

KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2019

Marks Scored:

Level : B.E.

Year : IV

Course : CHEG 402

Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date 08: MAR 2019

SECTION "A"

[20 Q. × 0.5 = 10 marks]

Choose and encircle the most appropriate answer.

- Composite materials are classified based on
 - Type of matrix
 - Size-and-shape of reinforcement
 - Both a and b
 - None
- Al-alloys for engine/automobile parts are reinforced to increase their
 - Strength
 - Wear resistance
 - Elastic modulus
 - Density
- Mechanical properties of fiber-reinforced composites depend on
 - Properties of constituents
 - Interface strength
 - Fiber length and orientation
 - All of the above
- Graphene is
 - A software tool to measure and graphically represent nanoparticles
 - Thin film made from fullerenes
 - A one-atom thick sheet of carbon
 - A new material made from carbon nanotubes
- Usually stronger constituent of a composite is
 - Matrix
 - Reinforcement
 - Both are of equal strength
 - Can't be defined
- Which of the following is an example of top-down approach for the preparation of nanomaterials?
 - Gas phase agglomeration
 - Molecular self-assembly
 - Mechanical grinding
 - Molecular beam epitaxy
- Which of the following is an example of bottom-up approach for the preparation of nanomaterials?
 - Etching
 - Hydrothermal synthesis
 - Lithography
 - Erosion
- Which of the following is the principal factor which causes the properties of nanomaterials to differ significantly from other materials?
 - Size distribution
 - Specific surface feature
 - Quantum size effects
 - All of the above
- The prefix "nano" comes from a ...
 - French word meaning billion
 - Greek word meaning dwarf
 - Spanish word meaning particle
 - Latin word meaning invisible

10. What is a buckyball?
 - a. A carbon molecule (C60)
 - b. Graphene sheet
 - c. Carbon nanotube
 - d. Concrete nanoparticle with a compressive strength of 20 nanonewtons (C20)
11. Industrial catalysts should have _____ surface area.
 - a. High
 - b. Low
 - c. Moderate
 - d. None of the above
12. "There is a plenty of room at the bottom." This was stated by
 - a. Isaac Newton
 - b. Albert Einstein
 - c. Richard Feynman
 - d. Eric Drexler
13. 1 nanometer = _____ m.
 - a. 10^{-9}
 - b. 10^{-8}
 - c. 10^{-7}
 - d. 10^{-6}
14. The approximate diameter of human hair is _____ nm
 - a. 17000-180000
 - b. 75-180
 - c. 17×10^{-5} - 17×10^{-5}
 - d. 7.5×10^{-9}
15. Piezoelectric materials
 - a. Produce a voltage when stress is applied
 - b. Collapse when the pH of the surrounding media changes
 - c. Change colour in response to thermal changes
 - d. None of the above
16. Nanoparticle properties are
 - a. May be same as in bulk material
 - b. Little bit different form bulk material properties.
 - c. Significantly different form bulk material properties
 - d. None of the above
17. Surface area per unit volume for nanoparticles is
 - a. Same as macro-size particles
 - b. Higher than macro-sized particles
 - c. Lower than macro-sized particles
 - d. None of the above
18. Mechanical properties of fiber-reinforced composites depend on
 - a. Properties of constituents
 - b. Interface strength
 - c. Fiber length, orientation, and volume fraction
 - d. All of the above
19. Nanotechnology, in other words, is
 - a. Carbon engineering
 - b. Atomic engineering
 - c. Small technology
 - d. Microphysics
20. Which of these historical works of art contain nanotechnology?
 - a. Lycurgus cup
 - b. Medieval stained glass windows in churches
 - c. Damascus steel swords
 - d. All of the above

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Level : B.E.
Year : IV
Time : 2 hrs. 30 mins.

08 MAR 2019
Course : CHEG 402
Semester : I
F.M. : 40

SECTION "B"
[8Q. × 5 = 40 marks]

Attempt *ANY EIGHT* questions.

1. Define a nanomaterial. How are nanomaterials classified? Explain with examples.
2. What are the factors that affects the mechanical properties of the fiber reinforced composite materials? Explain with example. Write down the applications of the fiber reinforced composite materials.
3. What do you mean by bottom-up method of nanomaterials synthesis? Describe thermal deposition, ultra sound and inert gas condensation process with their advantages and disadvantages.
4. Show your acquaintance with electron beam lithography and mechanical milling. Write down the advantages and limitations of each.
5. Write down the principle for piezoelectric materials, magnetic shape memory alloys, pH sensitive polymers and photonic materials? Discuss each with their applications.
6. What do you mean by chromogenic system? Discuss electrochromic, thermochromic and photochromic materials with examples.
7. Discuss the evolution and future perspective of nanoscience and nanotechnology.
8. Discuss the applications of nanotechnology in construction and computer science.
9. Write short notes on (*ANY TWO*)
 - a. Carbon nanofiber
 - b. Quantum dot
 - c. Arc discharge synthesis

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