

Exam. Code : 103205

Subject Code : 1401

B.A./B.Sc. 5th Semester**CHEMISTRY (PHYSICAL CHEMISTRY—III)**

Time Allowed—Three 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. What is liquid-junction potential ? Mention its significance.
2. Define equivalent conductance. How does it vary with dilution ?
3. What is the cause of radioactivity ?
4. Differentiate between binding energy and bond energy.
5. What do you mean by buffer action ? Give its mechanism.
6. Why is methanol a good solvent for UV but not for IR spectroscopy ?

7. What is meant by nuclear holocaust ?
8. Differentiate between combination bands and hot bands. 8×1

PART—B

Note :— Attempt **SIX** questions in all, selecting **TWO** questions from each section. Each question carries $4\frac{1}{2}$ marks.

SECTION—I

9. (a) How will you evaluate various thermodynamic parameters i.e. ΔG , ΔH and K for a cell reaction ?
- (b) Describe moving boundary method for the determination of transport numbers. 2.5,2
10. Define and explain the following :
- (a) Kohlrausch law
- (b) Ostwald dilution law
- (c) Specific conductance
- (d) Over-potential. 1,1,1,1.5
11. (a) How will you determine the pH of a solution by using glass electrode ?
- (b) Enlist various types of corrosion and suggest ways to prevent them. 1.5,3

SECTION—II

12. (a) Give an account of the nuclear forces.
- (b) Calculate the binding energy of ${}^8\text{O}^{16}$ nucleus. Given masses of a proton, neutron and oxygen nucleus as 1.00782, 1.00867 and 15.99491 a.m.u. respectively. 3,1.5
13. Tabulate the differences between the following :
- (a) Nuclear fission and nuclear fusion
- (b) Alpha, Beta and Gamma radiations
- (c) Nuclear and chemical fuels. 3×1.5
14. Write notes on the following :
- (a) Nuclear Reactor
- (b) Radiation hazards
- (c) Artificial radioactivity. 3×1.5

SECTION—III

15. (a) Describe the various factors that influence 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. 2,2.5
16. (a) Explain the effect of polar solvents on $n-\pi$ and $\pi-\pi^*$ transitions.

(b) By using a suitable energy diagram, illustrate the Franck-Condon principle in the vibronic spectra of diatomic molecules. 2,2.5

17. (a) State and explain the Born-Oppenheimer approximation.

(b) Describe rigid rotor model for the rotational spectra.

(c) The spacing between lines in the rotational spectrum of HF is 40 cm^{-1} . Calculate the moment of inertia and bond length in HF. 3×1.5