Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII EXAMINATION – SUMMER 2025

Subject Code:3170509 Date:16-05-2025

Subject Name:Nanoscience and Technology

Time:02:30 PM TO 05:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Define: Nano Science, Quantum dot, Grain boundary	**03**
	(b)	Justify why melting point is size dependent property?	**04**
	(c)	Explain in detail Top Down and Bottom up approach for synthesis of naomaterial.	**07**
Q.2	**(a)**	Briefly discuss the effect of size reduction on diffusivity.	**03**
	(b)	Differentiate Evaporation and Sputtering.	**04**
	(c)	Explain in detail Sol gel process for synthesis of nanoparticles.	**07**
		OR	
	(c)	Differentiate SEM and TEM for characterization of nanoparticles.	**07**
Q.3	**(a)**	Classify Micelle.	**03**
	(b)	What factors influence the stability of an emulsion, and how can emulsifiers be used to improve stability?	**04**
	(c)	How does temperature affect the mechanical attrition process? Should the mill be operated under cryogenic conditions for certain materials?	**07**
		OR	
Q.3	**(a)**	Explain colloid.	**03**
	(b)	What are the mechanisms of flocculation and deflocculation in colloidal systems, and how can they be controlled?	**04**
	(c)	Explain in detail the mechanism of nano-crystallization during high-energy ball milling.	**07**
Q.4	**(a)**	What is X-ray diffraction, and how does it work?	**03**
	(b)	What are examples of reversible and irreversible self-assembly systems?	**04**
	(c)	What are the thermodynamic and kinetic factors that influence crystal growth?	**07**
		OR	
Q.4	**(a)**	How do CNTs act as effective adsorbents for water purification and pollutant removal?	**03**
	(b)	Why is catalysis using micelles as “micro reactors” advantageous sometimes? When is it advantageous ?	**04**
	(c)	Compare Atomic Force Microscopy and other imaging techniques.	**07**
Q.5	**(a)**	List out the applications of nanotechnology in Fuel cells.	**03**
	(b)	Discuss the DNA self assembly structure.	**04**
	(c)	Explain principal, working, construction and application of the Dynamic light Scattering.	**07**

OR

Q.5	**(a)**	List out the applications of Gold nanoparticles.	**03**
	(b)	What is the primary safety concerns associated with the handling of nano materials?	**04**
	(c)	How does the surface area-to-volume ratio change as materials are reduced to the nanoscale, and why is this significant?	**07**

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