2022

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) What do you understand by perspective of length? Explain. 3
   (b) Write a note on nanoscience and nanotechnology. 3
   (c) Discuss the quantum confinement in detail. 7
   (d) Define prime materials. 1

2. (a) Write a note on the effects of surface of nanomaterials. 3
   (b) Discuss the carbon nanostructure in detail. 7
   (c) Explain nanomaterial metal oxide taking aluminium oxide and zinc oxide as reference. 4

UNIT–II

3. (a) Explain the top-down and bottom-up approaches in the synthesis of nanomaterials. 4
   (b) Write a note on solvothermal synthesis. 3
   (c) Draw and discuss reverse micellar method in detail. 7

4. (a) Explain the kinetics of solid-state reaction. 4
   (b) Illustrate in detail the sol-gel processes to prepare nanoparticles of different types like emulsion, aerogel, powder. 4
   (c) Write notes on the following: 3×2=6
      (i) Hydrothermal synthesis
      (ii) Co-precipitation

UNIT–III

5. (a) Discuss the conformation and molecular dimensions of polymer molecules. 5
   (b) Explain the molecular motion of polymers in dilute solutions, 4
   (c) What are the factors influencing glass transition temperature? 5

6. (a) Explain in detail elasticity and swelling of polymers. 6
   (b) Write a note on crystallinity in polymers. 4
   (c) Give the properties of isolated polymer molecules. 4

UNIT–IV

7. (a) What are the working principles of DSC? Explain. 4
   (b) Explain the instrumentation process of thermogravimetric analysis. 5
   (c) Discuss the Flory-Huggins and lattice theory of polymer solution. 5

8. (a) Explain the difference between DTA and DSC. 3
   (b) What are the different ways in which degradation of polymers are brought about? Explain its mechanism. 3+4=7
   (c) Write a note on gel permeation chromatography. 4

UNIT–V

9. (a) What are Newtonian and non-Newtonian fluid? Explain. 6
   (b) Explain the free volume theory of polymer fluidity. 4
   (c) How are rheological properties measured? Explain. 4

10. (a) Write a note on geometry of deformation. 4
    (b) Discuss time-dependent fluid responses. 4
    (c) Explain creep and relaxation behaviour of plastics. 4
    (d) What are viscoelastic properties? 2
