

**For Teachers:** Please have the students read the sentences one at a time and correct their pronunciation of each sentence then have them repeat after you. Wait until after they read the sentence (use the number in place of the missing word) to have the students choose the correct answer to fill in the blank. When the students finish the article, move on to the further questions.

日本語訳なしタイプ B もございます。スクロールダウンするとございますので好きな方をご利用下さい。

### 3[A] – Big Risks in Tiny Technology

Version3 G1 10-2

ナノテクノロジー

微細粒子 (びさいりゅうし)

1. Nanotechnology involves the creation of products using microscopic particles generally measuring 100 nanometers or less. To gain some idea of the size of these particles, consider that a strand of human hair is about 80,000 nanometers wide. In 2008, worldwide sale of products created using nanotechnology—from antibacterial skin creams to stain-resistant textiles—totaled approximately \$150 billion.

#### Further Questions

\*Ask student to answer the question on their own at first. If the student can't answer correctly, have him look at the last page and read the "example answer" for the question. Have the student try to memorize the answer, if it's too long or difficult, you should divide the sentence into 2 or 3 parts to make it easier to remember. Once they have memorized the answer, the teacher should ask the question one last time so that the student can practice answering. Also if you find any mistakes, please mark the page and let me know ASAP.

2. 1) How small are microscopic particles?
3. 微細粒子はどれくらい小さいのですか。
4. 2) What was the total sales of products created using nanotechnology in 2008?
5. ナノテクノロジーを使って作られた製品の2008年の総売上高はいくらでしたか。
6. 1) They generally measure 100 nanometers or less.
7. 2) They totaled approximately \$150 billion.
8. It is not surprising, then, that research has focused on the potential for nanoproduct development, while possible risks have been given short shrift. The few recent studies that have investigated this issue, however, are less than reassuring. Nanoparticles have far greater surface area relative to volume than larger particles. This dramatically increases their chemical reactivity, which makes them especially useful in medicine and as industrial catalysts, but many also make them toxic.
9. Researchers believe potential risk is heightened because nanoparticles can easily penetrate membranes that normally protect human organs, tissues, and cells. Nanoparticles released into the environment may be absorbed through contact with the skin or by inhalation. They could then enter the bloodstream and be transported to tissues in the internal organs and nervous system. Because of their minute size, nanoparticles may even enter cell components, such as the nucleus and mitochondria; this possibility has led some researchers to suggest that nanoparticles have the potential to cause DNA mutation and cell death.

#### Further Questions

10. 3) Why is the chemical reactivity of nanoparticles dramatically increased?

11. ナノ粒子の化学反応性が劇的に高まっているのはなぜですか。

12. 4) What could nanoparticles released into the environment do?

13. 周辺環境に放出されたナノ粒子は何をしますか。

14. 3) *They have a much greater surface area relative to volume.*

15. 4) *They could be absorbed through contact with the skin or by inhalation.*

16. The chemical composition, shape, and 溶解性 (ようかいせい) solubility of a nanoparticle are also believed to influence its toxicity. Each nanoparticle developed must therefore be individually evaluated to assess potential hazards. Many nanoparticles naturally generate フリーラジカル free radicals (molecules that can damage cells). When the body is unable to deal with the effects of these reactive molecules, 炎症 (えんしょう) inflammation, along with subsequent protein, membrane, and DNA damage, can occur.

17. Even nanoparticles that are not thought to be directly toxic to humans, such as the silver nanoparticles used in some soaps and toothpastes, can carry risks. These nanoparticles kill over 650 kinds of harmful bacteria but also destroy beneficial bacteria, such as those used to remove chemicals from wastewater in 汚水 (おすい) sewage systems. Treated wastewater is often released into oceans, rivers, and lakes, or ends up as 肥料 (ひりょう) fertilizer for crops, so it is 緊急 (きんきゅう) の imperative that it be safe. Troy Benn, a researcher at Arizona State University, says, “If those (silver) nanoparticles are released into the environment, you no longer have any control over what 生物 (せいぶつ) organisms they affect.”

## Further Questions

18. 5) What do nanoparticles generate?

19. ナノ粒子は何を生成しますか。

20. 6) What do silver nanoparticles do?

21. 銀ナノ粒子は何をしますか。

22. 5) *Many nanoparticles naturally generate free radicals.*

23. 6) *They kill over 650 kinds of harmful bacteria but also destroy beneficial bacteria.*

24. Some people are worried that the nanoparticle industry, blinded by the benefits and dollar signs, is ～するのに気(き)が進(すす)まない loath to address possible problems. Norwegian engineer Toril Hofshagen warns that developments “are being driven by desire for new functional products, while manufacturers don’t take enough time to identify any hazardous effects for products before they are put on the market.”

25. What is more, there are very few tests that can measure the toxicity of nanoparticles with accuracy. It would be wise to view with 懐疑 (かいぎ) skepticism any

attempts to <sup>軽視 (けいし) する</sup> downplay safety concerns. Indeed, some observers are urging an immediate <sup>停止 (ていし)</sup> moratorium on the sale of nanoproducts until the risks are better understood.

### Further Questions

26. 7) What is the nanoproduct industry being driven by?  
 27. ナノ製品業界は何に動かされていますか。  
 28. 8) What are some observers urging?  
 29. 評論家たちは何を強く求めていますか。  
 30. 7) *They are being driven by desire for new functional products.*  
 31. 8) *They are urging an immediate moratorium on the sale of nanoproducts.*

### \*Choose the correct answer from these choices.

32. (32) Recent studies on the risks associated with nanoproducts suggest that  
 33. ナノ製品に関連したリスクに関する近年の調査で分かった事は  
 34. 1. nanopartiles's size makes it almost impossible for scientists to detect them if they are released into the environment during the development process.  
 35. 2. the potential of nanoparticles to damage health is intensified by their ability to pass through the human body's natural lines of defense.  
 36. 3. chemical reactivity caused the large surface-area-to-volume ratio of nanoparticles can result in normally beneficial medicines being converted into poisons.  
 37. 4. the ability of nanoparticles to combine with other molecules means they often increase the toxic effect of chemicals are naturally present in human cells.  
 38. (33) What is one problem relating to use of nanoparticles?  
 39. ナノ粒子の使用に関する問題とは何ですか。  
 40. 1. Some are so effective at eliminating bacteria that they end up killing even those bacteria that are important for protecting public health.  
 41. 2. Although effective at killing most bacteria when used in <sup>衛生 (えいせい)</sup> hygiene products, they actually promote bacterial growth in certain parts of the human body.  
 42. 3. Even those tested and certified safe for use in hygiene products may undergo changes in their chemical composition, making them toxic to humans.  
 43. 4. The antibacterial action of many nanoparticles is <sup>逆 (ぎやく) に</sup> adversely affected by the free radicals that are commonly found throughout the human body.  
 44. (34) What view does the author of the passage express regarding the safety of nanotechnology?  
 45. ナノテクノロジーの安全性について、このパッセージの著者はどのような考えですか。

46. 1. The time and effort required to adequately test the safety of nanoproducts is preventing many potentially useful products from reaching the market.
47. 2. Although the industry claims to have come up with safe ways of using nanotechnology to improve water quality, it has yet to provide convincing evidence to support this.
48. 3. Given the tendency of companies involved in developing nanoproducts to put profits before health concerns, the public should hesitate to believe that such products are absolutely safe.
49. 4. While some nanoparticles may well turn out to be harmful the suggested ban on the marketing of nanoproducts is an overreaction.

### Answers for "Further Questions"

50. 1) How small are microscopic particles?  
*They generally measure 100 nanometers or less.*
51. 2) What was the total sales of products created using nanotechnology in 2008?  
*They totaled approximately \$150 billion.*
52. 3) Why is the chemical reactivity of nanoparticles dramatically increased?  
*They have a much greater surface area relative to volume.*
53. 4) What could nanoparticles released into the environment do?  
*They could be absorbed through contact with the skin or by inhalation.*
54. 5) What do nanoparticles generate?  
*Many nanoparticles naturally generate free radicals.*
55. 6) What do silver nanoparticles do?  
*They kill over 650 kinds of harmful bacteria but also destroy beneficial bacteria.*
56. 7) What is the nanoproduct industry being driven by?  
*They are being driven by desire for new functional products.*
57. 8) What are some observers urging?  
*They are urging an immediate moratorium on the sale of nanoproducts.*

66. 解答: (32)2 (33)1 (34) 3

### Type B 日本語訳なし

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