TB246703N

Reg. No :.....

Name :.....

BACHELOR'S DEGREE (C.B.C.S) EXAMINATION, MARCH 2024

2021 ADMISSIONS REGULAR

SEMESTER VI - CHOICE BASED CORE (PHYSICS)

PH6B13AB18 - Nano Science and Nano Technology

Time : 3 Hours **Maximum Marks : 80**

Part A

I. Answer any Ten questions. Each question carries 2 marks **(10x2=20)**

1. Outline the size dependence of magnetic properties of materials.
2. Name an experiment that helps in identifying magic numbers in a nanoparticle system. Also outline the principle involved.
3. Compare the density of states function of bulk semiconductor and quantum wire.
4. Explain the formation of the 13 atom nanoparticles in FCC structure.
5. Mention any two methods used for the fabrication of quantum dots. Mention their merits and defects.
6. Define the term epitaxy. Distinguish between homoepitaxy and heteroepitaxy.
7. Explain the components of two-photon lithography.
8. Define the term lattice constant and write down an equation for lattice constant. Explain the terms.
9. Define optical extinction.
10. Briefly explain how CNTs are used as chemical sensors.
11. State the reason for major failure mechanisms seen in conventional grain sized materials.
12. State the reason for change in absorption in metal nanocluster composite glasses.

Part B

II. Answer any Six questions. Each question carries 5 marks **(6x5=30)**

13. Explain the action of smart window. What materials are used to construct it?
14. Using the concept of quantum confinement, prove that the energy band gap will increase in the nanodomain.
15. Compare pulsed laser ablation and pulsed laser deposition for nano particle synthesis.
16. Mention the steps involved in the lithographic procedure. Explain each of them.
17. Explain the various crystal structures in three dimension.
18. Sketch and explain the IV characteristics of a metallic CNT.
19. Cite with examples the conventional hybridisations found in carbon compounds.
20. Explain how the photonic band gap helps in optical switching and polarization clean up.
21. Discuss the formation of nanostructured materials using zeolite.

Part C

III. Answer any Two questions. Each question carries 15 marks **(2x15=30)**

22. What are smart structures? Write an essay on smart structures used in medicine, industry, household and also in automobile.
23. Explain the process and components of MBE. Compare and contrast it with other deposition techniques.
24. Discuss any five applications of carbon nanotubes.
25. Discuss the effect of bulk nanostructuring on optical properties citing any three examples.