

## GE8073 FUNDAMENTALS OF NANOSCIENCE

### IMPORTANT QUESTIONS AND QUESTION BANK

#### UNIT-I INTRODUCTION

##### 2-Marks

1. Name any four nanostructures.
2. Analyse the term Nano meter scale.
3. List the classification of Nano materials.
4. Describe the properties of Nanowires and Nanoparticles.
5. Define Nano science and nano technology.
6. Define quantum dots.
7. Summarize ultra-thin films nanowires.
8. Formulate the synthesis methods of nanowires
9. Explain about Nano materials in various field.
10. Compare the mechanical and thermal properties of nano material.
11. Discuss the effects on optical properties of nano materials.
12. Illustrate electro deposition method.
13. Experiment on template base synthesis method of nanowires.
14. Nano particle of gold could be purple in colour. Explain why?
15. Give the applications of ultra-thin films and multi-layered materials.

##### 13-Marks

1. Describe about the implications of nano science and technology for physics and chemistry.
2. Generalize the effects of length scales involved and effect on properties in nanoparticles.
3. Explain the properties, synthesis method and applications of ultra-thin films and multi-layered materials.
4. Classify the various nanostructured materials in nanoscience.
5. Define the term Nano science, nano technology, nano meter scale, nano wires, ultra-thin films & multi-layered materials
6. Describe how the mechanical and magnetic properties.
7. Describe the plasma arcing method of producing Nano particles.
8. Demonstrate the synthesis method involved in nanoparticle
9. Illustrate the properties involved in nanoparticles.
10. Point out the applications of nano material

## **UNIT-II GENERAL METHODS OF PREPARATION**

### **2-Marks**

1. Differentiate bottom-up and top-down approach.
2. Point out the various liquid phase processes.
3. Explain the various strategy in self-assembly.
4. Define bottom-up synthesis method.
5. Describe the term ultrasonication.
6. Name some chemical vapour deposition method.
7. When does contamination arise in attritor milling?
8. Summarize about Atomic Layer Epitaxy.
9. Define sputtering and list its types.
10. Describe about co-precipitation.
11. Illustrate the principle of atomic layer epitaxy.
12. What are the objectives of milling?
13. Discuss about term colloidal routes.
14. Classify the physical vapour deposition.
15. Compare the term MBE and MOMBE.

### **13-Marks**

1. Explain in detail about the working principle of mechanical milling process and mention its merits and demerits.
2. 1. Discuss the various types of milling.  
2. Describe the strategies involved in self-assembly.
3. What is bottom-up approach of nanoparticle preparation? Explain in detail the process of MBE and MOMBE.
4. Illustrate in detail about ultrasound techniques involved in top-down approach.
5. Summarize in detail about the working of MOMBE.
6. Explain the working of vapour phase deposition and MOCVD.
7. Tabulate the MBE and MOCVD process.
8. Describe in detail about strategies involved in the synthesis of self-assembly.
9. Discuss in schematic diagram of a magnetron sputtering and its uses.
10. Generalize the schematic representation of electron-beam deposition system.

## **UNIT-III NANOMATERIALS**

### **2-Marks**

1. Define the carbon nanotube.
2. Point out three elements of Arc discharge method.
3. Explain about arc growth synthesis method.
4. Tabulate the properties of CNT.

5. Define Quantum confinement.
6. List the application of CNT.
7. Summarize the features of nano metal oxides.
8. Distinguish Quantum wires and Quantum dots.
9. Classify the applications in MNWCNT.
10. Describe nano alumina metal oxides.
11. Explain the CVD routes in nanotubes.
12. Explain about laser ablation synthesis.
13. List the few methods of synthesis in nanotubes.
14. Generalize the structure plasma CVD.
15. Differentiate single wall and multi wall carbon nanotubes.

### 13-Marks

1. With relevant example and mechanisms, explain in details the recent advances in SWCNT growth control.
2. Describe the principles and different methods of synthesis in nanoparticles.
3. Give the preparation, properties and application of quantum dots.
4. Explain nano forms of carbon.
5. 1. Give the application of nano metal oxides  
2. give the structure of nano metal oxides
6. Describe the functionalization and application.
7. Explain the mechanism of solid phase growth of CNTs.
8. Discuss the mechanism of nano particles formation in laser ablation process
9. Describe in detail about Buckminster fullerene carbon nanotube.
10. Explain in detail about Arc growth method and laser ablation.

### UNIT-IV CHARACTERIZATION TECHNIQUES

### 2-Marks

1. Assess the merits of X-ray diffraction technique.
2. Examine the principle of SEM.
3. Summarize surface analysis in Nano characterization.
4. Explain characterization in relation with materials.
5. List the modes of SPM.
6. Differentiate SEM from TEM.
7. List any four characterization techniques.
8. Describe SPM
9. Summarize TEM including high-resolution imaging.
10. Define ESCA.
11. Define SNOM. Also list their modes.
12. What is the difference between SEM and TEM?

13. What is the difference between SEM and AEM?
14. Write about SIMS.
15. Generalize the significance of nano indentation.

### 13-Marks

1. Explain the working of scanning electron microscopy (SEM) with a neat sketch.
2. How do you characterize a material with transmission electron microscope (TEM) with a neat sketch?
3. Explain the working of Scanning Tunnelling Microscopy (STM) with a neat sketch?
4. Explain in detail about the X-rays diffraction technique to prepare nano materials.
5. Distinguish: AFM, SPM, & STM.
6. Describe the principles and different working modes of AKM and its advantages.
7. Describe the construction and working of scanning probe microscopy (SPM) with a neat sketch?
8. Demonstrate the operation of Nano indentation using AFM and enumerate its application.
9. Explain the steps involved and application of Nano indentation.
10. Examine TEM including high resolution imaging.

### UNIT-V APPLICATIONS

### 2-Marks

1. What is Nano computer?
2. Give the uses of superchip/Nano chip.
3. Give detail about Nano crystal memory.
4. Name the Nano devices used in biotechnology.
5. What is TDD?
6. What is NEMS?
7. Compare MEMS and NEMS.
8. Give the application of nanoparticles.
9. Explain role of Nano science in solar cell.
10. Explain role of Nano science in battery.
11. List out the Nano info Tech methods.
12. List out some Nano computers.
13. What are Nano sensors? Give example?
14. What is atomic force microscopy and how it is used in NEMS?
15. Compare molecular crystal memory and molecular switch.

13-Marks

1. What is Nano InfoTech and explain any four methods
2. What Nano silver crystalline used for bacterial inhibition.
3. Explain the role of nanoparticles in medical field.
4. Explain about 1. Nano sensors 2. Nano particles in sun barrier product.
5. Give detail about MEMS and NEMS and compare it.
6. Explain about the term 1. Nano computer 2. Superchip.
7. Give the role of Nano probes in Nano biotechnology.
8. How information is stored using Nano techniques.
9. Explain Nano science in solar cell and battery.
10. Explain targeted drug delivery.

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