spacing of 12.8 cm^{-1}. Calculate the bond length for HI. (mH = 1amu, mI = 127 amu) 4

OR

13. (p) Which of the following molecules give rotational spectra and why?

(i) $HF_{(g)}$

(ii) $NO_{(g)}$

(iii) N_2

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

(q) What is electromagnetic spectrum ? Name and give the wavelength range of atleast 3 types of electromagnetic radiation. 4

(c) Calculate the energy of photon associated with the radiations having wave length 3000×10^{-10} m and 5000×10^{-10} m respectively. 4

Fifth Semester B. Sc. (Part – III) Examination

5S : CHEMISTRY

P. Pages : 8

Time : Three Hours] [Max. Marks : 80

Note : (1) Question No.**One** is compulsory.
(2) Solve **One** question from each unit.
(3) Draw diagrams and give equations whervere necessary.
(4) Use of calculator is allowed.

1. (a) Fill in the blanks :—

(i) Organomagnesium compounds are called as —— reagent.

(ii) In $[Co(NH_3)_6]\ Cl_3$ complex, —— are the primary valencies.

(iii) The emission of light in chemical reaction at ordinary temperature is called as ——.

(iv) —— are pest control chemicals which are used to kill rodents. 2

(b) Select the correct alternatives :—

(i) In octahedral field for the D term, mulliken symbol is.

(a) A_1g (b) T_1g

(c) T_2g and Eg (d) T_1g , T_2g and A_2g

(ii) In complex $[Fe.(NH_3)_6]^{2+}$ Fe ion is in a state of —— hybridization.

(a) sp^3d^2 (b) dsp^3

(c) d^2sp^3 (d) sp^3d.

(iii) Alizarine is ——.

(a) Direct dye (b) Ingrain dye

(c) Vat dye (d) Mordant dye.

(iv) Pyrrole is —— member heterocyclic compound.

(a) Four (b) Five

(c) Six (d) None of these 2

(c) Answer in **one** sentence.

(i) What are azodyes ?

(ii) Give the percent ionic character of organo lithium reagent.

(iii) What is the selection rule for vibrational transitions ?

(iv) Write spin only formula for the calculation of magnetic moment. 4

(c) State and explain Lambert–Beer's law. 4

OR

11. (p) State and explain :—

(i) Grothus–Draper's law.

(ii) Stark–Einstein's law. 4

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

(r) When irradiated with light of $5000\,A^0$ wave length, 1×10^{-4} mole of a substance is decomposed. How many photons are absorbed during the reaction if its quantum efficiency is 10 $(N = 6.023 \times 10^{23})$ 4

UNIT VI

12. (a) What is Raman spectrum ? How stokes and antistokes lines appear in Raman spectrum of a molecule ? 4

(b) Explain pure vibrational spectrum of a diatomic molecule considering it as a simple harmonic oscillator. 4

(c) The microwave spectrum of HI molecule consist of a series of equidistant lines with

UNIT IV

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

(b) Draw correct structure of following dyes :–

(i) Alizarine.

(ii) Crystal violet. 4

(c) Give the method of preparation and uses of Malathion. 4

OR

9. (p) How the drug chloroquine is synthesized ? Give its uses. 4

(q) Give the method of preparation and uses of methyl orange dye. 4

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

UNIT V

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

(b) What is quantum yield ? Give the reasons for high quantum yield. 4

UNIT I

2. (a) Give definition and type of isomerism shown by following complex pairs.

(i) $[Co(HN_3)_5SO_4]Br$ and $[Co(NH_3)_5Br]SO_4$

(ii) $[Co(NO_2)(NH_3)_5]Cl_2$ and $[Co(ONO)\ (NH_3)_5]Cl_2$ 4

(b) Define EAN. Calculate EAN of underlined metal in the following complexes. (At Nos. Co = 27, Cu = 29)

(i) $[\underline{Co}(NO_2)_6]^{3-}$

(ii) $[\underline{Cu}\ (NH_3)_4]^{2+}$ 4

(c) What are chelates ? Give any two examples each of bidentate and tridentate chelate. 4

OR

3. (p) Write structure from following IUPAC names.

(i) Potassium trisoxalatoaluminate (III)

(ii) Sodium dicyanoccurate (I)

(iii) Tetraminechloro nitrito–N–platinum (IV) sulphate

(iv) Potassium hexafluorochromate (II) 4

(q) Distinguish between inner orbital and outer orbital octahedral complexes. 4

(r) Discuss the V.B. Structure of $[Ni(CN_4]^{2-}$ ion. 4

UNIT II

4. (a) Explain the crystal field splitting of d–orbitals in octahedral complexes. 4

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

(c) Explain spin selection rule and Laporate orbital selection rule for d–d transitions. 4

OR

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

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

(r) Explain low spin and high spin complexes with suitable example of each. 4

UNIT III

6. (a) What happens when :—

(i) Mixture of acetylene and ammonia is passed through red hot tube.

(ii) Pyridine is heated with sodamide in liquid NH_3 at 373k followed by acidification with HCL. 4

(b) Explain the acidity and basicity of pyrrole. 4

(c) How will you obtain :—

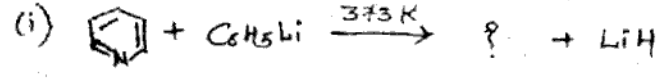
(i) Methane from methyl lithium.

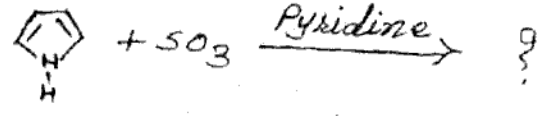
(ii) Acetic acid from methyl magnesium bromide. 4

OR

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

(q) Complete the following reactions.

(i) 

ii) 

4

(r) How will you convert :—

(i) Acetylchloride to acetone.

(ii) Acetaldehyde to isopropylalcohol by using CH_3MgBr. 4