

BACHELOR'S DEGREE (C.B.C.S) EXAMINATION, MARCH 2025
2018, 2019, 2020, 2021 ADMISSIONS SUPPLEMENTARY
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. Explain the significance of magic numbers in nanoparticles..
2. Give two examples to show that magnetic properties vary with size of the particles.
3. Compare the possible absorption spectrum of Q dots and their D(E).
4. Draw the structure of a Vertical Cavity Surface Emitting Laser.
5. Explain the formation of the 13 atom nanoparticles in FCC structure.
6. Distinguish between positive and negative resist.
7. Define the term epitaxy. Distinguish between homoepitaxy and heteroepitaxy.
8. Distinguish between bright field and dark field image.
9. Define allotrope. List down the allotropes of carbon.
10. Represent the formation of Landau levels and its relevance.
11. List down the failure mechanisms seen in conventional grain sized materials.
12. Briefly explain about bulk nanostructured materials.

Part B

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

13. Explain the construction, theory and working of a mass spectrometer. How is it relevant in nanoscience?
14. Outline the lithographic procedures for synthesis of CdSe quantum dots. Predict how the results will be different from that of chemical methods.
15. Explain how the nano imprint lithography different from any beam lithography.
16. Explain the pros and cons of electron beam lithography in the context of nanostructure fabrication.
17. Explain the various crystal structures in three dimension.
18. Discuss the advantage and disadvantages of various synthesis methods of CNTs.
19. Enumerate and contrast the allotropes of carbon.
20. Compare super prism effect with conventional prism.
21. Express the significance of selenium chains in mordenite over the trigonal crystals of selenium.

Part C

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

22. Explain the quantum confinement effects in semiconducting nanoparticles and arrive at equations for blue shift in band gap of the 2DEG, 1DEG and 0DEG. What is Fermi surface and Fermi space? Draw the modified dispersion curve of 2DEG, 1DEG and 0DEG compared to that of 3DEG.
23. Explain the process and components of MBE. Compare and contrast it with other deposition techniques.
24. Discuss and compare various kinds of scanning microscopy techniques.
25. Discuss the effect of bulk nanostructuring on optical properties citing any three examples.