2025年度

「英　語」

試験時間　60分

配点　100点

【１】次の英文の文脈に最も適合するように下線部(1)～(5)の [　　] 内の語（句）を並べ替えるとき，それぞれ 3 番目と 6 番目にくるものを選び，その番号をマークせよ．

Australian researchers say a simpler and cheaper (1)[① salt ② to ③ seawater ④ from ⑤ using ⑥ remove ⑦ method] heat could help combat what they call “unprecedented global water shortages.” The desalination of seawater is a process where salt and impurities are removed to produce drinking water.

Researchers at the Australian National University (ANU) say that while widespread, the current processes need large amounts of electricity and other expensive materials that need to be serviced and maintained.

Scientists at ANU say they developed the world’s first thermal desalination method. It is powered not by electricity, but by moderate heat generated directly from sunlight, or waste heat from machines such as air conditioners or other industrial processes.

It uses a phenomenon in (2)[① from ② cold ③ moves ④ which ⑤ hot ⑥ salt ⑦ to] temperatures. The researchers pumped seawater through a narrow channel, which runs under a unit that was heated to greater than 60 degrees Celsius and over a bottom plate that was cooled to 20 degrees Celsius. Lower-salinity water comes from the water in the top section of the channel, closer to the heat.

Juan Felipe Torres, the project’s lead chief investigator, explained his pioneering work.

“We use a phenomenon people have not used before,” he said. “We are exploring its applicability in this context but in essence (it) should be something super simple, something as (3)[① you ② which ③ have ④ as ⑤ through ⑥ a channel ⑦ simple] water flowing and you are going to produce some sort of separation, and this is what thermal desalination is doing.”

Torres said the ANU’s invention could (4)[① water ② under ③ communities ④ for ⑤ help ⑥ supplies ⑦ ensure] threat because of climate change.

“Our vision, let’s say, for the future to have a more equitable world in terms of water security and food security is a method that does not require expensive maintenance or to train personnel to continue running it. So, (5)[① that ② desalination ③ we ④ enable ⑤ think ⑥ would ⑦ thermal],” he said.

出典：*Voice of America*, May 31, 2024 より抜粋・改変

【２】次の英文を読み，以下の問いに答えよ．

Plants do not suffer in silence. Instead, when thirsty or stressed, plants make “airborne sounds,” according to a study published in *Cell*.

Plants that need water or have recently(1)(1a) ( ) (1b) ( ) up to roughly 35 sounds per hour, the authors found. But well-hydrated* and uncut plants are much quieter, making only about one sound per hour.

The reason you have probably never heard a thirsty plant make noise is that the sounds are ultrasonic—about 20-100 kilohertz. That means they are so high-pitched that very few humans could hear them. Some (2), however, probably can. Bats, mice and moths could potentially live in a world filled with the sounds of plants, and previous work by the same team has found that plants respond to sounds made by animals, too.

To eavesdrop* on plants, Lilach Hadany at Tel-Aviv University in Israel and her colleagues placed tobacco and tomato plants in small boxes kitted* out with microphones. The microphones picked up any noises made by the plants, even if the researchers couldn’t hear (3)them. The noises were particularly obvious for plants that were stressed by a lack of water or recent cutting. If the sounds are pitched down and sped up, “it is a bit like popcorn—very short clicks,” Hadany says. “It is not singing.”

Plants do not have vocal cords or lungs. Hadany says the current theory for how plants make noises (4)centers on their xylem*, the tubes that transport water and nutrients from their roots to their stems and leaves. Water in the xylem is held together by surface tension, just like water sucked through a drinking straw. When an air bubble forms or breaks in the xylem, it might make a little popping noise; bubble formation is more likely during drought stress. But the exact mechanism requires further study, Hadany says.

The team produced a machine-learning model to deduce* whether a plant had been cut or was water-stressed from the sounds it made, with about 70% accuracy. This result suggests a possible role for the audio monitoring of plants in farming and horticulture*.

To test the practicality of this approach, the team tried recording plants in a greenhouse. (5) the aid of a computer program trained to filter out background noise from wind and air-conditioning units, the plants could still be heard. Pilot studies by the authors suggest that (6)tomato and tobacco plants are not outliers. Wheat, corn and wine grapes also make noises when they are thirsty.

Previously, Hadany’s team has also studied whether plants can ‘hear’ sounds, and found that beach evening-primroses* release sweeter nectar* when exposed to the sound of a flying bee.

So are plant noises an important feature of ecosystems, influencing the behaviour of plants and animals alike? The evidence isn’t yet clear, according to Graham Pyke, a retired biologist at Macquarie University in Sydney, Australia, who specializes in environmental science.

He’s sceptical* that animals listen to the moans of stressed plants. “It is unlikely that these animals

are really able to hear the sound at such distances," he says. He thinks the sounds would be (　7　) faint. Further research should shed more light on the matter. But Pyke says he's perfectly willing to accept that plants 'squeal' when stressed.

出典：*Scientific American*, March 31, 2023 より抜粋・改変

注）
well-hydrated　十分に水分が補給された
eavesdrop　耳を傾ける
kit ~ with…　～に…を装備する
xylem　木部
deduce ~ from…　…から～を推測する
horticulture　園芸
beach evening-primroses　多年生の植物
nectar　花蜜
sceptical = skeptical

問 1　下線部(1)が意味の通る文になるように次の①～⑤の語（句）を各空所に入れるとき，(1a)と(1b)に該当する番号をそれぞれマークせよ．なお，不要な語（句）が 1 つ含まれている．

①　their stems　②　are　③　cut　④　produce　⑤　had

問 2　空所(2)に入る語として最も適当なものを次の①～④から 1 つ選び，その番号をマークせよ．

①　people　②　studies　③　plants　④　animals

問 3　下線部(3)が含むものとして最も適当なものを次の①～④から 1 つ選び，その番号をマークせよ．

①　The tiny noises coming from a pipe when smoking tobacco
②　The slight sound that a tobacco leaf makes when it is popped, like popcorn
③　The ultrasonic stress signals emitted by tobacco plants during water scarcity
④　The sound of tissue cells crunching as the tobacco leaves dry out and shrink

問 4　下線部(4)と置き換えられる語（句）として最も適当なものを次の①～④から 1 つ選び，その番号をマークせよ．

① emphasizes　② lies on　③ turns around　④ breaks up

問 5　空所(5)に入る語として最も適当なものを次の①～④から 1 つ選び，その番号をマークせよ．

① For　② Although　③ With　④ As

問 6　下線部(6)が表す内容に最も近いものを次の①～④から 1 つ選び，その番号をマークせよ．

① These plants have the ability to perceive sounds, similar to how other plant species can detect noise.

② Just as other plant species emit subtle ultrasonic sounds when they become thirsty, these plants also do.

③ For this study, the plants were placed inside the greenhouse rather than being arranged outside of it.

④ These plants, like wheat, corn, and wine grapes, are typically cultivated indoors in controlled environments.

問 7　空所(7)に入る語（句）として最も適当なものを次の①～④から 1 つ選び，その番号をマークせよ．

① too　② barely　③ by far　④ even

問 8　本文の内容と一致するものを次の①～④から 1 つ選び，その番号をマークせよ．

① Plants have specialized organs that produce sound when they are in danger or in emergency situations, and they generate sounds by regulating the amount of water in their bodies.

② Hadany’s research has not yet identified the exact mechanism by which plants produce sound. The current theory involves air bubbles in the xylem, but more research is needed to fully understand this process.

③ Hadany has found that some plants, such as beach evening-primroses, respond to sound. When hearing the sound of flying bees, the plants release sweeter nectar as well as producing peculiar sounds to attract the bees.

④ Plants produce short popping sounds, possibly due to air bubbles forming or bursting in their xylem, especially when under stress. This mechanism has already had practical application in plant health surveillance.

【３】Read the following passage and answer the questions below.

The rock group Counting Crows were onto something when they chose their band name. Crows can indeed count, according to research published in *Science*.

The results show that crows have counting capacities near those of human toddlers who are beginning to develop a knack for numbers, says lead study author Diana Liao, a postdoctoral researcher in neurobiology at the University of Tübingen in Germany. “We think this is the first time (1)this has been shown for any animal species,” she adds.

Crows do not appear to be capable of (2)symbolic counting, in which numbers are associated with a particular symbol that serves as an exact representation. This skill is still thought to be (A)unique to humans. (　i　) the birds are able to count by controlling the number of vocalizations* they produce to correspond to associated cues—just like young children who have yet to master symbolic counting often do, Liao says. For example, a toddler who is asked how many apples are on a tree may answer, “One, one, one” or “One, two, three”—producing the number of speech sounds that correspond to the number of objects they see rather than just saying, “Three.”

Scientists have long suspected that some nonhuman species might also have the ability to count by controlling the number of their vocalizations, but they have lacked the (B)smoking gun evidence to prove it. In a study of Black-capped Chickadees*, for example, researchers reported that (3)the number of “dee” notes at the ends of the birds’ alarm calls was inversely correlated with the size of the predator they were issuing warnings about. (The small predators in that study posed a higher risk to the chickadees than large ones did.) “They seemed to be conveying the magnitude of the threat,” Liao says.

Yet this finding on its own did not prove that chickadees were intentionally conveying information about the predator through numbered calls. The behavior could also be driven by the level of fear the birds were experiencing, Liao says, with more dangerous predators triggering higher states of arousal and thus more calls.

In (4)the new study, Liao and her colleagues ruled out these unknowns by running experiments with three carrion crows* in a carefully controlled laboratory setting. They presented the birds with randomly ordered cues, four of which were visual—colored Arabic numbers that appeared on a touch screen—and four of which were auditory, including a short guitar chord and a drumroll. Through trial and error, the birds had to figure out the correct number of calls, between one and four, to pair with each cue. If they got it right, they received a worm reward. (　ii　), they received a time-out from the game.

When the birds did get something wrong, they tended to make errors around the target number—a phenomenon referred to as the numerical distance effect. As Liao explains, “It’s easier to confuse three and four than it is one and four.”

After receiving between 166 and 189 training sessions, all of the crows were able to produce the correct number of vocalizations associated with the cues at a level higher than chance—a "pretty cool" finding, Liao says. She suspects, too, that the crows could have mastered numbers higher than four if they were given the opportunity.

Onur Güntürkün, a biopsychologist at Ruhr University Bochum in Germany, who was not involved in the research, says the new paper is "excellent"— (iii) the findings are "not unexpected" (iv) all that scientists already know about crows and many other species' intelligence.

"We know that crows can flexibly use both visual and auditory information to solve tasks, can control their vocalizations and can (C)exploit numerical information," Güntürkün says.

But it's worth remembering, Güntürkün continues, that mammals and birds separated on their evolutionary trajectories* about 324 million years ago, and strong evidence suggests that their last common ancestor "did not have the means to do what the crows of this paper did."

Counting abilities in birds and mammals thus represent "a spectacular case of (5)convergent brain evolution" in which both groups came up with (D)virtually the same solution to the cognitive challenges posed by life on Earth, he says. "As a result, crows learn, remember, plan, act and err as toddlers do."

出典：*Scientific American*, May 23, 2024 より抜粋・改変

注）
vocalization　音声，発声
Black-capped Chickadee　アメリカコガラ（英語名は鳴き声にちなんでつけられている）
carrion crow　ハシボソガラス
trajectory　道筋，足跡

1. What does the underlined part (1) "this" refer to? Choose the most appropriate answer and mark the number on your Answer Sheet.
   ① the capability human toddlers have to count
   ② the study conducted by a postdoctoral researcher
   ③ the knack researchers have for observing animals
   ④ the ability to count comparable to that of human toddlers

2. Which of the following is the most appropriate as an example of the underlined part (2) "symbolic counting"? Choose the most appropriate answer and mark the number on your Answer Sheet.

① A baby sees two women and cries, "Mama, Mama."

② A child sees five apples on the table and says, "There are five apples."

③ A teacher jumps four times to indicate how many times students should jump.

④ A toddler raises her index finger three times showing she wants three biscuits.

3. What does the underlined part (3) "the number of "dee" notes at the ends of the birds' alarm calls was inversely correlated with the size of the predator they were issuing warnings about" imply? Choose the most appropriate answer and mark the number on your Answer Sheet.

① The larger the predator, the larger the number of times the bird cries 'dee.'

② The smaller the predator, the larger the number of times the bird cries 'dee.'

③ The smaller the number of predators, the larger the volume of the bird's alarm calls.

④ The larger the number of predators, the larger the number of times the bird cries "dee."

4. Which of the following can be said about the underlined part (4) "the new study"? Choose the most appropriate answer and mark the number on your Answer Sheet.

① The lead study author thinks that it is impossible for the crows to master higher numbers than four.

② The results of the study are likely to be accidental and may be inappropriate in terms of the research methods.

③ The crows had to touch the Arabic number '3' on the screen when the researchers gave them three auditory cues.

④ When the crows made an error in the number of calls, they were more likely to make one more or one fewer call than the correct number.

5. Which of the following best explains the underlined part (5) "convergent brain evolution"? Choose the most appropriate answer and mark the number on your Answer Sheet.

① the gradual evolution of different species that the researchers have been unable to reveal for a long time

② the development of advanced brain functions that were required for species to survive in their harsh conditions

③ the process by which different species develop similar cognitive skills due to adapting to similar environments

④ the mechanism by which individuals of the same species develop entirely different cognitive abilities as a result of survival necessities

6. Choose the best word to replace each of the underlined parts from (A) to (D) and mark the number on your Answer Sheet.

(A) unique

① identical ② interesting ③ exclusive ④ sensitive

(B) smoking gun

① conclusive ② diverse ③ blurred ④ ambiguous

(C) exploit

① utilize ② learn ③ create ④ ignore

(D) virtually

① especially ② hardly ③ importantly ④ practically

7. Choose the most appropriate expression to fill in each blank from (i) to (iv) and mark the number on your Answer Sheet. Note that each option can only be used once, and that the options start in lowercase even when they would usually start with a capital letter.

① given ② instead ③ because ④ even if
⑤ if not ⑥ unless

8. Choose the most appropriate title for this article and mark the number on your Answer Sheet.

① Birds That Are Smarter Than Humans

② Counting Skills and Human Evolution

③ Crows Rival Human Toddlers in Counting Skills

④ How Crows Developed Mathematical Capabilities