

2022年度 入学試験問題

英 語

注 意

- (1) 解答用紙には受験番号の記入欄が3か所ある。
3か所とも正確、明瞭に記入すること。
- (2) 解答用紙には氏名の記入欄が1か所ある。
正確、明瞭に記入すること。
- (3) 解答はすべて解答用紙の所定欄に記入すること。
解答用紙の裏面は使用してはならない。
- (4) 問題紙の本文は18ページある。
試験開始後、落丁・損傷がないか確認すること。
- (5) 試験終了後、問題紙は各自持ち帰ること。

[I] 次の文章を読んで設問に答えなさい。[*印のついた語句は注を参照しなさい。](70点)

Imagine an elephant, but significantly taller and heavier and with longer tusks*. That's the Columbian mammoth, an imposing animal that roamed much of North America during the most recent ice age. ^(a)

When it comes to the mammoth family tree, it has long been believed that the Columbian mammoth evolved earlier than the smaller, shaggier* woolly mammoth. But now, using DNA that is more than a million years old—the oldest ever recovered from a fossil—researchers have turned that assumption on its head: They found that the Columbian mammoth is in fact a hybrid of the woolly mammoth and a previously unrecognized mammoth lineage*. ^(b)

These results were published on Wednesday in the journal *Nature*. Mammoths are depicted in many cave paintings, a reflection of their importance as a source of food, skin and bone during the Pleistocene*. During the last ice age, humans living in (W) is today the United States would have primarily encountered the Columbian mammoth, said Love Dalen, a paleogeneticist* at the Centre for Palaeogenetics* in Stockholm. "It's an iconic* species of the last ice age," he said.

Fossilized remains of mammoths, particularly those preserved in exquisite detail, can shed light on how these animals lived and died. But ^(d) analyzing an ancient creature's genetic code—by recovering its DNA and reassembling it into a genome*—opens up vast new research possibilities, said David Díez-del-Molino, another paleogeneticist at the Centre for Palaeogenetics. "You can track the origin of species."

A team of researchers, including Dr. Dalen and Dr. Díez-del-Molino, recently set (X) to do just that using three mammoth molars* unearthed* in northeastern Siberia. These teeth are old—about 700,000

years, 1.1 million years and 1.2 million years — and they're also impressive to look at, Dr. Dalen said. "They're the size of a carton of milk." The researchers started by extracting a bit of material from the interior of each tooth with a small dentist's drill. They then used chemicals and enzymes, followed by a washing protocol, to isolate the DNA in the resulting tooth powder.

Most of the DNA they extracted consisted of sequences just a few tens of base pairs* long. That is to be expected because the passage of time is tough on DNA molecules. Bacteria and enzymes chop up DNA after an organism dies, and water and cosmic rays continue the degradation process even after a sample is buried in permafrost*.

What started out as strands millions of base pairs long soon degrades, said Patricia Pecnerova, an evolutionary biologist at the University of Copenhagen and a researcher on the team. "The DNA is very fragmented," she said.

But before everything can be put back together digitally, it's necessary to decontaminate* each sample, said Tom van der Valk, another team member and a bioinformatician* at the Science for Life Laboratory in Stockholm. That's because DNA from plants, bacteria and humans is wildly adept* at sneaking into fossils, he said. "A large fraction of our data doesn't come from the mammoth."

To weed out interloping* DNA, the team compared the sequences with genetic code from an African elephant, a close relative of mammoths. They discarded anything that didn't match. Furthermore, they threw out sequences that matched the human genome.

After removing the non-mammoth DNA, the team was left with between 49 million and 3.7 billion base pairs in each of their three samples. (The mammoth genome is roughly 3.2 billion base pairs, which is slightly larger than the human genome.) The researchers compared their

data with African elephant DNA a second time, which allowed them to put all their DNA fragments in the correct order.

This mammoth DNA smashes the record for the oldest DNA ever sequenced, which was previously held by a roughly 700,000-year-old horse specimen, said Morten E. Allentoft, an evolutionary biologist at Curtin University in Perth, Australia, who was not involved in the research. “It’s the oldest DNA that’s ever been authentically identified,” he said.

When the researchers looked at the three genomes they reconstructed, the oldest stood (Y). “The genome looked weird,” Dr. Dalen said. “I think it’s likely this is a different species.” That was a shock: Researchers have long believed that there was only a single lineage of mammoths in Siberia that gave rise to woolly and Columbian mammoths. This discovery suggests that a previously undiscovered mammoth lineage existed as well. “It’s a huge surprise,” Dr. Dalen said. “It’s completely unexpected from the paleontology* that there would be a second lineage.”

The team next compared the three genomes with the genetics of the Columbian mammoth, which ambled* across much of North America as recently as 12,000 years ago. The goal was to determine how, (Z) at all, these two species were related. They found persuasive evidence that the woolly mammoth and this new unknown lineage ⁽ⁱ⁾crossbred* to form the Columbian mammoth, a hybrid species. No one (あ)(い) and (う)(え) long this new mammoth lineage (お), Dr. van der Valk said. “It’d be absolutely amazing if we could get a few more samples of this lineage.”

(By Katherine Kornei, writing for *The New York Times*,
February 17, 2021)

- [注] tusks 象などの牙
 shaggier (shaggy 毛むくじゃらの)
 lineage 血統、系統
 Pleistocene 更新世 (地質時代の一区分。約258万年前～約1万年前)
 paleogeneticist 古遺伝学者
 Centre for Palaeogenetics 古遺伝学センター
 iconic 象徴的な
 genome ゲノム
 molars 臼歯
 unearthed (unearth 発掘する)
 base pairs 塩基対 (核酸の水素結合による化合物)
 permafrost 永久凍土
 decontaminate 異質物除去をする
 bioinformatician 生物情報学者
 adept 熟達した
 interloping (interlope 侵入する)
 paleontology 古生物学
 ambled (amble ぶらぶら歩く)
 crossbred (crossbreed 異種交配する)

I - A 空所(W)～(Z)に入るもっとも適切なものを次の1～4の中からそれぞれ一つ
 選び、その番号を解答欄に記入しなさい。

- | | | | | | | | | |
|-----|---|------|---|------|---|-------|---|---------|
| (W) | 1 | that | 2 | what | 3 | where | 4 | which |
| (X) | 1 | at | 2 | by | 3 | out | 4 | through |
| (Y) | 1 | by | 2 | off | 3 | out | 4 | up |
| (Z) | 1 | by | 2 | for | 3 | if | 4 | not |

I - B 下線部 (a)~(i) の意味・内容にもっとも近いものを次の 1 ~ 4 の中からそれぞれ一つ選び、その番号を解答欄に記入しなさい。

(a) an imposing

- | | |
|----------------|----------------|
| 1 a dangerous | 2 a formidable |
| 3 an important | 4 an offensive |

(b) previously

- | | |
|----------------|------------|
| 1 dubiously | 2 formerly |
| 3 surprisingly | 4 widely |

(c) depicted

- | | | | |
|----------|---------------|-------------|-------------|
| 1 caught | 2 eternalized | 3 portrayed | 4 reflected |
|----------|---------------|-------------|-------------|

(d) exquisite

- | | | | |
|-----------|---------|-------------|----------|
| 1 eternal | 2 fancy | 3 necessary | 4 superb |
|-----------|---------|-------------|----------|

(e) extracting

- | | |
|---------------|---------------|
| 1 burning out | 2 finding out |
| 3 lining out | 4 taking out |

(f) protocol

- | | | | |
|----------|-----------|----------|-------------|
| 1 device | 2 machine | 3 option | 4 procedure |
|----------|-----------|----------|-------------|

(g) degradation

- | | | | |
|------------|---------|----------|--------------|
| 1 conflict | 2 decay | 3 fusion | 4 graduation |
|------------|---------|----------|--------------|

(h) discarded

- | | | | |
|------------|------------|--------------|--------------|
| 1 excluded | 2 regarded | 3 reinforced | 4 stimulated |
|------------|------------|--------------|--------------|

(i) persuasive

- | | | | |
|------------|--------------|-------------|------------|
| 1 affluent | 2 convincing | 3 efficient | 4 forceful |
|------------|--------------|-------------|------------|

I - C 波線部 (ア)~(ウ) の意味・内容をもっとも的確に示すものを次の 1 ~ 4 の中からそれぞれ一つ選び、その番号を解答欄に記入しなさい。

(ア) have turned that assumption on its head

- 1 have nearly forgotten that assumption
- 2 have put that assumption completely in doubt
- 3 have repeatedly thought about that assumption
- 4 have tirelessly promoted that assumption

(イ) the passage of time is tough on DNA molecules

- 1 DNA molecules are subject to deterioration
- 2 DNA molecules become more resistant to degradation
- 3 DNA molecules can be dated by the relative firmness of their shells
- 4 DNA molecules pass from generation to generation unchanged

(ウ) smashes the record for

- 1 dates back much farther than
- 2 destroys all evidence of
- 3 leaves us in ignorance about
- 4 reinterprets the music for

I - D 二重下線部の空所(あ)~(お)に次の 1 ~ 8 の中から選んだ語を入れて文を完成させたとき、(い)と(う)と(お)に入る語の番号を解答欄に記入しなさい。同じ語を二度使ってはいけません。選択肢の中には使われないものが三つ含まれています。

No one (あ) (い) and (う) (え) long this new mammoth lineage (お), Dr. van der Valk said.

- | | | | |
|-----------|--------|---------|---------|
| 1 exists | 2 for | 3 how | 4 knows |
| 5 thrived | 6 what | 7 where | 8 which |

I - E 本文の意味・内容に合致するものを次の1～8の中から三つ選び、その番号を解答欄に記入しなさい。

- 1 Until recently, the Columbian mammoth was thought to have a shorter history than the woolly mammoth.
- 2 Dalen suggests that ancient inhabitants of the region now known as America were likely to have encountered the Columbian mammoth.
- 3 Díez-del-Molino believes that examination of genes obtained from fossils will tell us much about the origins of mammoths.
- 4 DNA from plants, bacteria and humans often gets into fossils, but this does not affect scientific analysis.
- 5 The mammoth genome is short and irregular compared to the human genome.
- 6 Examining base pairs of selected specimens, scientists, including van der Valk, discovered a third lineage of the mammoth family in Siberia.
- 7 Allentoft and his research team showed that the 700,000-year-old mammoth DNA is more ancient than existing horse DNA.
- 8 Researchers had long asserted that woolly and Columbian mammoths descended from a single lineage in Siberia.

〔Ⅱ〕 次の文章を読んで設問に答えなさい。[*印のついた語句は注を参照しなさい。](80点)

The statistics are grim. Collectively, the Antarctic* and Greenland ice sheets lose around 466 tons of ice a year on average. That's more than 1.1 billion tons every day. The water from those liquefying* ice sheets pours into the oceans, inching sea levels higher and higher. There's little sign that the melting of the ice caps will slow any time soon. (W) anything, it's going to get exponentially* faster, scientists say. Like the glaciers themselves, it's a process that begins slowly but carries with it a terrifying momentum.

The ice caps store 99 percent of all the freshwater on Earth. (中略) Together, the ice ^(b) in Antarctica and Greenland would raise Earth's sea levels by around 230 feet if it all melted. The seas would eat up an appreciable* portion of the planet's current land, drowning coastal cities like New York, Los Angeles and Houston. Low-lying Florida would simply disappear. And Antarctica, once a snowy wasteland, would become a rocky archipelago*, free of the overlying ice and partially submerged by rising seas.

(X) an Earth completely free of ice isn't going to happen within our lifetimes, or likely even within the next few thousand years. Most projections put sea-level rise at around a foot by 2100—far less than ^(c) what's possible. By the next century, Earth's ice sheets will still be firmly in place, if diminished.

The last thing we should take away from that fact is a sense of complacency*, however. Even small changes in sea levels carry dire* consequences. That single foot of sea-level rise could devastate* low-lying coastal cities and force massive migrations inland. And melting glaciers have the potential to alter ocean currents, which could change global ^(e)

weather patterns in unpredictable ways.

The ice caps that adorn* Earth's North and South poles are so ingrained* into our mental geography that their presence is often no more than an afterthought. Even grade-schoolers know to splash some white on the top and bottom of a drawing of the Earth. But turn back the clock some 40 million years, and those icy promontories* disappear. Indeed, for the majority of Earth's existence, the poles have been ice-free.

In the times before our current Ice Age (which simply references the fact that permanent ice exists on the surface), dinosaurs roamed Antarctica and alligators swam in Alaska. (Y) in more recent times, the planet has been significantly warmer and wetter than it is now. (中略) It's not unusual for the ice sheets to be smaller and sea levels to be significantly higher than they are now. But, as with global temperatures, rapid changes to our natural world carry dire consequences for the ecosystems and organisms that depend on it.

The majority of the rise in sea levels today comes from two things: melting ice and expanding water. As water warms it becomes less dense, and some estimates suggest (あ)(い) much as half of sea-level rise this decade (う)(え) due (お) warmer ocean water taking up more space. But with melt rates only projected to increase, vanishing ice sheets will become the more important factor in sea-level rise in the future. The meltwater that's causing the oceans to rise comes from the Greenland and Antarctic ice sheets. While the Arctic ice cap is shrinking too, it doesn't contribute to sea-level rise because that ice is already floating in the ocean — it's taking up all the space it can. (中略)

(f) Most studies point out that ice loss and sea-level rise will keep increasing in magnitude as time goes (Z). One study finds a noticeable inflection point* in 2030, where under the worst-case scenario, the ice sheets begin adding tens of millimeters to sea levels every decade, (g)

ending up with over a foot of sea-level rise. That's roughly as much sea-level rise per decade as we've seen in the past 30 years. One reason for this could be that ice sheets are flowing into the ocean at ever-quicken- ing rates. As warmer ocean water eats away at their base, the massive glaciers that sprawl from mountains in Antarctica and Greenland and extend far out into the ocean have less holding them back. (中略)

Once begun, it's likely difficult to halt the process of ice sheet disintegration*. That means even getting our emissions under control and putting a halt to global warming might not stop the ice sheets from melting. And, though some evidence has indicated Antarctica might be gaining more ice than it's losing as wetter conditions increase snowfall, more recent studies say that's not true. Though some parts of the continent have been seeing more precipitation*, Antarctica has lost ice, on average, since we began keeping tabs on it.

So, while the ice caps aren't going to disappear, that's largely beside the point. There's so much water locked in ice on Earth that releasing even a small portion of it can cause big changes. We need only look back in time to see what we might be in for. During the last interglacial period*, a bit over 100,000 years ago, global temperatures were around 3 degrees hotter than today. That's about as warm as the planet is projected to be in 2100, if we're lucky. Despite that relatively small change in temperature, sea levels may have been 10 feet higher than they are today. Is it a glimpse of our future? Only time will tell.

(By Nathaniel Scharping, writing for *Discover Magazine*,
February 24, 2021)

[注] Antarctic 南極の
 liquefying (liquefy 液化する)
 exponentially 急激に
 appreciable かなりの
 archipelago 群島
 complacency 油断
 dire 悲惨な
 devastate 破壊する
 adorn 飾る
 ingrained 深くしみ込んだ
 promontories 岬
 inflection point 屈曲点、転換点
 disintegration 崩壊
 precipitation 降水
 interglacial period 間氷期

II - A 空所(W)～(Z)に入るもっとも適切なものを次の1～4の中からそれぞれ一つ
 選び、その番号を解答欄に記入しなさい。

(W)	1 As	2 For	3 If	4 Though
(X)	1 But	2 Once	3 Then	4 Therefore
(Y)	1 Best	2 Even	3 However	4 Only
(Z)	1 for	2 in	3 on	4 with

II - B 下線部 (a)~(j) の意味・内容にもっとも近いものを次の 1 ~ 4 の中からそれぞれ一つ選び、その番号を解答欄に記入しなさい。

(a) inching

1 dashing 2 measuring 3 moving 4 pinching

(b) store

1 export 2 hold 3 sell 4 supply

(c) projections

1 predictions 2 scenes 3 scientists 4 screenings

(d) diminished

1 completed 2 insignificant 3 reduced 4 replenished

(e) currents

1 banks 2 qualities 3 streams 4 tendencies

(f) floating

1 drifting 2 forming 3 freezing 4 sinking

(g) decade

1 hundred years 2 ten years
3 twenty years 4 year

(h) sprawl

1 crawl 2 form 3 spring 4 stretch

(i) emissions

1 release of emotions 2 release of gasses
3 sense of balance 4 sense of mission

(j) keeping tabs on

1 collecting parts of 2 having regrets about
3 paying attention to 4 taking control of

II - C 波線部 (ア)~(ウ) の意味・内容をもっとも的確に示すものを次の 1~4 の中からそれぞれ一つ選び、その番号を解答欄に記入しなさい。

(ア) carries with it a terrifying momentum

- 1 brings with it a momentary fear
- 2 brings with it an unstoppable force
- 3 takes an unexpected action
- 4 takes off an immense pressure

(イ) Even grade-schoolers know to splash some white on the top and bottom of a drawing of the Earth.

- 1 Even the best students can tell the difference between the Arctic and Antarctic by examining their colors.
- 2 Even the worst students would know how to crush ice in the poles.
- 3 Students, even at a young age, can paint the simple but splendid colors of the poles.
- 4 Students, even at a young age, know that ice is present in the Arctic and Antarctic.

(ウ) that's largely beside the point

- 1 the fact that the ice caps will remain is relatively unimportant
- 2 the fact that the ice caps will remain is the second most important issue
- 3 the fact that the ice caps will vanish is relatively unimportant
- 4 the fact that the ice caps will vanish is the second most important issue

II-D 二重下線部の空所(あ)～(お)に次の1～7の中から選んだ語を入れて文を完成させたとき、(あ)と(う)と(お)に入る語の番号を解答欄に記入しなさい。同じ語を二度使ってはいけません。選択肢の中には使われないものが二つ含まれています。

some estimates suggest (あ)(い) much as half of sea-level rise
this decade (う)(え) due (お) warmer ocean water taking
up more space

- | | | | |
|------|--------|-------|--------|
| 1 as | 2 been | 3 has | 4 more |
| 5 no | 6 that | 7 to | |

II-E 本文の意味・内容に合致するものを次の1～8の中から三つ選び、その番号を解答欄に記入しなさい。

- 1 Many signs show that the melting of the ice sheets in both Antarctica and Greenland will soon slow.
- 2 If all the fresh water trapped in the ice in Greenland melted, it would push up the sea levels by about 230 feet.
- 3 Though it is likely that some ice sheets will still be in place in the next century, we should not be lured into a sense of security.
- 4 The issue is not the melting of the ice sheet itself, since the Earth has been warmer in the past, but the speed at which the ice is melting.
- 5 Warmer, expanding water is unlikely to cause a rise in sea levels.
- 6 According to one study, the rise in sea levels will accelerate beginning in about 2030, partly due to ice flowing into the sea, in massive amounts, from Antarctica and Greenland.
- 7 Once rising sea levels reach a critical point, we can stop global warming and slow the disappearance of the ice sheets.
- 8 While some studies indicate that Antarctica is gaining more ice than it is losing, others suggest this has little to do with a wetter climate.

Ⅱ－F 本文中の太い下線部を日本語に訳しなさい。

Despite that relatively small change in temperature, sea levels may have been 10 feet higher than they are today.

〔Ⅲ〕 次の会話を読んで設問に答えなさい。(50点)

(*Ella, a university student, runs into her friend Adrian on campus at an American university.*)

Ella: Hey Adrian, how are you?

Adrian: Oh, hey Ella. I'm pretty good. I don't have class next period, so I was just going to read a little.

Ella: Oh yeah? _____ (a) _____ You really like books, don't you?

Adrian: Well, it's a fun way to pass the time, especially if you find a book you enjoy.

Ella: Yeah, maybe that's my problem. _____ (b) _____ So, what are you reading now?

Adrian: Oh, just some science fiction. _____ (c) _____

Ella: Oh, like *Star Wars* or something like that?

Adrian: No, not like that. I prefer hard science fiction.

Ella: What does that mean? Is it really difficult to read?

Adrian: No, that doesn't mean it's difficult. It just means that it tries to be scientifically accurate. [この種類の小説では、作家たちはいつの日か本当に存在しうる新しい技術について書くんだ。]

Ella: Oh, I see. So, what future technology is the book you're reading about?

Adrian: It's about robots. It's called *I, Robot*, and it's written by a famous author named Isaac Asimov. He was a professor of biochemistry.

_____ (d) _____ A lot of people are worried about robots and artificial intelligence, and this book predicted all of that.

Ella: Yeah, I hear about AI all the time now. It's kind of scary that someday computers might be smarter than people.

_____ (e) _____

Adrian: Right. That's what Asimov talks about in this book. He created something called the "Three Laws of Robotics."
_____ (f) _____ These days people are thinking about how to control AI, and they still talk about Asimov's three laws.

Ella: So, what are the three laws?

Adrian: Well, the first law says that a robot should not hurt a human or allow a human to be hurt.

Ella: Well, that's a good first rule. What's the second law?

Adrian: It says that a robot must follow a human's orders, unless those orders would make it break the first law.

Ella: _____ (g) _____

Adrian: Exactly. So, robots should do what we tell them to do, unless we tell them to harm someone. In that case they shouldn't follow our order.

Ella: No killer robots? That's a relief. And what about the third law?

Adrian: A robot should protect itself as long as it doesn't break the first or second law.

Ella: I see. So, a robot needs to protect people first, and then protect itself. Those are well thought-out laws. _____ (h) _____

Adrian: Well, believe it or not, it was written in 1950.

Ella: 1950? People were thinking about this seventy years ago?

Adrian: Maybe not most people, but Asimov was. He had an incredible imagination. Actually, he wrote over 500 books.

Ella: And maybe you'll read them all someday.

Ⅲ - A 空所 (a)~(h) に入る最も適切なものを次の 1~10 の中からそれぞれ一つ選び、その番号を解答欄に記入しなさい。同じ選択肢を二度使ってはいけません。選択肢の中には使われないものが二つ含まれています。

- 1 I have trouble finding books I like.
- 2 I hope they don't try to take over the world!
- 3 It seems like you're always reading.
- 4 It's really interesting because the ideas in it are still relevant today.
- 5 Oh, I haven't seen that in a long time.
- 6 Oh, so that means no one could tell a robot to hurt other people.
- 7 That's what I usually read for fun.
- 8 They are a really simple but clear set of rules for robots.
- 9 Was that book written recently?
- 10 Wasn't that made into a movie by the same director?

Ⅲ - B 本文中の [] 内の日本語を英語で表現しなさい。

この種類の小説では、作家たちはいつの日か本当に存在しうる新しい技術について書くんた。

