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

CHEMISTRY

(Physical Chemistry–B)

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

(All questions are compulsory)

1. Define specific conductance. How does it vary with dilution ?

2. State Kohlrausch law. Mention its significance.

3. What is reference electrode ? Give one example.

4. Define pH and pKa.

5. Draw a conductivity curve for titration of HCl and NaOH.

6. What is buffer solution ? Give one example of buffer solution.

7. What is the cause of radioactivity ?

8. What is the significance of selection rules in spectroscopy ?

8×1

PART—B

(Attempt six questions in all, selecting two questions from each section. Each question carries 4½ marks)

SECTION—I

9. (a) Describe Arrhenius theory of electrolyte dissociation and mention its limitations.

   (b) How will you determine the solubility product of a sparingly soluble salt by conductivity measurements ?

   2.5,2

10. (a) How will you determine pH of a solution by using hydrogen electrode ?

    (b) 60 cc of silver nitrate solution contains 13.143 g of the salt. It was electrolysed using platinum electrodes. After electrolysis, 60 cc of the anode solution was found to contain 12.553g $AgNO_3$ and 1.259g Ag deposited after passing electricity. Calculate transport numbers of Ag^- and NO_3^- ions. 1.5,3

11. Write notes on the following :

   (a) Concentration cells

   (b) Corrosion

   (c) Potentiometric titrations. 3×1.5

SECTION—II

12. Explain the difference between the following :

   (a) Thermal and nuclear reactions

   (b) Binding and bond energies

   (c) Nuclear fission and nuclear fusion. 3×1.5

13. (a) Give an account of nuclear models.

   (b) Enlist important applications of radioactivity. 3,1.5

14. Write notes on the following :

   (a) Artificial radioactivity

   (b) Nuclear forces

   (c) Radioactive decay. 3×1.5

SECTION—III

15. (a) Tabulate the differences between alpha, beta and gamma radiations.

   (b) Give qualitative description of non-rigid rotor.

   (c) The force constant of CO molecule is $1870 Nm^{-1}$. Calculate the vibrational frequency in cm^{-1}.

                                              3×1.5

16. (a) Taking a suitable example, explain P, Q and R branches in vibrational-rotational spectra.

   (b) Describe the effect of anharmonic motion and isotope on the vibrational spectrum.   2.5,2

17. Explain the following :

   (a) Franck-Condon principle

   (b) Born-Oppenheimer approximation

   (c) Harmonic Oscillator. 3×1.5