AS–1451

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 :

(i) The ligand contains atleast one atom having a ..... of electrons.

(ii) Pyrrole can be synthesized by distilling ..... with zinc dust.

(iii) Photochemical reactions are initiated by absorption of light radiations of ..... region.

(iv) For a molecule to be microwave active it must possess ..... dipole moment. 2

(B) Select the correct alternative :

(i) Sulphadiazine is synthesized from :

(a) Acetanilide (b) Quinoline

(c) Sulphanilamide (d) Acetone

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

(a) 1 (b) 2

(c) 3 (d) 4

(iii) Transition elements form complexes readily because of :

(a) Same size of cation (b) Vacant d-orbital

(c) Large ionic charge (d) All

(iv) For Stoke's lines :

(a) $\upsilon_i > \upsilon_s$ (b) $\upsilon_i = \upsilon_s$

(c) $\upsilon_i < \upsilon_s$ (d) All 2

(C) Answer in **one** sentence :

(i) Write the formula showing relationship between number of unpaired electrons and magnetic movement ?

(ii) Write spectrochemical series ?

(iii) What are herbicides ?

(iv) Define "electromagnetic spectrum". 4

UNIT—I

2. (a) Explain the following isomerism with suitable example :

(i) Ionisation Isomerism

(ii) Linkage Isomerism. 4

(b) Calculate EAN of the underlined metal in the following complexes :

(i) $[\underline{Fe}(CN)_6]^{4-}$ (At No. of Fe = 26)

(ii) $[\underline{Ni}(NH_3)_6]^{2+}$ (At No. of Ni = 28). 4

(c) Differentiate between double salt and complex compound. 4

OR

3. (p) Explain "$Fe(CN)_6^{4-}$ is diamagnetic but $[Fe(CN)_6]^{3-}$ is paramagnetic" on the basis of VBT. 4

(q) Give the correct formula of following complexes :

(i) Hexa ammine Nickel(II) chloride

(ii) Penta ammine bromo cobalt(III) sulphate. 4

(r) Define the terms giving example :

(i) Co-ordination number

(ii) Complex ion. 4

UNIT—II

4. (a) Explain crystal field splitting in tetrahedral complexes. 4

(b) Calculate the ground state term symbol for d^1 system. 4

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

OR

5. (p) What are the limitations of Crystal Field Theory (CFT) ? 4

(q) Explain Laporate orbital selection rule for d-d transitions. 4

(r) Calculate CFSE for $[Cr(H_2O)_6]^{3+}$ for which Δ_0 is 12600 cm^{-1}. 4

UNIT—III

6. (a) How will you convert the following ?

   (i) Methyl magnesium bromide to 1-butene

   (ii) Methyl lithium to acetic acid. 4

   (b) Discuss the orientation of nucleophilic substitution in pyridine. 4

   (c) How will you obtain ?

   (i) Pyrrole from succinimide

   (ii) Pyridine from acetylene. 4

OR

7. (p) Compare the basic nature of pyrrole with pyridine. 4

   (q) Complete the following reactions :

   (i) $CH_3Li + H - \overset{\overset{O}{\|}}{C} - H \longrightarrow ?$

   (ii) $CH_3MgBr + H_2C\diagup\!\!\diagdown^{O}\!\!\diagup\!\!\diagdown CH_2 \longrightarrow ? \xrightarrow{\text{Hydrolysis}} CH_3CH_2CH_2OH$ n-propanol 4

   (r) At what positions pyrrole undergoes electrophilic substitution ? Give reasons. 4

UNIT—IV

8. (a) Give the preparation and uses of alizarin. 4

   (b) Give the preparation and uses of sulphadiazine. 4

   (c) Explain the following terms :

   (i) Rodenticides

   (ii) Pesticides. 4

OR

9. (p) Give the preparation and uses of crystal violet. 4

   (q) What are sulphadrug ? How sulphanilamide is prepared ? 4

   (r) (i) What are fungicides ? Give examples.

   (ii) What are herbicides ? Give example. 4

UNIT—V

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

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

(c) The quantum yield for the reaction of decomposition of HI is 2. Calculate the number of photons absorbed in an experiment in which 0.01 moles of HI are decomposed. ($N = 6.023 \times 10^{23}$) 4

OR

11 (p) State and explain Lambert's law. 4

(q) Explain energy transfer processes in photosensitized reactions. 4

(r) Calculate the energy of a photon and an einstein of radiation of wavelength 4000 Å ?

Given : $h = 6.62 \times 10^{-34}$ J.sec

$c = 3 \times 10^{8}$ m sec^{-1}

$N = 6.023 \times 10^{23}$ 4

UNIT—VI

12. (a) Explain :

(i) Emission spectrum

(ii) Absorption spectrum. 4

(b) Show that spectral lines in the rotational spectrum of diatomic rigid rotator are equispaced (or equidistant). 4

(c) Calculate the wave number in m^{-1} of the radiation of frequency 1.5×10^{15} s^{-1} and 5×10^{16} s^{-1}.

Cc = 3×10^{8} m sec^{-1}. 4

OR

13. (p) Explain pure rotational Raman spectrum of a diatomic molecule. 4

(q) Draw energy level diagram and explain rotational, vibrational and electronic transitions in a molecule. 4

(r) Internuclear distance in HF molecule is 0.92 Å and reduced mass of HF is 1.578×10^{-27} kg. Calculate moment of inertia of HF molecule. 4