May 2025
M.Sc.
Fourth Semester
DISCIPLINE SPECIFIC ELECTIVE – 03
CHEMISTRY
Course Code: MCHD 4.11(C)
(Nanotechnology & Polymer Technology)

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

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

UNIT–I

1. (a) Explain the structure of nanomaterials. 4
   (b) Discuss the rotating crystal method for the characterisation of nanomaterials. 5
   (c) Determine the crystallite size using X-ray line broadening studies. 5

2. (a) Discuss the principle and methodology of dynamic light scattering. 5
   (b) Explain how X-ray diffraction patterns are employed in analysing the structure of ZnO and CuO. 5
   (c) What do you understand by small angle X-ray scattering? Explain. 4

UNIT–II

3. (a) What is nanotechnology? Explain the principle of electron microscope. 4
   (b) Write a note on each of the following: 5×2=10
   (i) Scanning electron microscope
   (ii) Transmission electron microscope

4. (a) Write a note on the method of sample preparation with at least three methods. 6

(b) Explain the following method for characterisation of nanomaterials: 4×2=8
(i) Scanning tunneling microscope
(ii) Atomic force microscope.

UNIT–III

5. (a) What are nanomaterials and how are they utilized in drug delivery system? 5
(b) Describe the role of nanomaterials in energy sector 5
(c) What is high energy density batteries? Explain. 4

6. (a) Explain how nanostructured materials contribute to the development of next-generation lithium-ion batteries. 5
(b) Discuss the applications of nanomaterials in water purification. 4
(c) Write a note on each of the following: 5
(i) Nanomaterials in food
(ii) Nanomaterials in ceramics industry

UNIT–IV

7. (a) Describe the process and application of emulsion polymerisation. 4
(b) Explain how Ziegler–Natta polymerisation is employed for the manufactured of polymer. 4
(c) Write a note on each of the following: 2×3=6
(i) Fillers
(ii) Plasticisers
(iii) Flame retardants

8. (a) Explain the manufacture and applications of thermoplastic polymers. 5
(b) What is metathesis polymerisation in olefins? 3
(c) Write a note on each of the following: 2×3=6
(i) Epoxy resins
(ii) Polymeric coating
(iii) Phenolic resins

UNIT–V

9. (a) Discus the structure, properties, and function of proteins. 6
   (b) What are synthetic biopolymers? Explain anyone compound of synthetic biopolymer. 5
   (c) Write a note on polymer chemistry of biological process. 3

10. (a) What are conductive polymer? Explain the factors which influence the molecular weight and conductivity of synthesised conducting polymers. 5
    (b) Explain the biodegradable polymer - PLA. 4
    (c) Write a note on each of the following: 2½×2=5
        (i) Drug delivery system
        (ii) Polymers in medicine