

Roll No. ....

**E-986**

**M. Sc. (Fourth Semester) (Main/ATKT)  
EXAMINATION, May-June, 2021**

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 :

- Crystal structures in cubic system, find the suitable parameters :
  - $a = b = c, \alpha = \beta = \gamma = 90^\circ$
  - $a = b \neq c, \alpha = \beta = \gamma = 90^\circ$
  - $a \neq b \neq c, \alpha = \beta = \gamma = 90^\circ$
  - $a \neq b \neq c, \alpha = \beta = 90^\circ, \gamma \neq 90^\circ$

- In metals, due to metallic bond, the valence electrons that are free to move within metal and hence called :
  - Valence electrons
  - Pair of electrons
  - Auger electrons
  - Conduction electrons
- Conduction mechanism in semiconductors is based on movement of :
  - Only electrons
  - Electrons + ions
  - Electrons + holes
  - Holes + ions
- Electrical conduction is the movement of electrically charged particles through a transmission medium (electrical conductor). The movement can form an electric current in response to a/an :
  - Magnetic field
  - Electric field
  - Both Magnetic + Electric field
  - Current density
- The next generation of CNTFET came in structure to improve the device performance :
  - Top Drain

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- (b) Top Gate
  - (c) Top Source
  - (d) None of the above
6. Cotton or jute are the suitable example for ;
- (a) Monomer
  - (b) Nanofiber
  - (c) Fiber
  - (d) Polymer
7. Protein nanofibers were deposited as a thin porous film on to a prosthetic device for implantation in the :
- (a) Central nervous system
  - (b) Backbone system
  - (c) Both Central nervous and backbone system
  - (d) None of the above
8. Biodegradable polymeric fibers have been directly sprayed on to the skin wounds with the aid of an electrical field is known as :
- (a) Electrochemical method
  - (b) Pulse ablation method
  - (c) Arc discharge method
  - (d) Electrospun method

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9. Nanofibrous membranes ranging from  $0.25 \times 10^8$  to  $100 \times 10^8$  mm<sup>2</sup>/g is highly efficient for :
- (a) Wound dressing and dermal delivery
  - (b) Fluid absorption and dermal delivery
  - (c) Cosmetics and dermal delivery
  - (d) Only fluid absorption
10. Materials reinforcement of Polybenzimidazole (PBI) nanofibrous non-woven mats with an average diameter is :
- (a) ~ 300 nm
  - (b) ~ 100–200 nm
  - (c) ~ 100–300 nm
  - (d) ~ 50–500 nm
11. Optical lithography is also known as :
- (a) Electron beam lithography
  - (b) Photolithography
  - (c) Ion beam lithography
  - (d) None of the above
12. Corporate Social Responsibility (CSR) funds mainly focused on :
- (a) Development on Industry
  - (b) Welfare Programme on Civil Society
  - (c) Welfare Programme on Religious Work
  - (d) Development on Tourist Places

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13. The concentrations on toxic effects in microbial community is :
- (a) 1500 mg/L
  - (b) 10 mg/L
  - (c) 1000 mg/L
  - (d) 150 mg/L
14. To enhance the environmental sustainability the use of nanotechnology refers to the :
- (a) Industrial Ecology
  - (b) Energy Conservation
  - (c) Green Nanotechnology
  - (d) Plant Biotechnology
15. Ion beam lithography is based on :
- (a) 3D etching method
  - (b) 2D etching method
  - (c) 1D topography
  - (d) 3D paintings
16. Focused Ion Beam Lithography (FIBL) can serve as an alternative to :
- (a) Electron Beam Lithography
  - (b) Optical Lithography
  - (c) X-ray Lithography
  - (d) None of the above

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17. The world freshwater accessible for direct human uses is :
- (a) ~ 10%
  - (b) 4.5%
  - (c) ~ 1%
  - (d) ~ 3.0%
18. Polymeric nanofibrous films were employed as a new sensing interface for developing chemical/biological sensor application is :
- (a) Poly (Vinylidene Fluoride) (PVdF)
  - (b) Poly (Ethylene Oxide) (PEO)
  - (c) Poly (Aniline) (PAN)
  - (d) Poly (Lactic-co-glycolic) Acid (PLGA)
19. In nanosolar cells a substrate with a coating of nano-crystals, are typically based on :
- (a) Si, CdTe
  - (b) Ge, CdTe
  - (c) Ge, C
  - (d) Si, Ge
20. Nano-lithography is the origin from :
- (a) Asian word
  - (b) Greek word
  - (c) Roman word
  - (d) Arabic word

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**Section—B**

2 each

**(Very Short Answer Type Questions)**

**Note :** Attempt all questions.

1. What is an electrical transport ?
2. Explain the energy band gap in semiconductors.
3. Define a carbon nano-tubes (CNTs).
4. What do you mean by Lithography ?
5. What is a clean energy ?
6. Define the industrial ecology.
7. Define polymeric nano-fibers.
8. What is a nano-solar cells ?

**Section—C**

3 each

**(Short Answer Type Questions)**

**Note :** Attempt all questions.

1. Describe the electrical transport in nano-structure.
2. Discuss the drug delivery system and how polymeric nano-fiber is useful in this system.
3. Explain the X-ray lithography.
4. Write a short note on Ion Beam Lithography.
5. Explain the fate of nanomaterials.
6. Explain the life cycle of nanomaterials.
7. Discuss the CNTFET.
8. Explain the wound dressing and cosmetics.

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**Section—D**

5 each

**(Long Answer Type Questions)**

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

1. Explain the photolithography and its working principle.
2. Discuss an industrial ecology and their impacts on environment.
3. Write short notes on any *two* of the following :
  - (a) Materials reinforcement
  - (b) Protective clothing
  - (c) Electrical conductors
4. What is Corporate Social Responsibility (CSR) ? Explain the nanolithography applications and current research.
5. Discuss the Electron Beam Lithography (EBL) and its applications.
6. Explain the ionic conduction mechanism and Arrhenius behaviour.

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