

20. (a) State the application of nanoelectric devices.

Or

(b) Write a short note on energy efficient windows.

SECTION C — ($3 \times 10 = 30$)

Answer any THREE questions.

21. Describe the cluster :

(a) formation

(b) growth

(c) properties

(d) types.

22. Discuss in detail about the application of carbon nano tubes.

23. Explain briefly the principle and experimental setup of electrochemical deposition of nanomaterials.

24. Brief out the modern advances of SEM.

25. List out the biomedical applications of nanomaterials.

S.No. 6997

P 22 PYE 3 A

(For candidates admitted from 2022–2023 onwards)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2023.

Physics — Elective

PHYSICS OF NANOMATERIALS

Time : Three hours

Maximum : 75 marks

SECTION A — (20 marks)

Answer ALL questions.

I. (A) Multiple choice questions. ($5 \times 1 = 5$)

1. A material with one dimension in nano range and the other two dimensions are large is called

- (a) Micro material (b) Quantum wire
(c) Quantum well (d) Quantum dot

2. Carbon nanotubes are the sheets of graphite about

- (a) 0.1 nm (b) 0.2 nm
(c) 0.3 nm (d) 0.4 nm

3. Which of the following is an example of Bottom up approach?

- (a) Attrition (b) Colloidal dispersion
(c) Milling (d) Etching

4. For high sensitivity or selectivity environmental sensors to sense the gaseous chemical like
 - (a) CO_2 (b) NO_3
 - (c) O_2 (d) NO
5. The band gap energies for silicon and germanium photodiodes are 1.1 eV and 0.67 eV respectively, their cutoff wavelength respectively would be
 - (a) 1850.27 nm, 2167.91 nm
 - (b) 456.12 nm, 1127.27 nm
 - (c) 1315.45 nm, 1850.75 nm
 - (d) 1127.27 nm, 1850.75 nm

(B) Fill in the blanks. (5 × 1 = 5)

6. The size of atom is nearly _____.
 7. The current used in the arc discharge method is about _____.
 8. Typical precursors used in Sol-gel are _____.
 9. The kinetic energy of the photoelectron energies is dependent on _____ of the atom, which makes XPS useful to identify the oxide state.
 10. Nano particles target the rare _____ causing cells and remove them from blood.
- II. Descriptive type questions. (5 × 2 = 10)
11. Differentiate the term crystalline solids from amorphous solids.
 12. Sketch a neat diagram of bucky ball structure.

13. What is molecular beam epitaxy of 2D materials?
14. Explain X-ray Diffraction (XRD).
15. List out the application of nanomaterials in biomedical imaging.

SECTION B — (5 × 5 = 25)

Answer ALL questions, choosing either (a) or (b).

16. (a) Discuss the classification of dimension in nanoscale material.
 Or
 (b) Write a short note on unique characteristics of nanoparticles.
17. (a) Briefly explain the laser ablation technique.
 Or
 (b) Describe about Fullerenes C60.
18. (a) Write a note on the merits and demerits of ball milling.
 Or
 (b) Discuss Sol-gel synthesis of nanoparticles.
19. (a) Discuss about UV-Vis-NIR spectrometry.
 Or
 (b) Explain the working principle of TEM (Transmission Electron Microscopy).