前期日程試験

令和３年度医学科入学試験問題

英　　語

〔注意事項〕

1　監督者の指示があるまで，この冊子を開いてはいけない。

2　**解答用紙に受験番号と氏名を必ず記入すること。**

3　この問題冊子の本文は，17 ページからなっている。落丁，乱丁及び印刷不鮮明な箇所等があれば，手をあげて監督者に知らせなさい。

4　この問題冊子の白紙と余白は，適宜下書きに使用してもよい。

5　解答は，すべて別紙「解答用紙」の指定された場所に記入すること。

6　この問題冊子は持ち帰ること。

I **Read the following passage and answer the questions which follow.**

The concept of probability is philosophically puzzling. Part of the puzzle is that the word 'probability' seems to have more than one meaning. If you read that the probability of an Englishwoman living to 100 years of age is 1 in 10, you would understand this as saying that one-tenth of all Englishwomen live to the age of 100. Similarly, if you read that the probability of a male smoker developing lung cancer is 1 in 4, you would take this to mean that a quarter of all male smokers develop lung cancer. This is known as the frequency interpretation of probability: it equates probabilities with proportions, or frequencies. But what if you read that the probability of finding life on Mars is 1 in 1,000? Does this mean that one out of every thousand planets in our solar system contains life? Clearly it does not. For one thing, there are only eight planets in our solar system. So a different notion of probability must be at work here.

One interpretation of the statement 'the probability of life on Mars is 1 in 1,000' is that the person who says it is simply reporting a subjective fact about themselves — they are telling us how likely they think life on Mars is. This is the subjective interpretation of probability. It takes probability to be a measure of the strength of our personal opinions. Clearly, we hold some of our opinions more strongly than others. I am very confident that Brazil will win the World Cup, reasonably confident that Jesus Christ existed, and rather less confident that global environmental disaster can be avoided. This could be expressed by saying that I assign a high probability to the statement 'Brazil will win the World Cup', a fairly high probability to 'Jesus Christ existed', and a low probability to 'global environmental disaster can be avoided'. Of course, to put an exact number on the strength of my belief in these statements would be hard, but supporters of the subjective interpretation regard this as a merely practical limitation. In principle, we should be able to assign a precise

numerical probability to each of the statements about which we have an opinion, reflecting how strongly we believe or disbelieve them, they say.

The subjective interpretation of probability implies that there are no objective facts about probability, independently of what people believe. If I say that the probability of finding life on Mars is high and you say that it is very low, neither of us is right or wrong — we are both simply stating how strongly we believe (1) the statement in question. Of course, there is an objective fact about whether there is life on Mars or not; there is just no objective fact about how probable it is that there is life on Mars, according to the subjective interpretation.

The logical interpretation of probability rejects (2) this position. It holds that a statement such as 'the probability of life on Mars is high' is objectively true or false, comparative to a specified body of evidence. (3) A statement's probability is the measure of the strength of evidence in its favour, on this view. Supporters of the logical interpretation think that, (4) for any two statements in our language, we can in principle discover the probability of one, given the other as evidence. For example, we might want to find the probability that there will be an ice age within 10,000 years, given the current rate of global warming. The subjective interpretation says that there is no objective fact about this probability. But the logical interpretation insists that there is: the current rate of global warming confers a definite numerical probability on the occurrence of an ice age within 10,000 years, say 0.9 for example. A probability of 0.9 clearly counts as a high probability — for the maximum is 1 — so (5) the statement 'the probability that there will be an ice age within 10,000 years is high' would then be objectively true, given the evidence about global warming.

If you have studied probability or statistics, you may be puzzled by this talk of different interpretations of probability. How do these interpretations connect to what you learned? The answer is that the mathematical study of

probability does not by itself tell us what probability means, which is what we have been examining above. (6) Most statisticians would in fact favour the frequency interpretation, but the problem of how to interpret probability, like most philosophical problems, cannot be resolved mathematically. The mathematical formulae for working out probabilities remain the same, whichever interpretation we adopt.

Philosophers of science are interested in probability for two main reasons. The first is that in many branches of science, especially physics and biology, we find laws and theories that are formulated using the notion of probability. Consider, for example, the theory known as Mendelian genetics, which deals with the transmission of genes from one generation to another in sexually reproducing populations. One of the most important principles of Mendelian genetics is that every gene in an organism has a 50% chance of making it into any one of the organism's gametes (sperm or egg cells). Hence, there is a 50% chance that any gene found in your mother will also be in you, and likewise for the genes in your father. Using this principle and others, geneticists can provide detailed explanations for why particular characteristics (e.g. eye colour) are distributed across the generations of a family in the way that they are. Now 'chance' is just another word for probability, so (7) it is obvious that our Mendelian principle makes essential use of the concept of probability. Many other examples could be given of scientific laws and principles that are expressed in terms of probability. The need to understand these laws and principles is an important motivation for the philosophical study of probability.

The second reason why philosophers of science are interested in the concept of probability is the hope that it might shed some light on inductive inference, in particular on Hume's problem; this will be our focus here. At the root of Hume's problem is the fact that the starting points of an inductive inference do not guarantee the truth of its conclusion. But it is tempting to

suggest that the starting points of a typical inductive inference do make the conclusion highly probable. Although (8) the fact that all objects examined so far obey Newton's law of gravity doesn't prove that all objects do, surely it does make it very probable? So surely Hume's problem can be answered quite easily after all?

However, matters are not quite so simple. For we must ask what interpretation of probability this response to Hume assumes. On the frequency interpretation, to say it is highly probable that all objects obey Newton's law is to say that a very high proportion of all objects obey the law. But there is no way we can know that, unless we use induction! For we have only examined a tiny (9) fraction of all the objects in the universe. So Hume's problem remains. Another way to see the point is this. We began with the inference from 'all examined objects obey Newton's law' to 'all objects obey Newton's law'. In response to Hume's worry that the starting points of this inference don't guarantee the truth of the conclusion, we suggested that it might nonetheless make the conclusion highly probable. But the inference from 'all examined objects obey Newton's law' to 'it is highly probable that all objects obey Newton's law' is still an inductive inference, given that the latter means 'a very high proportion of all objects obey Newton's law', as it does according to the frequency interpretation. So appealing to the concept of probability does not weaken Hume's argument, if we adopt a frequency interpretation of probability. For knowledge of probabilities then becomes itself dependent on induction.

The subjective interpretation of probability (10) is also powerless to solve Hume's problem, though for a different reason. Suppose John believes that the sun will rise tomorrow and Jack believes it will not. They both accept the evidence that the sun has risen every day in the past. Intuitively, we want to say that John is rational and Jack isn't, because the evidence makes John's belief more probable. But if probability is simply a matter of subjective

opinion, we cannot say this. All we can say is that John assigns a high probability to 'the sun will rise tomorrow' and Jack does not. If there are no objective facts about probability, then we cannot say that the conclusions of inductive inferences are objectively probable. So we have no explanation of why someone like Jack, who declines to use induction, is irrational. But Hume's problem is precisely the demand for such an explanation.

The logical interpretation of probability is more promising for a satisfactory response to Hume. Suppose there is an objective fact about the probability that the sun will rise tomorrow, given that it has risen every day in the past. Suppose this probability is very high. Then we have an explanation of why John is rational and Jack isn't. For John and Jack both accept the evidence that the sun has risen every day in the past, but Jack fails to realize that this evidence makes it highly probable that the sun will rise tomorrow, while John does realize this. Regarding a statement's probability as a measure of the evidence in its favour, as the logical interpretation recommends, matches neatly with our intuitive feeling that the starting points of an inductive inference can make the conclusion highly probable, even if they cannot guarantee its truth.

(11) Unsurprisingly, therefore, those philosophers who have tried to solve Hume's problem via the concept of probability have tended to favour the logical interpretation. (One of these was the famous economist John Maynard Keynes, whose early interests were in logic and philosophy.) Unfortunately, most people today believe that the logical interpretation of probability faces very serious, probably insuperable, difficulties. This is because all the attempts to work out the logical interpretation of probability in any detail have met a lot of problems, both mathematical and philosophical. As a result, many philosophers today are inclined to reject completely the underlying assumption of the logical interpretation — that there are objective facts about the probability of one statement, given another. Rejecting this assumption leads

naturally to the subjective interpretation of probability, but that, as we have seen, offers scant (12) hope of a satisfactory response to Hume.

Even if Hume's problem is ultimately insoluble, as seems likely, thinking about the problem is still a valuable exercise. For reflecting on the problem of induction leads us into an abundance of interesting questions about the structure of scientific reasoning, the nature of rationality, the appropriate degree of confidence to place in science, the interpretation of probability, and more. Like most philosophical questions, these questions probably do not admit of final answers, but in tackling them we learn much about the nature and limits of scientific knowledge.

(Adapted from: *Philosophy of Science: A Very Short Introduction* by Samir Okasha. Oxford University Press, 2002)

QUESTIONS

Underlined 1: What does "the statement in question" mean in the underlined part? Write the answer in Japanese.

Underlined 2: What does "this position" mean in the underlined part? Write the answer in Japanese.

Underlined 3: Explain the meaning of the underlined part specifically by clarifying "its" and "this". Write the answer in Japanese.

Underlined 4: Explain the meaning of the underlined part specifically by clarifying "one" and "the other". Write the answer in Japanese.

Underlined 5: Why does the author give this conclusion? Explain the reason(s) in detail logically according to the context. Write the answer in Japanese.

Underlined 6: Why does the author say this? Write the answer in Japanese.

Underlined 7: Why does the author say, "it is obvious"? Write the answer in Japanese.

Underlined 8: Why does the author say this? Write the answer in Japanese.

Underlined 9: Choose the answer which has the closest meaning to the word "fraction" in this sentence. Write the LETTER of the answer.

A: component

B: division

C: entity

D: fragment

E: portion

Underlined 10: Explain the underlined part, with reference to the meaning of "is also powerless". Write the answer in Japanese.

11. Fill in the blank with one word from the paragraph numbered (II) that makes the sentence logical.

Attempting to prove an assumption using a logical interpretation is not completely possible because the _____ of that assumption being true or false faces both mathematical and philosophical problems.

Underlined 12: Choose the answer which has the closest meaning to the word "scant" in this sentence. Write the LETTER of the answer.

A: enough

B: great

C: real

D: reasonable

E: slight

Ⅱ **Read the following passage and answer the questions which follow.**

When I was a child, I knew real darkness.

At my family's cabin on a lake in Minnesota, I knew woods so dark that my hands disappeared before my eyes. I knew night skies in which shooting stars left smoky trails across sugary spreads of stars. But now, when eight of ten children born in the United States will never know a sky dark enough for the Milky Way, I worry we are rapidly losing night's natural darkness before realizing its worth. On the shortest day this winter, as we cheer the days' gradual movement back toward light, let us also remember the irreplaceable value of darkness.

All life evolved to the steady rhythm of bright days and dark nights. Today, though, when we feel the closeness of nightfall, we reach quickly for a light switch. And too little darkness, meaning too much artificial light at night, causes trouble for all.

Already the World Health Organization classifies working the night shift as a probable human carcinogen, and the American Medical Association has voiced its unanimous support for "light pollution reduction efforts and glare reduction efforts at both the national and state levels."

Our bodies need darkness to produce the hormone melatonin, which keeps certain cancers from developing, and our bodies need darkness for sleep. Sleep disorders have been linked to diabetes, obesity, heart disease and depression, and recent research suggests one main cause of "short sleep" is "long light." Whether we work at night or simply take our tablets and notebooks to bed, there isn't a place for this much artificial light in our lives.

The rest of the world depends on darkness as well, including species of birds, insects, mammals, fish and reptiles that are active after sunset. Some examples are well known — the 400 species of birds that migrate at night in North America, the sea turtles that come ashore to lay their eggs — and some

are not, such as the bats that (5) save American farmers billions of dollars in pest control and the moths that give pollen to 80% of the world's plants. (6) Ecological light pollution is like the bulldozer of the night, wrecking habitat and disrupting (7) ecosystems several billion years in the making. Simply put, without darkness, Earth's ecology would collapse.

Yet all over the world, our nights are growing brighter. In the United States and Western Europe, the amount of light in the sky increases by an average of about six percent every year. Computer images of the United States at night, based on NASA photographs, show that what was a very dark country as recently as the 1950s is now nearly covered with a blanket of light. Much of this light is wasted energy, which means wasted dollars. Those of us over thirty-five are perhaps among the last generation to have known truly dark nights. Even (8) the northern lake where I was lucky to spend my summers has seen its darkness diminish.

It doesn't have to be this way. Light pollution is readily within our ability to solve, using new lighting technologies and shielding existing lights. Already, many cities and towns across North America and Europe are changing to LED streetlights, which offer dramatic possibilities for controlling wasted light. Other communities are finding success with simply turning off portions of their public lighting after midnight. Even Paris, the famed "City of Light," which already turns off its monument lighting after 1 a.m., will soon start to require its shops, offices and public buildings to turn off lights after 2 a.m. Though primarily designed to save energy, such reductions in light will also go far in addressing light pollution. But we will never truly address the problem of light pollution until we become more aware of the irreplaceable value and beauty of the darkness we are losing.

(9) This winter, let us begin.

(Adapted from: "Environment: Let there be dark" by Paul Bogard. In *The Los Angeles Times*. Monday, January 7, 2013.)

QUESTIONS

Underlined 1: In English, give two reasons why the author speaks of the "spreads of stars" as being "sugary."

Underlined 2: Complete the following sentence in English by filling in the underlined part so that its meaning is clearer.

Many children born in the United States "will never know a sky dark enough for the Milky Way"_____.

Underlined 3: What does "for all" refer to in the underlined part? Write the answer in one or a few English words.

Underlined 4: What does "carcinogen" mean in the underlined part? Answer by completing the following sentence:

The World Health Organization classifies working at night as "a probable human carcinogen" because it

_____.

Underlined 5: Exactly how do bats "save American farmers billions of dollars" in the underlined part? Write the answer in a complete English sentence.

Underlined 6: By quoting words from the passage, give two reasons why the author says that "Ecological light pollution is like the bulldozer of the night." Write the answer in English.

First reason: _____

_____.

Second reason: _____

_____.

Underlined 7: Rewrite "ecosystems several billion years in the making" so as to make its meaning clearer by beginning with "these ecosystems have taken":

These ecosystems have taken

_____.

Underlined 8: The author speaks of "the northern lake where I was lucky to spend my summers". Where was this lake located? Write the answer in English.

Underlined 9: "This winter, let us begin." Let us begin to do what? Complete this sentence by quoting words from the passage and write the answer in the underlined part.

This winter, let us begin

_____.

Ⅲ Read the following passage and answer the questions which follow.

In A.D. 410, Roman authority in Britain collapsed and the Romano-British population disappeared from history under the later invading tides of Angles and Saxons from northern Europe. Historians have been debating ever since whether the Romano-British died out, or survived by adopting their conquerors' language and culture.

A fine-scale genetic analysis of the British population has now provided the answer. The invaders and the existing population lived side by side and eventually intermarried extensively. The people of south and central England are now genetically well-mixed, with Saxon genes accounting for only about 20 percent of the mix, says a genetics team led by Stephen Leslie of a research institute in Australia, and by Peter Donnelly and Walter Bodmer of Oxford University.

The British Isles became uninhabited owing to the glaciers that descended toward the end of the last ice age and were repopulated some 10,000 years ago by people who hiked over the broad land bridge that then joined eastern England to Europe north of the Rhine. The researchers say that they can identify the genetic signature of this early migration, which survives most strongly in people from the western extremity of Wales.

Another strong genetic signal comes from the Orkney Islands north of Scotland. Some 25 percent of the DNA of Orcadians (those dwelling on the Orkney Islands) is of Norwegian origin. This is entirely consistent with Norway's long ownership of these islands.

But the geneticists see no trace of the Danelaw (the Danish rule over northern England from the ninth to the eleventh century), nor of the Norman Conquest of England in 1066. The numbers of invaders may have been too small to leave a continuing genetic effect on the population, and in the case of the Normans, who had previously emigrated from southern Denmark to

Normandy, it is hard to distinguish their genes from those of the earlier Danish invaders.

The people of the southern and central parts of England form a homogenous population, but all around the Celtic periphery — in Cornwall, Wales, and Scotland — are small clusters of genetically different populations. These populations have maintained their identity over the generations. This is a surprise, given that the Celtic peoples who ruled most of England until Caesar's invasion in B.C. 55 were assumed to be fairly homogeneous.

The explanation may have to do with the reach of Roman rule. In southern and central England, "the Romans controlled that area of Britain and introduced farming systems and roads and broke down many barriers to movement," according to a co-author of the study, published in the journal *Nature*. The population under Roman rule thus became homogenized, whereas those beyond it would have remained politically divided, making travel and intermarriage difficult.

The researchers found that the modern British population falls into 17 clusters altogether, based on genetic relatedness. Though very similar, the groups are genetically distinguishable, and even the main population cluster, that of southern and central England, is distinguishable from the populations of France, Germany, and other European countries.

Dr. Donnelly, a population geneticist and co-author of the report, said that the study was groundbreaking "because it is really the first time that scientists have looked in great detail within a country at the pattern of genetic variation."

There has been considerable migration into Britain over the last century from many countries of the former British Empire and from Continental Europe. Dr. Donnelly and his colleagues managed to avoid this recent mixing of the population history by seeking out elderly people who lived in rural areas and whose grandparents had been born locally. Because individual genomes are composed of random samples of the four grandparents' DNA, the

researchers were in effect looking two generations into the past and testing the population of the late 19th century.

They analyzed the DNA of their 2,000 subjects at 500,000 sites along the genome, and then organized them into the 17 genetic clusters. They also analyzed the genomes of 6,000 Europeans in the same way, and could thus identify the source populations in Europe from which each of the 17 British clusters was derived. The migrations revealed in that way match the known historical record but also point to events that have not been recorded, such as a major migration from northern France that accounts for about one-third of the ancestry of the average Briton.

(Adapted from: "Fine-scale study reveals genetic roots of modern Britons" by Nicholas Wade. In *The New York Times International Edition*. Friday, March 20, 2015.)

QUESTIONS

According to the content of the passage, write T for True, F for False or N for Not mentioned in the text for each statement. Answer a question with "N" only if the statement is either not present in the text or cannot be inferred from the information in the text.

1. The Romano-British population disappeared in 410 A.D. when the Roman Empire faced invaders from northern Europe resulting in the birth of Christianity in Rome.

2. The Anglo-Saxon invaders and the existent Romano-British inhabitants lived alongside each other and intermarried.

3. Approximately 10,000 years ago there was a migration, which the researchers can identify from the genetics of people in Wales.

4. The genetic markers of the migration 10,000 years ago have disappeared, making it difficult to determine the genetic roots of modern British people.

5. The current inhabitants of the southern and central parts of England have the same genetic identity as those who live on the periphery of the country — Cornwall, Wales, and Scotland.

6. In southern and central parts of England, farming systems and roads introduced during Roman rule made for easy intermarriage with the Celtic population along the periphery.

7. DNA analysis of Britain's modern 17 genetic clusters reveals that they are distinguishable based on whether they are located in rural or urban areas.

8. Genetic analysis by Dr. Donnelly and his colleagues reveals certain migrations — which were not part of historical records — into Britain from other countries.

Ⅳ Read the following and write an essay in English in about 200 words.

In recent years, the Japanese government has focused considerable energy on increasing international tourism to Japan. The effort has been effective, and the numbers of tourists visiting Japan have increased.

Write an essay in which you explain two or three negative outcomes that result or might result from increased international tourism, and then discuss two or three possible measures you consider should be taken to overcome these negative outcomes.