TDC Odd Semester Exam., 2020
held in July, 2021

CHEMISTRY

(Honours)

(3rd Semester)

Course No. : CHMH–301

(Inorganic Chemistry—III)

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)* Define first-order and second-order innermetallic complexes. 2

(b) Why is a terminal ligand so called? Contrast such a ligand with a bridging one. Define nuclearity of a complex. 1+1+1=3

(c) Draw the structures of any *two* of the following ligands : 1×2=2

(i) 18-crown-6

(ii) (2.2.1) crypt

(iii) The parent porphyrin ring

2. *(a)* Write the IUPAC names (2005) of the following : 1×2=2

(i) 

(ii) $[Co(NH_3)_6]\,[Cr(C_2O_4)_3]$

(b) What are the stereochemistries possible for a complex of type $[ML_5]$? Give examples. 1+2=3

(c) How does colour change principle help in detection of complex formation? 2

UNIT—II

3. *(a)* How is manganese extracted from its most important ore? 3

(b) Lanthanum exhibits +3 oxidation state whereas certain other elements of lanthanum series show +2 and +4 also. Explain. 3

(c) Comment on the colour of scandium (III) ion. 1

4. *(a)* Give an account for the colour exhibited by compounds of lanthanum series. 3

(b) How can chrome alum be prepared from potassium dichromate? 2

(c) How is scandium series different from lanthanum series in respect of complex formation? 2

UNIT—III

5. *(a)* "Covalent contribution is the main force in formation of an H_2 molecule in terms of VBT." Elucidate. 3

(b) Define resonance and resonance energy. Draw all the canonical structures of benzene. 2+2=4

6. *(a)* Discuss the natures and relative strength of Debye, Keesom and London forces. 3

(b) Explain the structure of SF_4 and BrF_5 in terms of VSEPR theory. 2+2=4

UNIT—IV

7. *(a)* In the light of band theory, explain the properties of semiconductor. 3

(b) Name and give the formulae of four pseudohalogens. Write two reactions showing the resemblance of pseudo-halogens with halogens. 2+2=4

8. *(a)* What are interhalogen compounds? How are they prepared? Write two important properties of interhalogen compounds. 1+1+2=4

(b) Give the formulas and preparations of Caro's and Marshall's acids. 1½+1½=3

UNIT—V

9. *(a)* Write two methods of preparation of metal carbonyls. Explain the synergic effect with respect to bonding in carbonyls. 2+2=4

(b) Explain the tetragonal distortion in $[PtCl_4]^2$. Comment on its magnetic properties. 2+1=3

10. *(a)* What is SHAB principle? On the basis of this principle, state why $[Ag(CN)_2]$ is stable whereas $[AgCl_2]$ is unstable. 2+2=4

(b) The stretching frequencies in $[Ni(CO)_4]$, $[Co(CO)_4]$ and $[Fe(CO)_4]^2$ are ~2060 cm ^{1}, ~1890 cm ^{1} and ~1790 cm ^{1} respectively. Explain this decreasing order on the basis of metal-CO bonding. 3

★ ★ ★