

# VI/CHEM (x)

2014

( 6th Semester )

CHEMISTRY

TENTH PAPER

Course No. : CHEM-362

( Inorganic Chemistry—III )

Full Marks : 55

Time : 2 hours

( PART : B—DESCRIPTIVE )

( Marks : 35 )

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

1. (a) What are the three broad classes of organometallic compound? Cite an example of each type. 3
- (b) Describe the bonding in metal carbonyl compounds. Draw the structures of  $\text{Fe}_2(\text{CO})_9$  and  $\text{Cr}(\text{CO})_6$ . 4

OR

2. (a) What is synergic bonding? Explain the fact that the CO group forms stable carbonyls with metal though it is a weak ligand. 3

(b) How is lithium magnesium chloride prepared? Discuss one characteristic property and application of lithium magnesium chloride. 4

3. (a) What is cooperativity effect in hemoglobin? Explain. 3

(b) What are silicones? How is  $(R_3Si)O$  made? Draw its structure. 4

OR

4. (a) Discuss briefly the role of myoglobin and hemoglobin in biological system.  $1\frac{1}{2} + 1\frac{1}{2} = 3$

(b) How does an inorganic polymer differ from an organic polymer? Illustrate with suitable example. 1

(c) How is  $(-PNCl_2-)$  made? Give its structure. Mention one of its application. 3

5. (a) What is lanthanide contraction? Explain the causes of lanthanide contraction. 1+2=3
- (b) Discuss in brief the colour and absorption spectra of actinide ions. 4

**OR**

6. (a) Compare the lanthanides and actinides in terms of their electronic configurations and oxidation states. 1½+1½=3
- (b) Discuss separation of lanthanides by ion exchange method. 4
7. (a) What is Curie law? Why was it modified to give Curie-Weiss law? Explain. 3
- (b) The complex  $[\text{NiCl}_4]^{2-}$  is paramagnetic with two unpaired electrons, while  $[\text{Ni}(\text{CN})_4]^{2-}$  is diamagnetic. Explain. 4

**OR**

8. (a)  $[\text{FeF}_6]^{3-}$  has magnetic moment of 5.9 BM whereas  $[\text{Fe}(\text{CN})_6]^{3+}$  has a value of 1.7 BM. Explain. 3
- (b) Make plots of magnetic susceptibility vs. temperature in case of paramagnetic, ferromagnetic and antiferromagnetic compounds and explain the difference. 4

9. (a) Discuss the IR spectra of metal-halogen bond. 3
- (b) Discuss in brief the Raman effect. 4

OR

10. (a) The IR spectra for *trans*-[Pd(NH<sub>3</sub>)<sub>2</sub>Cl<sub>2</sub>] and *cis*-[Pd(NH<sub>3</sub>)<sub>2</sub>Cl<sub>2</sub>] show the following  $\nu_{\text{Pd-N}}$  and  $\nu_{\text{Pd-Cl}}$  vibrational frequencies (in cm<sup>-1</sup>) :

	$\nu_{\text{Pd-N}}$	$\nu_{\text{Pd-Cl}}$
<i>trans</i> -[Pd(NH <sub>3</sub> ) <sub>2</sub> Cl <sub>2</sub> ]	496	333
<i>cis</i> -[Pd(NH <sub>3</sub> ) <sub>2</sub> Cl <sub>2</sub> ]	495; 476	327; 306

Comment on the observed IR band. 3

- (b) Discuss why the symmetric ( $\nu_1$ ) stretching of carbon dioxide molecule is Raman active, whereas, the bending mode ( $\nu_2$ ) and asymmetric stretching mode ( $\nu_3$ ) are Raman inactive. 4

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**( 6th Semester )**

**CHEMISTRY**

**TENTH PAPER**

**Course No. : CHEM-362**

**( Inorganic Chemistry—III )**

**( PART : A—OBJECTIVE )**

**( Marks : 20 )**

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

**SECTION—I**

**( Marks : 5 )**

Put a Tick (✓) mark against the correct answer in the brackets provided for it : 1×5=5

**1. In the formation of M—CO  $\pi$ -bond, metal atom acts as electron**

**(a) acceptor (    )**

**(b) donor (    )**

**(c) stabiliser (    )**

**(d) None of the above (    )**

( 2 )

2. Hemoglobin is found in

- (a) red blood cells ( )
- (b) brain cells ( )
- (c) stem cells ( )
- (d) None of the above ( )

3. The most common oxidation state of lanthanide is

- (a) + 2 ( )
- (b) + 3 ( )
- (c) + 4 ( )
- (d) + 7 ( )

4. The magnetic moment of  $[\text{MnBr}_4]^{2-}$  is 5.9 BM. The geometry of this complex ion is

- (a) square planar ( )
- (b) tetrahedral ( )
- (c) octahedral ( )
- (d) None of the above ( )

VI/CHEM (x)/557

5. Water molecule,  $\text{H}_2\text{O}$ , has the following normal modes of vibration

(a) 1 ( )

(b) 2 ( )

(c) 3 ( )

(d) 4 ( )

( 4 )

SECTION—II

( Marks : 15 )

Answer the following questions :

3×5=15

1. Why are CO and NO called  $\pi$ -acid ligand? Write the salient features of bonding involved in linear mononuclear metal carbonyl.

( 5 )

2. Write a short note on metalloenzymes of zinc.

3. Discuss the magnetic properties of  $M^{+}$  (lanthanides) ions.

( 7 )

4. Write short notes on ferromagnetism and antiferromagnetism.

( 8 )

5. Discuss the conditions required for a molecule to be IR active.

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VI/CHEM (x)