

M.Sc.(Phy.) Semester - 3 (CBCS) Examination**Oct/Nov-2022 (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.

-
- Q.1** Answer in brief any **seven**: **14**
- (a) Define nanoscience and nanomaterials.
 - (b) Draw the energy band diagrams for insulators, semiconductors and metals.
 - (c) Write the names of various carbon derivatives.
 - (d) Give two-two examples for natural and man-made nanomaterials.
 - (e) Which are the top-down fabrication methods?
 - (f) Provide names of methods that can be useful to prepare CNTs.
 - (g) Discuss in brief the Scherrer's formula.
 - (h) Provide the full forms of SIM and DLS.
 - (i) Discuss the quantum confinement effect in brief.
 - (j) Provide the names of biomedical materials.
- Q.2** Answer any **two** of following questions: **14**
- (a) Discuss in detail the methods: (i) laser ablation and (ii) arc discharge.
 - (b) Write a note on sol-gel method with its advantages and disadvantages.
 - (c) Write a note on MBE for synthesizing nanomaterials.
- Q.3**
- (a) Write notes on XRD technique and SAXS method. What is the use of SAXS method? 07
 - (b) Discuss in detail SPM and AFM techniques. 07
- OR**
- (a) Describe various optical spectroscopic techniques for characterization of nanomaterials. 07
 - (b) Write notes on RBS, FIB and DLS characterization tools. 07
- Q.4** Answer any **two** of following questions: **14**
- (a) Define nanomedicines and discuss various approaches in developing nanomedicines.
 - (b) What are sensors? Describe the nanosensors based on the quantum size effects.
 - (c) Describe in detail nanoshells, nanopores, and Tectodendrimers.
- Q.5** Answer any **two** of following questions: **14**
- (a) Write notes on graphite and graphene.
 - (b) Discuss in detail fullerene and graphene.
 - (c) Describe natural and man-made nanomaterials. Discuss in depth polymers and composite nanomaterials.
 - (d) What are different types and properties of CNTs? Discuss them in detail.
