令和５年度
医学科一般選抜（前期日程）

問題冊子

英　　語

（注　意）

1. 問題冊子は試験開始の合図があるまで開かないこと。
2. 問題冊子は表紙のほか９ページである。
3. 試験中に問題冊子及び解答用紙の印刷不鮮明，ページの落丁・乱丁等に気付いた場合は，手を挙げて監督者に知らせること。
4. 解答用紙のすべてに受験番号及び氏名をはっきり記入すること。
5. 解答はすべて解答用紙の所定の解答欄に明瞭に記入すること。
6. 解答に関係のないことを書いた答案は，無効にすることがある。
7. 本学受験票を机の右上に出しておくこと。
8. 試験時間は90分である。
9. 問題冊子は持ち帰ってもよいが，解答用紙は持ち帰らないこと。

英　　語（3問題）

Ⅰ．次の文章を読んで，下の設問に本文の内容に沿って答えよ。他の指示がない限り，記号以外の解答はすべて日本語ですること。右側に＊印のある語には注がある。　（配点 76 点）

[1] On October 31, 1832, Charles Darwin walked onto the deck of the Beagle and realized that the ship had been boarded by thousands of intruders*. Tiny red spiders, each a millimeter wide, were everywhere. The ship was 60 miles off the coast, so the creatures must have floated over from the Argentinian mainland.

[2] Spiders have no wings, but they can take to the air nonetheless. They will climb to an exposed point, raise their abdomens* to the sky, release threads* of silk, and float away. This behavior is called ballooning(1). It might carry spiders away from predators* or toward new lands with more resources. Whatever the reason for it, it is clearly an effective means of travel. Spiders have been found two and a half miles up in the air, and 1,000 miles out to sea.

[3] It is commonly believed that ballooning works because the silk catches on the wind, dragging the spider with it, but that does not entirely make sense, especially because spiders balloon only during light winds. Spiders do not shoot silk from their abdomens, and it seems unlikely that such winds could be strong enough to pull the threads out(2) — let alone to carry the largest species into the air, or to generate the big increase in speed of takeoff. Darwin himself found the rapidity of the spiders' flight to be difficult to determine and its cause to be "inexplicable" (difficult to explain).

[4] However, University of Bristol researchers Erica Morley and Daniel Robert have shown that spiders can sense Earth's electric field, and use it to launch themselves into the air. Every day, around 40,000 thunder-storms sound around the world, collectively turning Earth's atmosphere into a giant electrical circuit*. The upper reaches of the atmosphere have a positive charge*, and the planet's surface has a negative one.

[5] Ballooning spiders operate within this electric field. When their silk leaves their bodies, it typically picks up a negative charge. This repels* the similar negative charges on the surfaces on which the spiders sit, creating enough force to lift them into the air, and spiders

can increase those forces by climbing onto leaves, small branches, or blades of grass. Plants, being earthed, have the same negative charge as the ground that they grow upon, but they stick out (3) into the positively charged air. This creates substantial electric fields between the air around them and the tips of their leaves and branches — and the spiders ballooning from those tips. This idea — flight by electrostatic* repulsion* — was first proposed in the early 1800s, around the time of Darwin's voyage. Now, Morley and Robert have tested it with actual spiders.

[6] First, they showed that spiders can detect electric fields. They put the spiders on thick, stiff vertical strips of paper in the center of a plastic box (4), and then generated electric fields between the floor and ceiling of similar strengths to what the spiders would experience outdoors. These fields disturbed tiny sensing hairs on the spiders' feet. "It's like when you rub a balloon and hold it up to your hairs," Morley says.

[7] In response, the spiders performed a set of movements called tiptoeing — they stood on the ends of their legs and stuck their abdomens in the air. "That behavior is only ever seen before ballooning," Morley says. Many of the spiders actually managed to take off, despite being in closed boxes with no air-flow within them, and when Morley turned off the electric fields inside the boxes, the ballooning spiders dropped.

[8] Air currents might still play some role in ballooning. After all, the same hairs that allow spiders to sense electric fields can also help them to work out (5) wind speed or direction. Moonsung Cho from the Technical University of Berlin recently showed that spiders prepare for flight by raising their front legs into the wind, presumably to test how strong it (6) is.

[9] Still, Morley and Robert's study shows that electrostatic forces are, on their own, enough to launch spiders into the air. Peter Gorham, who previously conducted research in this field, says, "This is really top-notch science. As a physicist, it seemed very clear to me that electric fields played a central role, but I could only speculate on how the biology might support this. Morley and Robert have taken this to a level of certainty that far exceeds any expectations I had." Darwin might have been thrilled (7).

(出典 https://www.theatlantic.com/science/archive/2018/07/the-electric-flight-of-spiders/564437/より改変引用。)

注：

intruder(s)*＝侵入者

abdomen(s)*＝腹部

thread(s)*＝糸

predator(s)*＝捕食者

circuit*＝回路

charge*＝電荷

repel(s)*＝跳ね返す

electrostatic*＝静電気の

repulsion*＝反発

設問 1. What does underlined item (1) ballooning mean?

設問 2. Items A－D below have either a positive or a negative charge. Circle (＋) [a positive charge] or (－) [a negative charge] for each of the following.

A. the upper reaches of the atmosphere　　B. plants

C. the ground　　D. leaves of grass

設問 3. Translate underlined item (2) Spiders do not shoot silk from their abdomens, and it seems unlikely that such winds could be strong enough to pull the threads out.

設問 4. What does underlined item (3) stick out mean?

A. set out　　B. make contact　　C. balloon

D. extend outward　　E. become noticeable

設問 5. Describe the evidence for wind not being the only factor in the spiders' flight.

設問 6. Regarding underlined item (4) plastic box, describe the environmental conditions the scientists created inside of such boxes.

設問 7. What does underlined item (5) work out mean?

A. achieve　　B. form　　C. figure out

D. give out　　E. exercise

設問 8. What does underlined item it (6) refer to?

設問 9. Explain why Darwin might have been thrilled (7).

設問10. Choose the correct statement.

A. Darwin was robbed by Argentinian intruders.

B. A series of movements called tiptoeing are observed before ballooning.

C. Darwin conducted experiments to understand the mechanism of ballooning.

D. Morley and Robert rejected the idea that a magnetically charged atmosphere could keep spiders in the air.

設問11. Choose the correct statement.

A. In the experiment by Morley and Robert, many of the spiders somehow kept themselves in the air after the electric fields were turned off.

B. In the experiment by Morley and Robert, many of the spiders successfully took off without any air-flow.

C. The author believes that air currents have nothing to do with the ballooning of spiders.

D. Spiders balloon when the wind is strong enough to carry them into the air.

Ⅱ．次の文章を読んで，下の設問に本文の内容に沿って答えよ。他の指示がない限り，記号以外の解答はすべて日本語ですること。右側に＊印のある語には注がある。　（配点 84 点）

[1] In a story of lost and stolen books and careful detective work across continents, California Institute of Technology history professor Mordechai Feingold, and his former student Andrej Svorenčík, have discovered previously uncounted copies of Isaac Newton's groundbreaking science book *Philosophiae Naturalis Principia Mathematica*, known more commonly as the *Principia*. The new survey more than doubles the number of known copies of the famous first edition, published in 1687. According to the study authors, up to 200 additional copies likely still exist somewhere（**a**）public and private collections. The researchers spent more than a decade tracing(1) copies of the book around the world.

[2] Moreover, by analyzing ownership marks and notes written in the margins* of some of the books(2), in addition to related letters and other documents, the researchers found evidence that the *Principia*, once thought to be reserved for only a select group of expert mathematicians, was more widely read and comprehended than previously thought. Feingold realized that the spread of the book and its ideas was far quicker and more open than they had assumed, and that would affect future work in this subject.

[3] In the *Principia*, Newton introduced the laws of motion and universal gravitation*, "unifying* the terrestrial* and celestial* worlds under a single law," says Svorenčík. "By the 18th century, Newtonian ideas went beyond science itself(3)," says Feingold. "People（**b**）other fields were hoping to find a similar single law to unify their own fields. The influence of Newton, just like that of Charles Darwin and Albert Einstein, was considerable in many other aspects of life, and that is what made him such an established figure during the 18th century and beyond."

[4] Svorenčík says that the project was born out of a paper he wrote for a course taught by Feingold about the distribution of the *Principia* in Central Europe. He was interested in finding copies of the book that could be traced to the region around his home country, Slovakia. The survey done in the 1950s did not list any copies from Slovakia, the Czech Republic, Poland, or Hungary, nations where tracing copies had been politically difficult.

[5] To Svorenčík's surprise, he found many more copies than Feingold had expected. The following summer, Feingold suggested to Svorenčík that they turn his project into the first-

ever complete, systematic search for copies of the first edition of the *Principia*. Their worldwide detective work turned up about 200 previously unidentified copies in 27 countries, including 35 copies in Central Europe, more than doubling the total number of known copies. Feingold and Svorenčík even came across one in Italy that had been stolen in Germany decades earlier. "We contacted the German library to let them know, but they were too slow to make a decision to buy back the copy or claim it somehow, so it ended up back in the market," says Feingold. The historians estimate that up to 750 copies of the first edition were printed in 1687, and command high prices.

[6] The primary person behind the book's publication was Edmond Halley, a well-known English scientist who made several discoveries about our solar system. Feingold explains that, before the *Principia* was written, Halley had asked Newton for some calculations regarding orbits* of bodies (**c**) our solar system. According to Feingold, when Halley saw the calculations, he excitedly asked Newton to write the *Principia*, and funded the first edition.

[7] The book was soon recognized as a work of genius. "Because Halley had already prepared the public for what was to come," says Feingold, "there was a widespread recognition that the *Principia* was a masterpiece." However, later, a popular story developed about Newton: "There goes a man who wrote a book that neither he nor anybody else understands."
(4)

[8] Not only does the research show that there was a larger market for the book than once thought, it also demonstrates that people were digesting its contents to a greater extent
(5)
than realized. "When you look through the books, you might find small notes that give you clues about how it was used," says Svorenčík. When traveling (**d**) different countries, he would make time to visit local libraries. He looked at the condition of the ownership marks, overall book condition, and printing differences. Even without inspecting the books up close,
(6)
the historians could trace who owned them through library records and other documents, and learn how copies were shared.

[9] Ownership of a book does not always show engagement with the book, but one may look at the notes in the margins and how the book was shared. One can assume that for each copy of Newton's work, there were multiple readers. This exchange of ideas between people sharing copies helps to solve the puzzle.

[10] Svorenčík and Feingold hope that their survey, which they call a first step, will yield information about other existing copies hidden away with private owners, book dealers, and libraries. Continuing this line of research into the future, the historians plan to further refine our understanding of how the *Principia* shaped 18th-century science.

(出典 https://phys.org/news/2020-11-hundreds-newton-principia-census.html より改変引用。)

注：

margin (s) * ＝余白

gravitation* ＝重力

unifying* > unify ＝を統一する

terrestrial* ＝地上の

celestial* ＝天の

orbit (s) * ＝軌道

設問 1. What does underlined item (1) tracing mean?

A. copying　　B. covering　　C. drawing down　　D. tracking down

設問 2. Write the one preposition (前置詞) in English that correctly replaces a–d: (a) [in paragraph 1], (b) [in paragraph 3], (c) [in paragraph 6], and (d) [in paragraph 8].

設問 3. Which resource is NOT mentioned by the researchers as being used to study the history of the *Principia*?

A. Newton's original notes　　B. notes in the margins

C. letters　　D. documents　　E. ownership marks

設問 4. What was revealed by underlined item (2) analyzing ownership marks and notes written in the margins of some of the books?

設問 5. What does underlined item (3) Newtonian ideas went beyond science itself mean?

設問 6. The *Principia* was respected at publication because

A. Halley laid the groundwork.

B. Newton was already widely known for his discoveries.

C. Newton helped Halley write it.

D. Halley funded publicity.

設問 7. Translate underlined item (4) There goes a man who wrote a book that neither he nor anybody else understands.

設問 8. What does underlined item (5) digesting mean?

A. maintaining　B. ignoring　C. making up

D. taking in　E. leaving out

設問 9. What does underlined item (6) up close mean?

A. secretly　B. in person　C. open

D. under a magnifying glass　E. by touch

設問10. Explain the difference between ownership of a copy of the *Principia* and engagement with it.

設問11. Choose the correct statement.

A. The project started as coursework.

B. They recorded multiple copies from Slovakia in the 1950s.

C. Feingold found fewer copies than Svorenčík.

D. Feingold and his former student identified 25 formerly unknown copies in Central Europe.

設問12. Choose the incorrect statement.

A. Edmond Halley made a financial contribution to the publication of the *Principia*.

B. It took decades for the *Principia* to be recognized as an important work.

C. Feingold and his former student think their project on the *Principia* can and will develop further.

D. Researchers came across copies of the *Principia* on the market.

設問13. Choose the correct statement.

A. The survey done in the 1950s did not list any copies from several countries where it was politically difficult to trace them.

B. No fewer than 750 copies of the first edition were printed in 1687.

C. Several copies were found in Italy, which used to belong to a German library.

D. Excited by Newton's talent, Halley did the calculations for him so that he could write the *Principia*.

Ⅲ．以下は，グレゴリオおじいさんが孫に語りかけている言葉です。この文章を，あなたの解釈が分かるように英訳しなさい。（配点 40 点）

鳥かごに入った鳥の声を聞いて何になる？　鳥の歌声をめでたいのなら，自由に生きる自然の言葉はかごに入れるな。鳥が一番いい音楽を奏でられるのは木の枝の中だ。

自由に格子をはめる者は自分の心に鍵をかけ，自分の言葉を遮り，自分の尊厳を失うことになる。

自由な人間には値段がない。自由は金を出して買うことができるような商品じゃないからね。自由という心の宝石は人間が自ら勝ち取るべき特権なんだ。

（出典：ホルヘ・ミゲル・ココム・ペッチ『言葉の守り人』吉田栄人訳［国書刊行会］より改変引用。）