

M.Sc.(Phy.) Semester - 3 (CBCS) Examination**Oct/Nov-2021 (NEW COURSE)****Physics and Chemistry of Nanomaterials (Core (New))****Time: 2:30 Hours****Marks: 70****Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate marks.

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1. Answer in brief any **seven**: 14
 - (a) Define nanotechnology and nanomaterials.
 - (b) Sketch the energy band diagrams for conductors, semiconductors and insulators.
 - (c) Explain in brief the dependence of surface to volume ratio on size of nanomaterials.
 - (d) Give the names of various carbon derivatives.
 - (e) Provide examples of natural and man-made nanomaterials.
 - (f) Give the principle of working of TEM.
 - (g) Explain in brief the Scherer's formula for crystallite size determination.
 - (h) What is nanotribology?
 - (i) What are Tectodendrimers?
 - (j) What are MEMS?
 2. Answer any **two** of following questions: 14
 - (a) Write a note on Quantum confinement in nanomaterials.
 - (b) Discuss in detail the materials at nanoscale and their structure and properties.
 - (c) Growth and applications of carbon nanotubes.
 3. Answer the following questions: 14
 - (a) Write a note on Graphite and Diamond.
 - (b) Discuss in detail fullerenes and graphene.

OR

- (a) Explain the nanoscience of zinc oxide and titanium dioxide in detail.
 - (b) Write a note on polymers, composites and biomaterials as prime materials in nanotechnology.
4. Answer any **two** of following questions: 14
 - (a) Write a note on XRD and SAXS techniques for nanomaterials characterizations.
 - (b) Write notes on SEM and AFM.
 - (c) Write a note on physical properties of nanomaterials.
 5. Answer any **two** of following questions: 14
 - (a) What are sensors? Describe the nanosensors based on the quantum size effects.
 - (b) Write notes on nanoshells, nanopores, and Tectodendrimers.
 - (c) Write a note on top down methods: (i) arc discharge and (ii) laser ablation.
 - (d) Discuss in detail chemical vapor deposition and molecular beam epitaxy for nanofabrication.
