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**Second Semester B.E./B.Tech. Degree Supplementary Examination,  
June/July 2024**

# Introduction to Nanotechnology

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Exemplify the synthesis of nanomaterials by SILAR method.	08	L3	CO1
	b.	Explain the steps involved in the synthesis of silica nanoparticles by sol-gel method.	08	L2	CO1
	c.	Explain the chemical bath deposition method.	04	L2	CO1
<b>OR</b>					
Q.2	a.	Illustrate the Laser ablation technique for the preparation of nanomaterial with diagram.	08	L2	CO1
	b.	Outline Ball milling method to synthesize the nanoparticles with diagram.	08	L2	CO1
	c.	Write a note on surface to volume ratio.	04	L2	CO1
<b>Module – 2</b>					
Q.3	a.	Explain the basic principle, working and instrumentation of Scanning Electron Microscope (SEM) with diagram.	08	L2	CO2
	b.	Explain the principle and instrumentation of the UV – visible spectroscopy.	08	L2	CO2
	c.	Distinguish between AFM and STM.	04	L2	CO2
<b>OR</b>					
Q.4	a.	Explain the basic principle and instrumentation of Atomic Force Microscope (AFM).	08	L2	CO2
	b.	Derive expression for Debye-Scherrer equation. In a X-ray diffraction experiment peak width half maxima (FWHM) is $0.8^\circ$ and its Bragg angle ( $\theta$ ) is $32^\circ$ . Calculate the crystallite size using Scherrer equation. Given wavelength used in X-ray diffraction experiment is $1.54 \text{ \AA}$ (shape factor) $K = 0.94$ .	08	L3	CO2
	c.	Mention the differences between SEM and TEM.	04	L1	CO2
<b>Module – 3</b>					
Q.5	a.	Explain the synthesis of graphene by chemical vapour deposition method. Explain any one of property of graphene. Mention its applications.	08	L2	CO3

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	b.	Explain the synthesis, electrical, mechanical properties of fullerenes. Mention any two applications of fullerenes.	08	L2	CO3
	c.	Write a note on carbon nanofibres.	04	L2	CO3
OR					
Q.6	a.	Explain the electrical and mechanical properties of Single Walled Carbon Nanotubes (SWCNT's) and Multi Walled Carbon Nanotubes (MWCNT's).	08	L2	CO3
	b.	Explain the synthesis of SWCNT and MWCNT by chemical vapour deposition.	08	L2	CO3
	c.	Write a note on carbon nano diamonds.	04	L2	CO3
Module – 4					
Q.7	a.	Explain the construction and working of dye sensitized solar cells.	08	L2	CO4
	b.	Explain the construction and working of Lithium-ion battery.	08	L2	CO4
	c.	Mention the limitations of graphite anodes.	04	L2	CO4
OR					
Q.8	a.	Define solar cells. Explain briefly 1 <sup>st</sup> , 2 <sup>nd</sup> and 3 <sup>rd</sup> generation of solar cells.	08	L2	CO4
	b.	Explain the construction and working of fuel cells.	08	L2	CO4
	c.	Explain the requirements of anode, cathode materials for Lithium-ion battery.	04	L2	CO4
Module – 5					
Q.9	a.	Explain the application of nanotechnology in biological, biochemical and biosensing applications.	08	L2	CO5
	b.	Define nano electronics. Explain the application of nanotechnology in electronics and memory storage devices.	08	L3	CO5
	c.	Explain briefly the following terms: (i) Nanocomputing (ii) Nanophotonics (iii) Nanobiotechnology (iv) Nanochemistry	04	L1	CO5
OR					
Q.10	a.	Explain the application of nanotechnology in diagnosis and drug delivery.	08	L3	CO5
	b.	Explain the nanotechnology application in detector for Heart attacks, contact lenses, tiny 3-D printed batteries, creating biodegradable electrodes.	08	L3	CO5
	c.	Write a note on nanofertilizers.	04	L2	CO5

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