



Seat No. _____

H-003-0496001

B. Sc./M. Sc. (Applied Physics) (Sem. VI) (CBCS) Examination

April - 2023

Elements of Nanoscience and Nanotechnology : Paper-XXI

(New Course)

Faculty Code : 003

Subject Code : 0496001

Time : $2\frac{1}{2}$ / Total Marks : 70

Instructions :

- (1) All questions are compulsory.
- (2) Numbers in the right side indicate marks.

- 1 (A) Write answers : **4**
- (1) Give the chart of technological revolution.
 - (2) What is confinement ?
 - (3) What is Dichroism ?
 - (4) Define term 'Nano'.
- (B) Write answer of any One : **2**
- (1) How many cubes 1nm on each side can be curved out of a 1m on each side ? Find the collective surface area of the nanometer-sized cube.
 - (2) Give the name of Special Nanomaterials types.
- (C) Write answer of any One : **3**
- (1) Calculate a cube with side of length $1\ \mu\text{m}$. If the same mass of the cube is converted to cubes with sides of length 1nm, calculate the surface area of smaller sized cubes.
 - (2) Calculate the surface to volume ratio of the spheres
(a) Radius = 4 cm and (b) Diameter = 1.5 mm.
- (D) Write answer of any One : **5**
- (1) Explain Metal Nanomaterials in brief.
 - (2) Discuss Semiconductor Nanomaterials in detail.

- 2 (A) Write answers : 4
- (1) What is Top-down methods ?
 - (2) What is Bottom-up methods ?
 - (3) What is gelation is sol-gel method ?
 - (4) Write types of CVD method (any 4 with full name)
- (B) Write answer of any One : 2
- (1) What is Carrier Gas and Reactive Gas ?
 - (2) What is Microwave method for synthesis of nanomaterials ?
- (C) Write answer of any One : 3
- (1) Write procedure for preparation of gold nanoparticles using nucleation process.
 - (2) Explain Molecular Beam Epitaxy method in brief.
- (D) Write answer of any One : 5
- (1) Discuss Pulse Laser Deposition Method for thin film preparation.
 - (2) Explain Ball Milling Process and its applications in detail.
- 3 (A) Write answers : 4
- (1) Draw schematic diagram of SEM.
 - (2) Define Bragg's law using diagram.
 - (3) Give full form : TEM, AFM.
 - (4) How many operation modes in STM ? Give name.
- (B) Write answer of any One : 2
- (1) What information is obtained from Scanning electron microscopy imagers ?
 - (2) Which types of samples can be analyzed using atomic force microscopy ?
- (C) Write answer of any One : 3
- (1) Explain elastic and inelastic scattering mechanism.
 - (2) What information do we get from the X-ray diffraction ?
- (D) Write answer of any One : 5
- (1) Explain principle and instrumentation of Scanning electron microscopy.
 - (2) Explain X-ray diffraction characterization technique in detail.

- 4 (A) Write answers : 4
- (1) List out different types of Nanoelectronics.
 - (2) Define nanotechnology in medical field.
 - (3) What is Computing applications ?
 - (4) What is size range of nanomaterials in food science ?
- (B) Write answer of any One : 2
- (1) Write electronic applications of nanomaterials.
 - (2) Write optical applications of nanomaterials.
- (C) Write answer of any One : 3
- (1) What are the environmental effects of nanomaterials ?
 - (2) What are the disadvantages of nanomaterials?
- (D) Write answer of any One : 5
- (1) Write applications of nanomaterials in agriculture and food.
 - (2) Write note on Nano medicines.
- 5 (A) Write answers : 4
- (1) What is Luster ?
 - (2) Write names of any two PVD methods.
 - (3) What is 'microscopy' ?
 - (4) Full form of MRI.
- (B) Write answer of any One : 2
- (1) What are the advantages of Transmission electron microscopy ?
 - (2) Calculate the surface area and volume of a sphere with radius 2 cm.
- (C) Write answer of any One : 3
- (1) Explain Arc Discharge Method.
 - (2) What is the difference between SEM and TEM ?
- (D) Write answer of any One : 5
- (1) Explain Special Nanomaterials : CNT's
 - (2) Discuss Photoelectron spectroscopy in detail.
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