May 2025
M.Sc.
Fourth Semester
DISCIPLINE SPECIFIC ELECTIVE – 04
CHEMISTRY
Course Code: MCHD 4.21
(Nanochemistry & Polymer Science)

Total Mark: 70 *Pass Mark: 28*
Time: 3 hours

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

UNIT–I

1. (a) Citing an example, discuss the application of nanoscience in modern science. 5
   (b) Explain how zinc oxide is used as a nanomaterial. 5
   (c) Elaborate on the concept and applicability of bright future nanotechnology. 4

2. (a) Discuss in detail the prime material of carbon nanostructure. 5
   (b) Explain how aluminium oxide are used as nanomaterial. 5
   (c) Write a note on each of the following: 2×2=4
   (i) Nanotechnology
   (ii) Nanostructure

UNIT–II

3. (a) Discuss the hydrothermal synthesis for preparing nanomaterials. 5
   (b) Explain the mechanism for the synthesis of nanoparticles by the reverse micelles method. 5
   (c) Briefly describe polymer precursor method. 4

4. (a) What do you understand by sonochemical method for the preparation of nanomaterial? Explain. 5
   (b) Give a detailed account of the top-down and bottom-up approaches for the synthesis of nanomaterial. 5
   (c) Briefly explain nanoreactor. 4

UNIT–III

5. (a) Discuss the conformation and polymer dimension of polymer molecules. 5
   (b) Explain the geometrical structures and conformations of amorphous polymer. 5
   (c) Give a theoretical interpretation of crystallinity in polymer. 4

6. (a) Define plasticisation of polymer. Discuss the two phenomena which are associated with it. 5
   (b) Mention the factors that affects the glass transition temperature. 5
   (c) Write a note on change of state with temperature in polymeric materials. 4

UNIT–IV

7. (a) Explain the thermodynamic of polymer solution. 5
   (b) Discuss how to determine the molecular weight of polymer using thermogravimetric analysis. 5
   (c) Give a brief account of theta temperature for polymer. 4

8. (a) Explain the method for determining the molecular weight and molecular dimension of polymer using osmometry method. 5
   (b) Write a note on each of the following: 3×3=9
   (i) Enthalpy of mixing
   (ii) Polymer degradation
   (iii) Theory of polymer solution

UNIT–V

9. (a) Discuss the effect of application of stress and strain to the behaviour of a real or non-Newtonian fluid. 6
   (b) Give a detailed account of mechanical models of a viscoelastic material. 5
   (c) Write a note on dynamic flow behaviour. 3

10. (a) Discuss the method for determining rheological properties using free volume rheology of polymer fluidity. 6
   (b) Explain the creep and relaxation of a typical plastics with the help of an experimental curve method. 5
   (c) Differentiate Newtonian and non-Newtonian fluid behaviour. 3