2016

(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 bonding in $[Mn_2(CO)_{10}]$. 2

(b) What are π-complexes? Explain the nature of bonding in organometallic compounds. 1+2=3

(c) How are organometallic compounds classified into two classes? 2

OR

2. *(a)* Discuss the structure and mode of hybridization in $Fe(CO)_5$. 2

(b) Write one method of preparation of $[Ni(CO)_4]$. 2

(c) What is Grignard reagent? How will you use it for preparation of alcohol from carbonyl compounds? 1+2=3

3. *(a)* Describe the separation of Lanthanides by ion-exchange method. 2

(b) What are transuranic elements? Give any common property among themselves. 1+1=2

(c) Contrast the similarities and dissimilarities between Lanthanides and Actinides. 2

(d) What is the most common oxidation state of Lanthanides? 1

OR

4. *(a)* What is Lanthanide contraction? Discuss its consequences. 1+2=3

(b) Write a note on 'colour of M^{3+} actinide ions'. 2

(c) Describe the ability of complex formation in Lanthanides. 2

5. (a) What is carbonic anhydrase? Discuss its function in biological system. 1+2=3

(b) Describe the role and mechanism of oxygen binding of haemoglobin. 3

(c) Name the element present in the active part of carboxypeptidase. 1

OR

6. (a) What are silicones? Discuss one method of preparation of linear silicones. 1+2=3

(b) How will you differentiate between organic polymers and inorganic polymers? 2

(c) Write some uses of phosphazenes. 2

7. (a) What do you understand by magnetic induction? 1½

(b) Compare the magnetic behaviours of $[Fe(CN)_6]^{3-}$ and $[FeF_6]^{3-}$. State the mode of hybridization of iron in the two coordinate compounds. 2+2=4

(c) Determine the magnetic moment of Cr^{2+} ion. 1½

OR

8. (a) What is Curie law? Why is it modified to give Curie-Weiss law? 1+1½=2½

(b) Discuss the variation of magnetic susceptibility with temperature for ferromagnetic and paramagnetic substances. 2½

(c) Write a note on 'orbital magnetic moment' for an atom having one electron. 2

9. (a) Compare the stretching frequencies for the given carbon-halogen bonds : 2½

C—F, C—Cl, C—Br

(b) Mention some applications of IR spectroscopy. 2

(c) Discuss the factors on which vibrational energy depends. 2½

OR

10. (a) Differentiate between 'Stokes lines' and 'anti-Stokes lines' in Raman spectra. 2

(b) Point out the differences between Raman spectroscopy and infrared spectroscopy. 2

(c) What do you understand by the term 'Raman shift'? 2

(d) Calculate the number of fundamental modes of vibration for CO_2. 1

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Subject Code : CHEM/VI/10

Booklet No. A

Date Stamp .....

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To be filled in by the Candidate

DEGREE 6th Semester
(Arts / Science / Commerce / .....) Exam., **2016**

Subject .....
Paper .....

INSTRUCTIONS TO CANDIDATES

1. **The Booklet No. of this script should be quoted in the answer script meant for descriptive type questions and vice versa.**
2. **This paper should be ANSWERED FIRST and submitted within** *45 minutes* **of the commencement of the Examination.**
3. **While answering the questions of this booklet, any cutting, erasing, over-writing or furnishing more than one answer is prohibited. Any rough work, if required, should be done only on the main Answer Book. Instructions given in each question should be followed for answering that question only.**

To be filled in by the Candidate

DEGREE 6th Semester
(Arts / Science / Commerce / .....) Exam., **2016**

Roll No. .....
Regn. No. .....

Subject .....
Paper .....

Descriptive Type
Booklet No. B .....

Signature of Scrutiniser(s) *Signature of Examiner(s)* *Signature of Invigilator(s)*

/337

2016

(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—A

(*Marks* : 5)

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

1. The properties of actinides are considerably different from each other due to the small difference between

(a) 3*d* and 4*d* ( )

(b) 4*f* and 5*f* ( )

(c) 5*f* and 6*d* ( )

(d) None of the above ( )

2. The oxidation state of iron in deoxyhemoglobin is

(a) +2 ( )

(b) +3 ( )

(c) 0 ( )

(d) +4 ( )

3. The most convenient spectroscopic technique to establish the presence of intermolecular hydrogen bonding in hydroxy compounds is

(a) UV spectroscopy ( )

(b) IR spectroscopy ( )

(c) EPR spectroscopy ( )

(d) mass spectroscopy ( )

4. The general electronic configuration of Lanthanides is

(a) $4f^{1-14}\,5d^{0-1}\,6s^2$ ( )

(b) $5f^{1-14}\,6d^{0-1}\,7s^2$ ( )

(c) $7f^{1-14}\,8d^{0-1}\,9s^2$ ( )

(d) $6f^{1-14}\,7d^{0-1}\,8s^2$ ( )

5. For a non-linear molecule, the number of modes of vibration is given by

(a) $2n - 4$ ( )

(b) $3n - 6$ ( )

(c) $3n - 5$ ( )

(d) None of the above ( )

SECTION—B

(*Marks* : 15)

Answer the following questions : 3×5=15

1. Write a note on 'back bonding' in metal carbonyl compounds.

2. Discuss the magnetic property of Lanthanides having M^{3+} ions.

3. Explain, why $[Fe(CO)_5]$ is diamagnetic.

4. Discuss the structure and bonding in tricyclophosphazene, $[NPCl_2]_3$.

5. Give reasons why some vibrational modes of carbon dioxide (CO_2) are Raman active and IR inactive.

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