

2023
M.Sc.
Fourth Semester
DISCIPLINE SPECIFIC ELECTIVE – 04
CHEMISTRY
Course Code: MCHD 4.21
(Nano Chemistry & Polymer Science)

Total Mark: 70
Time: 3 hours

Pass Mark: 28

Answer five questions, taking one from each unit.

UNIT-I

1. (a) Discuss solid materials and their strength. 5
(b) Elaborate on the bright future of nanotechnology. 5
(c) Explain how zinc oxide is used as nanomaterial metal oxide. 4
2. (a) Write short notes on the following: 2×2=4
(i) Surface plasmon resonance
(ii) Quantum size effects
(b) Explain the nanostructures in nature. 6
(c) What are fullerenes? Explain. 4

UNIT-II

3. (a) Explain the nanomaterials synthesis. 2
(b) Justify the statement “Reverse micelles works as nano-reactor.” 4
(c) Give the mechanism for nanoparticle synthesis inside the reverse micelles. 5
(d) Write a note on solvothermal synthesis. 3
4. (a) Explain how nanomaterials can be synthesized using sono-chemical method? 5
(b) Give a comparative account between solvothermal and hydrothermal synthesis. 6
(c) Write a note on polymeric precursor method. 3

UNIT-III

5. (a) Give a relation between the density of crosslink and the extend of swelling in the polymeric chain. 6
(b) What are amorphous polymers? Explain. 4
(c) Discuss the effect of various parameters on glass transition temperature. 4
6. (a) What is glass transition temperature? How is it measured? 5
(b) Write a note on crystallinity in polymers. 4
(c) Discuss the elasticity and swelling of polymer gels. 5

UNIT-IV

7. (a) Write short notes on the following: 2×3=6
(i) Entropy of mixing
(ii) Enthalpy of mixing
(iii) Theta temperature
(b) Discuss the stabilization of polymers in detail. 6
(c) What are DSC curves? 2
8. (a) Explain the thermodynamics of polymer solutions. 4
(b) How are osmometry and light scattering used for molecular weight determination of polymers? 6
(c) What is differential thermal analysis? Explain with the help of a neat diagram. 4

UNIT-V

9. (a) Discuss the different methods of measuring rheological properties. 6
(b) Write a note on polymer rheology. 3
(c) Explain the free volume of polymer fluidity. 4
(d) Define a non-Newtonian fluid. 1
10. (a) Explain power-law fluid. 3
(b) Discuss the mechanical models of a viscoelastic material. 6
(c) Draw a comparison between Newtonian, non-Newtonian, and viscoelastic properties. 5