

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034



B.Sc. DEGREE EXAMINATION – PHYSICS

FOURTH SEMESTER – APRIL 2022

UPH 4602 – INTRODUCTORY NANO SCIENCE & NANO TECHNOLOGY

Date: 23-06-2022

Dept. No.

Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

PART – A

Q. No **Answer ALL Questions** **(10 x 2 = 20 Marks)**

- 1 Draw the graph that demonstrates the size dependence of melting temperature of Au nanoparticles.
- 2 Distinguish between crystallite size and particle size.
- 3 What do you understand by core-shell nanostructures?
- 4 Calculate the energy required to absorb the wavelength 650 nm by a semiconductor.
- 5 Define solvothermal process.
- 6 Write a short note on blue-shift and red-shift.
- 7 Mention the application of Scherrer's equation.
- 8 List out the advantages of scanning tunneling microscopy.
- 9 What is photo-catalysis?
- 10 Highlight the role of nanotechnology in cellular imaging.

PART – B

Answer any FOUR Questions **(4 x 7.5 = 30 Marks)**

- 11 Explain quantum confinement effect.
- 12 Describe sol-gel method for the synthesis of nanoparticles.
- 13 Sketch the block diagram of FESEM and explain its working and operation.
- 14 Discuss the electrical and optical properties of nanostructured materials.
- 15 Classify materials based on energy bandgap with necessary band diagrams.
- 16 Justify why materials change their behavior at nanoscale region.

PART – C

Answer any FOUR Questions **(4 x 12.5 = 50 Marks)**

- 17 Discuss in detail, the classification of nanomaterials based on morphology, dimension and formation.
- 18 Illustrate top-down approach. Elaborate the various top-down approaches to synthesize nanomaterials with neat flowcharts.
- 19 Using the block diagram explain the working principle, instrumentation and applications of UV-Visible Spectroscopy.
- 20 Explain the essential components, principle and operation of Molecular Beam Epitaxy (MBE) method with neat block diagram.
- 21 With neat sketch outline the principle and working of a transmission electron microscopy (TEM).
- 22 Discuss the applications of nanotechnology in (i) Medicine, (ii) Drug delivery, (iii) Solar photovoltaic cells, (iv) Photodegradation and (v) Water purification.

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