B.Sc. (Part—III) Semester-V Examination
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) Triplet states have _____ life time than that of singlet state.

(ii) A chromogen without _____ can never act as a dye.

(iii) The ligand that has two or more donor atoms for bonding is called _____.

(iv) The chemical substances used to lower down malarial fever are called _____.

(B) Select proper answer from the given alternatives : 2

(i) Alizarin is :

(a) Direct dye (b) Ingrain dye

(c) Mordant dye (d) Vat dye

(ii) Which of the following lines are not Raman lines ?

(a) Anti-stokes line (b) Balmer lines

(c) Stokes lines (d) Rayleigh lines

(iii) The value of resultant spin quantum number s for triplet state energy level is :

(a) 3 (b) 1

(c) 0 (d) 2

(iv) Substitution of an electrophile in pyrrole occurs at position number :

(a) 3 and 4 (b) 3

(c) 2 (d) 1

(C) Answer in **ONE** sentence : 4

(i) Define quantum yield.

(ii) What type of molecules give rotational spectra ?

(iii) What is the name of Thiram ?

(iv) What is crystal field splitting energy ?

UNIT—I

2. (A) Define the following terms : 4

   (i) Ligand

   (ii) Coordination Number.

   (B) What are inner and outer orbital octahedral complexes ? Explain with suitable examples. 4

   (C) Give the postulates of Werner's theory. Explain its applications to $[Co(NH_3)_6]Cl_3$. 4

OR

3. (P) Explain EAN concept. Calculate EAN in the following : 4

   (i) $[\underline{Cr}(NH_3)_6]^{3+}$

   (ii) $[\underline{Fe}(H_2O)_6]^{2+}$

   (Q) What are Chelates ? Give example of bidentate compounds. 4

   (R) Explain electronic structure and magnetic property in the (i) $[Co(NH_3)_6]^{3+}$ and (ii) $[Fe(H_2O)_6]^{3+}$. 4

UNIT—II

4. (A) Explain the factors affecting the magnitude of crystal field splitting energy (Δ_0) in octahedral complexes. 4

   (B) Calculate the CFSE of the following complexes : 4

   (i) $[Mn(H_2O)_6]^{3+}$

   (ii) $[COF_6]^{3-}$

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

OR

5. (P) Explain electronic spectra of $[Ti(H_2O)_6]^{3+}$. 4

   (Q) Explain high spin and low spin complexes on the basis of Δ_0 and pairing energy. 4

   (R) Arrange the following ligands in the increasing order of their splitting electrostatic crystal field : 4

   (i) CN^-, NH_3, Cl^-, H_2O

   (ii) F^-, Cl^-, I^-, Br^-

UNIT—III

6. (A) Give the synthesis of following : 4

   (i) Pyridine from acetylene

   (ii) Pyrrole from succinimides.

   (B) Explain why pyridine is more basic than pyrrole. 4

(C) Complete the following reactions : 4

(i) $CH_3—Li + H_2O \longrightarrow ?$

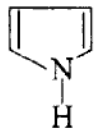
(ii) $CH_3—Mg—Br + \underset{\diagdown O \diagup}{CH_2——CH_2} \longrightarrow ? \xrightarrow{H_2O} ? + ?$

OR

7. (P) Discuss the orientation of electrophilic substitution in pyrrole. 4

(Q) Complete the following reactions : 4

(i)  $+ \underset{H_2SO_4}{\text{Fumming}} \longrightarrow ?$

(ii)  $+ 2\ SO_2Cl_2 \longrightarrow ?$

(R) What happens when : 4

(i) Methyl magnesium bromide is treated with formaldehydes

(ii) Methyl lithium is treated with acetone ?

UNIT—IV

8. (A) Explain : 4

(i) Ingrain dye

(ii) Disperse dye.

(B) What are sulpha drugs ? Give the synthesis of sulphanilamide. 4

(C) Give the synthesis and uses of malathion. 4

OR

9. (P) What are antimalarial drugs ? Give the synthesis of chloroquine. 4

(Q) Give the synthesis and uses of Alizarin. 4

(R) Explain : 4

(i) Fungicides

(ii) Rodenticides.

UNIT—V

10. (A) Explain energy transfer process in photosensitized reactions. 4

(B) State and explain Lambert-Beer's Law. 4

(C) Draw Jablonski diagram and explain the terms : 4

(i) Inter System Crossing (ISC)

(ii) Internal Conversion (IC).

OR

11. (P) Explain primary and secondary processes involved in photochemical reactions. 4

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

(R) State the law of Photochemical equivalence. Calculate the energy of one einstein of a light of wavelength 3000 Å.

(Given N = 6.023×10^{23}, h = 6.62×10^{-34} J.sec and c = 3×10^{8} msec^{-1}) 4

UNIT—VI

12. (A) Explain the terms : 4

(i) Zero point energy

(ii) Force constant.

(B) Give the selection rule for the following transition : 4

(i) Pure rotational

(ii) Pure vibrational

(iii) Rotational Raman

(iv) Vibrational Raman.

(C) Internuclear distance in HF molecule is 0.092 nm. Calculate moment of inertia of HF molecule.

(Given : MH = 1.00 amu, MF = 19.00 amu, 1 amu = 1.66×10^{-27} kg) 4

OR

13. (P) Explain the formation of Rayleigh, Stokes and Antistokes lines in the Raman spectrum of molecule on the basis of quantum theory. 4

(Q) Calculate the vibrational degree of freedom for CO_2 and H_2O. 4

(R) Explain with examples : 4

(i) Microwave active molecules

(ii) Microwave inactive molecules.