TB246792W

Reg. No :.....

Name :.....

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

2018, 2019, 2020 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 meaning of smart structures in nanoscience.
2. Elaborate on how the melting point and electrical and magnetic properties vary at the nanoscale?
3. Compare the possible absorption spectrum of Q dots and their D(E).
4. Explain the Fermi gas model and compare the equations for number of electrons (N) of bulk semiconductor and quantum well.
5. Explain the use of quantum dots and quantum wires in lasing media.
6. Briefly explain top down technique.
7. Mention four techniques for nano synthesis.
8. Distinguish between bright field and dark field image.
9. Report the normal modes of vibrations of carbon nanotube.
10. Recall the significance of scootering mechanism in CNT.
11. Briefly explain about bulk nanostructured materials.
12. Associate the type of nanostructure shown by porous silicon and photonic crystals.

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. Explain the working of quantum cascade lasers.
15. Compare pulsed laser ablation and pulsed laser deposition for nano particle synthesis.
16. Mention three techniques for the preparation of metallic nanoparticles. Explain each of them.
17. Explain the instrumentation and technique involved in STM.
18. Briefly explain a method to synthesis open ended carbon nanotube.
19. Enumerate and contrast the allotropes of carbon.
20. Explain how the photonic band gap helps in optical switching and polarization clean up.
21. Compare super prism effect with conventional prism.

Part C

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

22. Using the Fermi gas model, derive equations for density of states of bulk, Q-well and Q-wire. Plot the D(E) and N(E) functions of these three structures and Q-dots. How is the concept of D(E) useful in predicting optical behavior of a material?
23. What are the problems encountered in homogenous nucleation method? Can they be overcome in sol gel method and/or MBE? Explain.
24. Explain the various synthesis methods for carbon nanotubes.

25. Discuss the effect of bulk nanostructuring on optical properties citing any three examples.