Roll No. ..... Total Pages : 3

MDQ/M-20 **2435**

PHYSICAL CHEMISTRY (SPL.)

Paper–XX

Time Allowed : 3 Hours] [Maximum Marks : 60

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

UNIT–I

1. (a) Discuss the application of activated complex theory to study the reactions between atoms.

   (b) Explain the temperature dependence of pre-exponential factors.

   (c) Distinguish between the 'energy of an energized molecule (ε^*)' and 'energy of an activated complex (e^*_0)'. 5,5,2

2. (a) Write the salient features of Rice-Ramsperger-Kassel-Marcus (RRKM) theory.

   (b) Discuss the thermodynamic aspects of reaction rates. 8,4

UNIT–II

3. (a) Discuss the dependence of Collisional cross-section on translational energy.

   (b) Write short notes on the following :

   (i) Reaction cross-section

   (ii) Molecular beams.

   (c) Discuss briefly the dynamics of barrier-less chemical reactions in solutions. 4,3,5

4. (a) Write an account of 'reactions between polar molecules'.

   (b) Discuss the 'kinetic salt effect' for ionic reactions in solutions.

   (c) What is the effect of temperature on enzymatic reactions? 5,5,5

UNIT–III

5. (a) What are branching chain reactions? Explain, how branching chain reactions lead to explosion.

   (b) Write a detailed account of 'stopped-flow method' for studying fast reactions.

   (c) Which out of 'Temperature-jump' and 'pressure-jump' is a better method? Give reasons to your answer. 5,5,5

6. (a) Discuss, how the fast reactions can be studies using 'pressure jump' method.

   (b) Describe 'stopped-flow' method for studying rapid reactions.

   (c) Write a short note on 'Shock-Tube' technique. 5,5,2

UNIT–IV

7. (a) Discuss 'Maier and Saupe' theory of molecular ordering for nematic phase.

   (b) What are Lyotropic liquid crystals? How are they formed? Explain.

   (c) Write a brief note on 'twisted nematic' liquid crystals. 4,6,2

8. (a) Describe the molecular arrangement in Nematic, Cholesteric, Smectic A and Smectic C mosophoses.

   (b) Discuss the Deformation of Aligned Phases (DAP) effect shown by nematic liquid crystals due to their dielectric properties.

   (c) Explain 'homeotropic', 'planar' and 'schleiren' textures in liquid crystals. 5,3,4