Exam. Code : 103205
Subject Code : 1395

B.A./B.Sc. Semester—V
CHEMISTRY (Physical Chemistry—III)

Time Allowed—3 Hours]   [Maximum Marks—35

Note :— Part–A : Attempt **ALL** the questions. Each question carries **1** mark.

           Part–B : Attempt **SIX** questions in all, selecting **TWO** questions from each Section. Each question carries **4½** marks.

           Log Tables may be asked for.

PART—A

Note :– All questions are compulsory.

1. State Ostwald's dilution law and mention its limitations.

2. Define degree of dissociation. How is it related with the equivalent conductance ?

3. What is meant by over-potential ? Give its significance.

4. Write down the thermonuclear reaction that occurs in the Sun.

5. Enlist the hazards of nuclear radiations.

6. Why water cannot be used as a solvent in IR spectroscopy ?

7. What is the significance of selection rules in molecular spectroscopy ?

276(2116)/RRA-4408   1   **(Contd.)**

8. Mention the advantages of Raman spectroscopy over IR spectroscopy. $8 \times 1 = 8$

PART—B

Note :– Attempt **SIX** questions in all, selecting **TWO** questions from each Section. Each question carries 4½ marks.

SECTION—I

9. (a) Describe Hittorf method for the determination of transport numbers.

   (b) The specific conductance of a saturated aqueous solution of barium sulphate at 300 K is 1.85×10^{-4} S m^{-1}. The ionic conductivities of Ba^{2+} and $(SO_4)^{2-}$ ions at 300 K are 64×10^{-4} and 80×10^{-4} S m^2 mol^{-1} respectively. Calculate the solubility and solubility product of barium sulphate at 300 K. 2.5,2

10. (a) Derive Nernst equation for the measurement of EMF of an electrochemical cell.

    (b) How will you find the pH of a solution by using quinhydrone electrode ?

    (c) What do you mean by buffer action ? Explain.

    2,1½,1

11. Explain the difference between the following giving suitable examples :

    (a) Electrolytic and galvanic cells

    (b) Concentration cells with and without transport

    (c) Conductometric and potentiometric titrations.

    1.5,1.5,1.5

276(2116)/RRA-4408   2   **(Contd.)**

SECTION—II

12. Tabulate the differences between the following :

    (a) Chemical and nuclear reactions

    (b) Nuclear fission and nuclear fusion

    (c) Natural and artificial radioactivity. 3×1.5

13. (a) Discuss various applications of radioactivity.

    (b) Calculate the binding energy of α-particle in ergs. Given masses of a proton, neutron and helium nucleus as 1.00758, 1.00897 and 4.00820 amu respectively.
                                                       3,1.5

14. Write notes on the following :

    (a) Nuclear Forces

    (b) Radioactive Pollution.   2.5,2

SECTION—III

15. (a) Outline the basic features of different spectrometers.

    (b) The rotational spectrum of HCl has lines 21 cm^{-1} apart. Calculate the moment of inertia and bond length in HCl.   2.5,2

16. (a) What do you understand by P, Q and R branches in vibrational-rotational spectra ? Explain.

    (b) State and explain Frank-Condon principle.

    (c) The force constant of CO molecule is 1860 Nm^{-1}. Calculate the vibrational frequency in cm^{-1}.
                                                       2,1.5,1

17. Discuss the role of Finger-print region of IR spectroscopy in structure elucidation of organic molecules.   4.5