

Check your ALCE Reading Skills: Activity 2

Key and item analysis

Text

This text has been adapted from an article in the New Scientist

Imagine a world where microscopic medical implants patrol our bodies, diagnosing ailments and fighting disease; where computer chips are no bigger than specks of dust; and where clouds of miniature space probes transmit data from the atmospheres of Mars or Titan. Many claims have been made about the future's nanotechnological applications, and controversy has plagued this emerging technology, but what exactly does nanotechnology mean?

Nanotechnology is science and engineering at the scale of atoms and molecules, involving the manipulation and use of materials and devices so tiny that nothing can be built any smaller. Typically between 0.1 and 100 nanometers (nm) in size, with 1 nm being equivalent to one billionth of a meter, nanomaterials are at the scale at which the basic functions of the biological world operate - and materials of this size display unusual physical and chemical properties. These profoundly different properties are due to an increase in surface area compared to volume - and also the grip of different quantum effects at the atomic scale, attracting interest in their potential for practical applications. In fact, some of these applications have unwittingly been made use of for centuries. Tiny particles of gold for example, can appear red or green - a property that has been used to color stained glass windows for over 1,000 years.

Nanotechnology is found today in products ranging from nanometer-thick films on "self-cleaning" windows to pigments in sunscreens, longer lasting lipsticks, spill-proof pants and tennis rackets with extra pop. In 1991, tiny, super-strong rolls of carbon atoms known as carbon nanotubes were created. These are six times lighter, yet 100 times stronger than steel. Nanomaterials have also been used to create tough plastics, smaller computer chips, toxic gas detectors, and a number of other enhanced materials. The far future might even see the unique properties of nanomaterials harnessed to build a space elevator.

In the short term, the greatest advances through nanotechnology will come in the form of novel medical devices and processes. We are already seeing research on: the directing of drugs to tumors with tiny "smart bombs"; gold "nano-bullets" that seek-and-destroy tumors; starving cancer with nanoparticles; diagnosing diseases such as Alzheimer's, monitoring health and fighting sickness with tiny probes; And biochemists are hoping to deploy viruses as "nanocameras" to get a clearer picture of what is going on inside cells.

Nanotechnology has generated criticism from environmental groups. Calling for a moratorium on research, critics argue that we know little about the toxicological effects of nanoparticles, and that there are no regulations to control them. Nanotechnology advocates simply call this scaremongering, and fail to understand what all the fuss is about. According to the few experimental studies to date into the health impact of nanoparticles, high concentrations of nanotubes could damage the lungs of rats and mice. One study, independently commissioned in 2003 by Greenpeace, acknowledged that, while there could be risks from nanotechnology, the field could generate significant innovations to benefit the environment.

An open public debate on the development of nanotechnology may be the best way to stop it becoming embroiled in the same kind of furore that has surrounded GM organisms.

Question 1

Why does nanotechnology attract intense world wide interest?

- A. It can help us solve environmental problems.
- B. It can threaten the existence of life as we know it today.
- C. It has a long-term potential for practical usage.
- D. It leads to the development of new standards of measurement.

ANSWER KEY

C.

LEVEL OF DIFFICULTY

Medium

ITEM INFORMATION

C is the correct answer choice because the text states “Many claims have been made about the future's nanotechnological applications...” and a number of examples of practical use for nanotechnology are given in paragraph 1, while in paragraph two, the text states “...attracting interest in their potential for practical applications.”

Question 2

What happens to materials at the nanoscale?

- A. No fundamental changes occur as size is reduced.
- B. Some unique and potentially useful properties emerge.
- C. Their atoms behave in a way that is incomprehensible to scientists.
- D. Their physical and chemical properties become inactive.

ANSWER KEY

B.

LEVEL OF DIFFICULTY

More challenging

ITEM INFORMATION

B is the correct answer choice because the text states “...materials of this size display unusual physical and chemical properties...”

Question 3

Why is nanotechnology currently used in products according to the text?

- A. To create a wide variety of new products.
- B. To improve product quality and functionality.
- C. To increase efficiency of manufacturing.
- D. To produce higher revenue for investors.

ANSWER KEY

B.

LEVEL OF DIFFICULTY

Medium

ITEM INFORMATION

B is the correct answer choice because the text states a number of examples of improved product quality and functionality, e.g. "...self-cleaning" windows to pigments in sunscreens, longer lasting lipsticks, spill-proof pants and tennis rackets with extra pop."

Question 4

What do advocates claim in response to the development of nanotechnology?

- A. Criticism causes delays that outweigh the risks of development.
- B. Criticism is destructive, ineffective and pointless.
- C. Criticism results in unnecessary public fear of nanotechnology.
- D. Criticism will cause research to relocate to less responsible venues.

ANSWER KEY

C.

LEVEL OF DIFFICULTY

More challenging

ITEM INFORMATION

C is the correct answer choice because the text states "Nanotechnology advocates simply call this scaremongering..." in reference to criticism.

Question 5

What does research suggest about the development of nanotechnology?

- A. Experiments should be more strictly controlled.
- B. Further development should be halted to avoid risk to society.
- C. Nanotechnology is just as dangerous as biotechnology.
- D. The full biological and ecological effects of nanotechnology are not yet known.

ANSWER KEY

D.

LEVEL OF DIFFICULTY

More challenging

ITEM INFORMATION

D is the correct answer choice because the text states “According to the few experimental studies to date into the health impact of nanoparticles, high concentrations of nanotubes could damage the lungs of rats and mice. One study, independently commissioned in 2003 by Greenpeace, acknowledged that, while there could be risks from nanotechnology, the field could generate significant innovations to benefit the environment.” This implies that scientists have not yet evaluated the risks fully and that further research would be needed.

Question 6

Which title best reflects the article?

- A. The Costs of Current Early Explorations into Nanotechnology
- B. The Economic Implications of Nanotechnology
- C. The Enormous Potential of Nanotechnology
- D. Nanotechnology: Past, Present and Future

ANSWER KEY

C.

LEVEL OF DIFFICULTY

Medium

ITEM INFORMATION

C is the correct answer choice because the text emphasizes the benefits and particularly the future benefits of nanotechnology, e.g. “...the greatest advances through nanotechnology will come in the form of novel medical devices and processes.”

Question 7

What is the purpose of the writer?

- A. To boost further financial investment in nanotechnology.
- B. To emphasize that further discussion on the impact of this science is necessary.
- C. To ensure a favorable reception of the science among the public.
- D. To promote a shutdown on all research in the field of nanotechnology.

ANSWER KEY

C.

LEVEL OF DIFFICULTY

Medium

ITEM INFORMATION

C is the correct answer choice because the text is favorable towards nanotechnology, citing many of the benefits, and concludes with “An open public debate on the development of nanotechnology may be the best way to stop it becoming embroiled in the same kind of furore that has surrounded GM organisms”, thereby calling for a discussion now so as to avoid a negative image for this technology in the future.
