AT–377

B.Sc. (Part-III) Semester-V Examination

5S : CHEMISTRY

Time : Three Hours] [Maximum Marks : 80

Note :— (1) Question No. **1** is compulsory.

(2) Solve **ONE** question from each unit.

(3) Draw diagrams and give equations wherever necessary.

(4) Use of calculator is allowed.

1. (a) Fill in the blanks : 2

(i) $Zn[CoCl_2(NH_3)_4]Cl$, the co-ordination number of Co is _____.

(ii) The extent of ionic character of C-M bond depends on _____ nature of the metal.

(iii) The spacing distance between two adjacent spectral lines in rotational spectra is constant and it is equal to _____.

(iv) Pesticides which are used to destroy unwanted weeds in the crop are called _____.

(b) Select the correct alternatives : 2

(i) In Pyrrole, nitrogen atom is in a state of _____ hybridization.

(a) sp (b) sp^2

(c) sp^3 (d) sp^3d

(ii) Methyl orange is an example of :

(a) Nitroso dye (b) Phthalein dye

(c) Azo dye (d) Anthroquinone dye

(iii) The selection rule for vibrational transition is :

(a) $\Delta V = \pm 2$ (b) $\Delta J = \pm 1$

(c) $\Delta V = \pm 1$ (d) $\Delta J = 0$

(iv) The velocity of electromagnetic radiation is :

(a) 2×10^7 m/sec (b) 3×10^8 m/sec

(c) 4×10^9 m/sec (d) 5×10^8 m/sec

(c) Answer in one sentence : 4

(i) Write the correct formula of hexachloroplatinate (IV) ion.

(ii) What is chemiluminescence ?

(iii) What is Rayleigh line ?

(iv) What are antipyretics ?

UNIT—I

2. (a) Describe the postulates of Werner's theory of coordination compounds. 4

(b) Explain the structure and magnetic properties of $[Ni(CN)_4]^{2-}$ complex ion on the basis of VBT. 4

(c) Identify the coordination number and oxidation state of central metal ion in following complexes :

(i) $[Cu(NH_3)_4]SO_4$

(ii) $K_4[Fe(CN)_6]$ 4

OR

3. (p) Write the IUPAC names of following :

(i) $[Co(en)_2Cl_2]_2SO_4$

(ii) $K_3[Al(C_2O_4)_3]$ 4

(q) Define the following terms giving example :

(i) Ligand

(ii) Coordination number. 4

(r) What are chelates ? Give their any three applications. 4

UNIT—II

4. (a) Discuss crystal field splitting in octahedral complexes. 4

(b) What is an orgel diagram ? Draw orgel diagram for octahedral d^1 and d^9 complexes. 4

(c) The value of Δ_0 for $[Mn(H_2O)_6]^{3+}$ and $[Mn(CN)_6]^{3-}$ are 21000 cm^{-1} and 38500 cm^{-1} respectively. Calculate CFSE. if pairing energy P is 28000 cm^{-1}. 4

OR

5. (p) Give the distribution of electron in weak field and strong field octahedral complexes for the following configuration :

(i) d^4 and

(ii) d^7. 4

(q) Discuss spectrochemical series in detail. 4

(r) Calculate ground state term symbol for d^3 system. 4

UNIT—III

6. (a) How will you prepare :

(i) Pyrrole from succinimide

(ii) 2-Aminopyridine from pyridine. 4

(b) Compare the basicity of pyrrole with pyridine. 4

(c) Complete the following reactions :

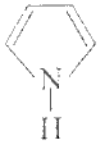
(i) $CH_3MgBr + CH_2 = CH-CH_2-Br \rightarrow ? + ?$

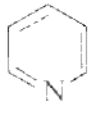
(ii) $CH_3Li + CO_2 \longrightarrow ? \xrightarrow{H_2O/H^+} ? + LiOH$ 4

OR

7. (p) Discuss the orientation of electrophilic substitution in pyridine. 4

(q) Complete the following reactions :

(i)  $+ SO_3 \xrightarrow[C_2H_4Cl_2]{\text{Pyridine}} ?$

(ii)  $+ NaNH_2 \xrightarrow[HCl]{\text{liq-NH}_3} \longrightarrow$ 4

(r) Explain molecular orbital structure of pyrrole. 4

UNIT—IV

8. (a) Give the method of preparation and properties of crystal violet dye. 4

   (b) Give the synthesis of chloroquine from 4, 7-dichloroquinoline. 4

   (c) What are pesticides ? How are they classified ? 4

OR

9. (p) What are azo dyes ? Give the preparation and uses of methyl orange. 4

   (q) How the drug sulphadiazine is prepared ? Give its uses. 4

   (r) Give the method of preparation and uses of Thiram. 4

UNIT—V

10. (a) What is quantum yield ? Give the reasons for low quantum yield. 4

    (b) Draw Jablonski diagram and explain non-radiative processes. 4

    (c) When a substance 'A' was exposed to light, 0.002 mole of it reacted in 20 min. and 4 sec. In the same time 'a' absorbed 2×10^6 photons of light per second. Calculate the quantum yield of a reaction. ($N = 6.023 \times 10^{23}$) 4

OR

11. (p) What are photosensitized reactions ? Give two examples. 4

    (q) State and explain :

    (i) Grotthus-Draper's law

    (ii) Stark-Einstein's law. 4

    (r) Calculate the energy associated with (a) one photon and (b) one Einstein of radiation of wave length 8000 Å. ($h = 6.6256 \times 10^{-34}$ J.sec, $c = 3 \times 10^8$ m.sec^{-1}, $N = 6.023 \times 10^{23}$) 4

UNIT—VI

12. (a) Derive the relation between moment of inertia and bond length of rigid rotator. 4

    (b) Which of the following molecules give rotational spectra and why ?

    (i) $CO_{(g)}$

    (ii) $O_{2(g)}$

    (iii) $HBr_{(g)}$

    (iv) $NO_{(g)}$ 4

(c) Calculate the energy of photon associated with radiations having wavelength 4000×10^{-10} m and 6000×10^{-10} m respectively. 4

OR

13. (p) Explain the formation of Stoke's and Anti-Stoke's lines on the basis of quantum theory. 4

(q) What is electromagnetic spectrum ? Name at least four regions of electromagnetic spectrum. 4

(r) For HCl, the frequency difference between successive absorption lines has been found to be 20.7 cm^{-1}. Find the bond length for HCl molecule in the rotational spectrum. (mH = 1.08 amu, mCl = 35.5 amu) 4