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) Pyrrole is _____ basic than Pyridine.

(ii) Rotational constant is _____ proportional to the moment of inertia.

(iii) The complex having heterocyclic rings are called as _____.

(iv) Tetramethyl Thiuram disulfide is also known as _____.

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

(i) _____ is the production and emission of light by a living organism.

(a) Chemiluminescence (b) Bioluminescence

(c) Phosphorescence (d) Fluorescence

(ii) The CFSE for low-spin octahydral complex of d^7 ion is :

(a) $2.4\ \Delta_o$ (b) $-1.8\ \Delta_o^{+3P}$

(c) $.2\Delta_o$ (d) $-0.6\ \Delta_o$

(iii) Organomagnesium compounds are called as ____ reagents.

(a) Luca's (b) Grignard

(c) Gilman (d) Linder's

(iv) Complexes with tridentate ligands are called :

(a) Ligands (b) Chelates

(c) Complexes (d) None

(C) Answer in **ONE** sentence :— 4

(i) What is meant by Rodenticides ?

(ii) What are Chelates ?

(iii) Define zero point energy.

(iv) Define quantum yield.

UNIT—I

2. (a) Find out the number of unpaired electrons in the following species on the basis of given information : 4

(i) $[Zn(NH_3)_4]^{2+}$ — is tetrahedral complex.

(ii) $[MnCl_4]^{2-}$ —sp^3 hybridization.

(b) Explain with suitable example : 4

(i) Co-ordination sphere.

(ii) Ionization isomerism.

(c) Discuss geometrical isomerism exhibited by complexes with co-ordination number 4. 4

OR

3. (p) What are Limitations of Sidgwick's theory ? 4

(q) What is co-ordination number ? Calculate EAN of central metal ion in the following :—

(i) $[Ni(NH_3)_6]Cl_2$

(ii) $K_3[Fe(CN)_6]$ 4

(r) What are Chelates ? How they are classified ? 4

UNIT—II

4. (a) Discuss the Laporte orbital selection rule. What are the relaxations of this rule ? 4

(b) Calculate CFSE in the following Low-spin complexes :—

(i) $[Mn(CN)_6]^3$

(ii) $[CO(NH_3)_6]^{3+}$. 4

(c) Calculate the ground state term symbol for d^2 configuration. 4

OR

5. (p) Explain crystal field splitting in octahydral complexes. 4

(q) What is spectrochemical series ? Give its applications. 4

(r) In which of the following complexes the value of Δ_o will be higher ? Explain : 4

(i) $[Co(NH_3)_6]^{3+}$ **OR** $[Rh(NH_3)_6]^{3+}$

(ii) $[Fe(H_2O)_6]^{2+}$ **OR** $[Fe(H_2O)_6]^{3+}$

UNIT—III

6. (a) How will you obtain :— 4

(i) Pyridine from pentamethylene diamine hydrochloride.

(ii) Pyrrole from furan.

(b) Discuss the molecular orbital structure of pyrrole. 4

(c) How will you convert following :—

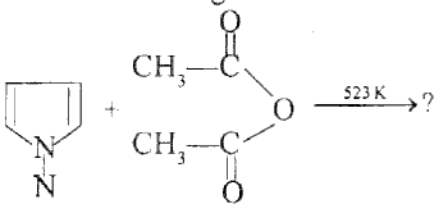
(i) Methyl magnesium bromide to ethanol

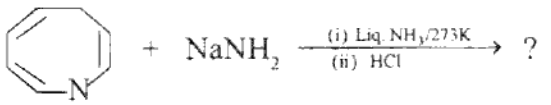
(ii) Methyl Lithium to acetic acid ? 4

OR

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

(q) Complete the following reactions :— 4

(i) 

(ii) 

(r) How will you convert the following :— 4

(i) Grignard reagent to acetone

(ii) Organo Lithium compound to isopropyl alcohol ?

UNIT—IV

8. (a) Give the synthesis and uses of methyl orange. 4

(b) What are analgesic drugs ? Give the synthesis of phenyl butazone. 4

(c) Write a short note on :— 4

(i) Insecticides

(ii) Herbicides.

OR

9. (p) Give the synthesis and uses of sulphadiazine. 4

(q) What are Pesticides ? Give the synthesis of 2, 4, D. 4

(r) Give the structure and uses of following compounds :— 4

(i) Crystal violet

(ii) Phenolphthalein.

UNIT—V

10. (a) Explain the kinetics of photochemical decomposition of HI. 4

(b) Explain the following terms :— 4

(i) Photosensitized reactions.

(ii) Chemiluminescence.

(c) When propionaldehyde is irradiated with light of $\lambda = 3020$ Å, it is decomposed to form carbon monoxide.

$$CH_3CH_2CHO + h\nu \longrightarrow CH_3\text{–}CH_3 + CO.$$

The quantum yield of the reaction is 0.54. The light energy absorbed is 1.5×10^{-3} J/mole in a given time. Find the amount of CO formed in moles in the same time.

(Given $h = 6.62\times10^{-34}$ J.sec., $c = 3\times10^{8}$ msec^{-1}) 4

OR

11. (p) Explain the terms :— 4

(i) Grothus–Draper Law

(ii) Stark-Einstein Law of Photochemical equivalence.

(q) Give the reasons for high and low quantum yield of photochemical reactions. 4

(r) A substance in a cell of length '*l*' absorbs 20% of the incident light. What fraction of light will be absorbed in a cell of length *sl* ? 4

UNIT—VI

12. (a) Give the general characteristics of electromagnetic radiations. 4

(b) Explain emission spectrum and absorption spectrum. 4

(c) What is Raman Spectra ? Give the condition for Raman active molecules. 4

OR

13. (p) Explain electronic, vibrational and rotational transitions in a molecule with the help of energy level diagram. 5

(q) Derive an expression for moment of inertia of a diatomic rigid rotator. 4

(r) The wavelength of radiation is 3×10^{-6} m. Calculate wave number and frequency for the radiation ($c = 3\times10^{8}$ msec $^{-1}$). 3

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