

B. SC. DEGREE (C.B.C.S.S) EXAMINATION, MARCH 2018
(2015 Admission Regular)
SEMESTER VI - CORE (PHYSICS)
PH6B13ATB - NANO SCIENCE AND NANO TECHNOLOGY

Time : 3 Hours

Maximum Marks : 80

Part A

I. Answer all questions. Each question carries 1 marks **(6x1=6)**

1. What are micelle and reverse micelle?
2. What is Bragg reflection?
3. What are the allotropes of Carbon?
4. What are nanocomposites? Give its significance.
5. Draw 1D and 2D PC structure.
6. What are the advantages of MEMS devices?

Part B

II. Answer any Seven questions. Each question carries 2 marks **(7x2=14)**

7. Explain how the melting point and electrical and magnetic properties vary at the nanoscale?
8. Explain how nanoscience has improved our quality of life?
9. What is the advantage of two photon lithography over ordinary optical lithography?
10. Mention four techniques for the preparation of metallic nanoparticles.
11. What is the role of STM in studying quantum corrals?
12. What is the idea behind colored stained- glass windows in medieval cathedrals? Explain briefly.
13. Explain the super prism effect.
14. Draw the reflection and transmission curve of a PC.
15. Briefly explain any two NEMS devices.
16. Briefly illustrate the components of a Spin Valve Transistor.

Part C

III. Answer any Five questions. Each question carries 6 marks **(5x6=30)**

17. Outline the role of smart structures in industry and medicine.
18. Compare the density of states function of bulk semiconductor and quantum wire.
19. Write an account of nanoimprint lithography.
20. Outline the features of two photon lithography.
21. Explain the XRD experiment and how to use it for particle size determination.
22. Illustrate that CNTs are low dimensional structure.
23. Write a short note on features and synthesis techniques for metal nanocluster composite glasses.
24. Write the features of Spin valve Transistors.

Part D

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

25. 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.
26. Explain how to make use of STM and FIM in synthesis and characterization of nanoparticles.
27. Write an account of various kinds of CNTs and discuss the properties of carbon nanotubes.
28. Outline the features of photonic crystals. Also explain how these features can be used to advantage.