

DSE-III

Nano Materials and Applications

1 MARK QUESTIONS:

1. What refers to Nano?
2. What do you mean by Nano science?
3. What is the width of a single strand of DNA?
4. What are Nano-structures? What do you mean by Nano-technology?
5. Which technology is capable of manipulating single atoms and molecules?
6. What are the different fields of applications of Nano-technology?
7. What is quantum confinement?
8. Write the time dependent Schrodinger equation in 1D.
9. Write the time independent Schrodinger equation in 1D.
10. Write the time independent Schrödinger equation in 3D.
11. Write an expression for the normalization constant for the infinite potential well.
12. What is Eigen function?
13. Write examples of top-down approach.
14. Write examples of bottom-up approach.
15. Which method uses chemical processes to create an image?
16. Which method uses light to transfer a geometric pattern from a photo mask to a light sensitive chemical on the substrate?
17. Which method is based on the mechanical crushing process?
18. Which method requires perfect alignment between mask and pattern on the wafer?
19. Which method is used for the synthesis of single phase metals, semiconductors and metal oxide nanoparticles?
20. Which technique is an important tool for the study of crystal structures and atomic spacing?
21. Which technique is helpful to reveal the phonon modes of the materials?
22. Write Sherrer formula. What are direct detection techniques?
23. What are indirect detection techniques?
24. State and explain Bragg's law.
25. Why Nano-materials are different from other materials?
26. Why Nano-materials are extremely reactive?
27. Why CNT has a very high strength?
28. Write examples of one dimensional applications of Nano-materials.
29. Write examples of two dimensional applications of Nano-materials.
30. Write examples of three dimensional applications of Nano-materials.

1.5 MARK QUESTIONS:

1. What are photonic devices?
2. Write the uses of bulk Nano-materials.
3. What are quantum dots? Write their uses.
4. Write the uses of Nano-composites.
5. Write the uses of Nano-metals. 3
6. What are the uses of fullerenes?
7. What are the uses of dendrimers?
8. What are the uses of Nano-porous materials?
9. What are micro electro mechanical systems?
10. Write the applications of MEMs.
11. What are Nano-electro mechanical systems?
12. Write the applications of NEMs.
13. What are uses of MEMs microphones?
14. Write the examples of MEMs silicon pressure sensor.
15. What are the uses of bio-MEMs?
16. Write the biomedical applications of MEMs.
17. Write the uses of MEMs accelerometers.
18. Write the applications of MEMs gyroscopes.
19. What are uses of MEMs magnetic field sensor.
20. What are uses of MEMs displays.
21. Write the applications of MEMs transducers.
22. Write the applications of MEMs for energy harvesting.
23. What is optical disc drive?
24. What is magnetic quantum well?
25. How magnetic quantum well is formed?
26. What is CNT?
27. What is SWCNT?
28. What is MWCNT?
29. What is HRTEM?
30. What is APCVD?
31. What is LPCVD?
32. What is UHVCVD?

2.5 MARK QUESTIONS:

1. What are magnetic quantum semiconductors?
2. What are dilute magnetic semiconductors?
3. What is spintronic?
4. Write the disadvantages of single electron box.
5. What is coulomb blockade?
6. What is coulomb blocked effect?

7. What is single electron transistor?
8. What is single electron trap?
9. What is transmission electron microscopy?
10. What is atomic force microscopy?
11. What is scanning probe microscopy?
12. What is scanning tunnelling microscopy?
13. Which technique is used to view the images of the surface of a sample at the atomic level?
14. Which method is used to produce high purity and high performance solid materials?
15. Classify CVD process according to the physical characteristics of the vapour.
16. Classify CVD process according to the source of energy.
17. Which method is used for the fabrication of colloidal dispersions of inorganic and organic- Inorganic hybrid materials?
18. Which method has precise control over doping level?
19. Write an equation for the wave function of a potential box.
20. Write an expression for the energy of particle in a potential box.
21. Write an equation for the wave function of an electron trapped in 2D plane Nano scale.
22. Write an equation for the energy of an electron trapped 2D plane
23. Write an expression for the wave function of an electron moving in 1D nanowire.
24. Write an expression for the energy of an electron moving in 1D nanowire.

5MARK QUESTIONS:

1. What do you mean by nanostructured materials? Explain OD, ID, 2D and 3D nanostructures.
2. Describe the density of states of materials at nanoscale.
3. Write one dimensional time independent Schrodinger equation and apply this equation to explain the quantum confinement of a particle trapped in an infinite potential well.
4. Discuss the application of Schrodinger equation to a particle moving along the positive x-axis toward a potential step.
5. Apply Schrodinger wave equation to explain the quantum confinement of a particle in 3D trapped inside a potential box.
6. What do you mean by photolithography? Write its limitations.
7. Write short notes on: (a) Ball milling (b) Gas phase condensation
8. What is vacuum based deposition? Write its limitations.
9. What do you mean by sputtering? Write the characteristics of sputtering and give its uses.
10. What do you mean by solution based deposition? Write its limitations.

11. Write notes on: (a) Nanoparticle solar cell (b) Quantum dot solar cell (c) Nanowire solar cell (d) Thin film solar cell
12. Write short notes on: (a) Micro Electromechanical systems. (b) Nano Electromechanical systems.