

Department : Computer Science Engineering
Year & Semester : IV Year & I Semester
Sub Code & Sub Name : 200HSM471

Unit-I

S. No.	PART -A Questions
1	Define nanomaterials.
2	Define Nanoscience and Nanotechnology.
3	How have nanomaterials been defined?
4	What are the key criteria for defining nanomaterials?
5	Define Nanoscience and Nanotechnology.
6	What are one dimensional nanomaterials?
7	Distinguish between bulk particles and nano-particles.
8	What are the key criteria for defining nanomaterials?
9	Discuss the significance of Nanoscale.
10	Define Quantum Confinement.
11	What is the size range of nanomaterials?
12	List out the types of nanomaterials.
13	List out challenges faced by Nanotechnology.
14	Demonstrate any four day to day live commercial applications of nanotechnology.
15	Write the examples of zero dimensions and two dimensions of nanostructured materials.

S.No	Part-B Questions
1.	Discuss the Classification of Nanomaterials in detail.
2.	Explain quantum confinement and surface to volume ratio.
3.	Describe about 1D, 2D and 3D nanostructured materials with examples.
4.	Explain the basic principles of nanomaterials with suitable diagram.
5.	Explain in detail about the significance of nanoscale.
6.	What is the significance of surface-to-volume ratio and quantum confinement in nanomaterials?
7.	Make short note on : (a) Surface area to Volume ratio (b) Quantum confinement.
8.	Distinguish 0D, 1D and 2D nanostructured materials.
9.	How are nanomaterials classified based on their dimensions?
10.	Discuss the surface area to volume ratio and quantum confinement of nanomaterials.
11.	Discuss the significance of nanomaterials comparing with bulk materials.
12.	Explain how surface area to volume ratio and quantum confinement plays a vital role in nanomaterials.
13.	Define Nanoscale and explain its significance in detail.
14.	Differentiate 0D, 2D and 3D nanostructured materials with suitable examples.
15.	Explain the following terms (a) Nanoscale B) Types of nanostructured materials C) Basic principles of nanomaterials

Unit-II

S.No	Part-A Questions
1.	Differentiate between Bottom-up and Top down approach.
2.	List any three top-down approaches for the synthesis of nanomaterials.
3.	Point out the advantages of top-down approach.
4.	State the principle of bottom-up approach with an example.
5.	What is sol-gel method?
6.	List three synthesis methods of nanomaterial involving bottom up approach.
7.	Describe three methods under each approach.
8.	Define Chemical vapour deposition.
9.	What is Ball milling?
10.	What do you mean by electrochemical method?
11.	List out the applications of sol-gel method.
12.	Point out the advantages of Ball milling.
13.	What do you mean by electrochemical method?
14.	What are merits and demerits of chemical vapour deposition.
15.	Draw the experimental set-up of chemical vapour deposition for the synthesis of nanomaterials.

S.No	Part-B Questions
1.	Explain in detail about the working of mechanical milling process and mention its merits and demerits.
2.	Enumerate the different chemical methods of synthesis of nanomaterials and state its advantages and disadvantages.
3.	Explain how oxide nanoparticles can be obtained by Sol gel method.
4.	Describe the principle and experimental set up of electrochemical deposition method.
5.	Discuss chemical vapour deposition for the preparation of nanomaterials.
6.	Explain the preparation of nanomaterials by Plasma arching method.
7.	List out the advantages, disadvantages and applications (a) Chemical vapour deposition (b) Sol gel method
8.	Differentiate the bottom-up and Top down approaches with suitable chemical methods.
9.	Discuss the principle and applications of sol-gel method and Electrochemical method.
10.	Explain the significance of Sol gel, Ball milling and Plasma arching method.
11.	Explain the synthesis of nanostructured materials using Ball milling.
12.	Explain the following deposition techniques (a) Chemical vapour deposition (b) Sol gel (c) Ball milling
13.	Draw neat diagram for the preparation nanostructured materials using Sol-gel.
14.	Explain any two chemical deposition techniques for the synthesis of nanomaterials.
15.	Draw a neat diagram for the synthesis of nanomaterials using Chemical vapour deposition method.

Unit-III

S.No	Part-A Questions
1.	What is the principle of X-ray diffraction?
2.	What information can XRD provide about nanomaterials?
3.	Define Bragg's law.
4.	What is the basic principle of UV-Visible spectroscopy?
5.	What is the typical wavelength range for UV-Vis spectroscopy?
6.	What is the purpose of using FTIR spectroscopy in nanomaterial analysis?
7.	What is the principle of FTIR spectroscopy?
8.	What is the working principle of SEM?
9.	What type of information can SEM provide about nanomaterials?
10.	What is the function of the electron gun in SEM?
11.	What is the principle of TEM?
12.	What kind of details can TEM reveal about nanoparticles?
13.	Why must TEM samples be extremely thin?
14.	What is the working principle of the STM?
15.	What is the basic working principle of AFM?

S.No	Part-B Questions
1	Explain the principle, working, and applications of X-Ray Diffraction (XRD) in the structural characterization of nanomaterials.
2	How does X-ray diffraction reveal the crystallite size and lattice strain in nanomaterials?
3	Explain the principle and instrumentation of UV-Visible spectroscopy and its application in determining the optical properties of nanomaterials.
4	Explain the working principle of Fourier Transform Infrared (FTIR) spectroscopy and its role in identifying functional groups on nanomaterial surfaces.
5	How does FTIR help in identifying chemical bonding and surface functionalization in nanomaterials?
6	Explain the construction, working principle, and applications of Scanning Electron Microscopy (SEM) in nanomaterial characterization
7	Discuss how secondary and backscattered electrons contribute to image formation in SEM.
8	How does SEM help in determining surface morphology and particle size distribution of nanomaterials?
9	Explain the principle and working of Transmission Electron Microscopy (TEM) with a neat diagram.
10	How does TEM enable visualization of lattice fringes and crystal defects in nanoparticles?
11	Explain the quantum tunneling principle involved in Scanning Tunneling Microscopy (STM).
12	How does STM achieve atomic-scale imaging of nanomaterial surfaces?
13	Describe the instrumentation and working of STM for atomic-scale surface characterization.
14	Explain the working principle of Atomic Force Microscopy (AFM) and its different
15	How does AFM measure surface topography at nanometer resolution?

Unit-IV

S.No	Part-A Questions
1.	How do melting points change at the nanoscale?
2.	What are physical properties of nanomaterials?
3.	How does surface energy influence chemical activity?
4.	Why are nanomaterials more reactive?
5.	Why are nanomaterials stronger than bulk materials?
6.	How does size affect conductivity in nanomaterials?
7.	How does thermal conductivity change at the nanoscale?
8.	How does particle size affect magnetism?
9.	Why do gold nanoparticles show different colors?
10.	How do nanomaterials improve corrosion resistance?
11.	How are nanoparticles used in drug delivery?
12.	How are nanomaterials used in solar cells?
13.	How are nanomaterials used in water purification?
14.	How are nanomaterials used in sports equipment?
15.	What role do nanomaterials play in batteries?

S.No	Part-B Questions
1.	a) What makes the physical properties of nanomaterials different from bulk materials? b) How does the size of nanoparticles influence their density and melting point?
2.	a) Why are nanomaterials more chemically reactive than bulk materials? b) How do nanomaterials act as catalysts in chemical reactions?
3.	a) How does the reduction in size enhance the strength of nanomaterials? b) What is the relationship between grain size and hardness in nanomaterials?
4.	a) How does quantum confinement affect the electrical conductivity of nanomaterials? b) Why do metallic nanoparticles show enhanced electrical properties?
5.	a) How do nanomaterials exhibit different thermal conductivity compared to bulk materials? b) Why does thermal stability vary with particle size in nanomaterials?
6.	a) What is superparamagnetism and why does it occur in nanoparticles? b) How does particle size influence the magnetic behavior of nanomaterials?
7.	a) Why do nanoparticles exhibit color changes with size variation? b) What is the quantum confinement effect in optical properties?
8.	Explain about the applications of nanomaterials in Material Science
9.	Explain about the applications of nanomaterials in biology and medicine
10.	Explain about the applications of nanomaterials in Surface Science
11.	What role do nanomaterials play in energy storage and conversion?
12.	How can nanomaterials be used in water purification and pollution control?
13.	What role do nanocomposites play in industrial manufacturing?
14.	a) How are nanomaterials used to make lightweight sports equipment? b) What advantages do nanocoatings provide in consumer products?
15.	Give the nanomaterials applications in the field of energy, material science and medicine

Unit-V

S.No	Part-A Questions
1.	List out the allotropes of carbon.
2.	Define graphite and graphene.
3.	Define fullerene.
4.	Define graphene.
5.	Mention few properties of graphene.
6.	Define carbon nanotube.
7.	How are carbon nanotubes classified?
8.	Point the types of carbon nanotubes?
9.	List any four properties of Carbon nanotubes.
10.	Differentiate single walled and multiwalled carbon nanotubes.
11.	Differentiate carbon nanotubes from bucky balls.
12.	What is single walled carbon nanotube?
13.	Mention the types of single walled carbon nanotube.
14.	What is multiwalled carbon nanotube?
15.	List out the applications of carbon nanotubes.

S.No	Part-B Questions
1.	What are the different allotropes of carbon, and how do they differ in structure?
2.	What is graphene, and why is it considered the building block of carbon nanotubes?
3.	a) What are carbon nanotubes (CNTs), and how are they discovered? b) What are the different types of carbon nanotubes?
4.	What is the structural difference between single-walled and multi-walled carbon nanotubes?
5.	How are single-walled carbon nanotubes (SWCNTs) formed?
6.	How are multi-walled carbon nanotubes (MWCNTs) formed?
7.	What is the Plasma Arcing (Arc Discharge) method for fabricating carbon nanotubes? ☒
8.	What are the important physical and chemical properties of carbon nanotubes?
9.	What are the electrical and thermal properties of carbon nanotubes?
10.	What are the major applications of carbon nanotubes in material science?
11.	What are the industrial and commercial uses of carbon nanotubes?
12.	How do carbon nanotubes contribute to energy storage and environmental technologies?
13.	What is the structural difference between single-walled and multi-walled carbon nanotubes?
14.	a) What is the Plasma Arcing (Arc Discharge) method for fabricating carbon nanotubes? b) What are the advantages and limitations of the plasma arcing method?
15.	Elaborately discuss the applications of CNTs in various fields