

2022
M.Sc.
Fourth Semester
DISCIPLINE SPECIFIC ELECTIVE - 03
CHEMISTRY
Course Code: MCHD 4.11 (C)
(Nanotechnology & Polymer Technology)

Total Mark: 70
Time: 3 hours

Pass Mark: 28

Answer five questions, taking one from each unit.

UNIT-I

1. (a) Explain the following using X-ray diffraction technique:
 - (i) The Laue method
 - (ii) The rotating crystal method 7
- (b) Write the determination of the crystallite size distribution using X-ray line shape analysis. 7
2. (a) Explain the principle, theory and methodology of dynamite light scattering. 7
- (b) Discuss the determination of crystallite size using X-ray line broadening studies. 7

UNIT-II

3. (a) Discuss the method of scanning electron microscope for the analysis of microstructure. 7
- (b) What is EDX? Discuss the method of EDX for determining the chemical composition of unknown materials. 7
4. (a) Give a detailed account on the principle, theory and methodology of any two of the following: 3½×2=7
 - (i) Transmission electron microscopy
 - (ii) Atomic force microscopy
 - (iii) Scanning tunnelling microscopy
- (b) Discuss the principle, theory and method of BET surface area. 7

UNIT-III

5. (a) Explain the application of nanomaterials in medicine. 7
(b) Briefly discuss how nanomaterials are employed for catalysis. 4
(c) Mention the importance of gold as nanomaterial. 3
6. (a) Discuss how nanomaterials can be used for purification of water. 7
(b) Explain briefly how nanomaterials are used in energy sector. 4
(c) Give a brief account on the application of nanomaterials in next generation computer. 3

UNIT-IV

7. (a) Explain in detail about the preparation and mechanism of Ziegler-Natta catalyst. 7
(b) Briefly explain what metathesis polymerization is and write its application in polymer industry. 4
(c) Distinguish between amino resins and epoxy resins. 3
8. (a) With examples explain the following terms: $3 \times 2 = 6$
(i) Thermosetting polymer
(ii) Cross linking agents
(b) Discuss in detail the molecular imprinting technique. 4
(c) Distinguish between mass polymerization and suspension polymerization. 4

UNIT-V

9. (a) Write the structure, function and properties of naturally occurring polymer protein. 6
(b) Discuss the structure, properties and the application of hyaluronic acid (HA). 8
10. (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) Give the structure, properties and application of the following biodegradable polymer: 3×2=6

(i) Polyglycolic acid (PGA)

(ii) Polylactic acid (PLA)
