令　和　6　年　度
医学部前期入学試験問題

英　　語

(時間：100 分)

注　意　事　項

1　試験開始の合図があるまで，この問題冊子の中を見てはいけません。

2　問題冊子は本文 6 ページ，解答用紙は 3 枚です。

3　試験中に問題冊子の印刷不鮮明，ページの落丁・乱丁および解答用紙の汚れ等に気付いた場合は，手を挙げて監督者に知らせなさい。

4　解答は，すべて解答用紙の所定の欄に記入しなさい。

5　問題冊子の余白は，下書き等に利用して構いません。

6　試験終了後，解答用紙のみを回収します。

〔1〕 次の文章を読み，問いに答えよ。

With the world getting warmer, knowing is / to / how / respond / important / organisms / temperature changes.(1) All organisms have specific temperature ranges in which they can survive and reproduce. Even humans can't survive if it gets too cold or too hot! As temperatures increase, some species travel to new locations to stay within their temperature ranges. Other species are able to adapt to the warmer temperatures. Many scientists have conducted studies to see how survival characteristics (such as body size and life cycle changes) can help animals adapt to warmer temperatures. Our study focuses on how organisms adapt through changing reproductive [1]traits. After all, both (A) and (B) are necessary for a species to be successful in a particular environment.

A common reproductive trait is [2]ornamental coloration. Species use different colors and designs to attract [3]mates and to [4]intimidate rivals. In our study, we looked at [5]dragonflies because the males have dark coloration on their wings. The darker the male's coloring, the more successful he is. Yet this same dark coloring also influences body temperature: it absorbs more [6]solar radiation, increasing the body temperature of the male dragonfly. Females also have ornamental coloration, but they spend more time in the shade looking for food. Based on the above understanding of dragonflies,(2) we hypothesized that only male coloration would decrease in warmer temperatures, not the female ornamentation. We tested this hypothesis by looking at how dragonfly species have changed over time and space.

We created a database of the male and female wing ornamentation for 319 different dragonfly species. They came from as far north as Alaska and Canada, and as far south as northern Mexico. We divided this area into [7]1° latitude by 1° longitude cells. We also used field guides and pictures on the website iNaturalist to determine [①]. If a species had wing ornamentation, we indicated [②]. Next, we found [③]. Then we analyzed the data to see [④].

We focused on the populations of 10 species that each had wide geographic ranges. Using iNaturalist observations, we measured the area of the dark coloration on over 200 individuals in each species. We then calculated the ratio of ornamentation area to total wing area. We compared this ratio(3) to the average yearly temperature for the location of each dragonfly observation. This comparison allowed us to see if dragonflies in populations that face warmer temperatures had smaller areas of dark coloration on their wings. We also tracked these species between 2005 and 2019 to see [⑤].

First, we looked at the results from dragonflies from different species. We found that species that live in warmer climates were less likely to have wing ornamentation and, when they did, the male wing ornamentation was usually lighter in color. Then we looked at the results from dragonflies from the same species. We saw that the warmer the habitat, the smaller the wing ornamentation for male dragonflies. Our analysis showed that between 2005 and 2019, male dragonflies had smaller ornamentation areas in the warmest years.

In both of our comparisons, the wing ornamentation of female dragonflies did not show any relationship to climate.

There are four major [8]takeaways from our study.

1. The wing ornamentation of male dragonflies is (C) in warmer climates. For other animals that also use dark coloring to attract mates, we expect similar changes as they adapt to increasing temperatures.

2. Because they have different roles, male and female dragonflies did not respond to their climate in the same way. We cannot assume that the males and females of any species will respond in exactly the same way when they face new environments.

3. The wing ornamentation changed in a relatively short period: 15 years. This probably means that climate change is the cause of [9]natural selection on these important dragonfly traits. Warmer temperatures reduce the number of highly ornamented males from the [10]breeding population.

4. Based on climate prediction, the wing ornamentation of male dragonflies will most likely need to decrease over the next 70 years. If it continues to decrease, reproductive behavior might change over time.

Reproduction is a key component for a species to survive in an ecosystem. We need to conduct more research to understand how reproductive traits respond to climate changes. After all, if we want to conserve a species, we need to know how their reproductive behavior is changing with the changing climate.

(*Science Journal for Kids and Teens*, 2021, modified)

注

[1]trait: 特徴

[2]ornamental coloration: 体表面に色・模様をつけること

[3]mate: 交尾相手

[4]intimidate: 威嚇する

[5]dragonfly: トンボ

[6]solar radiation: 太陽の放射，日射

[7]1° latitude by 1° longitude cell: 緯度1度×経度1度のます目

[8]takeaway: 重要な点，結論

[9]natural selection: 自然淘汰(とうた)

[10]breeding population: 繁殖個体数[個体群]

問 1 下線部(1)について，斜線(/)で区切られた語句を並べ替えて正しい英語を完成せよ。

問 2 (　A　)，(　B　)の部分に入る適切な語をア～エのうちから1つずつ選び(順不同)，記号で答えよ。

ア involvement　　イ reproduction　　ウ survival　　エ temperature

問 3 下線部(2)について，オスとメスの特徴の違いが分かるように120字以内(句読点を含める)の日本語で具体的に説明せよ。

問 4 [　①　]～[　⑤　]の部分に入る最も適切な表現をそれぞれア～オのうちから1つずつ選び，記号で答えよ。

ア if dark coloration was less common in warmer years

イ if it was dark (black or dark brown) or light (lighter brown or yellow)

ウ if species with dark ornamentation usually occurred in areas with cooler temperatures

エ the average yearly temperature for each species' geographical range

オ which species have wing ornamentation and which species do not

問 5 下線部(3)の内容を日本語で具体的に述べよ。

問 6 (　C　)の部分に入る最も適切な語句をア～エのうちから選び，記号で答えよ。

ア less likely and darker in color

イ less likely and lighter in color

ウ more likely and darker in color

エ more likely and lighter in color

問 7 本文に即して，以下の質問にThey(＝organisms)で始まる15語以内(Theyを含める)の英文で答えよ。

What are the two major ways that organisms deal with a changing environment?

〔2〕 次の文章を読み，問いに答えよ。

Most people tend to think of interruptions as originating from another person or from our devices, such as through an email notification on our computer and smartphone. But in our studies of people in their natural work environments, we observed a strange and regular phenomenon which typically looked like this. A person would be working on a task on their computer. Then, for no apparent reason to the observer, this person suddenly stopped what they were doing and checked their email or picked up their phone. There was no observable [1]stimulus that caused the person to interrupt themselves — there was rather some internal trigger, perhaps a thought, a memory, or habit. These interruptions originate from within ourselves. One of the most surprising (A) in our research is that we find that (1) people are nearly as likely to self-interrupt due to something internal in them as to be interrupted by something external to them.

We may not even be aware of how often we self-interrupt. Recently, in the middle of reading an article on AI, a random thought suddenly entered my mind to find out how safe it is to eat [2]non-organic strawberries. (2) I couldn't get this question out of my mind and switched my attention to the [3]browser and searched for strawberries and [4]pesticides. I then spent a good amount of time reading about the topic. Many of our participants report that these inner urges are disconnected from their work. Even basic human (B) can cause us to self-interrupt: a [5]graduate student of mine said that when she gets hungry, she self-interrupts to look up recipes.

What (C) people to self-interrupt? Jing Jin and Laura Dabbish from Carnegie Mellon University set out to answer this question, and shadowed people in a workplace for about one hour each, noting down their interruptions, and then interviewed them to ask why they self-interrupted. They found that people self-interrupted for a range of reasons that you might guess: to change their environment to be more productive (e.g., closing distracting windows), to do something less boring, to seek information, to take care of something that (3) be / needs / remembered / done / they / to, or to fill time (e.g., while waiting for an email). Their current task might also cue them to interrupt themselves, such as to send an email. People may also self-interrupt just out of habit, such as following a routine that includes checking the news when starting to work.

Not too long ago, I was searching for an apartment in New York City. I put in a number of inquiries. While there wasn't really much urgency, I kept checking my [6]inbox and the [7]real estate sites to see if a response had come in. My stress mounted, and it was hard to concentrate on my work. My first choice did come through. But even after the apartment was booked, it was hard for my mind to (D) and for me not to keep self-interrupting to check my inbox. It can take anywhere from 18 to 254 days to form a habit, and my habit of checking for [8]rentals was developed in closer to 18 days.

I had become conditioned to self-interrupt, which is consistent with evidence that my student Victor González and I found in an early study from 2005. We observed 36 people in three different companies for three days each as they went about their daily work. We recorded every moment-by-moment activity that each participant engaged in. In addition to timing their activities to the second, we also observed and noted down when people were being interrupted by something external to them (e.g., a person, a phone call, an email notification) or by something internal (i.e., with no observable stimulus).

Of the interrupting events, 56 percent were due to external interruptions, and 44 percent were due to self-interruptions. We then counted the number of internal and external interruptions on an hourly basis. We wanted to see if there was any relationship between these two kinds of interruptions in people's daily lives. We indeed found a stable pattern where, when external interruptions increased or decreased in one hour, (4) the internal interruptions followed a similar pattern in the next hour. Thus, if external interruptions increased, then self-interruptions in the next hour would also increase. But only external interruptions predicted self-interruptions. (5) Conditioning seems to play a role here. If a person is not getting interrupted externally, then it seems that a person will self-interrupt to maintain a consistent pattern of interruptions. We have become so accustomed to being interrupted that we do it to ourselves.

(Gloria Mark, *Attention Span*, 2023, modified)

注

[1]stimulus: 刺激

[2]non-organic: 非有機農法で栽培された

[3]browser: ブラウザ，閲覧ソフト

[4]pesticide: (害虫駆除の)農薬

[5]graduate student: 大学院生

[6]inbox: (電子メールの)受信箱

[7]real estate: 不動産(の)

[8]rental: 賃貸物件

問 1 下線部(1)を日本語に訳せ。

問 2 下線部(2)の内容を日本語で説明せよ。“this question”の内容も明示すること。

問 3 下線部(3)について，斜線(/)で区切られた語を並べ替えて正しい英語を完成せよ。

問 4 下線部(4)の内容を日本語で具体的に説明せよ。

問 5 下線部(5)について，(i)と(ii)に答えよ。

(i) 下線部(5)の内容を 100 字以内(句読点を含める)の日本語で具体的に説明せよ。

(ii) (i)の説明を踏まえて，二重下線部(I had become conditioned to self-interrupt)について 100 字以内(句読点を含める)の日本語で具体的に説明せよ。

問 6 (　A　)～(　D　)の部分に入る最も適切な語句をそれぞれア～エのうちから 1 つずつ選び，記号で答えよ。

(A)
- ア contrasts
- イ examples
- ウ results
- エ problems

(B)
- ア abilities
- イ behaviors
- ウ drives
- エ reactions

(C)
- ア allows
- イ expects
- ウ leads
- エ proves

(D)
- ア be active
- イ go blank
- ウ remain unchanged
- エ settle down

〔3〕 Read the following passage and answer the questions (Questions 1–4).

Japan is building its own versions of ChatGPT — the artificial intelligence (AI) chatbot made by US firm OpenAI that gained worldwide attention after it debuted in late 2022. The Japanese government and major technology companies like NEC, Fujitsu, and SoftBank are spending hundreds of millions of dollars to build AI systems based on the same technology called large language models (LLMs). However, these Japanese versions will use the Japanese language rather than translations from English.

According to Keisuke Sakaguchi, a researcher at Tohoku University in Japan, current public LLMs like ChatGPT do very well in English but often struggle with Japanese because of differences in the alphabet system, limited data, and other factors. LLMs typically use huge amounts of data from publicly available sources to learn the patterns of natural language. They are trained to predict the next word in a text based on previous words. However, most of the data GPT-3 — the previous model of ChatGPT — was trained on was in English.

ChatGPT's ability to hold human-like conversations has both impressed and concerned researchers. Some see it as a tool to reduce work, while others worry that it could be used to create false scientific papers or data.

In Japan, there's a concern that AI systems trained on data sets in other languages cannot understand the [1]intricacies of Japan's language and culture. The structure of sentences in Japanese is completely different from English. (A)ChatGPTは日本語のリクエストを英語に翻訳し，答えを見つけ，そして日本語に翻訳し戻さなければなりません。 This process can result in unusual characters and words.

For an LLM to be valuable and profitable, it needs to accurately reflect cultural practices as well as language. For instance, if asked to write a job application email in Japanese, ChatGPT might miss standard polite expressions and appear to be a direct translation from English.

To assess how sensitive LLMs are to Japanese culture, a group of researchers created Rakuda, a ranking of how well LLMs can answer [2]open-ended questions about Japanese topics. The researchers asked ChatGPT to compare the [3]fluidity and cultural appropriateness of answers to standard [4]prompts. The best [5]open-source Japanese LLM ranks fourth on Rakuda, indicating that Japanese LLMs are improving but still are far behind.

One large effort to create a Japanese LLM is using the powerful Japanese supercomputer Fugaku, supported by multiple institutions such as the Tokyo Institute of Technology, Tohoku University, and Fujitsu. This LLM is expected to be released soon and will provide its code to all users, unlike GPT-4 (a newer version of ChatGPT) and other [6]proprietary models.

However, there may be an even larger LLM in the future than the Fugaku one. Japan's Ministry of Education, Culture, Sports, Science and Technology is providing financial support for the creation of a Japanese AI program specializing in scientific research. This AI program will be capable of generating scientific hypotheses by studying existing research, making it faster to target areas for investigation.

Several Japanese companies are already [7]commercializing their LLM technologies. NEC, a supercomputer manufacturer, is using generative AI based on the Japanese language to reduce the time required to create reports and software codes. SoftBank, a telecommunications company, is investing in generative AI trained on Japanese text and plans to create its own LLM to help companies digitize their businesses and increase productivity.

Meanwhile, Japanese researchers hope that a precise, effective and made-in-Japan AI chatbot could help to accelerate science and bridge the gap between Japan and the rest of the world.

"If a Japanese version of ChatGPT can be made accurate, it is expected to bring better results for people who want to learn Japanese or conduct research on Japan," says Shotaro Kinoshita, a researcher in medical technology at the Keio University School of Medicine in Tokyo. "As a result, there may be a positive impact on international joint research."

(*Scientific American*, 2023, modified)

Notes:

[1]intricacies: the complicated details of something

[2]open-ended question: a question without a definite answer

[3]fluidity: the quality of being smooth and continuous

[4]prompt: an instruction or question given to a computer in natural language

[5]open-source: software that is free and includes the language of the program, so that users can make changes to it

[6]proprietary: advertised and protected by a company's brand name

[7]commercialize: to sell something completely new to the public for the first time

Question 1: Read the underlined section (A) and write the English translation.

Question 2: Choose the most appropriate answer to the following question.

According to the passage, why is Japan investing in building its own versions of AI chatbots like ChatGPT?

A) To challenge the dominance of US-based AI technology companies

B) To create chatbots that perform better in the Japanese language and culture

C) To develop AI systems for scientific research only

D) To reduce the cost of AI development

Question 3: Choose the most appropriate answer to the following question.

What is one of the key challenges mentioned in the passage when using public LLMs like ChatGPT for the Japanese language?

A) Concerns about the cost of implementing LLMs

B) Differences in sentence structure between Japanese and English

C) Difficulty in creating scientific hypotheses

D) Lack of interest from Japanese researchers

Question 4: AI is being used in various ways in hospitals to improve patient care and assist medical professionals. What are some ways that you think you will use AI or AI chatbots in your future career? Provide specific examples and express your opinion in ***at least 100 English words***.