KATHMANDU UNIVERSITY
End Semester Examination
24- December 2023

Marks Scored:

Level : B.E.
Year : IV

Course : CHEG 402
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date :

SECTION "A"

[20Q. × 0.5 =10 marks]

Encircle the most appropriate option from each set of choices

1. How does nanotechnology contribute to the early strength development of cement?
   a. Delays the setting time of concrete
   b. Accelerates the hydration process
   c. Has no impact on the curing time
   d. Increases the water-to-cement ratio

2. What is the primary advantage of using nanomaterials in drug delivery systems?
   a. Increased shelf life
   b. Enhanced bioavailability
   b. Reduced cost of production
   d. Improved taste and flavor

3. Which nanomaterial is often employed to encapsulate and deliver hydrophobic drugs?
   a. Gold nanoparticles
   b. Carbon nanotubes
   c. Liposomes
   d. Quantum dots

4. What is the primary purpose of incorporating nanomaterials in food packaging?
   a. Enhancing flavor
   b. Improving nutritional content
   c. Extending shelf life
   d. Increasing food temperature

5. Which of the following is an example of top-down approach for the preparation of nanomaterials?
   a. Gas phase agglomeration
   b. Molecular self-assembly
   c. Mechanical grinding
   d. Molecular beam epitaxy

6. Which of the following is an example of bottom-up approach for the preparation of nanomaterials?
   a. Etching
   b. Hydrothermal synthesis
   c. Lithography
   d. Erosion

7. What year did Richard Feynman deliver his groundbreaking lecture that is often considered the starting point for the field of nanotechnology?
   a. 1965 b. 1973 c. 1959 d. 1982

8. What famous phrase did Feynman use to emphasize the potential of working at the nanoscale during his 1959 lecture?
   a. "Small Wonders"
   b. "Tiny Marvels"
   c. "There's Plenty of Room at the Bottom"
   d. "Microscopic Miracles"

9. What is the significance of the nanotechnology in the Lycurgus cup?
   a. It enhances the cup's durability
   b. It makes the cup resistant to heat
   c. It enables the cup to change color in different lighting conditions
   d. It improves the cup's insulating properties

10. What is the significance of the term "bottom-up" in nanotechnology?
    a. Refers to a top-secret manufacturing technique
    b. Indicates assembling structures from individual atoms or molecules
    c. Describes a classification method for nanomaterials
    d. None of the above

11. What is the typical size range of objects on the nanometer scale?
    a. 1 to 100 millimeters
    b. 1 to 100 micrometers
    c. 1 to 100 nanometers
    d. 1 to 100 centimeters

12. Which of the following techniques is commonly used for the bottom-up synthesis of nanomaterials?
    a. Lithography
    b. Top-down approach
    c. Self-assembly
    d. Grinding

13. In the context of nanomaterial synthesis, what does the acronym "ALD" stand for?
    a. Atomic Layer Deposition
    b. Advanced Lithography Design
    c. Amplified Laser Diffraction
    d. Acoustic Levitation Device

14. Which smart material is sensitive to changes in light and is used in the production of smart windows?
    a. Shape memory alloy
    b. Electrochromic material
    c. Magnetostrictive material
    d. Conductive polymer

15. What type of smart material changes its color in response to an external stimulus such as temperature or light?
    a. Shape memory alloy
    b. Thermochromic material
    d. Piezoelectric material
    d. Electrostrictive material

16. Shape memory alloys exhibit which unique property?
    a. Ability to generate electricity
    b. Ability to return to a pre-defined shape
    c. High thermal conductivity
    d. High tensile strength

17. What is a potential benefit of employing nanosensors in agriculture?
    a. Increased soil erosion
    b. Enhanced pesticide resistance
    c. Real-time monitoring of crop conditions
    d. Delayed plant growth

18. How does nanotechnology contribute to improved performance in paints?
    a. By reducing viscosity
    b. By enhancing adhesion and durability
    c. By changing color properties
    d. By increasing toxicity

19. Which nanoparticle is commonly used to provide UV protection in nanotechnology-based paints?
    a. Carbon nanotubes
    b. Silver nanoparticles
    c. Titanium dioxide nanoparticles
    d. Gold nanoparticles

20. In marine nanotechnology, what role do nanosensors play?
    a. Monitoring marine life populations
    b. Enhancing ship aesthetics
    c. Regulating water temperature
    d. Detecting and reporting changes in marine conditions

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Year : IV
Time : 2 hrs. 30mins.

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F. M. : 40

SECTION "B"
[8Q. × 5 = 40 marks]

Attempt *ANY EIGHT* questions

1. Describe the photolithographic process for the nanomaterial preparation. What are the advantages and limitations of lithography? [4+1]

2. Differentiate between bottom-up and top-down methods of nanomaterial synthesis. Describe the thermal decomposition, ultra sound and inert gas condensation processes with their advantages and disadvantages. [1+4]

3. What do you mean by smart materials? Describe different types of smart materials with applications. [1+4]

4. Write down the different types of nanoparticles used in paints and coatings. Discuss the advantages of nanocoating in the marine industry. [2+3]

5. What do you mean by precision farming? Discuss the challenges of using nanotechnology in the agriculture industry. [2+3]

6. Discuss the scope of nanotechnology in the food and pharmaceutical industries, along with its advantages and disadvantages. [2.5+2.5]

7. Write brief notes on the different types of nanomaterials used in cement. Discuss the advantages and limitations of using nano/composite materials in the construction industry. [2+3]

8. Discuss the evolution and future perspectives of nanoscience and nanotechnology.

9. Write short notes. [5 × 1 = 5 marks]
   a. Composite materials
   b. 1D, 2D and 3D nanomaterials
   c. Co-precipitation synthesis.
   d. Arc discharge synthesis
   e. Ball milling for nanoparticle synthesis