

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH 2014**Sixth Semester****Choice Based Course—NANOSCIENCE 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.**Each bunch of four questions carries a weight of 1.***BUNCH I**

Fill in the blanks :

1. The number of atoms in a Face centered cubic crystal is _____.
(a) 4. (b) 2.
(c) 3. (d) 6.
2. Acceptors are the impurities having valency _____.
(a) 1. (b) 2.
(c) 3. (d) 4.
3. The C_{60} molecule has _____ vertices.
(a) 15. (b) 30.
(c) 60. (d) 90.
4. Superconductors have _____ resistance.
(a) High. (b) Low.
(c) Zero. (d) Unit.

BUNCH II

Choose the correct answer :

5. The surface area of the nano-particles should be :
(a) Small. (b) Large.
(c) Moderate. (d) Very large.

Turn over

6. Applied voltage in a transmission electron microscope is :
- (a) Low. (b) High.
(c) Medium. (d) None of these.
7. Quantum well structure is :
- (a) Homostructure. (b) Hetrostructure.
(c) Molecular structure. (d) Isotopic structure.
8. Quantum dots are :
- (a) Nano-crystals. (b) Amorphens.
(c) Crystalline bulk materials. (d) F-centered crystals.

BUNCH III

Fill in the blanks :

9. Small ferimagnetic nano-particles possess ——— paramagnetism.
- (a) Hetrogeneous. (b) Homogenous.
(c) Super. (d) All are correct.
10. Carbon nano-tubes are ——— of carbon.
- (a) Allotrope. (b) Isomers.
(c) Isotopes. (d) Chain.
11. STM is based on the concept of ——— tunneling.
- (a) Particle. (b) Quantum.
(c) Atom. (d) Super cooled gas.
12. The typical time between two flips of magnetic nano-particles is called ——— relaxation time.
- (a) Neel. (b) Quantum.
(c) Electron. (d) Magnetron.

BUNCH IV

13. The mobility of electrons are :
- (a) Low. (b) High.
(c) Extremely low. (d) Extremely high.
14. The electron hole effective mass ratio is high in the :
- (a) Valance band. (b) Conduction band.
(c) Fermi surface. (d) Metastable state.

15. Fullerenes are a ————— powdery material.
- (a) Black. (b) Yellow.
(c) Red. (d) Blue.
16. Which is a photonic crystal?
- (a) GaN. (b) Si.
(c) YAG. (d) Photodiode.

(4 × 1 = 4)

Part B (Short Answer Questions)

*Answer any five questions.
Each question carries a weight of 1.*

17. What are called Excitons?
18. How particle size of Nano-material is determined?
19. Write a note on magic numbers regarding Nano-science.
20. Give few applications of carbon Nano-tubes.
21. What are called Ferrofluids?
22. Write few properties dependent on density of states.
23. Give the salient features of NEMS.
24. List a few examples of Metal nano-particles.

(5 × 1 = 5)

Part C (Short Essay/Problems)

*Answer any four questions.
Each question carries a weight of 2.*

25. Give an account of tetrahedrally bonded semiconductor structures.
26. Explain in detail about the optical properties of nano-particles.
27. Write a short note on nano-structural multilayers and their electrical properties.
28. Give an account of application of nano-materials in computers and sensors.
29. Write briefly about infrared detectors in the field of nano-technology.
30. Discuss briefly about Microelectrochemical systems.

(4 × 2 = 8)

Turn over

Part D (Essays)

*Answer any **two** questions.*

Each question carries a weight of 4.

31. Explain in details some of the tools for measuring nano-structure.
32. Discuss the various types of carbon nano-tubes. Give their synthesis process and also explain their properties.
33. Describe in detail about quantum nano-structures with size and dimensionality effects and also explain their density of states.

(2 × 4 = 8)