Roll No. ..... Total Printed Pages - 8

F- 756

M.Sc. (THIRD SEMESTER)
EXAMINATION, Dec. - Jan., 2021-22
(PHYSICS)
(Physics of Nanomaterials - I)

PAPER FOURTH (C)

Time : Three Hours] ***[Maximum Marks : 80***

Note : Attempt all sections as directed.

Section - A

(1 mark each)

(Objective /Multiple Choice Questions)

Note : Attepmt all Questions.

Choose the correct answer.

1. Richard Feynman is of ten credited with predicting the potential of anotechnology. What was the title of his famous speech given on Dec 29, 1959?
   (A) There is plenty of room at the bottom.
   (B) Things get nanoscopic at the bottom.
   (C) What is bottom?
   (D) There is a tiny room at the bottom.

2. The degree of freedom of an electron trapped in a Bulk material is.
   (A) 3 dimensions
   (B) 2 dimensions
   (C) 1 dimension
   (D) 0 dimension
3. C_{60}, C_{70}, C_{80} and C_{100} are examples of.
   (A) Liquid crystals
   (B) Carbon nanotube
   (C) Fullerene
   (D) None of the above
4. The melting point of nanomaterials is usually ..... than their bulk counterpart.
   (A) Remains same
   (B) Decreases
   (C) Increases
   (D) None of the above
5. A material with one dimension in nano region and other two dimension are large-
   (A) Quantum Wire
   (B) Quantum Well
   (C) Quantum Dot
   (D) Bulk Materials

6. The colour of the nano semiconductor is ..... .
   (A) White
   (B) Yellow
   (C) Red
   (D) Orange
7. The top-down approach for synthesis of nanomaterials involves:
   (A) Adding materials molecules by molecule
   (B) Milling the materials
   (C) Removing material layer by layer.
   (D) Both (B) and (C).
8. Which of these Carbon allotropes can be formed by Graphene?
   (A) Carbon narotube
   (B) Graphite
   (C) Fullerene
   (D) All of the above
9. Photo-lithography is a technique for obtaining:
   (A) Nanotubes
   (B) Nanowire
   (C) Nanowall
   (D) Pre-designed patterns of substrate

10. Which of the following is an example of Bottom-up approach?
    (A) Milling
    (B) Etening
    (C) Colloidal dispersion
    (D) Attrition
11. Processes related to photo lithography are mentioned here. Arrange the processes in proper order.

(i)	Soft bake	(ii)	Photoresist coating
(iii)	Water cleaning	(iv)	Exposure
(v)	Alignment	(vi)	Development

    (A) ii - i - iv - ii - v - vi
    (B) iii - i - ii - v - iv - vi
    (C) iii - iv - i - vi - v - vi
    (D) iii - ii - i - v - iv - vi
12. To improve the composite of graphite _____ is used as a catalyst fo CNT synthesis.
    (A) Ni
    (B) Co
    (C) Fe, Ni and Co
    (D) Fe

13. What does "F" stand for in AFM?

    (A) Fine

    (B) Flux

    (C) Front

    (D) Force

14. With the use of _____, Robert F. Curl and others discovered Fullerence.

    (A) XRD

    (B) EXAFS

    (C) STM

    (D) EM

15. _____technique is suitable for function group detection.

    (A) FTIR

    (B) XRD

    (C) NMR

    (D) TEM

16. Principal of UV-Vis spectroscopy is based on-

    (A) Bragg's Law

    (B) Beer - Lambert Law

    (C) Snell's Law

    (D) None of the above

17. In TEM, the image is obtained by the electrons.

    (A) Scattering from the sample

    (B) Passing through the sample

    (C) Absorbed by the sample

    (D) None of the abvoe

18. Photoluminescence spectra of nanocrystals are usually shifted towards-

    (A) Lower wave length

    (B) No change

    (C) Higher wavelength

    (D) None of the above

19. Which metal is used with nanoparticles for antibiotic delivery?

    (A) Gold (B) Titanium

    (C) Zinc (D) Silver

20. X-ray diffractometers are not used to identify the physical properties of which of the following?

    (A) Metal

    (B) Polymeric Materials

    (C) Glass

    (D) Lia, vids

Section - B

(2 Marks each)

(Very Short Answer Type Questions)

Note- Attempt all questions.

1. Why properties of nanomaterials different from those of the same material in bulk form?
2. What are the advantages of nanomaterials over bulk materials?
3. How many types of CNT are there?
4. What is speciality of Graphene?
5. Which nanomaterial is used for cutting tools?
6. What is basic difference between top-down and bottom-up method?
7. Write difference between TEM and SEM.
8. Describe different thermal analysis method.

Section - C

(3 Marks each)

(Very Short Answer Type Questions)

Note : Attempt all questions.

1. Write a different modes of classification of Nanomaterials.
2. Write some challeges faced in Nono Science and Nanotecnology.
3. Write a short note on -
   (i) Optical properties of CNT
   (ii) Mechanical properties of CNT

4. Explain a X-ray diffraction for nanomaterials.
5. Describe Plasma deposition of Ultra-thin functional films on nanomaterials.
6. Describe Photoluminescence (PL) spectroscopy for nano-materials.
7. Explain nano-identation technique.
8. Explan Raman spectroscopy for Graphene (2D).

Section - D

(5 Marks each)

(Long Answer Type Questions)

Note- Attempt any Four questions.

1. Explain in detail Electrical, magnetic and thermal properties of nano structured materials.
2. Explain chemical vapor deposition method of carbon nanotubes.
3. Explain thermo Gravimetric analysis and differential scanning calorimetry for nanomaterials.
4. Describe atomic force microscopy and gives its advantages and disadvantages in respect biogoical sample.
5. Describe Raman Spectroscopy. What information does Raman spectoscopy provide from Graphene sample?
6. What is difference between CNT and Graphene? How are CNT and Graphene similar?
7. Discuss how Luminescence technique is used to investigate Nanomaterials. Which type of lumescence is not beneficial?