

- (b) Discuss the irreversible thermodynamic treatment of membrane transport of a neutral species. 4
- (c) Examine the mechanism of glucose transport in erythrocytes. 4

Roll No.

Total Pages : 04

LMDQ/M-24

7522

PHYSICAL CHEMISTRY SPECIAL-V
CHEM-403

Time : Three Hours]

[Maximum Marks : 60

Note : Eight questions will be set, two from each of the Sections A, B, C and D. Attempt *Five* questions in all, selecting at least *one* question from each Section. All questions carry equal marks.

Section A

1. (a) What are single and multiple heating rate methods ?
Which are better for kinetic study and why ? 5
- (b) Discuss the applications of thermogravimetry in the pharmaceutical industry, coal analysis, and purity check of compounds. 5
- (c) Why does glass transition for polymer yield no exothermic or endothermic peaks ? 2
2. (a) What is the difference between DTA and DSC study and explain. Why DSC analysis is better than DTA in polymer studies ? 5

- (b) What are the differences between Heat flux DSC and Power compensated DSC ? **4**
- (c) Discuss the application of DTA in the determination of heat capacity and crystallinity. **3**

Section B

- 3. (a) What are the factors of nucleation ? **3**
- (b) How physical properties of material change on varying the size of particles from micro to nano ? **3**
- (c) Using examples describe the synthesis of nanoparticles using : **6**
 - (i) sol-gel method
 - (ii) MOCVD.
- 4. (a) How different properties of nanoparticles change with reference to ? **9**
 - (i) Electrical
 - (ii) Magnetic
 - (iii) Optical.
- (b) Discuss some applications of nanotechnology. How is nanotechnology used in catalysis ? **3**

Section C

- 5. (a) Explain the Franck-Condon principle and its significance in understanding electronic transitions in molecular systems. **5**

- (b) Discuss the assumptions underlying the Wigner spin conservation rule and its applicability in predicting the spin states of electronic transitions in molecules. **3**

- (c) What are charge transfer transitions ? **4**

- 6. (a) Discuss the assumptions underlying the Stern-Volmer equation and explain when it is applicable in the study of fluorescence quenching phenomena. **6**
- (b) Discuss the application of lasers in photochemical kinetics. **4**
- (c) How does delayed fluorescence differ from fluorescence ? **2**

Section D

- 7. (a) Clarify the forces involved in maintaining the biological structure and interactions between them. **2**
- (b) Elaborate the thermodynamic stability of native and unfolded states of proteins and the driving forces involved in protein folding. **5**
- (c) Describe the molecular basis of sliding filament theory. **5**
- 8. (a) Describe the uses of fluorescence spectroscopy in biological systems. **4**