

令和2年度入学者選抜学力検査問題

〈前期日程〉

外 国 語

英 語

(医学部 医学科)

注 意 事 項

- 1 試験開始の合図があるまでこの冊子を開いてはいけない。
- 2 問題はⅠからⅣまでである。  
試験開始の合図のあとで問題冊子の頁数(1～13頁)を確認すること。
- 3 解答は必ず解答用紙の所定の欄に記入すること。  
所定の欄以外に記入したものは無効である。
- 4 解答用紙は持ち帰ってはいけない。
- 5 問題冊子は持ち帰ってよい。

**I** 次の英文を読み、空所( 1 )から( 15 )を補うのに適切な1語を下の語群内の(a)から(o)より選び、記号で答えなさい。なお、( 4 )は2か所あり、同じ語が入ります。[...]は省略を示します。

Zero, nothing, is a pretty hard concept to understand. Children generally can't grasp it until kindergarten. And it's a concept that may not be innate\* but rather ( 1 ) through culture and education. Throughout human history, civilizations have had varying representations for it.

Yet our closest animal ( 2 ), the chimpanzee, can understand it. And now researchers in Australia writing in the journal *Science* say the humble honey bee can be taught to understand that zero is less than one.

The result is kind of astonishing, considering how tiny bee brains are. Humans have around 100 billion neurons\*. The bee brain? Fewer than 1 million.

The findings suggest that the ability to fathom\* zero may be more widespread than previously thought in the animal kingdom—something that ( 3 ) long ago and in more branches of life.

It's also possible that in deconstructing how the bees compute numbers, we could make better, more efficient computers one day.

Our computers are electricity-guzzling\* machines. The bee, however, "is doing fairly high-level ( 4 ) tasks with a tiny drop of nectar\*," says Adrian Dyer, a Royal Melbourne Institute of Technology researcher and co-author on the study. "Their brains are probably ( 5 ) information in a very efficient way."

But before we can deconstruct the bee brain, we need to know that it can do the ( 6 ) math in the first place.

Bees are fantastic learners. They spend hours foraging\* for nectar in among flowers, can remember where the juiciest flowers are, and even have a form of communication to inform their hive mates of where food is to be found.

Researchers train bees like they train many animals: with food. "You have a drop of sucrose\* ( 7 ) with a color or a shape, and they will learn to reliably go back to that color or shape," Dyer explains.

With this simple process, you can start teaching bees rules. In this case, the researchers wanted to teach 10 bees the basic rules of arithmetic.

So they put out a series of sheets of paper that had ( 8 ) numbers of objects printed on them. Using sugar as a reward, the researchers taught the bees to always fly to the sheet that had the fewest objects printed on it.

Once the bees learned this rule, they could reliably figure out that two shapes are less than four shapes, that one shape is smaller than three. And they'd keep doing this even when a sugary reward was not waiting for them.

And then came the ( 9 ): What happens when a sheet with no objects at all was presented to the bees? Would they understand that a blank sheet—which represented the concept of zero in this experiment—was less than three, less than one?

To a degree much greater than ( 10 ), they did, and chose the blank page 60 to 70 percent of the time. And they were significantly better at discriminating a large number, like six, from zero, than they were in discriminating one from zero. That finding “is actually ( 11 ) with the idea that zero is a hard thing for the brain to represent,” Dyer says.

[...]

In a supplement commentary in *Science*, Andreas Nieder, a German neurobiologist\*, explains why it's so astonishing that humans and bees demonstrate similar ( 4 ) abilities.

“Their last common ancestor, a humble creature that barely had a brain at all, lived more than 600 million years ago, an eternity in ( 12 ) terms,” Nieder writes. But somehow, separately, both vertebrates\* and insects developed these similar skills.

It's possible that bees are just oddly ( 13 ) compared to other insects, but Dyer suspects his results suggest “probably a much broader spectrum of animals can process the idea of zero.” Though it would take individually training and testing different species of animals to prove this hunch\*. Scientists don't even understand the human brain's comprehension of nothingness all that well.

In the meantime, we can marvel at the ingenuity of bees—and consider what we'll lose if bee colony collapse disorder continues to devastate\* these remarkable creatures.

Learning how their tiny brains work helps us appreciate the ( 14 ) of our own.

“What is nothing?” Dyer explains, is a question that “seems a bit ( 15 ) to us. But the actual ability to do it took a long time to arrive in human culture. And so it's not straightforward, so understanding how a brain does it is exciting.”

—Brian Resnick, “Study: honey bees understand nothing.” <https://www.vox.com/science-and-health/2018/6/7/17437640/bees-zero-math-humans-science>, 一部改変.

Notes: innate 持って生まれた      neuron ニューロン      fathom 識別する  
guzzling 大量に消費する      nectar 花蜜      foraging 探し回ること  
sucrose ショ糖      neurobiologist 神経生物学者  
vertebrate 脊椎動物      hunch 直感      devastate 壊滅させる

語 群

- |                |                |               |                  |
|----------------|----------------|---------------|------------------|
| (a) associated | (b) challenge  | (c) chance    | (d) cognitive    |
| (e) complex    | (f) consistent | (g) differing | (h) evolutionary |
| (i) evolved    | (j) learned    | (k) power     | (l) processing   |
| (m) relative   | (n) simple     | (o) smart     |                  |

(白 紙 頁)

**II**

次の英文を読んで下の質問に答えなさい。ただし、問1と問6以外は日本語で解答すること。

What they don't understand about birthdays and what they never tell you is that when you're eleven, you're also ten, and nine, and eight, and seven, and six, and five, and four, and three, and two, and one. And when you wake up on your eleventh birthday you expect to feel eleven, but you don't. You open your eyes and everything's just like yesterday, only it's today. And you don't feel eleven at all. You feel like you're still ten. And you are—underneath the year that makes you eleven.

Like some days you might say something stupid, and that's the part of you that's still ten. Or maybe some days you might need to sit on your mama's lap because you're scared, and that's the part of you that's five. And maybe one day when you're all grown up maybe you will need to cry like if you're three, and that's okay. That's what I tell Mama when she's sad and needs to cry. Maybe she's feeling three.

Because the way you grow old is kind of like an onion or like the rings inside a tree trunk or like my little wooden dolls that fit one inside the other, each year inside the next one. That's how being eleven years old is.

You don't feel eleven. Not right away. It takes a few days, weeks even, sometimes even months before you say Eleven when they ask you. And you don't feel smart eleven, not until you're almost twelve. That's the way it is.

Only today I wish I didn't have only eleven years rattling inside me like pennies in a tin Band-Aid box. Today I wish I was one hundred and two instead of eleven because if I was one hundred and two I'd have known what to say when Mrs. Price put the red sweater on my desk. I would've known how to tell her it wasn't mine instead of just sitting there with that look on my face and nothing coming out of my mouth.

"Whose is this?" Mrs. Price says, and she holds the red sweater up in the air for all the class to see. "Whose? It's been sitting in the coatroom for a month."

"Not mine," says everybody. "Not me."

"( 1 )," Mrs. Price keeps saying, but nobody can remember. It's an ugly sweater with red plastic buttons and a collar and sleeves all stretched out like you could use it for a jump rope\*. It's maybe a thousand years old and even if it belonged to me I wouldn't say so.

Maybe because I'm skinny, maybe because she doesn't like me, that stupid Sylvia Saldívar says, "I think it belongs to Rachel." An ugly sweater like that, all raggedy\* and old, but Mrs. Price believes her. Mrs. Price takes the sweater and puts it right on my desk, but when I open my mouth nothing comes out.

"That's not, I don't, you're not . . . Not mine," I finally say in a little voice that was maybe me when I was four.

“Of course ( 2 ),” Mrs. Price says. “I remember ( 3 ).” Because she’s older and the teacher, she’s right and I’m not.

Not mine, not mine, not mine, but Mrs. Price is already turning to page thirty-two, and math problem number four. I don’t know why but all of a sudden I’m feeling sick inside, like the part of me that’s three wants to come out of my eyes, only I squeeze them shut tight and bite down on my teeth real hard and try to remember today I am eleven, eleven. Mama is making a cake for me for tonight, and when Papa comes home everybody will sing Happy birthday, happy birthday to you.

But when the sick feeling goes away and I open my eyes, the red sweater’s still sitting there like a big red mountain. I move the red sweater to the corner of my desk with my ruler. I move my pencil and books and eraser as far from it as possible. I even move my chair a little to the right. Not mine, not mine, not mine.

In my head I’m thinking how long till lunchtime, how long till I can take the red sweater and throw it over the schoolyard fence, or leave it hanging on a parking meter, or bunch it up into a little ball and toss it in the alley. Except when math period ends Mrs. Price says loud and in front of everybody, “Now, Rachel, ( 4 ),” because she sees I’ve shoved the red sweater to the tippy-tip\* corner of my desk and it’s hanging all over the edge like a waterfall, but I don’t care.

“Rachel,” Mrs. Price says. She says it like she’s getting mad. “( 5 ) and no more nonsense.”

“But it’s not—”

“Now!” Mrs. Price says.

This is when I wish I wasn’t eleven, because all the years inside of me—ten, nine, eight, seven, six, five, four, three, two, and one—are pushing at the back of my eyes when I put one arm through one sleeve of the sweater that smells like cottage cheese, and then the other arm through the other and stand there with my arms apart like if the sweater hurts me and it does, all itchy\* and full of germs that aren’t even mine.

That’s when everything I’ve been holding in since this morning, since when Mrs. Price put the sweater on my desk, finally lets go, and all of a sudden I’m crying in front of everybody. I wish I was invisible but I’m not. I’m eleven and it’s my birthday today and I’m crying like I’m three in front of everybody. I put my head down on the desk and bury my face in my stupid clown-sweater arms. My face all hot and spit coming out of my mouth because I can’t stop the little animal noises from coming out of me, until there aren’t any more tears left in my eyes, and it’s just my body shaking like when you have the hiccups\*, and my whole head hurts like when you drink milk too fast.

<sup>(3)</sup> But the worst part is right before the bell rings for lunch. That stupid Phyllis Lopez, who is even dumber than Sylvia Saldívar, says she remembers the red sweater is hers! I take it off right away and give it to her, only Mrs. Price pretends like everything's okay.

Today I'm eleven. There's a cake Mama's making for tonight, and when Papa comes home from work we'll eat it. There'll be candles and presents and everybody will sing Happy birthday, happy birthday to you, Rachel, only it's too late.

I'm eleven today. I'm eleven, ten, nine, eight, seven, six, five, four, three, two, and one, but I wish I was one hundred and two. I wish I was anything but eleven, because I want today to be far away already, far away like a runaway\* balloon, like a tiny *o* in the sky, so tiny-tiny you have to close your eyes to see it.

—From Sandra Cisneros, "Eleven," *Woman Hollering Creek* (1991).

Notes: jump rope	なわとびのなわ	raggedy	ぼろぼろの
tippy-tip	ぎりぎりの先端	itchy	かゆい
hiccup	しゃっくり	runaway	急速に上がっていく

問 1 本文の空所( 1 )~( 5 )に入る最も適切なものを下のA~Eからそれぞれ1つずつ選び、記号で答えなさい。ただし、文頭に来る語も小文字で記している。

- A. you put that sweater on right now
- B. it has to belong to somebody
- C. it's yours
- D. that's enough
- E. you wearing it once

問 2 下線部(1)の筆者の言葉は何を具体的に指しているのかを明らかにしなさい。

問 3 筆者はなぜ下線部(2)で表された気持ちになったのか理由を述べなさい。

問 4 自分の机に置かれたセーターに対して Rachel が取った行動を 3 点挙げなさい。

問 5 下線部(3)の "the worst part" とは何を具体的に意味するのかを説明しなさい。

問 6 本文の内容に関する以下の英文に関して、正しいものには○、間違っているものには×で答えなさい。

- (1) Rachel's passive attitude and hesitation to assert herself led Mrs. Price to dominate her.
- (2) In finding the owner of the sweater, Sylvia claimed that it was held by Rachel for valid reasons.
- (3) Rachel thought that her birthday was ruined because Phyllis was mean to her.



(白 紙 頁)

Ⅲ 次の英文を読んで下の質問に答えなさい。すべて日本語で解答すること。[...]は省略を示します。

The sickness spread at funerals.

The Fore people, a once-isolated tribe in eastern Papua New Guinea, had a long-standing tradition of mortuary\* feasts—eating the dead from their own community at funerals. Men consumed the flesh of their deceased\* relatives, while women and children ate the brain. It was an expression of respect for the lost loved ones, but the practice wreaked havoc\* on the communities they left behind. That's because a deadly molecule that lives in brains was spreading to the women who ate them, causing a horrible degenerative\* illness called "kuru" that at one point killed 2 percent of the population each year.

The practice was banned in the 1950s, and the kuru epidemic\* began to decrease. But in its wake it left a curious and irreversible\* mark on the Fore, one that has implications far beyond Papua New Guinea: After years of eating brains, some Fore have developed a genetic resistance to the molecule that causes several fatal brain diseases, including kuru, mad cow disease and some cases of dementia\*.

The single, protective gene is identified in a study published in the journal *Nature*. Researchers say the finding is a huge step toward understanding these diseases and other degenerative brain problems, including Alzheimer's and Parkinson's.

The gene works by protecting people against prions\*, a strange and sometimes deadly kind of protein. Though prions are naturally manufactured in all mammals, they can be deformed in a way that makes them turn on the body that made them, acting like a virus and attacking tissue. The deformed prion is even capable of infecting the prions that surround it, reshaping them to mimic\* its structure and its malicious\* ways.

The prions' impact on their hosts is devastating and invariably fatal. Among the Fore, the prions riddled\* their victims' brains with microscopic holes, giving the organ an odd, spongy\* texture. In cattle, prions cause mad cow disease—they are responsible for the epidemic in Britain of the late '80s and '90s that required hundreds of thousands of cattle to be destroyed. They have been linked to a bizarre form of fatal insomnia\* that kills people by depriving them of sleep. And they're the source of the degenerative neurological\* disorder Creutzfeldt-Jakob disease (CJD), characterized by rapid dementia, personality changes, muscle problems, memory loss and eventually an inability to move or speak.

The vast majority of prion-diseases are "sporadic\*," seemingly appearing without cause. But a lead author of the study, John Collinge, said that a portion of cases are inherited from one's parents, and an even smaller percentage are acquired from consuming infected tissue.

Variant CJD, often called the “human mad cow disease,” is caused by eating beef from infected cows.

[ . . . ]

The study by Collinge and his colleagues offers a critical insight into ways that humans might be protected from the still-little-understood prions. They found it by examining the genetic code of those families at the center of the Fore’s kuru epidemic, people who they knew had been exposed to the disease at multiple feasts, who seemed to have escaped unharmed.

When the researchers looked at the part of the genome\* that encodes\* prion-manufacturing proteins, they found something completely unprecedented. Where humans and every other vertebrate\* animal in the world have an amino acid called glycine, the resistant Fore had a different amino acid, valine.

“Several individuals right at the epicenter\* of the epidemic, they have this difference that we have not seen anywhere else in the world,” Collinge said.

That minute alteration in their genome prevented the prion-producing proteins from manufacturing the disease-causing form of the molecule, protecting those individuals from kuru. To test whether it might protect them from other kinds of prion disease, Collinge—the director of a prion research unit at University College London—and his team engineered the genes of several mice to mimic that variation.

When the scientists re-created the genetic types observed in humans—giving the mice both the normal protein and the variant in roughly equal amounts—the mice were completely resistant to kuru and to CJD. But when they looked at a second group of mice that had been genetically modified to produce only the variant protein, giving them even stronger protection, the mice were resistant to every prion strain they tested—18 in all.

“This is a striking example of Darwinian evolution in humans, the epidemic of prion disease selecting a single genetic change that provided complete protection against an invariably fatal dementia,” Collinge said.

—from Sarah Kaplan, “How a History of Eating Human Brains Protected This Tribe from Brain Disease,” *The Washington Post*, June 11, 2015, 一部改变.

Notes: mortuary 埋葬の            deceased 死亡した            wreak havoc 惨事をもたらす  
 degenerative 変性の            epidemic 伝染病            irreversible 不可逆的な  
 dementia 認知症            prion プリオン(タンパク質の一種)  
 mimic 模倣する            malicious 害を及ぼす            riddle (穴で)いっぱいになる  
 spongy スポンジ状の            insomnia 不眠症            neurological 神経系の  
 sporadic 散発的な            genome ゲノム            encode コード化する  
 vertebrate 脊椎のある            epicenter 中心点

- 問 1 kuru が Fore people の間に発症した原因を説明しなさい。  
 問 2 下線部(1)が意味する内容を明らかにしなさい。  
 問 3 下線部(2)を和訳しなさい。  
 問 4 Creutzfeldt-Jakob disease の特徴を挙げなさい。  
 問 5 下線部(3)が示す実験の内容を具体的に説明しなさい。  
 問 6 kuru の研究が何に役立つと期待されているのかを述べなさい。

(白 紙 頁)

**IV** 2017年、日本政府は「働き方改革実行計画」の一環として副業・兼業の普及促進を図ることを決定しました。あなたが医療従事者になった場合、副業・兼業としてやってみたい仕事とその理由を90～100語の英文で述べなさい。なお、文末に使用した語数を記すこと。