TB206565W

Reg. No :.....

Name :.....

B. Sc. DEGREE (C.B.C.S.) EXAMINATION, MARCH 2023

(2020 Admission Regular, 2019, 2018 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. Using an example, explain how nanoscience has revolutionized diagnosis and treatment.
2. Explain the significance of magic numbers in nanoparticles.
3. Explain two properties that are dependent on density of states.
4. Define density of states. How is it related to optical properties?
5. Draw the structure of a Vertical Cavity Surface Emitting Laser.
6. List down the steps in sol gel technique.
7. Mention four techniques for nano synthesis.
8. Briefly explain the concept of EDAX.
9. Represent the formation of Landau levels and its relevance.
10. Define allotrope. Cite examples.
11. List down the failure mechanisms seen in conventional grain sized materials.
12. Illustrate the MH curve of superparamagnetic materials.

Part B

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

13. What are MEMs and NEMS? Explain their role in nanoscience and technology.
14. Explain the working of quantum cascade lasers.
15. What are micelles and reverse micelles? Explain their role in 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. CNT can reduce the processor time in computers. Substantiate.
19. Identify the low dimensional structure exhibited by CNT. Substantiate.
20. Compare super prism effect with conventional prism.
21. Compare and contrast crack and dislocations and their relevance.

Part C

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

22. Do material properties change with size of the materials? Why? Substantiate theoretically. Explain optical, electrical, mechanical and magnetic properties at nanoscale.
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.