英　　語

（医　学　部）

― 2月2日 ―

解答はすべて解答用紙に記入して提出しなさい。

1 次の英文を読み、問1～問8は文を完成させ、問9、問10は問いに答えなさい。答えは最も適切なものを、それぞれア～エの中から一つ選びなさい。問11は指示に従ってTかFを選びなさい。

Beauty takes a range of forms, from the expanse of the night sky to a tiny shell on a beach. Although some ideals of beauty can vary over time, one fundamental characteristic of beauty never changes, and it can be found in human art from our beginnings to the present day. It can also be found in nature, in that night sky and that little shell, and it is known as a fractal. Fractals helped our ancient ancestors thrive, and our attraction to them continues to influence human culture today.

Scientist Benoit Mandelbrot, who coined the word "fractal" in the 1970s, recognized that many phenomena and shapes in nature that first appear random or chaotic follow simple mathematical rules called fractal laws. These have since advanced our understanding of the natural world. A head of broccoli can be used to illustrate fractal patterns. If you break off one of its florets*, that piece resembles a smaller version of the whole head. You can even repeat the process, taking a segment of this floret, creating an even smaller version of the whole head. In the same way, if you break off a branch of a Christmas tree, the branch looks like a smaller version of the whole tree. In other words, any small part of the whole resembles the whole. Fractal patterns can also appear on much larger scales in nature. For example, in a river system, tributaries (A) of water flow into the next in a repeating pattern. Similarly, the outline of a coast just a few kilometers long on a map looks very similar to the outline of a coast thousands of kilometers long. In the natural world, these repeating patterns can get far more intricate and complex than a head of broccoli or a river but still follow a precise statistical formula.

Identifying and assessing fractal patterns assisted early humans in their survival. Fractal growth patterns helped determine such things as when to plant and harvest crops. It is often assumed that predicting the size, location, and timing of natural hazards such as large storms is impossible without powerful computers. However, researchers such as Shaun Lovejoy of McGill University claim that early humans' intuitive knowledge of fractals allowed them to make simple and accurate predictions about weather based on small, localized observations. His 2020 research indicates that we do not need to analyze the atmosphere above us as an elaborate whole but as a series of processes, with large atmospheric events influencing much smaller ones. Lovejoy argues that, using fractal analysis of much smaller data sets, we can make accurate and large-scale weather predictions based on smaller pockets of air known as zephyrs. In fact, fractal predictions are now provided to government agencies by meteorologists in order to help them prepare for natural disasters.

Modern humans do not require an intuitive understanding of fractals for survival, but the rewards we receive from observing them are still present in what scientists call a biological-cultural relationship. Neuroscientist Anjan Chatterjee, in her book *The Aesthetic Brain*, explains that when our ancestors discovered and utilized phenomena such as fractals, it triggered the reward centers in their brains, resulting in a pleasurable feeling. This reaction was a key driver of evolution, and we still experience it today when we view works of art that contain the same patterns. Pleasing fractal shapes can be found, for example, in 5th-century Roman mosaics, Leonardo da Vinci's *Turbulence* (1500), Hokusai's *Great Wave* (1830), and M.C. Escher's *Circle Series* (1950s).

Another example is found in the art of Jackson Pollock. His art can seem unsophisticated: he dipped brushes

into paint and dripped it in continuous trajectories across large canvases. When his paintings first appeared in the 1940s, many critics accused Pollock of mocking artistic traditions. However, today, his works are regularly exhibited in many of the world's most famous art galleries. In 1999, an article in the journal *Nature* showed that Pollock's paintings are based on strict fractal forms. Eye-tracking analysis revealed that people who had not been tutored in art still instinctively traced fractal patterns as they viewed his paintings. The same participants were shown paintings generated by a computer program called a "Pollockiser" that generated fractal and non-fractal patterns in the Pollock style. When 120 participants were asked to choose one or the other, 113 preferred the fractal patterns, confirming their powerful aesthetic appeal.

Pollock attributed the inspiration for his art to nature, and his friends recalled the hours that he spent staring at the landscape around his home as if assimilating the natural shapes surrounding him. Over the course of millions of years, human biology evolved to process visual input as Pollock did in order to assess our environment and aid our survival. From this evolutionary standpoint, the fractals in nature and art both have a meaningful influence on our lives, and in our modern world, perhaps it is worth giving both a little more space.

*floret: (ブロッコリーなどの)房

問 1 According to the first paragraph, fractals are _____.

ア. visually appealing

イ. only apparent in nature

ウ. limited in size and scale

エ. primarily noticeable at night

問 2 According to the second paragraph, Benoit Mandelbrot's word "fractal" describes _____.

ア. a mathematical pattern

イ. a scientific belief of the 1970s

ウ. the chaotic state of nature

エ. a way to prepare broccoli

問 3 The second paragraph suggests that coastlines provide a good example of a fractal pattern because they _____.

ア. influence the natural landscape

イ. appear similar at various scales

ウ. can be easily depicted on maps

エ. are key parts of river systems

問 4　In the second paragraph, tributaries (A) is closest in meaning to _____.

ア. patterns that form on the surface of water

イ. bodies of water that feed into others

ウ. barriers that inhibit the flow of water

エ. the branches of trees that grow next to water

問 5　The third paragraph suggests that predicting the weather _____.

ア. was beyond the capability of early humans

イ. cannot be done accurately by computers

ウ. could be accomplished using greatly reduced data sets

エ. must rely on analysis of major atmospheric events

問 6　The main purpose of the fourth paragraph is to _____.

ア. develop further the idea that early humans required fractals to survive

イ. list various works of fractal art that have been created

ウ. explain the continuing relationship between humans and fractals

エ. convince readers that modern humans can ignore fractals

問 7　According to the fifth paragraph, a key reason for the appeal of Pollock's art is _____.

ア. the rarity of seeing an original yourself

イ. the mockery it made of traditional artistic styles

ウ. the publicity it gained in a scientific journal

エ. the patterns inherent in its design

問 8　According to the fifth paragraph, the "Pollockiser" _____.

ア. was a painting tool used by Pollock

イ. created paintings that resembled Pollock's work

ウ. analyzed 120 versions of fractal art

エ. tracked eye movements of research participants

問 9　Which statement best summarizes the content of the final paragraph?

ア. Pollock's friends remember him seemingly studying the area around his home.

イ. Fractals have always enhanced humanity's relationship with art and nature.

ウ. According to Pollock, nature provided important stimulation for his artwork.

エ. Human culture as we know it today has been evolving for millions of years.

問10 Which would be the best title for the passage?

ア. How Humans Can Design Fractals

イ. The Natural Origins of Modern Art

ウ. How Pollock's Paintings Evolved

エ. The Science and Beauty of Fractals

問11 According to the passage, mark "T" if the statement is true and mark "F" if the statement is false.

1. A circle provides an ideal example of a fractal.

2. Government officials have begun using fractal analysis in planning for hazardous weather events.

3. Fractal patterns first began to appear in art during the 1500s.

4. In a study reported on in a 1999 article, only seven participants preferred non-fractal paintings.

2 次の1～10の英文の空所に入る最も適切な語(句)を，それぞれア～エの中から一つ選びなさい。

1．It is essential that the critical thinking skills universities provide students with (　　) as much as possible.

ア．be retaining　　イ．be retained　　ウ．retaining　　エ．retains

2．Was (　　) stopped my son from falling into the swimming pool?

ア．it who that man　　イ．it that man who　　ウ．that man who it　　エ．that man it who

3．Mr. Kawasaki. one of our most popular teachers. (　　) at the high school for twenty years before retiring next March.

ア．will have been teaching　　イ．had been teaching　　ウ．will teach　　エ．teaches

4．They listened with frowns on their faces as if (　　) by my excuses.

ア．annoying　　イ．annoyed　　ウ．annoy　　エ．annoys

5．This coffee mug is (　　) of the pair because I use it every morning.

ア．dirtier　　イ．the dirtiest　　ウ．the dirtier　　エ．dirtiest

6．My dance instructor Tina says it's important to (　　) your core muscles before trying to master complicated choreography.

ア．strong　　イ．strength　　ウ．strongly　　エ．strengthen

7．Please do not hesitate to ask our volunteer assistants (　　) you need any help here at the conference.

ア．could　　イ．should　　ウ．may　　エ．must

8．The family had to pay additional fees upon check-in because they had brought too (　　) luggage.

ア．many　　イ．few　　ウ．much　　エ．scarce

9．The housework that husbands and wives need to share includes (　　) the living room.

ア．doing the shopping and clean　　イ．do the shopping and clean

ウ．do the shopping and cleaning　　エ．doing the shopping and cleaning

10．Let those who paved the way for us not (　　) as we move forward.

ア．be forgotten　　イ．forgetting　　ウ．forgotten　　エ．to forget

3 次の1～10の英文を読み，下線部の意味に最も近い語(句)を，それぞれア～エの中から一つ選びなさい。

1. Seeing a pedestrian in the dark street, the police officer immediately began to interrogate him.

ア. pardon　イ. arrest　ウ. question　エ. chase

2. Certain economists are embarrassed because they failed to foresee the current depression in the global economy.

ア. prevent　イ. present　ウ. predict　エ. preserve

3. My baby sister is the apple of my eye, but I don't think she feels the same way about me.

ア. anxious about me　イ. fond of me　ウ. reliant on me　エ. precious to me

4. What is most alarming about the findings is that only 78% of the parents in the study were found to be literate.

ア. able to read and write　イ. able to calculate　ウ. able to raise children　エ. able to teach

5. Many pop singers performing in the '80s fell into obscurity in the '90s.

ア. were older　イ. were talented　ウ. were musical　エ. were forgotten

6. The failure of your business was not necessarily caused by the incompetence of your employees.

ア. inability　イ. inflexibility　ウ. incompatibility　エ. individuality

7. Most of the professors are getting to work much earlier than usual because they are gearing up for the new semester.

ア. returning　イ. preparing　ウ. hoping　エ. claiming

8. We don't have room for another member in our study group, so don't try to butter me up.

ア. mention me　イ. tease me　ウ. flatter me　エ. anger me

9. If your arguments are not pertinent, nobody will take your opinions seriously.

ア. relevant　イ. brilliant　ウ. observant　エ. constant

10. Our office was refurbished two years ago, but my boss still wonders whether it was a good idea.

ア. researched　イ. renovated　ウ. replaced　エ. regulated

4 次の2つの会話文を読み，1．3．8～10は意味・内容に合うように文を完成させ，2．4～7は問いに答えなさい。答えは最も適切なものを，それぞれア～エの中から一つ選びなさい。

Captain Lu: Mission Control, this is Station. I am ready for the event.

Mission Control: Earth and Space Museum. Station is ready.

Eleanor: Station, this is Eleanor Platz, Director of the Earth and Space Museum in the U.K. I'm here today with 30 lucky children who have traveled from around the country, and thousands of other children around the world who are following this event online. Thanks to the support of Mission Control, we can see you perfectly on the live video stream. Can you hear me?

Captain Lu: Hello to the Earth and Space Museum! I can hear you loud and clear.

Eleanor: Then I'm going to start with our first question from Harry Fong.

Harry: Hello, Captain Lu, my name is Harry, and I'm from Goose Burn Elementary School. What can you see out of your windows?

Captain Lu: Good question! I'm looking out of a window right now, and I see that we're approaching South America. I can see the Andes, the long, winding Amazon, and the beautiful green expanse of the rainforests.

Eleanor: Speaking of greens, Captain Lu, isn't your main mission to monitor the growth of lettuces in zero gravity?

Captain Lu: That's right. Being able to grow food in space is the next step in planning longer space journeys.

Eleanor: Fascinating. Our next question comes from Golden Trees Elementary School, where Captain Lu was a student!

Chloe: Hi, I'm Chloe. How long does it take to get to the space station?

Captain Lu: Hi Chloe! It's great to talk to a fellow Golden Trees student! Space starts at 100 kilometers above the Earth, and we get there in the blink of an eye. At take-off, we need to travel really fast to reach escape velocity. After just five minutes, we're in space and keep going at this speed for another five minutes until we reach 200 kilometers and enter orbit. In orbit, we don't need to fight against the pull of gravity, so we no longer use our boosters and slow down. We can then safely leave our seats and experience weightlessness. But we can't relax because we have to perform very important safety checks right away before reaching 400 kilometers and arriving at the space station, which takes between a few hours and several days.

Eleanor: Thanks, Chloe, for your question. Next is a great question from Rupal. But I'm sorry, Captain Lu, we can see that Captain Pavel is there with you and that you're speaking, but we cannot hear you. Well, we seem to have lost communication with the space station, but we're not ready to finish yet! If you look in the gift bags that you were given today, you'll find a quiz about space travel that could win you a trip to Mission Control in Florida! Take some time now to take the quiz.

1. According to the dialogue. the event is _____.

ア. being attended by 30 schoolchildren who have won a trip to Florida

イ. an interview with a former astronaut about his recent space mission

ウ. being held at an elementary school in the U.K. that Captain Lu once attended

エ. a collaboration between the Earth and Space Museum and Mission Control

2. According to the dialogue. what is the primary reason for Captain Lu's visit to the International Space Station?

ア. to educate children about the nature of traveling in space

イ. to experience the effects of weightlessness on the human body

ウ. to monitor the health and extent of South American rainforests

エ. to find a possible way for astronauts to remain in space longer

3. When Captain Lu says "in the blink of an eye," he most likely means _____.

ア. with a feeling of relief

イ. at a great distance

ウ. extremely quickly

エ. while carefully watching

4. According to the dialogue. why does the second 200 kilometers take the majority of the travel time?

ア. The astronauts slow down after entering orbit to perform some safety checks.

イ. It is not safe for the astronauts to travel at high speeds for too long.

ウ. The effect of the Earth's gravity on the space shuttle slows it down.

エ. Outside Earth's atmosphere. the shuttle does not travel at such high speeds.

5. According to the dialogue. what problem occurred during the event?

ア. There were not enough gifts to share.

イ. Rupal forgot what his question was.

ウ. Captain Pavol did not show up.

エ. There were technical difficulties.

Mohammad: Welcome back to the studio! I'm here with my co-host Bruce James and our special guest, Gilbert Flannery. As fans know, Gilbert played rugby for the Hawks for seven seasons. Gilbert, what do you make of the first half?

Gilbert: Well, the Spears are just three points ahead of the Comets despite being stronger so far. How the Comets have managed to score nine points, I'm not sure, but it's going to make for a very interesting second half.

Bruce: I agree, Gilbert. These two teams have a rivalry that stretches back almost 90 years, and you can see it in the energy of the players. The Comets' defense has been superb, and I was particularly impressed with 18-year-old Sefina Ott, who's playing in his first professional match.

Mohammad: Yes, his skill level is what you'd expect from a seasoned professional. Bruce, what did you think of that incident during the eleventh minute when Rupert Globe seemed to illegally bring down Wyn Easterland just as the Comets were attacking?

Bruce: I think the referee got that wrong. Globe should have been kicked off the field for such a dangerous tackle. I can't believe Keil didn't blow his whistle and get out his red card.

Gilbert: I disagree, Bruce. Keil was correct to continue the game without stopping. This is a contact sport, and we should expect these things. Anyway, it might have been a blessing in disguise for the Comets; it seems to have inspired them to strengthen their defense, just as it looked like the Spears were about to score again.

Mohammad: Controversial, indeed. Now let's look at the replay of the Spears' score right at the start of the match.

Bruce: We see Harry Baum attacking straight from the kick-off. The Comets really should stop him, but as defending champions, it seems they're too confident. Baum reacts quickly and kicks the ball over the defenders' heads. He then catches it and runs past Burton, then collides with Nguyen. Baum manages to keep hold of the ball and keeps going forward, but he runs so fast he unexpectedly trips. This seems to confuse the last defender, Smith, who stumbles himself and can only watch as Baum scores. Even though the season has just begun, we might already have seen the incident everyone will be talking about after it's over.

Gilbert: I agree, Bruce, and with the Spears playing the Kestrels next, I'm going to have to study how Baum managed to do that so easily.

Mohammad: I'll have to interrupt; it looks like the teams are coming out, and we're about to start the second half.

6. According to the dialogue, what is the score at half time?

ア. The Spears have nine points, and the Comets have nine.

イ. The Spears have nine points, and the Comets have twelve.

ウ. The Spears have twelve points, and the Comets have three.

エ. The Spears have twelve points, and the Comets have nine.

7. According to the dialogue, what do Bruce and Gilbert disagree about?

ア. which team has done better so far in the game

イ. the seriousness of one player's action

ウ. a young new player's level of skill

エ. which of the players scored in the first half

8. When Gilbert says "a blessing in disguise," he most likely means _____.

ア. a good time to arrive and help

イ. a short rest period during a game

ウ. a decision that has been made very hastily

エ. an unfortunate event leading to good results

9. According to the dialogue, Keil is most likely _____.

ア. a player for the Comets

イ. the coach of the Spears

ウ. the referee for this game

エ. a commentator in the studio

10. According to the dialogue, Baum manages to get past Smith and score by _____.

ア. distracting him by almost falling down

イ. running so fast that he can't catch up

ウ. colliding with him and knocking him over

エ. kicking the ball high over his head

5 次の問1～問4の英文を読み，話の流れに沿って意味が通るように並べ替えた場合，最も適切なものはどれか。それぞれア～エの中から一つ選びなさい。

問1
1. Joining Ireland and Canada, this cable made telegraph contact between Europe and North America possible for the first time.
2. That summer, four American and British naval ships successfully placed nearly 3,200 kilometers of cable across the floor of the Atlantic Ocean.
3. After several failed attempts, one of history's greatest engineering achievements took place in 1858.
4. Indeed, messages that had taken 10 days to cross the ocean by ship could now cross in minutes, opening a new age of global communication.

ア. 3 → 2 → 1 → 4　　イ. 3 → 4 → 1 → 2
ウ. 3 → 2 → 4 → 1　　エ. 3 → 4 → 2 → 1

問2
1. Surprisingly, it was not until the 21st century that the alleged relationship between head shape and personality was scientifically disproved.
2. During the 19th century, millions of people in the U.S. and Europe believed that human behavior could be scientifically explained and predicted through "phrenology."
3. According to this practice, personal characteristics such as kindness, caution, and even musical ability influenced the shape of a person's head.
4. Thus, by feeling the bumps on a person's head with the fingertips, a "phrenologist" could "read" their character.

ア. 2 → 3 → 1 → 4　　イ. 2 → 4 → 1 → 3
ウ. 2 → 3 → 4 → 1　　エ. 2 → 4 → 3 → 1

問3
1. The characteristic "W" shape of their wings allows them to coast on air currents, flying for hours or even days without flapping their wings.
2. Frigate birds fly over the ocean for as long as two months at a time without ever touching down on land or water.
3. These short naps may help them postpone the need for deeper sleep until they can return to land, where they sleep for about 12 hours each day.
4. This, in turn, enables them to sleep in the air, taking 10-second naps which total roughly 45 minutes a day.

ア. 2 → 1 → 3 → 4　　イ. 2 → 3 → 1 → 4
ウ. 2 → 1 → 4 → 3　　エ. 2 → 3 → 4 → 1

問4　1. Her research proved that the principle of conservation of parity, which had been considered a law of nature, was not true.

2. In 1956, at the request of two colleagues, she designed an experiment intended to show that identical nuclear particles do not always act alike.

3. However, while this major achievement helped her two associates win the Nobel Prize, Dr. Wu's contribution was not acknowledged.

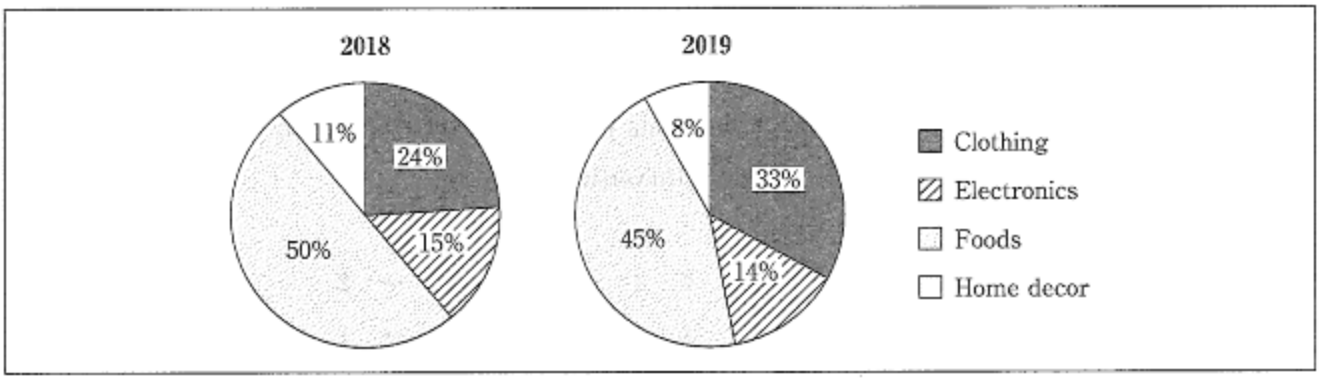
4. Born in 1912 in Liu Ho, China, Chien-Shiung Wu moved to the U.S. to study science, eventually becoming a full professor of physics at Columbia University.

ア. 4 → 2 → 1 → 3　　イ. 4 → 3 → 1 → 2

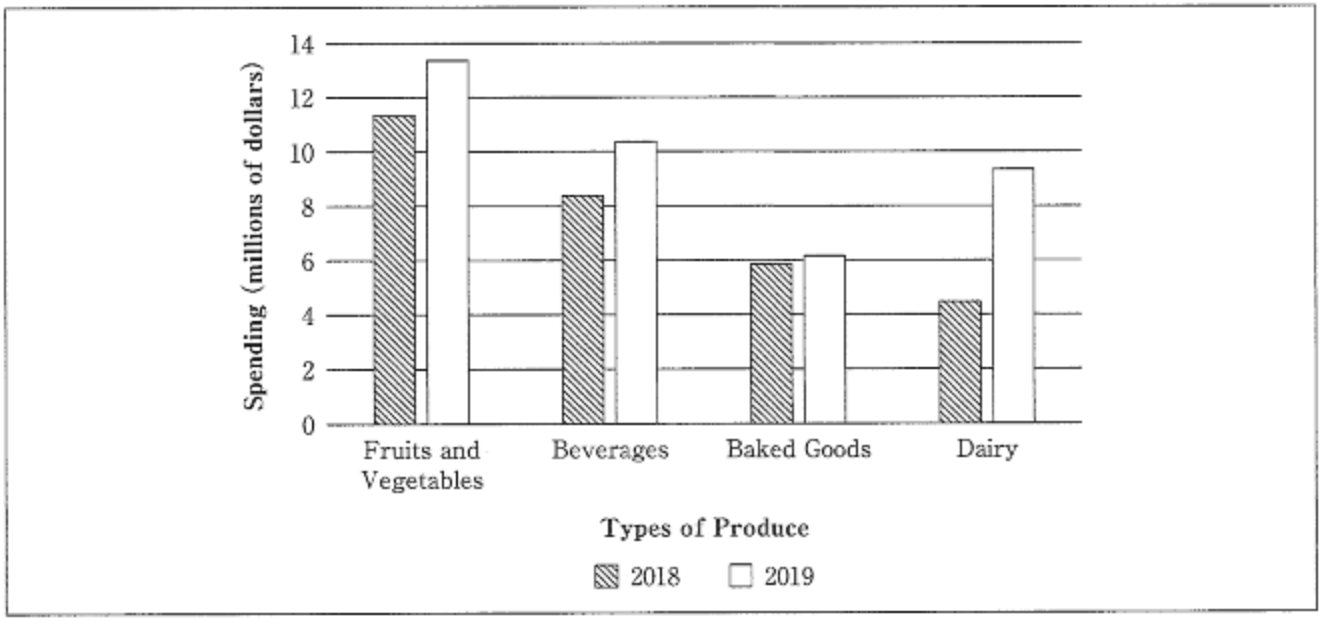
ウ. 4 → 2 → 3 → 1　　エ. 4 → 3 → 2 → 1

6 次のグラフを見て，英文の空所(　1　)～(　4　)に入る最も適切なものを，それぞれア～エの中から一つ選びなさい。

Spending on Advertising by Hangrove



Advertising Budget: Foods



—— 上記のグラフは架空のものです ——

The discount store chain Hangrove has over 400 stores across the country offering goods in four categories. The pie charts show the percentage of the overall advertising budget spent on each category in 2018 and 2019, while the bar graph provides more specific details on the advertising outlay in the foods category. In 2018, Hangrove introduced a new range of home decor products; still, in both 2018 and 2019, expenditure on advertising for this category accounted for the (　1　) component of Hangrove's total advertising budget. A celebrity-led digital media campaign to sell (　2　) meant that a lower percentage of the total budget was allocated to each of the other three categories in 2019 than in 2018. The bar graph shows that, in 2019, more was spent advertising all four subcategories within foods than in 2018, but the biggest jump was seen in the (　3　) subcategory. The only foods subcategory not receiving a significant increase in spending was baked goods, with expenditure on them hovering around (　4　) million dollars in both years.

(1)	ア. smallest	イ. second-smallest	ウ. second-largest	エ. largest
(2)	ア. clothing	イ. electronics	ウ. foods	エ. home decor
(3)	ア. fruits and vegetables	イ. beverages	ウ. baked goods	エ. dairy
(4)	ア. two	イ. four	ウ. six	エ. eight

7 次の英文を読み，下線部(1)と(2)を日本語に訳しなさい。英単語をそのまま転記したり，カタカナを使用したりしないこと。

The body of scientific literature in the field of environmental conservation continues to expand as we face increasing threats to the Earth. (1) However, most major scientific journals are disseminated in English, meaning that those in other languages fail to reach a wider audience and their findings are ignored in the international arena. For instance, research on biodiversity, especially that which is strongly connected to native customs and lifestyles of a particular region, is often conducted, not in English, but in local languages. (2) As a result, many rare animal species and isolated indigenous cultures that are in danger of extinction have been ineffectively described in English-language studies. This language barrier creates a knowledge gap among various scientific communities around the world. As the field of environmental conservation becomes increasingly important on a global scale, the languages used to share scientific information should be diversified. This is not just to enhance knowledge, but also to reinforce collaboration between scientific communities.

8 次の文を読み，下線部(1)と(2)を英語に訳しなさい。

A scientist puts a microscopic organism into a massive, ultra-high-tech machine and accidentally creates a super-powered mutant. It sounds like a story from a comic book, but in one particular case, it happens to be true. In 2018, a team of scientists at the University of Portsmouth in the U.K. used a synchrotron, a device that generates light 10 billion times brighter than the sun, to study an enzyme. With a unique ability to eat through polyethylene terephthalate (PET) plastic, this enzyme had been discovered near a plastic-recycling center in Japan. (1) 驚くべきことに，その光線はこの能力を加速させ，化合物が自然に生物分解するには何世紀もかかるであろうところを，数日で分解することを可能にした。 Scientists are researching ways that this enzyme could help to reduce the huge amounts of plastic waste in the world. (2) 空想科学小説で度々登場する筋書きでは，実験室で生まれた生物が逃げ出し，地球をおびやかすが，現実ではそのような生物が地球を救うかもしれない。