

E 1699

(Pages : 4)

Reg. No.....

Name.....

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH 2015

Sixth Semester

Choice Based Course—NANO SCIENCE AND NANO TECHNOLOGY

(Common for B.Sc. Physics Model—I and Model—II)

Time : Three Hours

Maximum Weight : 25

Part A (Objective Type Questions)

Answer all questions.

Weight 1 for each bunch of four questions.

BUNCH I

Fill in the blanks :

1. As particle size increase the absorption is shifted to ——— end of the visible spectrum.
(a) Violet. (b) Yellow.
(c) Red. (d) Orange.
2. STM means ———.
(a) Scanning Tunneling microscope.
(b) Scanning Tunneling magnetometer.
(c) Scanning Tunneling electron microscope.
(d) Screeing Tunne microscope.
3. Fullerence is an allotrope of ———.
(a) Gallium. (b) Indium.
(c) Carbon. (d) Zinc.
4. Exitonic transition play an important role in ——— confined devices.
(a) Quantum. (b) Atomic.
(c) Molecular. (d) Nano.

BUNCH II

Choose the correct answer :

5. To get the best properties in Nano materials the surface area to volume ratio must be ———.
(a) Small. (b) Large.
(c) Very very small. (d) Comparatively large.

Turn over

6. Name the natural Nano particle which is made by bacteria :
- (a) Magnetate. (b) Cadmium Sulphide.
(c) Zinc oxide. (d) Copper oxide.
7. In bottom-top approach, Nano particles are prepared from ———.
- (a) Molecular level. (b) Atomic level.
(c) Crystalline level. (d) Amorphous level.
8. The number of faces in C_{60} molecular structure is ———.
- (a) 60. (b) 32.
(c) 44. (d) 68.

BUNCH III

Fill in the blanks :

9. The absorption of a ——— result in the formation of an exciton.
- (a) Photon. (b) Phonon.
(c) Quantum. (d) Atomic.
10. The range of quantum dot is about ———.
- (a) 10 nm. \rightarrow 20 nm. (b) 100 nm. \rightarrow 200 nm.
(c) 1 nm \rightarrow 10 nm. (d) 1 \AA \rightarrow 1000 \AA .
11. The nano material LiBiO_2 is used in ——— batteries.
- (a) Lithium ion. (b) Bismuth ion.
(c) Lithium Bismuth oxide ion. (d) None of these.
12. Mini bands are associated with ——— lattice structure.
- (a) Super. (b) Two Dimensional.
(c) Three dimensional. (d) Atomic.

BUNCH IV

Choose the correct answer :

13. The image produced by Transmission Electron microscopes are ———.
- (a) 2 Dimensional. (b) 3 Dimensional.
(c) Both 2D and 3D. (d) All the these.

14. The surface Plasmon resonance wavelength moves into _____ portion of the spectrum.
(a) IR. (b) UV.
(c) X-ray. (d) γ -ray.
15. Carbon nano-tubes have _____ nano structure.
(a) Planar. (b) Cylindrical.
(c) Spherical. (d) Straight line.
16. Photonic crystals are _____ band gap materials.
(a) Direct. (b) Indirect.
(c) both (a) and (b). (d) (a) only.

(4 × 1 = 4)

Part B (Short Answer Questions)

Answer any five questions.

Weight 1 for each.

17. Define effective mass.
18. How particle size of nano particles are calculated ?
19. Give few examples of semiconducting nano particles.
20. What are the applications of carbon nanotubes ?
21. List out some of the natural nano crystals.
22. What are called ferrofluids ?
23. Mention about superconductors.
24. Discuss on supramolecular switches.

(5 × 1 = 5)

Part C (Short Essay/Problem)

Answer any four questions.

Weight 2 for each.

25. What are semiconductors ? Also discuss their energy bands and gaps.
26. Write about the mechanical and electrical properties of nanostructured materials.
27. Describe how TEM is used for the study of nano materials.
28. Explain about Gaint and colossal magneto resistance.

Turn over

29. Calculate the Fermi function of energy state of 5 eV at $t = 300$ K and having Fermi energy of 2.5 eV.
30. Describe about micro-electrochemical systems.

(4 × 2 = 8)

Part D (Essays)

Answer any two questions.

Weight 4 for each.

31. Give an account of synthesis of nano particles in RF plasma and pulsed laser method.
32. Write in detail about nano-structured ferromagnetism.
33. Explain about quantum dot lasers and superconductivity in detail.

(2 × 4 = 8)