

Fundamentals of Nanotechnology

Science · Practice Test · 25 Questions

1. What is the range of dimensions typically associated with nanotechnology?

- A) 1 to 100 micrometers
- B) 1 to 100 nanometers
- C) 100 to 1000 nanometers
- D) 0.1 to 1 nanometer

2. Which phenomenon explains why gold nanoparticles appear red or purple rather than yellow?

- A) Surface Plasmon Resonance
- B) The Photoelectric Effect
- C) Quantum Tunneling
- D) Thermal Conductivity

3. What does the abbreviation 'AFM' stand for in the context of imaging nanoscale surfaces?

- A) Atomic Force Microscopy
- B) Automated Field Mapping
- C) Atomic Frequency Measurement
- D) Advanced Filter Mechanism

4. Which carbon allotrope, discovered in 1985, consists of a hollow sphere of 60 carbon atoms?

- A) Graphene
- B) Fullerene (Buckminsterfullerene)
- C) Carbon Nanotube
- D) Diamond

5. At the nanoscale, which force often becomes dominant, making objects stick together?

- A) Gravitational force
- B) Magnetic force
- C) Van der Waals forces
- D) Centrifugal force

6. What is the primary material used to create carbon nanotubes?

- A) Silicon
- B) Graphene sheets rolled into cylinders
- C) Gold atoms in a chain
- D) Titanium dioxide crystals

7. Which property of silver nanoparticles makes them useful in medical applications like wound dressings?

- A) High reflectivity
- B) Antimicrobial properties
- C) Superconductivity
- D) Radioactivity

8. Who is often credited with giving the first lecture on the potential of nanotechnology, titled 'There's Plenty of Room at the Bottom'?

- A) Albert Einstein
- B) Richard Feynman
- C) Marie Curie
- D) Nikola Tesla

9. What is the primary difference between a scanning tunneling microscope (STM) and an optical microscope?

- A) STM uses electrons, optical uses light
- B) STM uses lasers, optical uses magnets
- C) STM works only in vacuums, optical only in water
- D) There is no significant difference

10. What is the term for the ratio of surface area to volume as objects become smaller?

- A) It remains constant
- B) It decreases significantly
- C) It increases significantly
- D) It becomes zero

11. Which of the following is a naturally occurring example of nanotechnology found in nature?

- A) A desert sand dune
- B) The structure of a lotus leaf
- C) A cloud formation
- D) The bark of an oak tree

12. What is the primary purpose of a cleanroom in nanotechnology research?

- A) To keep the equipment warm
- B) To prevent microscopic dust from contaminating samples
- C) To store hazardous chemicals
- D) To provide high-speed internet access

13. Graphene is composed of a single layer of carbon atoms arranged in what geometric pattern?

- A) Hexagonal lattice
- B) Cubic grid
- C) Tetrahedral structure
- D) Amorphous cloud

14. Which unit is equivalent to one billionth of a meter?

- A) Millimeter
- B) Micrometer
- C) Nanometer
- D) Picometer

15. What is the primary function of a 'quantum dot' in modern television displays?

- A) To cool the screen
- B) To produce precise colors
- C) To increase the screen weight
- D) To act as a remote control

16. Which of these describes the 'bottom-up' approach in nanotechnology?

- A) Carving materials out of a larger block
- B) Building structures atom by atom
- C) Using extreme heat to melt materials
- D) Using biological organisms to mine ore

17. Why are nanomaterials often more chemically reactive than bulk materials?

- A) They have more atoms inside
- B) They have a higher percentage of atoms on the surface
- C) They are made of toxic elements
- D) They absorb more light

18. What is the purpose of 'self-assembly' in nanotechnology?

- A) Disassembling broken machines
- B) Arranging components into ordered structures without external guidance
- C) Cleaning the workspace
- D) Printing labels on electronics

19. What happens to the melting point of a substance when it is reduced to nanoparticles?

- A) It stays the same
- B) It typically increases
- C) It typically decreases
- D) It becomes unstable

20. Titanium dioxide nanoparticles are commonly used in which consumer product for their UV-blocking ability?

- A) Food flavoring
- B) Sunscreen
- C) Battery acid
- D) Plastic wrap

21. What is the main challenge in the mass production of carbon nanotubes?

- A) They are too heavy
- B) They are extremely expensive to produce in high quality
- C) They melt at room temperature
- D) They cannot be seen by the human eye

22. In the context of nanotechnology, what is 'lithography' used for?

- A) Creating patterns on a substrate
- B) Measuring atomic weight
- C) Refining gold ores
- D) Calculating chemical bonds

23. Which field combines biology and nanotechnology to develop medical treatments?

- A) Nanomedicine
- B) Astrophysics
- C) Paleontology
- D) Botany

24. What effect does the wave-like behavior of electrons have at the nanoscale?

- A) Quantum confinement
- B) Increased rust
- C) Thermal expansion
- D) Faster oxidation

25. Which of the following is a potential application of nanotechnology in water treatment?

- A) Adding sugar to water
- B) Using nanofilters to remove pollutants
- C) Freezing the water
- D) Evaporating the water