

Roll No. ....

**D-976**

**M. Sc. (Fourth Semester) (Main/ATKT)  
EXAMINATION, May-June, 2020**

PHYSICS

Paper Fourth (C)

**(Physics of Nanomaterials—II)**

Time : Three Hours ] [ Maximum Marks : 80

**Note :** Attempt all Sections as directed.**Section—A** 1 each**(Objective/Multiple Choice Questions)****Note :** Attempt all questions.

Choose the correct answer :

1. Polymer can be occurring :

- (a) Only Naturally
- (b) Only Synthetic
- (c) Naturally or Synthetic
- (d) None of these

2. Cotton is a suitable example for :

- (a) Organic metal
- (b) Fiber
- (c) Hard material
- (d) Composite materials

3. Width of DNA molecule in the range between :

- (a)  $10^0-10^1$  (m)
- (b)  $10^{-6}-10^{-4}$  (m)
- (c)  $10^{-9}-10^{-10}$  (m)
- (d)  $10^{-9}-10^{-7}$  (m)

4. Drug delivery via polymeric nanofibers is based on principle that of :

- (a) Dissolution rate of particulate drug
- (b) Density of a drug
- (c) Composition of a drug
- (d) Both (a) and (c)

5. Polymeric nanofibrous mat dressing to shield the wound against bacterial penetration in order to applied :

- (a) 1-100 nm
- (b) 1-100  $\mu$ m
- (c) 500-1000 nm
- (d) 500-1000  $\mu$ m

6. Nanolithography are based on :

- (a) X-ray Diffraction Patterns (XRD)
- (b) Atomic Force Microscopy (AFM)
- (c) Differential Scanning Calorimetry (DSC)
- (d) Scanning Probe Microscopy (SPM)

**P. T. O.**

[ 3 ]

D-976

7. Lithography consists of patterning substrate by employing the interaction of beams of photons or particles with materials is known as :
- (a) Photolithography
  - (b) Ion beam lithography
  - (c) Electron beam lithography
  - (d) X-ray lithography
8. Ion beam lithography is based on :
- (a) 3-dimensional topography
  - (b) 3-dimensional printing
  - (c) 3-dimensional etching
  - (d) None of these
9. In lithography techniques Si/SiO<sub>2</sub> can be used as :
- (a) Insulator
  - (b) Conductors
  - (c) Separators
  - (d) Wafers
10. The lithography process involves the category of nanolithographic techniques known as :
- (a) Ion beam lithography
  - (b) X-ray lithography
  - (c) Soft lithography
  - (d) Photolithography

[ 4 ]

D-976

11. In photolithography commonly used photoresist is :
- (a) Poly (vinylidene fluoride) PVdF
  - (b) Poly (ethylene oxide) PEO
  - (c) Poly (methyl methacrylate) PMMA
  - (d) Poly (vinyl alcohol) PVA
12. Industrial ecology is a contradiction in term “burning + ice” or :
- (a) Obscure + Clarity
  - (b) Melting + Freezing
  - (c) Burning + Melt
  - (d) Ice + Boiling
13. Industrial ecology refers to the use of nanotechnology to enhance the environmental :
- (a) Pollution
  - (b) Sustainability
  - (c) Industrial waste
  - (d) Both (a) and (b)
14. Toxic effects on established microbial communities concentration is :
- (a) ~ 50 mg/litre
  - (b) ~ 1000 mg/litre
  - (c) ~ 5 mg/litre
  - (d) ~ 150 mg/litre

P. T. O.

[ 5 ]

D-976

15. In nanosolar cells based on a substance with a coating of nanocrystals, the nanocrystals are typically based on :
- (a) Si, CdTe
  - (b) Ge, CdTe
  - (c) Si, C
  - (d) Ge, C
16. How many types of display devices are commercially available in market at presently ?
- (a) two types
  - (b) three types
  - (c) five types
  - (d) seven types
17. Most of flat panel displays form digits or characters with combination of how many segments or dots ?
- (a) Seven
  - (b) Four
  - (c) Five
  - (d) Two
18. In CNT FET works on the principle of direct tunneling through the Schottky barrier at the source channel junction is known as :
- (a) MOSFET CNT

P. T. O.

[ 6 ]

D-976

- (b) SB CNT FET
  - (c) Coaxial CNT FET
  - (d) Bottom Gate CNT FET
19. Pure or doped highly anisotropic crystalline metals, semiconductors or insulators with a lateral dimension of 5-100 nm is known as :
- (a) Composite nanomaterials
  - (b) Filter materials
  - (c) Functional doping materials
  - (d) Functional nanomaterials
20. In defects only the smaller ion (cation) leaves its original lattice sites, known as :
- (a) Schottky defects
  - (b) Frenkel defects
  - (c) Dislocation
  - (d) Point defect

**Section—B**

2 each

**(Very Short Answer Type Questions)**

**Note :** Attempt all questions.

1. What is a crystal defect ?
2. Define functional nanomaterials.
3. What is a Polymer ?
4. Define lithography.

[ 7 ]

D-976

5. Define carbon nanotube (CNT).
6. What do you mean by Engraving ?
7. What is Industrial Ecology ?
8. Define a drug delivery.

**Section—C**

3 each

**(Short Answer Type Questions)**

**Note :** Attempt all questions.

1. Explain the crystal bonding and band structure.
2. Explain the electron transport in semiconductors.
3. Explain the photolithography.
4. Explain the fate of the nanomaterials in environment.
5. Explain the environmental life cycle of nanomaterials.
6. Explain the medical prostheses and wound dressing.
7. Give a brief explanation on flat panel displays (FPDs).
8. Discuss in brief about Soft Lithography.

**Section—D**

5 each

**(Long Answer Type Questions)**

**Note :** Attempt any *four* questions.

1. Write a brief note on nanolithography and current research.
2. Explain Ion Beam Lithography (IBL) and its applications.

[ 8 ]

D-976

3. Explain corporate social responsibility (CSR) for nanotechnology and nanomaterials in future implications.
4. Write short notes on the following :
  - (a) Protective clothing
  - (b) Material reinforcement
  - (c) Electrical conductors
5. Explain the solar nanocells and CNT FETs.
6. Explain the electrical transport in nanostructure materials.

D-976

P. T. O.