2015

(6th Semester)

CHEMISTRY

TENTH PAPER

Course No. : CHEM–362

(Inorganic Chemistry—III)

Full Marks : 55

Time : 2½ hours

(PART : B—DESCRIPTIVE)

(*Marks* : 35)

The figures in the margin indicate full marks for the questions

1. *(a)* Describe the structure and modes of bonding in the following : 2+2=4

(i) $Ni(CO)_4$

(ii) $Co_2(CO)_4$

(b) Write a short note on organometallic compounds of magnesium. 3

OR

2. *(a)* What are different modes of bonding of NO in metal nitrosyls? Give appropriate example of each. 4

(b) Describe a method of preparation and uses of organometallic compounds of tin. 3

3. *(a)* Compare the structural features of deoxygenated haemoglobin and oxygenated haemoglobin. 3½

(b) What are silicones? Write some of their uses. 3½

OR

4. *(a)* Describe coordination around zinc ion and the function of carbonic anhydrase. 2+1=3

(b) What are phosphazines? Mention one method of preparation of phosphazines. 2

(c) Discuss the structure of $(PNCl_2)_3$. 2

5. *(a)* What are lanthanides? Discuss briefly the following properties of lanthanides : 2

(i) Electronic configuration

(ii) Colour of tripositive ions

(Continued)

(b) How do you separate lanthanides by ion-exchange method? 2

(c) Point out similarities between lanthanides and actinides. 3

OR

6. (a) Mention any two consequences of lanthanide contraction. 2

(b) Mention any two uses of lanthanides and their compounds. 2

(c) Describe the tendency of complex formation in actinides. 3

7. (a) Draw plots of magnetic susceptibility vs. temperature in case of paramagnetic and ferromagnetic compounds and explain the difference. 3

(b) Explain the magnetic behaviour of the following compounds : 2×2=4

(i) $K_4[Fe(CN)_6]$

(ii) $K_3[CoF_6]$

OR

8. (a) What is magnetic susceptibility? How do you deduce magnetic moment from magnetic susceptibility? 1+3=4

(b) Write Curie's law and Curie-Weiss law. Explain the improvement incorporated in Curie-Weiss law over Curie's law. 3

9. (a) Discuss the conditions required for a molecule to be IR active. 4

(b) Illustrate in brief about Raman effect using a suitable energy-level diagram. 3

OR

10. (a) Predict the number of normal vibrational modes for a CO_2 molecule and mention whether they are IR active. 3

(b) Discuss the Raman spectra of—

(i) CO_2;

(ii) N_2O. 2+2=4

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(PART : A—OBJECTIVE)

(*Marks* : 20)

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SECTION—A

(*Marks* : 5)

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

1. Which of the following is a π-acid ligand?

(a) NH_3 ( )

(b) CO ( )

(c) F^- ( )

(d) Ethylene diamine ( )

2. The paramagnetism in substances

(a) is independent of temperature and strength of magnetic field ( )

(b) shows large decrease below Curie temperature ( )

(c) varies inversely with temperature and independent of the strength of magnetic field ( )

(d) None of the above ( )

3. Which of the following is not an organometallic compound?

(a) CH_3MgBr ( )

(b) $(C_2H_5)_4Pb$ ( )

(c) $(CH_3)_3SnX$ ( )

(d) $Al(OC_2H_5)_3$ ( )

4. The most stable oxidation state of lanthanides is

(a) +1 ( )

(b) +2 ( )

(c) +3 ( )

(d) +4 ( )

5. Haemoglobin

(a) acts as an oxygen carrier ( )

(b) contains Mg ( )

(c) contains both Mg and Fe ( )

(d) None of the above ( )

SECTION – B

(*Marks* : 15)

Answer the following questions : 3×5=15

1. Mention the uses of organometallic compounds.

2. Discuss the importance of Na^+ and K^+ ions in the biochemical processes.

3. How can you differentiate a diamagnetic material from an antiferromagnetic material?

4. Write a note on synergic bonding

8. Differentiate between Raman spectroscopy and Infrared spectroscopy Discuss it with example.

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