2024

M.Sc.

Fourth Semester

DISCIPLINE SPECIFIC ELECTIVE – 03

CHEMISTRY

Course Code: MCHD 4.11(C)

(Nanotechnology and 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 X-ray diffraction technique using the powder method. 7
   (b) Discuss the X-ray diffraction pattern and analysis of 3½+3½=7
   (i) ZnO
   (ii) CuO

2. (a) Write a note on small angle X-ray scattering. 3
   (b) Explain the following using X-ray diffraction technique: 4+4=8
   (i) The Laue method
   (ii) The rotating crystal method
   (c) How will you determinate the crystallite size distribution using X-ray line shape analysis? 3

UNIT–II

3. (a) Write short notes on the following: 2×4=8
   (i) Dehydration
   (ii) Sectioning
   (iii) Staining
   (iv) Methods of sample preparation
   (b) What is a chemical fixation technique? Explain. 6

4. (a) What is EDX? Discuss the method of EDX for determining the chemical composition of unknown materials. 7
   (b) Explain the strength and limitations of SEM. 5
   (c) Give a comparison between STM and AFM. 2

UNIT–III

5. (a) How is colloidal gold different from nano gold? Explain the role of gold as nanoparticles. 1+6=7
   (b) Explain the role of nanomaterials in water purification. 7

6. (a) Discuss the role of di-electric materials in nano chemistry. 5
   (b) Write short notes on the following: 3×3=9
      (i) Kinetic energy (KE) penetrators with enhanced lethality
      (ii) High energy density batteries
      (iii) Nanomaterials in next-generation computer

UNIT–IV

7. (a) Write notes on additives for plastics with special reference to fillers, plasticizers, and cross-linking agents. 9
   (b) Explain the role of epoxy resins in polymer technology. 5

8. (a) What is a mass polymerization? Give the advantages and disadvantages of solution polymerization. 2+4=6
   (b) Discuss the chemistry of phenolic resins formation. 5
   (c) Write a note on stabilizers as a component for plastic additives. 3

UNIT–V

9. (a) "Plastic or polymer products are not always bad as one may project." Elaborate. Briefly discuss the various steps involved in the recycling of plastics through mechanical process. List out some applications, advantages, and disadvantages of recycled plastics. 2+3+3=8
   (b) Write the structure, function, and properties of naturally occurring polymer protein. 6

10. (a) Give the structure, properties, and application of the following biodegradable polymer: 3+3=6
    (i) Polyglycolic acid (PGA)
    (ii) Polylactic acid (PLA)
    (b) Explain the role of polymers in medicine. 4
    (c) Discuss the properties and the application of hyaluronic acid (HA). 4