

Advanced Nanotechnology Milestones

Nanotechnology · Answer Key · 20 Questions

1. In his 1959 lecture 'There's Plenty of Room at the Bottom', what specific theoretical limit did Richard Feynman suggest for the size of a motor?

- A) 1/64 of an inch**
- B) 1/100 of an inch
- C) 1/256 of an inch
- D) 1/500 of an inch

2. The term 'nanotechnology' was first coined in 1974 by which researcher at the Tokyo University of Science?

- A) Eric Drexler
- B) Norio Taniguchi**
- C) Sumio Iijima
- D) Richard Smalley

3. What is the exact atomic number of the element whose 1985 discovery, in the form of C60 buckminsterfullerene, launched the era of fullerene research?

- A) 5
- B) 6**
- C) 7
- D) 8

4. The 1981 invention of the Scanning Tunneling Microscope (STM), which allowed for the imaging of individual atoms, earned its inventors which fraction of the 1986 Nobel Prize in Physics?

- A) 1/4
- B) 1/3
- C) 1/2**
- D) Full prize

5. In 1991, Sumio Iijima published his seminal paper in Nature describing the discovery of what structure?

- A) Multi-walled carbon nanotubes**
- B) Single-walled carbon nanotubes
- C) Quantum dots
- D) Graphene sheets

6. In 1959, Richard Feynman offered a prize of \$1,000 for the first person to build an electric motor that fit into what volume?

- A) 1 cubic millimeter
- B) 1/64 cubic inch**
- C) 1 cubic micrometer
- D) 1/1000 cubic centimeter

7. What is the diameter, in nanometers, of the DNA double helix that serves as a common reference for biological nanotechnology?

- A) 0.5 nm
- B) 1.0 nm
- C) 2.0 nm**
- D) 5.0 nm

8. The National Nanotechnology Initiative (NNI) was officially signed into law as a federal program by which U.S. President in 2003?

- A) Bill Clinton
- B) George W. Bush**
- C) Barack Obama
- D) Ronald Reagan

9. What is the specific wavelength (in nanometers) typically used for the excitation of standard CdSe (Cadmium Selenide) quantum dots to achieve blue fluorescence?

- A) 300-400 nm**
- B) 400-500 nm
- C) 500-600 nm
- D) 600-700 nm

10. In 1986, K. Eric Drexler published his book 'Engines of Creation', which popularized the concept of molecular nanotechnology. How many chapters does this book contain?

- A) 8
- B) 10
- C) 12
- D) 14**

11. A 'nanometer' is defined as exactly what fraction of a meter?

- A) 10^{-7}
- B) 10^{-8}
- C) 10^{-9}**
- D) 10^{-10}

12. In 1989, Don Eigler of IBM famously used an STM to spell out the 'IBM' logo using how many individual Xenon atoms?

A) 35

B) 42

C) 50

D) 64

13. What is the approximate tensile strength (in GPa) of a defect-free single-walled carbon nanotube?

A) 10-20 GPa

B) 50-100 GPa

C) 150-200 GPa

D) 500+ GPa

14. What is the specific surface-area-to-volume ratio of a sphere with a radius of 1 nm?

A) 1 m^{-1}

B) 2 m^{-1}

C) 3 nm^{-1}

D) 6 nm^{-1}

15. The 'Feynman Prize' for nanotechnology was established in what year?

A) 1990

B) 1993

C) 1997

D) 2000

16. What is the approximate bond length (in nanometers) of a carbon-carbon covalent bond in a graphene sheet?

A) 0.142 nm

B) 0.242 nm

C) 0.342 nm

D) 0.442 nm

17. In 2004, Andre Geim and Konstantin Novoselov isolated graphene using what mechanical method?

A) Chemical Vapor Deposition

B) Scotch tape exfoliation

C) Laser ablation

D) Molecular beam epitaxy

18. How many carbon atoms are contained in a standard C60 Buckminsterfullerene molecule?

- A) 40
- B) 50
- C) 60**
- D) 70

19. What is the approximate limit of resolution (in nanometers) of a high-end commercial Transmission Electron Microscope (TEM)?

- A) 0.05 nm**
- B) 0.5 nm
- C) 5 nm
- D) 50 nm

20. The first 'nanocar' (a molecular machine) was synthesized by James Tour's group in what year?

- A) 2003
- B) 2005**
- C) 2007
- D) 2009