

H-4/29/22

Roll No.

IV Semester Examination, 2022**M.Sc.****PHYSICS****Paper II****(Physics of Nanomaterials and Devices)**

Time : 3 Hours]

[Max. Marks : 80

Note : All questions are compulsory. Question Paper comprises of 3 sections. Section **A** is objective type/multiple choice questions with no internal choice. Section **B** is short answer type with internal choice. Section **C** is long answer type with internal choice.

SECTION A**1×8=8****(Objective Type/Multiple Type Questions)***Choose the correct answer :*

1. Nanomaterials are materials with at least one dimension measuring less than :
 (a) 1 nm (b) 10 nm
 (c) 100 nm (d) 1000 nm
2. The melting point of particles in nano range :
 (a) Increase
 (b) Remains same

P.T.O.

(c) Decrease

(d) Increases then decreases with size

3. Which of the following is a bottom up synthesis approach :
 (a) Etching
 (b) Ball milling
 (c) Colloidal dispersion
 (d) Attrition
4. Chemical solution deposition is also known as :
 (a) CVD (b) CBD
 (c) Sol-Gel (d) LASER Pyrolysis
5. The maximum value of λ (wave length) detection by XRD is :
 (a) d (b) $3d$
 (c) $4d$ (d) $1 D$
6. Which carbon nanostructure is placed on both the ends of the CNTs ?
 (a) Graphite (b) Diamond
 (c) C_{60} (d) Benzene

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7. Which of the following is used in electron microscope ?

- (a) Electron Beams
- (b) Light Waves
- (c) Magnetic fields
- (d) Both electron beams and magnetic fields

8. Which property of nanomaterials make them suitable for the elimination of pollutants ?

- (a) Better thermal conductivity
- (b) Self cleaning
- (c) Enhanced chemical activity
- (d) Quantum confinement

SECTION B

6×4=24

(Short Answer Type Questions)

Unit-I

1. Write striking changes that Nanoscience and technology may bring into society, Industry and medicine.

Or

Explain surface plasmon resonance in metallic nanoparticles.

Unit-II

2. Describe the process, characteristic features and applications of electron beam lithography.

Or

Explain pros and cons of X-ray lithography as compared to electron beam lithography.

Unit-III

3. Explain working of X-ray diffractometer giving description of various parts of the instrument. Hence describe the method of determination of crystal structure and particle size using it.

Or

Discuss various methods of chemical characterization using optical microscopy.

Unit-IV

4. Give a brief account of principle, construction and working of Active microfluidic devices.

Or

Explain giving suitable example, the basic principle and mechanism of Targeted drug delivery.

SECTION C**12×4=48****(Long Answer Type Questions)****Unit-I**

1. Derive an expression for chemical potential as a function of surface curvature. Hence explain, why is the solubility of a smaller particle higher than that of a bigger particle ?

Or

Describe the changes observed in the magnetic properties of nano materials as compared to bulk.

Unit-II

2. Write short notes on any *one* :
- (a) Soft Lithography
 - (b) Self assembly of deposition of monolayers

Unit-III

3. What are core-shell structures ? Write synthesis strategies and specific applications of any two core-shell nano structures.

Or

Discuss structure, chirality, synthesis strategies and applications of CNT.

Unit-IV

4. What do you mean by Band gap engineering ? Discuss band gap engineered quantum DOT (QD) devices and explain the major difficulties with suitable remedies.

Or

Discuss concept of molecular switches describe the process by giving suitable examples for designing various molecular switches and logic gates.

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