PG Odd Semester (CBCS) Exam., December—2018

CHEMISTRY

(1st Semester)

Course No. : CH–101 (C)

(Inorganic Chemistry—I)

Full Marks : 75
Pass Marks : 30

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer **five** questions taking **one** from each Unit

UNIT—I

1. *(a)* Furnish Schoenflies notation for the following species : 2×4=8

(i) BrF_5

(ii) CH_2Cl_2

(iii) CO_3^2

(iv) H—C≡C—X

(b) What attributes lead to point group C_1 and C_s? Illustrate with suitable example. 4

(c) From symmetry criteria, how would you explain zero dipole moment for CO_2? 3

2. *(a)* Work out the symmetry point groups of the following species : 2×4=8

(i) NH_2Cl

(ii) $CHCl_3$

(iii) Phenol

(iv) BH_4

(b) Based on symmetry criteria, examine if Fe(acac)$_3$ would be optically active or not. 4

(c) Which form (*cis* or *trans*) of the complex $[ML_4X_2]$ would possess higher symmetry? 3

UNIT—II

3. *(a)* Explain the bond order of N_2 and N_2 and also the number of odd electron based on MOT concept. 4

(b) Using VSEPR concept, draw the structure of the following species (give explanation) : 2×3=6

(i) $BeCl_2$

(ii) XeF_5

(iii) CD_3^2

(c) Make a brief comparative assessment of Pauling's and Mulliken's scale of electronegativity. 5

4. *(a)* Write brief notes on the following : 3×2=6

(i) Chemical hardness

(ii) *p*-type semiconductor

(b) $[IF_6]$ is not a regular octahedral. Rationalise. 4

(c) Define the term 'valence bond' and 'conduction bond', and hence explain 'insulator'. Give suitable example. 5

UNIT—III

5. *(a)* What are metalloborane? How $[Fe(CO)_3B_4H_8]$ may be prepared? Give chemical reaction and its structure. 6

(b) How is $(Cl_2PN)_4$ synthesised? How would you access $[(CH_3O)_2PN]_4$ from this? 4

(c) Write notes on the following : 2½×2=5

(i) Isopoly anions

(ii) S_4N_4

6. *(a)* Apply Wade's rule to predict the structure of the following : 4

(i) B_5H_9

(ii) B_5H_{11}

(b) Write short notes on the following : 4

(i) Kaolinite

(ii) Fullerenes

(c) How is peroxomonosulphuric acid, H_2SO_5 prepared? Briefly state its applications. 4

(d) How S_4^2 may be prepared? Give its structure. 3

UNIT—IV

7. *(a)* Write short notes on the following : 5

(i) Photochemical smog

(ii) Acid rain

(b) Render an account of occurrence of arsenic in groundwater highlighting the toxicity aspect. 5

(c) Discuss how the concentration gradient is maintained across the cell membrane. 5

8. *(a)* Give an account of pollution in natural waterbodies due to phosphates. 5

(b) Briefly discuss the occurrence and role of essential elements in living system. 5

(c) Write notes on the following : 2½×2=5

(i) Valinomycin

(ii) Cotoxicity

UNIT—V

9. *(a)* Distinguish between an inner and an outer sphere electron transfer reaction. Cite one example of each type. 5

(b) Draw and explain the reaction profile diagram of associative and dissociative reactions. 5

(c) The rate constant for the replacement of Cl by H_2O in *cis*-$[PtClL(PEt_3)_2]$ is given as

L =	Pyridine	2-Me-py	2,6-diMe-py
K_r/s^{-1}	8×10^{-2}	2×10^{-4}	1×10^{-6}

Explain. 5

10. *(a)* Giving suitable example, explain the concept of *trans*-effect. 5

(b) What type of species are referred as the 'bent sandwich' compounds? Comment on their structure taking a suitable example. 5

(c) Discuss the base hydrolysis reaction of $[CoCl(NH_3)_5]^{2+}$. 5

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