Total number of printed pages:5 **PG/2nd/PFET2122**

2021

NANOMATERIAL SYNTHESIS AND CHARACTERIZATION TECHNIQUES

Full Marks: 60

Time: Two hours

The figures in the margin indicate full marks for the questions.

A. Multiple Choice Questions 1 x 20=20

1. The prefix "nano" comes from a
   a. Spanish word meaning particle
   b. French word meaning billion
   c. Greek word meaning dwarf
   d. Latin word meaning invisible
2. What was the title of Richard Feynman famous speech given on December 29, 1959?
   a. There is a tiny room at the bottom
   b. Things get nanoscopic at the bottom
   c. There is plenty of room at the bottom
   d. Bottom? What bottom?
3. Question 2: Who first used the term nanotechnology and when?
   a. Richard Feynman, 1959
   b. Norio Taniguchi, 1974
   c. Eric Drexler, 1986
   d. Sumio Iijima, 1991
4. What is graphene?
   a. A one-atom thick sheet of carbon
   b. A new material made from carbon nanotubes
   c. A software tool to measure and graphically represent nanoparticles
   d. Thin film made from fullerenes

5. What is the procedure in Top-down fabrication method?
    a. Nano-particles → Powder → Bulk
    b. Powder → Bulk → Nano-particles
    c. Bulk → Powder → Nano-particles
    d. Nano-particle → Bulk → Powder
6. Which of the following is an example of Bottom-Up approach?
    a. Milling
    b. Etching
    c. Colloidal dispersion
    d. Attrition
7. CVD stands for _____
    a. Chemical vapour density
    b. Carbon vapour deposition
    c. Chemical vapour deposition
    d. Carbon vapour density
8. Why to use biological methods for synthesis of nanoparticles?
    a. Reduce toxic chemicals concentration
    b. Eco-friendly nanoparticles
    c. Economically viable
    d. All of the above
9. Nanoparticles from mechanical attrition are produced by _____process.
    a. bottom-down
    b. bottom-up
    c. top-down
    d. top-up
10. Spherical gold nanoparticles are ___ dimensional (D) nanomaterials.
    a. 0
    b. 1
    c. 2
    d. 3

11. Nanomaterials are the materials with at least one dimension measuring less than _____

    a. 1 nm
    b. 10 nm
    c. 100 nm
    d. 1000 nm

12. The colour of the nano gold particles is _____

    a. Yellow
    b. Orange
    c. Red
    d. Variable

13. The size of atoms is nearly _____

    a. 0.01 nm
    b. 0.1 nm
    c. 1 nm
    d. 10 nm

14. Fullerene or bucky ball is made up of ____ carbon atoms.

    a. 100
    b. 60
    c. 66
    d. 80

15. The cut-off limit of human eye is ____ nm.

    a. 2,000
    b. 5,000
    c. 10,000
    d. 50,000

16. The wavelength of visible light is ____ nm.

    a. 40-70
    b. 400-700
    c. 4000-7000
    d. 40000-70000

17. The size of a quantum dot is ____ nm.
    a. 5
    b. 25
    c. 50
    d. 100
18. Nanostructures have sizes in between --------
    a. 1 and 100 Å
    b. 1 and 100 nm
    c. 1 and 100 nm
    d. None of the above
19. The quality of not having toxic or injurious effects on biological systems called
    a. biocompatibility
    b. biodegradability
    c. biocentrism
    d. None of the above
20 Who prepared and explained nanotubes for the first time?
    a. Sumio Tijima
    b. Richard Smalley
    c. Eric Drexler
    d. Richard Feynmann

B. Very Short Question 2*6=12

1. List few historical events in the field of nanotechnology.
2. Define Nanotechnology and Nanoparticles.
3. Write short note on Carbon fullerenes
4. Write short note on Carbon Nanotubes
5. What are the potential applications of silver nanoparticles?
6. Write the name of plant materials which acts as reducing and stabilizing agents during nanoparticles synthesis.

C Short Question 4*7=28

1. What do you understand by green synthesis of nanoparticles? Write the various biological agents/materials used for green synthesis of nanoparticles.
2. Differentiate between Bottom-up and Top-down approach of Synthesis of Nanomaterials.
3. What are the differences between UV-Vis and FTIR spectroscopy?
4. Name different type of electron microscope, and write how do TEM differ from SEM.
5. Explain 0D, 1D, 2D and 3D nanomaterials.
6. Write about CVD method used for deposition of thin films/coatings?
7. Explain the principle of XRD analysis of nanoparticles.