2024

M.Sc.

Fourth Semester

DISCIPLINE SPECIFIC ELECTIVE – 04

CHEMISTRY

Course Code: MCHD 4.21

(Nano Chemistry & Polymer Science)

Total Mark: 70 *Pass Mark: 28*

Time: 3 hours

Answer five *questions, taking* one *from each unit.*

UNIT–I

1. (a) Discuss the application of nanomaterials and nanotechnology in modern science. 6
   (b) Explain how aluminium oxide is used as nanomaterial. 5
   (c) Write short note on surface plasmon. 3

2. (a) Give a detail account of carbon nanotubes with examples. 5
   (b) Explain how magnesium oxide is used as nanomaterial. 5
   (c) Write short notes on the following: 2×2=4
      (i) Quantum confinement
      (ii) Quantum size effects

UNIT–II

3. (a) Discuss the top-down and bottom-up approaches for the synthesis of nanomaterials. 6
   (b) Explain the mechanism for nanoparticle synthesis inside the reverse micelles. 5
   (c) Briefly describe sono-chemical method. 3

4. (a) Give the mechanism for nanoparticle synthesis inside the co-precipitation method. 5
   (b) Explain solvothermal method for the synthesis of nanoparticles. 5
   (c) Describe briefly how reverse micelle work as nano reactor. 4

UNIT–III

5. (a) Discuss in detail the geometrical structure of polymer. 5
   (b) Elaborate on the change of state in polymeric material with change in temperature. 5
   (c) "Swelling and the extend of swelling is controlled by two opposing factors, osmotic pressure Π and elasticity of polymeric chain σ." Justify. 4

6. (a) Explain how the three (3) parameters namely temperature, amount of catalyst and role of polymerization control the molecular weight or size of the polymer molecule during polymerization. 6
   (b) Discuss how to determine the transition of glass temperature (*Tg*) by free volume method. 5
   (c) Suggest three (3) application of swelling phenomenon of polymers for human use. 3

UNIT–IV

7. (a) Explain Florry-Huggin's and lattice theory of polymer solution. 6
   (b) Discuss the TGA and DTA method for determining the molecular weight of polymers. 6
   (c) Write a note on entropy of mixing. 2

8. (a) Discuss how to determine the molecular weight and molecular dimension using light scattering method. 6
   (b) Briefly explain polymer degradation and stabilization. 6
   (c) Write a note on enthalpy of mixing. 2

UNIT–V

9. (a) Discuss in detail the behaviour of an ideal or Newtonian fluid with the help of applied stress and the amount of strain or deformation. 6
   (b) Explain the creep and relaxation of a typical plastics with the help of an experimental curve model. 5
   (c) Write short note on the role of stress and strain in the control of polymer deformation. 3

10. (a) Explain power law. Illustrate with a plot of log τ_s versus log $\left(d\gamma_s / dt\right)$ for different types of fluid materials. 6

(b) Suggest a method for measurement of rheological properties of fluid. 4

(c) Discuss the flow behaviour of a real fluid or non-Newtonian fluid. 4
