英　　語

第１問　Read the following passage and choose the most appropriate answer from **a**～**d** for each question.

The term “water footprint” describes the amount of water that is used to produce the goods and services we use. It can measure the water used in growing crops, producing a t-shirt, or creating gas for a car. It can also tell us how much water a country is using, from a river or an *[1]aquifer. The water footprint allows us（　1　）a lot of questions, especially whether we are protecting our water resources for the future of people and nature.

The water footprint distinguishes between green, blue, and grey water. Green water comes from rain and it is especially *[2]relevant for agriculture. Blue water is from surface or underground sources and it applies（　2　）industry and household uses. Grey water contains *[3]pollutants that end up in soil and lakes. These measures are important in government policies, businesses, and communities.

In terms of the food that we consume, plant protein has a smaller footprint than animal protein. In the Netherlands, for example, a 150-gram soy burger has a footprint of about 160 liters of water.（　3　）, a beef burger takes an average of 1,000 liters.

Looking at national scales, the water footprint of American citizens（　4　）2,840 cubic meters per year per person. Approximately 20% of this is external, meaning from outside the country. Japan has a much lower footprint of 1,380 cubic meters per year per person. However, about 77% of the total water footprint is outside the borders of the country. Japan has lots of rain, but it（　5　）an enormous amount of goods from overseas.

［Source: Vardaman, James M. *The Future We Face*］

Notes: *[1]aquifer　帯水層　　*[2]relevant　重要な　　*[3]pollutant　汚染物質

問 1 Which best fills in the blank (1)? **1**

a ask and answer

b asking and answering

c ask and answering

d to ask and answer

問 2 Which best fills in the blank (2)? **2**

a for

b by

c of

d to

問 3 Which best fills in the blank (3)? **3**

a As a result

b In comparison

c In addition

d Therefore

問 4 Which best fills in the blank (4)? **4**

a that is

b which are

c is

d are

問 5 Which best fills in the blank (　5　)? **5**

a designs

b recycles

c imports

d travels

第 2 問 Choose the most appropriate answer to fill in the blank from **a** ～ **d** for each question.

問 1 Climate change (　　) impacts the Earth's ecosystems and weather patterns. 6

a significant
b signified
c significantly
d significance

問 2 Our sales manager always (　　) our customers' expectations. 7

a lives up to
b calls on
c comes true
d results in

問 3 Shall we (　　) the discussion where we left off last week? 8

a ascend
b consume
c intend
d resume

問 4 You can get a ticket at a reasonable price (　　) you reserve it at once. 9

a considered
b that
c so that
d provided

問 5 John is the key person in our group. Who can take (　　) of him? 10

a a change

b the lead

c the place

d a chance

問 6 We waited for more than two hours at the library but she never (　　). 11

a appeared on

b showed up

c handed on

d turned in

問 7 Takashi is no more an artist than Michiko is. This means that (　　). 12

a Takashi is better at art than Michiko

b Michiko is a better artist compared to Takashi

c Michiko is the only one with a good sense of art

d both of them lack artistic sense

問 8 A: How much milk is left in the refrigerator?

B: (　　), I'm afraid. 13

a Not one

b None

c Not some

d Nothing

問 9 A: I am not sure which topic I should choose for my research paper.

B: (　　) consulting the professor after class? 14

a How about

b What if

c Why not

d How come

問10 A: That noise our car is making really gets on my nerves.

B: I agree. It (　　), too. We should get it repaired soon. 15

a turns me up

b satisfies me

c bothers me

d settles me down

問11 A: Do you know where I can buy organic vegetables?

B: They are (　　) at the grocery store in my neighborhood. 16

a available

b required

c valid

d able

第 3 問 Read the following passage and choose the most appropriate answer from **a**～**d** for each question.

A nanometer is a billionth of a meter. To help you understand how small this is, the *[1]diameter of a human hair is about 80,000 nanometers and the thickness of a sheet of paper is 100,000 nanometers. Human DNA is 2.5 nanometers, in diameter, while atoms range in size from 0.1 to 0.5 nanometers. Nanotechnology is the science of creating materials, components and machines at this tiny scale.

There are countless applications for nanotechnology, some that are already in use today and others that are expected in the near future. You may be surprised at how common some of these applications are. For instance, one advantage of using nanotechnology is that you can make materials stronger and more *[2]durable without adding any extra weight. For this purpose, nanoparticles are often used in the manufacture of baseball bats, tennis rackets, bicycles, motorcycle helmets, cars, trucks and airplanes. Nanoparticles can also improve the performance of golf clubs and even reduce the speed at which air *[3]leaks out from a tennis ball. In the fashion industry, special nanotech coatings have been created to make clothes water-resistant or stain proof. Other coatings kill bacteria to stop unpleasant smells or block *[4]ultraviolet rays to protect the wearer from sunburn. Nanoparticles are also used in skincare products to deliver vitamins deeper into the skin.

The chances are, then, that you have already used products which make use of nanotechnology. But how about applications beyond such everyday items? In *[5]electronics, nanotechnology has been used to shrink the size of *[6]transistors within computer chips in order to make them smaller and more powerful. In 2000, a typical transistor was between 130 and 250 nanometers in size; in 2016, a laboratory in California demonstrated the first 1-nanometer transistor. More efficient transistors may eventually mean that your computer's entire memory could be stored on just one tiny chip. In the same field, nanomaterials could also be used to create flexible electronic devices, such as electronic paper that can be rolled up and wearable solar *[7]generators that charge your smartphone as you walk.

The most exciting applications for nanotechnology come in the field of medicine. Nanotechnology is already being used to treat certain kinds of cancer through the use of lasers which apply heat to nanoparticles placed inside the unhealthy cells. There is

also the prospect of creating *[8]microscopic nanorobots that could be sent into the *[9]bloodstream to carry out delicate surgical operations inside the body. Finally, there may also be good news for those who hate getting their influenza *[10]injection each year. Scientists are currently working on ways to use nanotechnology to deliver vaccines without the use of a needle.

[Source: Rear, Dave and Kayoko Murakami. *Advances in Science—Learning from the Past, Looking to the Future*]

Notes: *[1]diameter 直径 *[2]durable 耐久性のある *[3]leak out 漏れる
*[4]ultraviolet rays 紫外線 *[5]electronics 電子工学 *[6]transistor トランジスタ
*[7]generator 発電機 *[8]microscopic 極小型の *[9]bloodstream 血流
*[10]injection 注射

問 1 Which of the following is mentioned in the passage? 17

a One billion times one meter is one nanometer.

b A nanometer is a unit of weight.

c A human hair is as thick as a piece of paper.

d Atoms are smaller than a nanometer.

問 2 What is true about nanotechnology? 18

a It has developed materials and instruments in small sizes.

b It has the risk of consuming a large quantity of energy.

c It has few ways to be utilized in industries.

d It has a substantial effect on human genetics.

問 3 Why is nanotechnology used in manufacturing processes? 19

a It can make things break down easily.

b It can strengthen materials without making them heavier.

c It can create tiny particles that have more weight than usual.

d It can increase the speed of producing goods.

問 4 Which of the following use of nanoparticles is mentioned in the passage? 20

a Soccer balls

b Golf carts

c Baseball equipment

d Tennis courts

問 5 How does nanotechnology work in the fashion industry? 21

a Special coatings make clothes look cleaner and more modern.

b Nanoparticles in coatings transfer sufficient water into clothing.

c Nanotech coatings contain bacteria that give a good smell to clothes.

d Coatings using the technology prevent wearers from damaging their skin.

問 6 What change has nanotechnology brought to computers? 22

a Achieving size reduction in transistors in computer chips

b Making the size of devices within computer chips larger

c Enabling a computer's entire memory to be stored in a tiny transistor

d Making the average size of a transistor 130 nanometers

問 7 What is implied about the application of nanotechnology in electronics? 23

a Charging smartphones while walking could become easier.

b Computers without transistors will be developed.

c Electronic paper requires the use of solar power.

d Quieter and cheaper computers are on the market.

問 8 How is nanotechnology being used to fight cancer? 24

- **a** By taking nanoparticles out of the bloodstream
- **b** By delivering nanoparticles in cancer drugs
- **c** By heating nanoparticles in affected cells
- **d** By using nanorobots to search for cancer

問 9 What changes does the author expect in future medical practices? 25

- **a** Some types of cancer could be treated by placing nanomaterials in healthy cells.
- **b** Tiny robots could be sent into the body to do operations.
- **c** All surgeries will be conducted using nanotechnology.
- **d** The number of influenza injections will increase.

問10 Which of the following is the most appropriate as the title of this passage? 26

- **a** The History of Scientific Crises
- **b** The Impact of Nanotechnology on Human Nature
- **c** The Conflict between Humans and Technology
- **d** The Huge Potential of Tiny Science

第 4 問 Read the following passage and choose the most appropriate answer from **a**～**d** for each question.

Millions of *[1]frustrated farmers and gardeners can *[2]attest that crows are smart. But at least one—Betty by name—is (2)at the head of the class. She not only knows how to use items as tools, she makes her own. Confronted by a small bucket of food inside a pipe—in a lab at England's Oxford University—Betty figured out how to bend a piece of wire into a hook and *[3]retrieve what she wanted. And she repeated the success over and over, using the wire to pull the bucket up by its handle. Her *[4]exploits are reported in a paper in Friday's issue of the journal *Science*.

"We were delighted and extremely surprised," said Alex Kacelnik, who teaches at Oxford and at the Science College of Berlin. Kacelnik and his colleagues were trying to determine if the crows, who have been known to use *[5]twigs to pick things up in the wild, could choose the right tool to retrieve food. They did not, however, expect the birds to make their own tools.

Richard Banks, an *[6]ornithologist at the Smithsonian's National Museum of Natural History, agreed that it was (　4　) for a bird to make a tool. Banks, an expert on North American crows, said he has seen a report of some species using materials as tools, but not actually making them. Some African chimpanzees have been observed selecting and using stones to open nuts and monkeys are known to use sticks to fish *[7]edible ants and *[8]termites out of their nests.

"Toolmaking and tool use has always been considered one of the *[9]diagnostics of a superior intelligence. Now a bird is shown to have greater *[10]sophistication than many closer relatives of us humans," Kacelnik commented. "People expect *[11]apes to be the pinnacle of intelligence in the animal kingdom because they are our closest relatives, but nature may have reached different solutions to similar problems," he said. "There is no doubt that the tool-manufacturing abilities of these animals have *[12]evolved independently of that of *[13]primates, and this gives us a lever to understand what makes intelligent solutions an advantage."

The Oxford researchers were working with a species of crow known as Corvus moneduloides, a type that lives on the island of New Caledonia in the Pacific Ocean. Two crows—Betty and Abel—were presented with a small bucket of food down inside a tube and two pieces of wire, one hooked and one straight. "Our surprise came when, in the fifth trial, the male stole the hooked wire from the female and took it away. Far from giving up, she then picked the remaining straight wire and bent it herself," Kacelnik explained. "To make sure of our observation we then offered repeatedly only the straight wire, and she unfailingly did the same trick over and over again," he went on. Both birds had used hooks before, he noted. "In fact these crows do use hooks made out of twigs in the wild."

[Source: Sugimoto, Toyohisa and Takako Sugimoto. *In-Depth Reading*]

Notes: *[1]frustrated　いらいらしている　*[2]attest　～を証言する　*[3]retrieve　～を回収する
*[4]exploit　離れわざ　*[5]twig　小枝　*[6]ornithologist　鳥類学者
*[7]edible　食べられる　*[8]termite　シロアリ　*[9]diagnostic　特徴
*[10]sophistication　高度な知識　*[11]ape　類人猿　*[12]evolve　進化する
*[13]primate　霊長類

問 1　What is implied about crows? **27**

a　Crows are clever and annoy farmers.

b　Farmers use crows to protect their fields.

c　Gardeners feed crows food from their land.

d　Farms and gardens are rarely visited by crows.

問 2　Why is Betty considered to be (2)at the head of the class? **28**

a　She is owned by a lab at a university.

b　She is capable of making her own tools.

c　She is keen on putting food in a pipe.

d　She is tested by some researchers.

問 3 What did Alex Kacelnik expect as the result of the experiment? 29

a Crows would use the right tool to get food when necessary.

b Crows would make their own tools appropriately.

c Crows would use tools when they worked in a group.

d Crows would preserve food for a long time with tools.

問 4 Which best fills in the blank (4)? 30

a ordinary

b anxious

c surprising

d predictable

問 5 Which of the following is true about the use of natural materials? 31

a Some African chimpanzees use natural materials to produce instruments.

b Monkeys utilize a piece of wood to catch ants.

c Some African chimpanzees make stones sharp to open nuts.

d Monkeys try to leave wooden sticks untouched in the wild.

問 6 What does Kacelnik indicate about the intelligence of animals? 32

a Humans and apes are the only intelligent animals.

b Birds can have higher intelligence than apes in some aspects.

c Intelligence of wild animals is inferior to that of humans.

d Superior intelligence is common among the majority of animals.

問 7 What behavior did researchers notice when observing two crows? 33

a The male crow took the tool from the female crow.

b The male crow repeatedly gave food to the female crow.

c The female crow preferred the straight wire.

d The female crow repeatedly tricked the male crow.

問 8 What did Kacelnik find out from the experiment? 34

a Betty gave up picking up the food after several attempts.

b Betty was reluctant to choose the hooked wire.

c Betty worked with another crow to improve a tool.

d Betty changed the shape of the wire deliberately.