Exam. Code : 103205
Subject Code : 1331

B.A./B.Sc. 5th Semester

CHEMISTRY

(Physical Chemistry—III)

Time Allowed—3 Hours] [Maximum Marks—35

Note :—Attempt **FIVE** questions in all, selecting at least **ONE** question from each section. The **fifth** question may be attempted from any section. All questions carry equal marks. Log Tables may be asked for.

SECTION—A

1. (a) Describe moving boundary method for the determination of transport numbers.

   (b) How will you evaluate various thermodynamic parameters i.e. ΔG, ΔH and K for a cell reaction ?

   (c) Enlist the factors affecting transport number. 3,3,1

2. Explain the difference between the following :

   (a) Specific and equivalent conductances.

   (b) Conductometric and potentiometric titrations.

   (c) Electrolytic and galvanic cells. 2,2.5,2.5

SECTION—B

3. (a) Construct a concentration cell with transference. How will you evaluate its EMF ?

   (b) How will you determine the pH of a solution by glass electrode ?

   (c) Differentiate between over-potential and liquid-junction potential. 3,2.5,1.5

4. (a) What is the cause of radioactivity ?

   (b) Tabulate the differences between :

   (i) Nuclear fission and Nuclear fusion

   (ii) Nuclear and thermal reactions.

   (c) Calculate the binding energy of $_8O^{16}$ nucleus. Given masses of proton, neutron and oxygen nucleus as 1.00782, 1.00867 and 15.99491 a.m.u. respectively. 1,3,3

SECTION—C

5. State and explain the following :

   (a) Born-Oppenheimer approximation.

   (b) Degrees of freedom.

   (c) Selection rules.

   (d) Isotope effect. 2,2,1.5,1.5

6. (a) Describe rigid rotor model for rotational spectra.

   (b) The spacing between lines in the rotational spectrum of HF molecule is 42 cm^{-1}. Calculate the moment of inertia and bond length in HF. 3,4

SECTION—D

7. (a) Describe various factors that affect the vibrational frequency of a particular group.

   (b) How do the Raman and IR spectra of the same molecule resemble and differ ? Illustrate by taking suitable examples.

   (c) The force constant of CO molecule is 1860 Nm^{-1}. Calculate the vibrational frequency in cm^{-1}. 2.5,2.5,2

8. (a) State and explain Franck-Condon principle.

   (b) Elaborate the role of Fingerprint region of IR spectroscopy in structure elucidation of organic compounds. 2,5