

11/07/2025

POT (Lib)

(Pages : 3)

V – 5444

Reg. No. :

Name :

Fourth Semester M.Sc. Degree Examination, June 2025

Physics

Special Paper II

PH 243 M : MATERIALS SCIENCE II

(2020 Admission Onwards)

Time : 3 Hours

Max. Marks : 75

SECTION – A

Answer any five questions. Each question carries 3 marks.

1. How do photonic crystals affect the propagation of light?
2. What is the Peltier effect and how does it relate to the Seebeck effect?
3. How do the electronic properties of materials change as the dimensionality is reduced?
4. Write a short note on Fullerenes.
5. What is the role of spin-orbit coupling in magneto-resistance?
6. What are MEMS (micro-electro-mechanical systems), and how are they used in electronic devices?
7. Briefly describe the principle of X-ray diffraction crystallography.
8. What are excitons?

(5 × 3 = 15 Marks)

P.T.O.



SECTION – B

Answer **all** questions. Each question carries **15** marks.

9. Briefly explain the particle size effect on the optical, electrical and thermal properties of materials.

OR

10. Explain in detail the optical properties of nanomaterials and the factors affecting them.
11. Discuss the various bottom up approaches in the synthesis of nanoparticles.

OR

12. Bring out the significance of UV-Vis spectroscopy in the characterisation of nanomaterials.
13. What is meant by single electron tunnelling? Discuss in detail its applications in infrared detectors and quantum dot lasers.

OR

14. Explain
- (a) Spintronics
 - (b) Quantum dot lasers
 - (c) MEMS

(3 × 15 = 45 Marks)

SECTION – C

Answer any **three** questions. Each question carries **5** marks.

15. Calculate the electrical conductivity of aluminum at
- (a) 200°C and (b) 500°C.

The resistivity of aluminum at room temperature is 2.65×10^{-8} ohm cm and the temperature resistivity coefficient is 0.00429 ohm/ohm°C.



16. Discuss the structure of quantum well and quantum dot.
17. Discuss the working principle of SEM.
18. Highlight the optical and mechanical properties of CNT.
19. Distinguish between piezoelectricity and ferroelectricity.
20. Discuss the role of spin in electronic devices.

(3 × 5 = 15 Marks)

