the following complexes is paramagnetic?
- (a) $[\text{PtCl}_6]^{2-}$ ()
- (b) $[\text{Fe}(\text{CN})_6]^{4-}$ ()
- (c) $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ ()
- (d) $[\text{Pt}(\text{NH}_3)_6]^{4+}$ ()
4. The vibrations without a centre of symmetry are active in
- (a) IR but inactive in Raman ()
- (b) Raman but inactive in IR ()
- (c) Raman and IR ()
- (d) None of the above ()
5. The shape of $\text{Fe}(\text{CO})_5$ is
- (a) square planar ()
- (b) square pyramidal ()
- (c) trigonal bipyramidal ()
- (d) octahedral ()

SECTION—B

(Marks : 15)

Answer the following questions :

3×5=15

1. What do you mean by lanthanide contraction?
2. How does ferromagnetism vary with temperature? What is Curie temperature?
3. Write a note on the applications of organometallic compounds of Mg in organic synthesis.
4. Mention three differences between inorganic and organic polymers.
5. Differentiate between Stokes' lines and anti-Stokes' lines.

(PART : B—DESCRIPTIVE)

(Marks : 35)

The figures in the margin indicate full marks for the questions

1. (a) What are simple and mixed organometallic compounds? Give examples. 3
(b) Discuss the bonding in the π -metal olefin complexes. How is the bonding different from the one in σ -metal olefins? 4

OR

2. (a) Discuss the structure of $\text{Fe}_2(\text{CO})_9$. 3
(b) What are π -acceptor ligands? Discuss in detail the nature of bonding involved in metal carbonyls. 4
3. (a) Discuss the cooperativity effect in haemoglobin. 4
(b) Discuss the role of carboxy peptidase in the biological systems. 3

OR

4. (a) Discuss in detail the preparations of silicones. 4
(b) Write a brief note on Na⁺-K⁺ pump. 3
5. (a) What are the problems in the separation of lanthanides? Discuss the ion-exchange method of separation of lanthanides. 4
(b) Mention three similarities and three differences between lanthanides and actinides. 3

OR

6. (a) Account for the colours exhibited by the lanthanide compounds. 3
(b) Define *trans-uranic* elements. 1
(c) What are the consequences of lanthanide contraction? 3

7. (a) What is Curie's law? How has it been corrected in Curie-Weiss law? 4
 (b) Write notes on the following : 3
 (i) Magnetic susceptibility
 (ii) Antiferromagnetism

OR

8. (a) Discuss the magnetic properties of $[\text{CoF}_6]^{3-}$ and $[\text{Fe}(\text{CN})_6]^{4-}$. 3
 (b) Define the following terms : 2
 (i) Magnetic induction
 (ii) Bohr magneton
 (c) Write a note on orbital magnetic moment for an atom having one electron. 2
9. (a) What is rule of mutual exclusion? Explain taking CO_2 and N_2O molecules as example. 4
 (b) Explain how inductive effect changes the vibrational frequency. 3

OR

10. (a) How is IR spectroscopy useful in the study of H-bonding? Explain with example. 3
 (b) Calculate the normal modes of vibration in CO_2 and H_2O molecule. 1
 (c) Comment on the stretching frequencies for the given copper-halogen bonds : 3

<i>Complex</i>	:	$[\text{CuCl}_2]$	$[\text{CuBr}_2]$	$[\text{CuI}_2]$
$(\nu_{\text{Cu-X}})$ (in cm^{-1})	:	300	193	148
