

Roll No. _____

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DEPARTMENT OF CHEMISTRY
SEMESTER-IV EXAMINATIONS-2024
M.Sc. CHEMISTRY

PAPER CODE: MCHOE – 407

PAPER TITLE: CHEMISTRY IN NANOSCIENCE

(Write your Roll No. at the top immediately on receipt of this question paper)

Time: 2½ Hours

Maximum Marks: 60

Note: This paper has 3 sections A, B, and C, Attempt all three sections

Section A: Answer all the questions; **Section B:** Answer any 2 out of 4; **Section C:** Answer all the questions, each question has an internal choice.

Abbreviations Used

CLO- Course Outcome, PLO- Program Outcome, BTL- Bloom Taxonomy Level: BT level 1-Remember; BT level 2-Understand; BT level 3-Apply; BT level 4-Analyse; BT level 5-Evaluate, BT level 6-Create

Section A

(1.5x10 = 15 Marks)

Q.	Very short type questions (attempt all)	BTL	CLO	PLO
1.	Define transmission electron microscopy (TEM). List any two advantages of using TEM for the characterization of nanomaterials.	1/2	1/2	1/2
2.	What are Optical Tweezers? How are they used in the manipulation of nanomaterials? Give one application.	1/2	1/2	1/2
3.	Briefly explain how solid-lipid nanoparticle systems enhance drug delivery.	2/3	2/3	2/3
4.	Describe the role of polymeric micelles in solubilizing drugs and increasing their bioavailability.	2-4	2-4	2-4
5.	Define nanoparticle tagging and explain its significance in analysis of biological samples.	1	1	1
6.	How are electrospun nanofibers utilized as drug-delivery systems?	2	2	2
7.	What are nanostructured materials?	2	2	2
8.	Name one type of nanoparticle commonly used in molecular diagnostics.	1/2	1/2	1/2
9.	What is the role of nanoparticles in molecular diagnostics?	2-4	2-4	2-4
10.	What are quantum dots?	1	1	1

Section B

(2x10 = 20 Marks)

Q.	Long Type questions (Attempt any two out of four)	BTL	CLO	PLO
1.	Describe the working principles, instrumentation, and applications of scanning probe microscopy (SPM) techniques. Evaluate the advantages and limitations of SPM techniques compared to other characterization methods such as electron microscopy.	3-5	3-5	3-5
2.	Describe the design principles and advantages of using hydrogel-based nanoparticulate drug-delivery systems. Provide examples of hydrogel materials commonly employed in drug delivery and explain how their properties can be modified.	3-5	3-5	3-5

PTO.

3.	Describe the advantages of electrospun nanofibers as drug carriers and provide examples of different polymers commonly used in electrospinning for drug delivery and discuss their unique properties.	3-5	3-5	3-5
4.	Investigate the role of gold nanoparticles in molecular diagnostics. Provide examples of gold nanoparticle-based assays used in clinical diagnostics	4-6	4-6	4-6

Section C

(5x5 = 25 Marks)

Q.	Attempt <u>all</u> questions, each question has an <u>Internal choice</u>	BTL	CLO	PLO
1.	Explain the principles of scanning electron microscopy and transmission electron microscopy, and compare the two techniques. OR Describe and compare the two nanomaterial manufacturing techniques, top down approach and bottom-up approach with specific examples and discuss their applicability.	2-4 2-5	2-4 2-5	2-4 2-5
2.	Discuss the mechanism of lipid based colloidal nanodrug-delivery system, discuss its advantages over traditional methods with specific examples. OR Explain the role of nanoparticulate polymeric micelles as drug carriers. Discuss the interaction of polymeric micelles and the reticuloendothelial system (RES).	4-5 2-4	4-5 2-4	4-5 2-4
3.	Explain the concept of single molecule detection and its significance in understanding for molecular interaction and disease mechanism. OR Define nanostructured materials and how their properties arise from their architecture. Also give specific examples with their potential applications in various fields.	2-4 3-4	2-4 3-4	2-4 3-4
4.	Explain the role of nanotechnology in molecular diagnostics, analyze the advantages of using nanotechnology-based approaches in molecular diagnostics compared to traditional methods. OR Discuss the role of quantum dots in drug discovery and its various applications.	4-5 3-6	4-5 3-6	4-5 3-6
5.	Explain the concept of nanoparticle tagging and its application in biological analysis and detection with specific examples OR How do nanoparticles interact with pathogen to enhance immune response? Also describe the use of protective nanoparticles.	2-4 4-6	2-4 4-6	2-4 4-6