

PG (CBCS)
M.SC. Semester-IV Examination, 2026
CHEMISTRY
PAPER: CEM 403
(ADVANCED PHYSICAL CHEMISTRY-IV (PHYSICAL SPL.))
Full Marks: 40 Time: 2 Hours

The figures in the right-hand margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

GROUP-A

1. Answer any **FOUR** of the following questions: 2×4=8

- a) What is meant by a potential energy surface (PES) in chemical kinetics?
- b) Define entropy of activation.
- c) What is meant by a diffusion-controlled reaction?
- d) What is overvoltage in electrochemistry?
- e) What are the components of an agarose gel?
- f) Write some applications of cyclic voltammetry.

GROUP-B

2. Answer any **FOUR** of the following questions: 4×4=16

- a) Discuss potential energy surfaces, reaction coordinates, and reaction paths for elementary reactions.
- b) Explain the BEBO method and its application to barrier height estimation.
- c) Explain the basic idea of agarose gel electrophoresis for nucleic acids.
- d) How Fluorescence Spectroscopy can be used for the estimation of protein conformation.
- e) Write a note on photoelectrochemical cells.
- f) Describe the working principle of alkaline fuel cells.

GROUP-C

3. Answer any **TWO** of the following questions: 2×8=16

- a) Develop the thermodynamic formulation of reaction rates and show how absolute rate theory can be expressed using partition functions. Comment on equilibrium formulation of rate constants. (6+2)



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- b) Describe in detail the RRK and RRKM theories of unimolecular reactions. State the limitations of the above theories. Illustrate their relation to Hinshelwood's approach.
(3+3+2)
- c) Give a detailed account of the methods of determining molecular weight of polymers using viscosity and light scattering approach. Indicate the type of average obtained in each case.
(4+4)
- d) Explain the principles of any two techniques used to study biomolecules: CD, IR, and Raman spectroscopy.
(4+4)

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