647510 **MSC3PhyC302x** **Seat No :_____**

M.Sc.(Phy.) Semester - 3 (*CBCS*) Examination

OCT/NOV-2024

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.

Que-1 **Answer in brief any SEVEN.** **(14)**

(1) Define nanoscience and nanotechnology.
(2) Write the names of various carbon derivatives.
(3) List various fabrication methods for nanomaterials.
(4) What is the use of RBS?
(5) What are nanopores?
(6) Give the importance of nanomaterials in nanotechnology.
(7) Discuss in brief the use of Scherer's formula.
(8) Define Molecular nanomachines.
(9) What is difference between SAXS and XRD?
(10) Draw the energy bands for metal, semiconductor and insulator.

Que-2 **Answer the following questions: Any TWO out of THREE** **(14)**

(1) Discuss in detail: fullerene and graphene.
(2) Define nanomedicine and discuss various approaches in developing nanomedicines.
(3) Describe carbon nanotubes and its properties with any one synthesis technique.

Que-3 **Answer the following questions: ALL ARE COMPULSORY**

(A) Explain the nanoscience of zinc oxide and titanium dioxide in detail. **(07)**

(B) Describe natural and man-made nanomaterials. Discuss in depth polymers and composite nanomaterials. **(07)**

OR

Que-3 **Answer the following questions: ALL ARE COMPULSORY**

(A) Discuss in detail the top-down methods: (i) ball milling (ii) laser ablation. **(07)**

(B) Explain steps of sol-gel technique in detail. **(07)**

Que-4 **Answer the following questions: Any TWO out of THREE** **(14)**

(1) Describe : (i) electron, (ii) photoelectron and (iii) vibrational spectroscopic techniques.
(2) Write notes on SEM and TEM techniques for materials characterizations.
(3) Write notes on Scanning Probe Microscopy and Atomic Force Microscopy techniques.

Que-5 **Write any TWO short notes.** **(14)**

(1) Describe various ionic spectroscopic techniques for characterization of nanomaterials.
(2) Write notes on QCM and MEMS.
(3) Discuss and explain CVD method with proper chamber diagram.
(4) Write a note on MBE technique for high quality growth of two-dimensional nanomaterials.

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