

## 英語

1 (A) 以下の英文を読み、その内容を70~80字の日本語で要約せよ。句読点も字数に含める。

You'd think that it would be simple to determine if someone is dead. But making the call can come with risks especially when science conflicts with our cultural, religious and legal understandings of death.

The invention of ventilators and other advanced care has complicated the definition of death, making it possible for a person without brain function to have a heartbeat and be breathing. "It's a strange thing to have to accept that a person who looks alive is actually brain-dead," according to science writer Laura Sanders. "That relatively recent possibility opened the door for confusion."

Sanders reports on a new international effort to define brain death. Clinicians from around the world reviewed the existing data, which are slimmer than you might think, and then outlined a set of steps to take before declaring someone brain-dead. The guidelines are a big improvement, but the diagnoses can still be complicated, sometimes relying on tests that are not necessarily conclusive and steps that vary with the patient's age.

And if it's confusing now, get ready for even more challenges in the future. Advances in brain science and in technology may blur the definition of death further. And they may change life, too, in ways both good and bad. Scientists may develop new ways to treat diseases, but drugs and implants could also be used to control our thoughts and emotions, or even change who we are.

Sanders is fascinated by the deep questions raised when science races ahead of society. In 2019, she covered the startling news that researchers

had restored cellular activity to pigs' brains hours after the animals had been killed. "This gets at one of the most fundamental questions we have: What it is to be alive," Sanders says. "As scientists get closer to understanding how the brain operates, they're going to be able to start clarifying those limits in totally new ways. And that, of course, will raise more questions."

注

ventilator 人工呼吸器

implant 体内に移植された臓器, または体内に埋め込まれた装置など

cellular 細胞の

(B) 以下の英文を読み、(ア)、(イ)の問い合わせに答えよ。

The aspects of human life that make our species unique depend in numerous ways on the special human ability to use language. For anyone who thinks it is important to understand what humans are like and why, a scientific grasp of the capacity for language is essential. Linguistics is the scientific field devoted to achieving that understanding.

What exactly do I mean by a “language”? In a sense the whole discipline of linguistics is devoted to a long-term project of properly answering that question by giving a full theory of the nature of the human languages, the things they share, and the ways in which they differ. But as a rough starting point, human languages are structured systems for making articulated thoughts fully explicit both internally and externally, and linguistics studies all components of such systems, together with the ways in which they are used.

(1) They should never be equated, however. They are clearly distinct in that each is found in the absence of the other. Most communication, even between humans, has nothing to do with language (think of frowning, winking, shrugging, grinning, eyebrow-raising, or glaring). Some of it isn’t even voluntary (limping, trembling). On the other hand, lots of the use we make of language involves no communication in any reasonable sense. Think of someone silently planning a speech that they will never give, or checking a document for wording errors, or silently reflecting on whether *likely* has exactly the same meaning as *probable*.

All animals communicate, but only humans have languages in the strict sense of the term. (2) It’s just that when we consider the basic facts, these metaphorical extensions of the term “language” should be ignored, because they will only encourage confusion.

Let me get just a little more specific about languages. The systems that

linguists study connect virtually unlimited numbers of sentence meanings (arbitrarily complex thoughts) to external realizations, in a medium-independent way (a given sentence can be presented in either written or spoken form). Thus the subject matter for linguists extends from the (1) the study of how meaningful sentences are used in context to convey implicit meaning. Sentences can instruct or query or signal emotion, and crucially they can express claims, either true or false, and can be used not only externally, for communication or easing of social interaction, but also internally, for reasoning.

Consider a specific sentence like *Everybody seems to be leaving*. You don't need to utter it aloud; you can just think it. You can also privately and internally figure out its logical consequences; for example, it implies that apparently nobody is planning to stay. It could provide grounds for thinking that pretty soon the place will be empty. You could make it audible by saying it out loud, or make it visible by writing it down, but you don't have to. It's still a sentence. And crucially, you can do any or all of these things without being in a situation where the statement could conceivably be true. The sentence doesn't just pop up involuntarily in your mouth when everyone does actually seem to be leaving. (3)

Other animals show no signs of being able to do anything of this sort. Various cases have been reported of animals that produce warning cries when predators are spotted, and make different sounds for different types of predators — one call for a snake on the ground, another for an eagle in the air, and so on. But they produce these calls involuntarily when a predator is noticed, and they never use the calls for anything else. (4) You can wonder aloud about who would win in a fight between an eagle and a snake, without there being any eagles or snakes nearby. No monkey can do that.

That's not to say animals are unintelligent. Dogs, in particular, have a wonderful social ability: more than any other animal, they use their

intelligence to attempt to figure out what we are paying attention to and what we might be planning. They have admirable memory powers, too. A border collie named Rico was trained to fetch any of about 200 specific named toys on command. In fact, if given an unfamiliar name (“Fetch the glimp!”), Rico would run and fetch a previously unnamed toy, if there was one, assuming the new word was its name.

However, this was entirely the result of intensive training and supplying of rewards. Rico only responded to the owner’s fetch commands, and responded solely by running to fetch the named toy. Everything was task-based and in the moment. (5) Complaining about having lost one, for example, or asking whether it’s time to go out and buy some. That kind of word use is the province of humans alone. And it forms just one small part of the array of human abilities that linguistics seeks to understand.

注

arbitrarily 任意に

predator 捕食者

border collie ボーダーコリー(犬)

(ア) 空所(1)～(5)に入れるのに最も適切な文を以下の a)～f) より一つずつ選び、マークシートの(1)～(5)にその記号をマークせよ。ただし、同じ記号を複数回用いてはならない。

- a) Humans can use a word like *sock* in other ways than by running to the bedroom to fetch one in order to get a snack as a reward.
- b) It is extremely common for people to take “language” and “communication” to be the same thing.
- c) It is nothing like what you, as a speaker of a human language, can do.
- d) One might consider spoken and written language to have many things in common.
- e) That doesn’t mean I disapprove of talk about the language of music, flowers, art, or architecture.
- f) You can consider the sentence and grasp its meaning whether it’s true right now or not.

(イ) 与えられた語を正しい順に並べ替え、空所(イ)を埋めるのに最も適切な表現を完成させて、記述解答用紙の1(B)に記入せよ。

are / of the / produced / sounds / speech / study / to /  
ways

2 (A) 「意見を言わないということは同意することを意味する」という主張について、あなたはどう考えるか、理由を添えて、60～80語の英語で述べよ。

(B) 以下の下線部を英訳せよ。

この世は、土地を持っている人間と、持っていない人間に分かれており、土地を持つていない人間は、馬鹿高い金額を払って土地を手に入れ、ブラックボックスと化し、部品の値段など分からなくなってしまっている家という商品を購入しない限りは、自分のための家を手に入れることはできないのである。だから大抵の人は家を所有者から借りることになるのだが、家賃を払うお金すらない人は、路上生活者になるしか道はない。

これはどう考へても憲法違反のような気がするのであるが、お金という権力を持っている人間だけが支配している現状について、誰も疑問に思っていないようだ。たとえ疑問に思っていたとしても、権力を持つ者が動かしている政治を変えることは難しいと捉えており、だからこそ、土地や家を持っていない人々は、がむしゃらに働き、支払いに何十年とかかっても手にしようと試みる。

僕はこの家の在り方をおかしいと思う。

(坂口恭平『モバイルハウス 三万円で家をつくる』を一部改変)

3 放送を聞いて問題 (A), (B), (C) に答えよ。 (A), (B), (C) のいずれも 2 回ずつ放送される。

- ・聞き取り問題は試験開始後 45 分経過した頃から約 30 分間放送される。
- ・放送を聞きながらメモを取ってもよい。
- ・放送が終わったあとも、この問題の解答を続けてかまわない。

(A) これから放送するのは、蝶の長距離移動についての文章である。これを聞き、(6) ~ (10) の問い合わせに対して、それぞれ最も適切な答えを一つ選び、マークシートの (6) ~ (10) にその記号をマークせよ。

注

monarch butterfly オオカバマダラ(蝶)

caterpillar (蝶や蛾の) 幼虫

chrysalis <sup>さなぎ</sup> 蛹

(6) Where do monarch butterflies from the west mostly migrate to in the fall?

- a) California coasts
- b) Mexico
- c) New Hampshire
- d) Rocky Mountains
- e) None of the above

(7) What is mentioned as unique to the particular generation of monarchs that migrate south in the fall?

- a) They are born in the summer and live for only one month.
- b) They feed exclusively on milkweed.
- c) They have never been to their destination before.
- d) They have special direction-finding capacity.
- e) They live much longer than other generations.

(8) What capacity do scientists believe that monarchs can use to find their way to the migration destination?

- a) Their ability to follow natural wind currents.
- b) Their ability to perceive magnetic fields.
- c) Their highly delicate sense of smell.
- d) Their memory, passed on from the previous generation.
- e) Their sense of where the weather is warmer.

(9) What was the author's hope when looking at the monarchs in Mexico?

- a) That he would recognize some that came from his own yard.
- b) That the environment there would be preserved.
- c) That they would migrate north soon.
- d) That they would start breeding again immediately.
- e) That they would survive the winter safely.

(10) What is happening with the author's milkweed plants now?

- a) He is getting ready to plant them again.
- b) New monarchs can be seen on their leaves.
- c) Spring regrowth is visible.
- d) The milkweed plants have died.
- e) Two thin stalks still survive.

(B) これから放送するのは、架空のラジオ番組の一部である。これを聞き、(11)～(15)の問い合わせに対して、それぞれ最も適切な答えを一つ選び、マークシートの(11)～(15)にその記号をマークせよ。

注

caterpillar (蝶や蛾の) 幼虫

chrysalis <sup>さなぎ</sup> 蛹

(11) What does Dr. Lamkin think about the life of a butterfly collector?

- a) As long as you are cautious around animals, it is wonderful.
- b) He does not have any opinion about it.
- c) It is an easy and relaxing job, surrounded by nature.
- d) It is not an easy life but it is rewarding.
- e) It is only for people who are passionate about butterflies.

(12) What determines the color of wings?

- a) A kind of plastic material which comes off easily.
- b) Different species-specific mechanisms.
- c) The arrangement of tile-like pieces.
- d) The spacing between veins in the wings.
- e) The transparent nature of the wings themselves.

(13) What does Dr. Lamkin say about butterfly color variation?

- a) Color variation is strongly related to climate.
- b) It depends on the number of species in an area.
- c) Only in cooler parts of the world do the colors vary much.
- d) The colors are always similar but the number of species varies.
- e) They change color depending on the continent.

(14) What did scientists recently find through butterfly fossils?

- a) Butterflies evolved much later than previously thought.
- b) Butterflies have existed for at least 50 million years.
- c) Different insects evolved independently into modern butterflies.
- d) In the distant past, butterflies used to be quite different colors.
- e) They did not actually find butterfly fossils.

(15) What is unusual about Black-spotted Flash butterflies?

- a) Ants are a key source of food.
- b) Ants help them to leave the nest.
- c) They can fly within five minutes.
- d) They differ a lot depending on the environment.
- e) They have a covering to protect from ant bites.

(C) これから放送するのは、都市の植生についての講義である。これを聞き、(16)～(20)の問い合わせに対して、それぞれ最も適切な答えを一つ選び、マークシートの(16)～(20)にその記号をマークせよ。

注

canopy 樹冠(樹木上部の枝葉が茂る部分)

sapling 若木

(16) Which of the following is NOT mentioned as a benefit of trees in urban environments?

- a) Trees help keep cities cooler.
- b) Trees help prevent flooding.
- c) Trees help purify the environment.
- d) Trees make the city look nicer.
- e) Trees provide a place for animals to live.

(17) Which of the following is FALSE, according to the speaker?

- a) Politicians have not felt that it is important to plant trees in cities.
- b) Politicians have not spent enough money on planting trees.
- c) The parts of cities where people of color live are likely to be hotter than the parts where white people live.
- d) The US and the UK face similar problems with respect to their urban forests.
- e) Wealthy people are more likely to have trees in their neighborhoods.

(18) Which of the following is TRUE, according to the speaker?

- a) Having many young trees is better than having many older trees in a city.
- b) It can take 30 years for a tree to have an overall positive effect.
- c) It is a waste of effort to plant and maintain trees in urban areas.
- d) Local residents are not concerned about trees.
- e) Rural authorities are more active in planting trees than urban authorities.

(19) Which of the following is TRUE, according to the speaker?

- a) Death rates for trees in the city and in the countryside both increase as the trees get older.
- b) Rural trees are more likely to die than urban trees as they get older.
- c) The age at which a tree dies is unlikely to be related to the cause of death.
- d) Tree deaths in the countryside tend to be due to other trees, unlike in the city.
- e) Trees in the city were more likely to die when they were young than trees in the countryside.

(20) Which best represents the speaker's main point?

- a) It is difficult for trees to survive due to global warming.
- b) It is important to water young trees and provide appropriate nutrients.
- c) To improve the environment, it is important to keep trees from dying.
- d) We should plant more trees in response to global warming.
- e) We should plant trees in urban environments to eliminate discrimination.

4 (A) 以下の英文の段落 (21) ~ (25) にはそれぞれ文法上または内容上の誤りがある。修正が必要な下線部を各段落から一つずつ選び、マークシートの (21) ~ (25) にその記号をマークせよ。

(21) A practical way of conceiving rules in general is to account to them as the mechanisms that create consensus among players. They are the framework that is used to agree on what has happened within the game. This idea, put forward by designers Vincent Baker and Emily Care Boss, emerged in online discussions about creating role-playing games. These discussions also recognized the incomplete nature of rules, because it is impossible to create in advance rules to cover all the situations that can emerge in play.

(22) In some traditions of game research, rules are not necessarily intended to be fully binding. In the field of operational gaming, which games are utilized for goal-oriented purposes such as forecasting, testing, and training, gaming is divided into two categories. In rigid-rule gaming, the rules are exactly specified, possibly implemented as a computer program, and not altered after gaming starts, and “every possible combination of players' decisions is thus exactly defined.” In free-form gaming, the participants supply some of the rules, and they can sometimes even invent more rules while the game is ongoing.

(23) Not all constraints relating to a game need to be shared socially. Sometimes players come up with their own additional rules to make playing more demanded or interested. They may come up with new goals in games that are open ended, or they may decide to make the game easier and ignore some formal rules. Rules, laws, and norms obviously also exist outside of games. In social life, rules have a dual nature. As sociologist Thomas Janoski writes, “Rules are basic to group life, but so is the play of power, the effort to use others to achieve ends even against opposition.”

Social and societal rules are created, enforced, and violated by people, and they are connected with strategies of domination. Simultaneously, <sup>(e)</sup>rules order social reality in ways that are not about domination. Janoski argues:

(24) Rules <sup>(a)</sup>that guide people in their everyday behavior, that tell them how to till the fields or work their machines or mate or die, <sup>(b)</sup>do much more than establish and maintain patterns of hierarchy.  
<sup>(c)</sup>They make available people the wisdom of accumulated experience, and they secure people <sup>(d)</sup>against the totally unexpected in social encounters. They also make possible the implicit cooperation that supports social life. In the classical line of sociological thinking, <sup>(e)</sup>rules originate and persist in the effort to solve these problems of collective life.

(25) These “problems of collective life” <sup>(a)</sup>influence games, for example, through end-user license agreements and parental time limits. Additionally, <sup>(b)</sup>gameplay is also constrained by material reality. The insecure pile of sticks and the shaking human hands <sup>(c)</sup>trying to pick up them are both <sup>(d)</sup>constraints that limit player action, establishing the affordances that <sup>(e)</sup>make it possible for the player to perform meaningful game actions.

注

societal 社会全体に関する

affordance 環境が人間を含む動物に対して与えている価値や意味

(B) 以下の英文を読み、下線部(ア), (イ), (ウ)を和訳せよ。

Censorship may be as old as literature itself. (ア) “You can’t say that!” I imagine someone sitting around an evening fire suddenly shouting to the community’s favorite storyteller. “If you say that, tomorrow we will return empty from the hunt,” calls out another. And so for the next gathering, the storyteller modifies the tale, omits a few details, changes some words and expressions. His listeners seem happy, his critics softened.

Yet our ancient storyteller is frustrated. He wants to say what he wants to say. And precisely in the way he wants to say it. But that is now forbidden by the elders: prohibited, not-allowed, taboo. Then, gradually, he discovers different ways to communicate what he wants, maybe through a moral story, an unusual figure of speech, an ironic joke—and he smiles to himself knowing his listeners are none the wiser. Most, that is; he also notices that a small part of his clan understands what he’s done. (イ) They silently “get it” and a bond is now formed between them. These few “insiders” have done what alert audiences would do throughout all succeeding generations. We call it “reading between the lines.” What does it mean to “read between the lines”? Essentially, it’s to realize that what we are hearing—or reading—is not what it appears to be, that hidden inside what is being said is another message or implication, one the apparent audience doesn’t, or hopefully doesn’t, recognize. (ウ) The exciting tale of how the dangerous beast was skillfully trapped and killed is really—as some listeners figure out—a story about ridding themselves of their vicious leader.

注

censorship 檢閲

5 イスラームを信仰する人々 Muslims が断食 fast を行うイスラーム暦の第9月(ラマダーンという)に関する以下の文章を読み、(A)～(D)の問い合わせに答えなさい。

I was born and raised in the United States. I spent my school days in beautiful New Jersey and my summers in the war zone known as the West Bank. The first Ramadan I ever fasted was no joke. I was eight years old and on summer vacation in my parents' village. It was late June and the Middle East is a sauna at that time of year. During Ramadan, those <sup>(26)</sup>observing the fast abstain from food, beverages, smoking, and shagging. <sup>(A)</sup>I have never had an issue with fasting. I love Ramadan.

I have cerebral palsy. That means, technically, I am excused from fasting, even though it is one of the five pillars of Islam and extremely important to the faith. The Qu'ran states clearly that those who have medical conditions are pardoned, so I was treated like a champion for fasting. My family was extremely happy and I refused to show any weakness. I knew that by <sup>(27)</sup>fasting against the odds I had been born with, I'd totally get into heaven and, more important, would get amazing gifts for Eid. Eid is the celebration that marks the end of fasting. Muslims celebrate for three days, because after thirty days of fasting, one day simply isn't enough.

Regardless of the heat, it's fun to fast for Ramadan when you are in a country where the majority of folks around you are also starving. Ramadan is not as much fun in America, where you are the only one fasting. In my day, teachers weren't as culturally savvy as they are now. I had teachers who were genuinely afraid for my life and were convinced that I was being forced by my horrible Muslim parents to fast. They'd try to slip me a butterscotch candy at lunchtime. I would push their candy away and tell them not to push their beliefs on me. I could eat whatever I wanted at sunset, thank you very much.

Every Ramadan, without fail, my mother has given me the option to not fast. Those who cannot fast during Ramadan get to make a donation that will feed a hungry person during the holy month. (B) If you cannot afford to do so, you should instead perform any acts of charity within your capability.

My mom has donated on my behalf every single year I have fasted, just in case it ever got to be too much and I had to give up. How is that for faith?

My (28) Ramadan came in the form of a ten-day road trip in 2011, in America's Deep South, on a comedy tour called "The Muslims Are Coming." Ramadan, which moves back ten days each year, happened to land in August. I was filming a documentary in addition to performing nightly. We would spend all day on the street doing interviews with the locals who weren't too fond of Muslims. For the first time in my history of Ramadans, I complained. I was hot, thirsty, and tired of bigotry. Some nights I didn't break my fast until 10:30 p.m., but I survived. I broke down and broke my fast only once on tour. We were at Elvis's house in Tupelo, Mississippi. The statue of the King spoke to me and I realized if I didn't drink water I would drop down dead just like he did. I did not want to die where Elvis was born. It's okay to miss a day or five, if you are sick or traveling, or are on your ladies' holiday. You then have a whole year to make it up. Some Muslims are slick and do their makeup days in December when the sun sets at, like, 4:30 p.m. and they have to fast for only six or seven hours.

On July 10, 2013, after three decades, my days of fasting came to an end. As I mentioned, I have cerebral palsy. One of my symptoms is that I shake all the time. On the first day of Ramadan 2013, (29) my shaking got the best of me. By noon, I no longer had the ability to tweet, and by the time I broke my fast at 8:30 p.m., I could barely breathe. I knew that I had fasted my last day. (C) The next morning the water I drank tasted like poison. It felt so wrong to satisfy my thirst during the daylight hours. Ramadan is

something I strongly associate with the happiest times of my life, so I felt like a tradition was lost.

I am not ashamed that I cannot fast, but I know many who are, even though they are excused for God's sake. I miss fasting, but I'm happy to take on my newest mission of reminding those who can't fast that <sup>(30)</sup>there is no reason to put themselves at risk. Muslims fast so they can suffer a little. It is important not to die in the process. Instead, those who can't should channel their devotion into charity. This will not only help you stay healthy but also will help someone who is genuinely suffering. Those who are blessed with the health to fast, please don't interrogate your fellow Muslims about their hunger status. It is impolite to ask others if they are fasting unless you are in the process of offering them something to eat, and sometimes you really don't want to know the answer.

### 注

the West Bank ヨルダン川西岸。パレスチナ自治区がある。

sauna サウナ(風呂)

abstain 控える, 絶つ

shagging 性行為を意味する口語的表現

cerebral palsy 脳性麻痺

the Qu'ran クルアーン(コーラン)。イスラームの聖典。

savvy よく理解している, 心得ている

bigotry 偏見, 差別

the King エルヴィス・プレスリー(Elvis Presley, 1935-77)。アメリカ合衆国の有名な歌手。

slick 抜け目ない, 狡猾な

interrogate 尋問する, 問いただす

(A) 下線部 (A) の内容を次のように表現する場合、空所に入れるのに最も適切な動詞 1 語を本文中から抜き出し、空所にふさわしい活用形で記入せよ。

I have never ( ) about fasting.

(B) 下線部 (B) について、so の内容を明らかにして和訳せよ。

(C) 下線部 (C) について、筆者が “like poison” と表現したのはなぜか、それ以前のラマダーンとの関連をふまえて説明せよ。

(D) 以下の問い合わせに解答し、その答えとなる記号をマークシートにマークせよ。

(26) 下線部 (26) について、“observe” の語義が最も近い選択肢を次のうちから一つ選び、マークシートの (26) にその記号をマークせよ。ただし人称や時制などによる動詞の変化は考慮しない。

- a) He often observed that the more wealth he had, the more miserable he felt.
- b) Mary observed a growing intensity in the rain falling outside the window.
- c) Observe how strictly people obey the rules around here.
- d) The school told me to observe how she spoke to her students in the classroom.
- e) You have to observe the local customs so that you do not make people uncomfortable.

(27) 下線部 (27) に意味内容が最も近いものを次のうちから一つ選び, マークシートの (27) にその記号をマークせよ。

- a) fasting despite my birthplace
- b) fasting in spite of my medical conditions
- c) fasting in the face of my family
- d) fasting while committing no sin
- e) fasting without any chance of success

(28) 空所 (28) に入れるのに最も適切な表現を次のうちから一つ選び, マークシートの (28) にその記号をマークせよ。

- a) funniest
- b) most challenging
- c) most favorite
- d) most shameless
- e) smartest

(29) 下線部 (29) に意味内容が最も近いものを次のうちから一つ選び, マークシートの (29) にその記号をマークせよ。

- a) I took advantage of my shaking
- b) I was surprised at my shaking
- c) my shaking overwhelmed me
- d) my shaking stopped
- e) my shaking transformed me into the best version of myself

(30) 下線部 (30) に意味内容が最も近いものを次のうちから一つ選び, マークシートの (30) にその記号をマークせよ。

- a) it is not reasonable to think Ramadan is dangerous
- b) no one blames them for not fasting
- c) they can't feel ashamed of their medical conditions
- d) they don't have to fast for religious reasons
- e) they shouldn't die by fasting

(31) 本文によるラマダーンについての説明と合致しないものを次のうちから一つ選び、マークシートの(31)にその記号をマークせよ。

- a) During Ramadan, Muslims can eat food after sunset.
- b) Fasting in Ramadan lasts for thirty days.
- c) If you are fasting during Ramadan, you cannot drink water before sunset.
- d) Ramadan always comes in summer.
- e) There are Muslims who are embarrassed because, for medical reasons, they cannot fast.
- f) Through Ramadan, you can deepen your understanding of other people's suffering.

(32) 本文で述べられた内容に合致するものを次のうちから一つ選び、マークシートの(32)にその記号をマークせよ。

- a) At school the author's teachers indicated their support for her religious belief by giving her candies.
- b) In America's Deep South the author saw a lot of people who disliked Muslims.
- c) The author is embarrassed because she cannot fast during Ramadan.
- d) The author suggests that we should ask Muslims how hungry they are during Ramadan in order to keep them from starvation.
- e) The author was at least 68 years old when she wrote this essay.
- f) The author's mother donated every year because the author failed in fasting every year.

## 令和7年度英語リスニング試験【スクリプトのみ】(本問題)

## 問題 A

Every year as it gets colder, North American monarch butterflies migrate south between August and October. Monarchs that spend the summer breeding west of the Rocky Mountains tend to migrate to California coasts, while monarchs breeding in the east migrate to Mexico, traveling up to 4,500 kilometers. The butterflies cluster together in large groups during the winter to survive the cold. Once spring begins, they migrate north to start the breeding season all over again.

Monarchs that migrate north will breed and pass away long before their descendants are ready to migrate south again. None of the monarchs on the south migration path have ever been to their destination before, and yet they know exactly where to go. Scientists believe they use cues like magnetism and sunlight to navigate directionally, but the rest is still a mystery. The monarchs that migrate south are the last of four or more generations born each year, and they live up to eight months longer than their ancestors from earlier in the summer.

In February, I took the trip of a lifetime to a nature reserve in Mexico where eastern monarch butterflies spend the winter. For our group of fifteen, getting to the monarchs' wintering grounds in the volcanic mountains of central-southern Mexico involved four hours on a bus from Mexico City, half an hour up steep dirt roads in the backs of open-air trucks, half an hour on horses led by locals, and, finally, 45 minutes hiking up the last 600 feet of elevation to their current location at 11,100 feet above sea level.

Here on the limbs and branches of specific species of trees, they rest, mostly in large groups, some individually. Most appear immobile and blend in with the woods, as we only see the gray undersides of their wings. The masses of butterflies are heavy, the branches rock gently as a few take off or land. When they fly, they flash beautiful orange, black, and white wings that are a bit worse for wear, having flown some 4,500 kilometers to get here.

Amazed by the sheer number of butterflies, I found myself wondering – did any of these magical creatures get their start in my yard in New Hampshire, in the north-eastern United States? Several years ago, I was given some special plants which monarch caterpillars are known to survive on exclusively, called “milkweed”. I’m not good with plants and thought I had killed them off, but last summer they came up again, and on my two thin stalks I found four healthy monarch caterpillars. I never found their chrysalises, but six months later, in the mountains of Mexico as I stared at the monarchs lazily flapping their wings on the trees, I wished I could get a glimpse of recognition that would tell me that my monarchs had survived to adulthood and arrived safe and sound in Mexico.

Now, in May, the children of those monarchs are working their way north. My milkweed has just emerged from the soil, getting ready for their arrival this summer. This time, though, I will know that a few generations ago, their ancestors and I were in the same place, and I may have looked at their great-great-great-grandparents!

## 問題B

A: There are few things in the natural world as joyful as the butterfly. We are talking today with Dr. Trevor Lamkin, an insect researcher and a butterfly collector. Hi Trevor.

B: Hello!

A: Is the life of a butterfly collector a good life?

B: I think butterfly collecting is hard work but it turns out to be a good life. Obviously there's getting out into the wild green forests and appreciating the beauty of the plant life and all sorts of other animals that are around. The other thing too is the beauty of all butterflies, and they really are beautiful.

A: What do those wings look like up close?

B: Well if you try to handle them you end up with the color all over your fingers, but when you look up close the butterfly wing is see-through, like a sheer plastic panel with veins, and laid over that sheer panel are thousands of lines of what look like roof tiles, stacked on top of each other, and how reflective they are depends on how they are stacked and that will basically determine what color the wings are.

A: Do butterflies change color from continent to continent, or from cold to warmer parts of the globe?

B: Look in general in the cooler parts of the world we see more browns and yellow colors but once we get into the warmer sub-tropical and tropical areas the colors really get very bright. Of course the number of species increases too. We have something like around 430 species in Australia, but for example, Costa Rica, which is much smaller, has 2,000 species. It sits in a very warm and wet part of the globe, and that means more tropical forest, diversity increases and the colors are magnificent.

A: What are they evolved from?

B: So recently they found fossils of butterflies...

A: They found butterfly fossils?

B: Yes they did, and they go a lot further back than what scientists thought. Fifty million years ago, there was an explosion of species where all your flowering plants came in and they had thought that butterflies were later than that and came from some other insect, but recently they found actually that butterflies are that old. A few of them actually were found with color on them, so the colors in the tiles have been preserved as well, it's quite interesting.

A: When butterflies emerge from the chrysalis, how long does it take to unfold their wings?

B: Usually the wings are fully expanded within five minutes but there is an interesting butterfly, the Black-spotted Flash butterfly, whose caterpillar lives inside an ant nest and it makes its chrysalis there inside the nest. When the butterfly emerges from the chrysalis, it has a lot of white sticky stuff all over its wings and its body. The ants attack it but their teeth get stuck on this stuff when they bite it. So it takes longer to unfold its wings because it's got to make its way out of the nest first, which takes a while. So, every butterfly is designed a little bit different to suit its environment.

A: Fascinating, thanks so much for your time.

B: You're welcome.

## 問題C

The majority of the human population now live in cities, and the urban environment is forecast to be three times the size it was at the turn of this century by 2030. The importance of urban forests is growing accordingly. For instance, city trees help reduce the urban heat island effect by limiting the amount of the sun's radiation absorbed by the buildings and streets, as well as cooling the surrounding air. Trees reduce flooding by capturing rain. They also clean pollution from the air and water, serve as habitat for many species of urban wildlife, and store carbon.

While city authorities have long recognized these benefits, most haven't invested enough to maintain their urban forests, or haven't done so equitably. In the US, decades of discriminatory planning practices have left many neighborhoods that are inhabited primarily by people of color with fewer trees than whiter neighborhoods. Low-income neighborhoods in the US have 15 per cent less tree cover on average than wealthier ones, and the UK has similar differences. Hotter than average temperatures in these neighborhoods are largely a reflection of their lack of trees.

Growing recognition of those inequities, along with rapid urbanization and billions of dollars in climate change-related funding, has spurred urban authorities to increase their efforts to maintain and expand urban forests. Many local residents have also got involved. However, if a lot of these trees die within a few years of planting, much of this effort is wasted. Trees need to get really big to benefit people. It takes some 10 years after a tree is planted for it to become established and grow a large enough cooling canopy. Depending on the city and the species, a tree must survive two or three decades just to offset the carbon emissions produced by planting and maintaining it. A city of saplings is no replacement for a long-lived urban forest. This is why early mortality among city trees is so concerning.

To tackle the problem, we must first understand why trees are dying. One clue to why city trees die is when they tend to die. There is a general pattern that can be seen clearly in the closely studied trees of Boston. When researchers compared thousands of the city's trees with their rural counterparts, they found that both died at high rates when young. Urban trees continued to die at a high rate when bigger, whereas mortality rates fell in rural trees the longer they survived.

This suggests different causes of death in urban and rural settings. Older city trees regularly die from over-aggressive trimming or are removed because they are judged to be in the way or to pose a hazard. For younger urban trees, their deaths are often due to a failure to establish roots and access water. On the other hand, in rural environments tree seeds initially grow vigorously, but the population of saplings is naturally reduced as they compete for light and nutrients. City trees' failure to establish roots may be caused by stressors unique to cities, such as densely packed soils, excess nutrients, and hotter temperatures.