

Roll No. :

Total No. of Questions : 11]

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BPF-2237

M.Sc. (Final) Examination, 2022

PHYSICS

Paper - VIII (B)

(Physics of Nanomaterials and Environmental Physics)

Time : 3 Hours]

[Maximum Marks : 75

Section-A

(Marks : 2 × 10 = 20)

Note :- Answer all *ten* questions (Answer limit **50** words). Each question carries **2** marks.

Section-B

(Marks : 5 × 5 = 25)

Note :- Answer all *five* questions. Each question has internal choice (Answer limit **200** words). Each question carries **5** marks.

Section-C

(Marks : 10 × 3 = 30)

Note :- Answer any *three* questions out of five (Answer limit **500** words). Each question carries **10** marks.

Section-A

1. (i) Define Density of states in energy bands.
- (ii) Write an expression that gives relation between density of states of free electrons and their energy.
- (iii) Define Quantum well and Quantum dots.

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- (iv) Draw band structures for metals, insulator and semi-conductors.
- (v) Write the expression for eigenvalue and eigenvectors for the electron confined into 2D well.
- (vi) Draw a labelled diagram to explain the ion beam deposition method.
- (vii) What is greenhouse effect ?
- (viii) Write the Kirchoff's law and Beer's law of radiation.
- (ix) Explain turbulence and turbulent diffusion briefly.
- (x) What are main elements of weather and climate ?

Section-B

2. Explain the formation of band structure in solid materials.

Or

Explain the free electron theory and write its features.

3. An electron is confined into infinite deep square potential well, use Schrödinger equation to find eigenvalue and eigenfunction for this state and interpret the results.

Or

Explain the detailed method to find the particle size using Raman spectra in nano-materials.

4. Explain the construction, working and principle of cluster beam evaporation.

Or

Write short notes on transport of matter, energy and momentum in nature.

5. Explain the solar and terrestrial spectra in detail.

Or

Write short notes on the following :

- (a) Air and Water quality standards
- (b) Heat island effect

6. Explain in detail about fuel cell and nuclear energy sources.

Or

Explain horizontal and vertical motion of air and how it affect climate ?

Section-C

7. Explain in detail how density of state and band gap vary with size of crystals.

8. Write short notes on the following :

(a) Increase in width of XRD peaks of nanoparticle.

(b) Shift in photoluminescence peaks.

9. Explain chemical bath preposition with capping technique and ball minning technique for preparation of nanomaterial.

10. Write short notes on the following :

(a) Wet and dry deposition

(b) Puffs and Plumes

(c) Gaseous and Paniculate matters

11. Explain the following terms in detail :

(a) A zero dimensional greenhouse model

(b) Enhanced greenhouse effect

(c) Role of viscous and inertial force in explaining weather