英　　語

〈監督者の指示があるまで開いてはいけない〉

1. 試験開始後，まず解答用紙に自分の受験番号と氏名を正しく記入しなさい。
2. 試験開始後，速やかに問題冊子に落丁や乱丁がないか確認しなさい。
   落丁や乱丁があった場合は，手を挙げなさい。
3. 下書きは問題冊子の余白を利用しなさい。
4. 記入中でない解答用紙は必ず裏返しにしておきなさい。
5. 問題冊子は試験終了後，持ち帰ってもよい。
   ただし，試験途中には持ち出してはいけない。

I . Read the following passage and answer the questions that follow.

Investigators at the Stanford University School of Medicine and the Buck Institute for Research on Aging have built an inflammatory-aging clock that's more accurate than the number of candles on your birthday cake in predicting how strong your immune system is, how soon you'll become frail or whether you have unseen cardiovascular problems that could become clinical headaches a few years down the road.

In the process, the scientists fingered a bloodborne substance whose abundance may accelerate cardiovascular aging. "Every year, the calendar tells us we're a year older," said David Furman, PhD, the study's senior author. "But not all humans age biologically at the same rate. You see this in the clinic — some older people are extremely disease-prone, while others are the picture of health."

This divergence, Furman said, traces in large part to differing rates at which people's immune systems decline. The immune system excels at mounting a quick, intense, localized, short-term, resist-and-repair response called acute inflammation. This "good inflammation" typically does its job, then wanes within days. (An example is that red, swollen finger you see when you have a splinter, and the rapid healing that follows.)

As we grow older, a low-grade, constant, bodywide "bad inflammation" begins to kick in. This systemic and chronic inflammation causes organ damage and (A) vulnerability to a who's who of diseases spanning virtually every organ system in the body and including cancer, heart attacks, strokes, neurodegeneration and autoimmunity.

To date, there have been no metrics for accurately assessing individuals' inflammatory status in a way that could predict these clinical problems and point to ways of addressing them or staving them off, Furman said. But now, he said, the study has produced a single-number quantitative measure that appears to do just that.

Furman directs the Stanford 1000 Immunomes Project and is a visiting scholar at Stanford's Institute for Immunity, Transplantation and Infection. For the 1000 Immunomes Project, blood samples were drawn from 1,001 healthy people ages 8-96 between 2009 and 2016. The samples were (B) to a barrage of analytical procedures determining levels of immune-signaling proteins called cytokines, the activation status of numerous immune-cell types in responses to various stimuli, and the overall activity levels of thousands of genes in each of those cells.

The new study employed artificial intelligence to boil all this data down to a (C) the researchers refer to as an inflammatory clock. The strongest predictors of inflammatory age, they found, were a set of about 50 immune-signaling proteins called cytokines. Levels of those, massaged by a complex algorithm, were sufficient to generate a single-number inflammatory score

that tracked well with a person's immunological response and the likelihood of incurring any of a variety of aging-related diseases.

In 2017, the scientists assessed nearly 30 1000 Immunomes Project participants ages 65 or older whose blood had been drawn in 2010. They measured the participants' speed at getting up from a chair and walking a fixed distance and, through a questionnaire, their ability to live independently ("Can you walk by yourself?" "Do you need help getting dressed?"). Inflammatory age proved superior to chronological age in predicting frailty seven years later.

Next, Furman and his colleagues obtained blood samples from an ongoing study of exceptionally long-lived people in Bologna, Italy, and compared the inflammatory ages of 29 such people (all but one a centenarian) with those of 18 50- to 79-year-olds. The older people had inflammatory ages averaging 40 years less than their calendar age. One, a 105-year-old man, had an inflammatory age of 25, Furman said.

To further assess inflammatory age's effect on mortality, Furman's team turned to the Framingham Study, which has been tracking health outcomes in thousands of individuals since 1948. The Framingham study lacked sufficient data on bloodborne-protein levels, but the genes whose activity levels largely dictate the production of the inflammatory clock's cytokines are well known. The researchers measured those cytokine-encoding genes' activity levels in Framingham subjects' cells. This (D) for cytokine levels significantly correlated with all-cause mortality among the Framingham participants.

The scientists observed that blood levels of one substance, CXCL9, contributed more powerfully than any other clock component to the inflammatory-age score. They found that levels of CXCL9, a cytokine secreted by certain immune cells to attract other immune cells to a site of an infection, begin to rise precipitously after age 60, on average.

Among a new cohort of 97 25- to 90-year-old individuals selected from the 1000 Immunomes Project for their apparently excellent health, with no signs of any disease, the investigators looked for subtle signs of cardiovascular deterioration. Using a sensitive test of arterial stiffness, which conveys heightened risk for strokes, heart attacks and kidney failure, they tied high inflammatory-age scores — and high CXCL9 levels — to unexpected arterial stiffness and another portent of untoward cardiac consequences: excessive thickness of the wall of the heart's main pumping station, the left ventricle.

CXCL9 has been (E) in cardiovascular disease. A series of experiments in laboratory dishware showed that CXCL9 is secreted not only by immune cells but by endothelial cells — the main components of blood-vessel walls. The researchers showed that advanced age both correlates with a significant increase in endothelial cells' CXCL9 levels and diminishes endothelial cells' ability to form microvascular networks, to dilate and to contract.

But in laboratory experiments conducted on tissue from mice and on human cells, reducing CXCL9 levels restored youthful endothelial-cell function, suggesting that CXCL9 directly contributes to those cells' dysfunction and that inhibiting it could prove effective in reducing susceptible individuals' risk of cardiovascular disease.

"Our inflammatory aging clock's ability to detect subclinical accelerated cardiovascular aging hints at its potential clinical impact," Furman said. "All disorders are treated best when they're treated early."

[Adapted from: Goldman, Bruce. "Immune system 'clock' predicts illness and mortality." *Stanford Medicine News Center*, 12 July, 2021. URL: https://med.stanford.edu/news/all-news/2021/07/immune-system-clock-predicts-illness-and-mortality.html]

1. Choose the best word from the list to fill in blanks (A)~(E) and write the number in the space on the answer sheet.

(A) :	1. harms	2. changes	3. declines	4. promotes
(B) :	1. exposed	2. subjected	3. closed	4. compared
(C) :	1. composite	2. minimum	3. solution	4. combination
(D) :	1. associate	2. proxy	3. match	4. instrument
(E) :	1. related	2. located	3. implicated	4. produced

Choose the best answer for each question and write the number in the space on the answer sheet.

2. Why did the researchers focus on inflammation in their study?
   1. Bad inflammation can make a person age more quickly.
   2. The type of inflammatory response indicates a person's general health.
   3. Inflammation and the immune system mortality are closely linked.
   4. Inflammation's prediction lasts longer as people get older.

3. What is the inflammatory clock?
   1. It is a set of proteins that indicate the capability of a person's immune system.
   2. It is the age of the patient related to the capacity of their inflammation.
   3. It is the length of time that a patient has inflammation during immune response.
   4. It is a series of data compiled by artificial intelligence that shows a person's true age.

4. How did the researchers determine if their inflammatory clock in the new study was accurate?
   1. They tracked the inflammatory age of people in Italy who were known to live a long time.
   2. They confirmed that the physical capabilities of older patients matched their blood test results from seven years earlier.
   3. They compared the levels of cytokines in groups of people in Bologna and Framingham.
   4. They examined a link between inflammatory age and a special cytokine that increases after age 60.

5. What did the researchers examine with the final group of test subjects?
   1. They compared subjects with high CXCL9 scores to subjects with high inflammatory age.
   2. They tested the CXCL9 scores of subjects with arterial stiffness.
   3. They looked for a link between heart health and high inflammatory-age scores.
   4. They checked the weakening of heart and blood vessels in healthy-looking subjects.

Ⅱ. Read the following passage and answer the questions that follow.

Few adults can remember anything that happened to them before the age of 3. Now, a new study has (A) that it's about age 7 when our earliest memories begin to fade, a phenomenon known as "childhood amnesia." For the study, researchers at Emory University interviewed children about past events in their lives, starting at age 3. The children were then interviewed again years later to test their recall. "Our study is the first (B) demonstration of the onset of childhood amnesia," said Emory University psychologist Dr. Patricia Bauer, who led the study. "We actually recorded the memories of children, and then we followed them into the future to track when they forgot these memories."

It's been long known that most people's earliest memories only go back to about age 3. Sigmund Freud coined the term "childhood amnesia" to describe this loss of memory from the infant years. Using his psychoanalytic theory, Freud theorized that people repressed their earliest memories due to their inappropriate sexual nature. But now, research is showing that infants do not have the sophisticated neural architecture needed to form and hold onto more complex forms of memory.

For their experiment, the researchers recorded 83 children at the age of 3, while their mothers or fathers asked them about events they had experienced in recent months, such as a trip to the zoo or a birthday party. Bauer explained that parents were asked to speak as they normally would to their children, (C) them with questions, such as "Remember when we went to Chuck E. Cheese's for your birthday party? You had pizza, didn't you?" The child might then recount details of the birthday party or divert the conversation to another event, such as a visit to the zoo. The researchers noted that some mothers might keep asking about pizza, while other mothers would ask about the trip to the zoo. Parents who followed a child's lead in these conversations tended to elicit richer memories from their 3-year-olds, according to Bauer. "This approach also related to the children having a better memory of the event at a later age," she said.

The researchers then followed up with the children years later, asking them to recall the events that they recounted at age 3. The children were divided into five groups, and each group of children returned only once to participate in the experiment, from the ages of 5 to 9. While the children between the ages of 5 and 7 could recall 63 to 72 percent of the events, the children who were 8 and 9 years old remembered only about 35 percent of the events, the researchers reported. "One surprising finding was that, although the 5-and-6-year-old children remembered a higher percentage of the events, their narratives of these events were less complete," Bauer said. "The older children remembered fewer events, but the ones they remembered had more detail."

Some reasons for this difference may be that memories that stick around longer may have

richer detail associated with them, she said. More advanced language skills also enable an older child to better (D) the memory, further cementing it in their minds, she adds. Young children tend to forget events more rapidly than adults because they lack the strong neural processes required to bring together all the pieces of information that go into a complex autobiographical memory, she explained. "You have to learn to use a calendar and understand the days of the week and the seasons," she said. "You need to encode information about the physical location of the event. And you need development of a sense of self, an understanding that your (E) is different from that of someone else." She uses an analogy of pasta draining in a colander to explain the difference between early childhood and adult memories.

"Memories are like orzo," she said, referring to the rice-grained-sized pasta, "little bits and pieces of neural encoding." Young children's brains are like colanders with large holes trying to retain these little pieces of memory, she continued. "As the water rushes out, so do many of the grains of orzo," she said. "Adults, however, use a fine net instead of a colander for a screen." Bauer said further research is planned to find the age when people acquire an adult memory system, which she believes is between the age of 9 and the college years. "We'd like to know more about when we trade in our colanders for a net," she said. "Between the ages of 9 and 18 is largely a no-man's land of our knowledge of how memory forms."

[Adapted from: Wood, J. (2018). What's Your Earliest Memory? *Psych Central*. Retrieved on September 9, 2024, from https://psychcentral.com/news/2014/01/26/whats-your-earliest-memory/64982.html]

1. Choose the best word from the list to fill in blanks (A)~(E) and write the number in the space on the answer sheet.

(A) :	1. documented	2. accepted	3. recognized	4. predicted
(B) :	1. qualified	2. theoretical	3. suitable	4. empirical
(C) :	1. suggesting	2. prompting	3. encouraging	4. confusing
(D) :	1. share	2. elaborate	3. develop	4. improve
(E) :	1. memory	2. experience	3. perspective	4. identity

Choose the best answer for each question and write the number in the space on the answer sheet.

2. According to the text, what was Sigmund Freud's explanation for why people forget their childhood memories?
   1. Children blocked their memories because they did not understand about sex.
   2. People likely forgot their early memories because they were disturbing.
   3. Complex memories are too difficult for children to understand.
   4. Freud thought that children didn't have complex enough brain structure.

3. According to the text, what could help very young children retain their early memories?
   1. Asking questions about memorable events such as birthday parties
   2. Letting children guide the conversation about their childhood events
   3. Asking children about the same events even when the child wanted to talk about something else
   4. Prompting children to remember childhood events by repeating the same questions

4. According to the text, what was unusual about the memories of children about events from when they were 3 years old?
   1. Younger children were able to remember more events than older children.
   2. Younger children were able to recall fewer events than older children.
   3. Children's memories of past events tended to recover as they got older.
   4. None of the children could remember many things from before they were 3.

5. According to the text, what is one possible explanation why older children's memories of early childhood events had more detail?
   1. Older children have a larger vocabulary that helps them to understand early events.
   2. Older children have less of a sense of self than younger children.
   3. Older children no longer have a psychological need to forget early childhood events.
   4. Older children have had more discussions about their early childhoods with their parents.

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

That the body has utilitarian value has long been recognized. Nineteenth-century philosopher Jeremy Bentham believed that corpses would be of greater use to society if they were studied or displayed rather than simply buried away. Preserved, exhibited, and studied, a corpse, he said, could serve "moral, political, honorific, dehonorific, money-saving, money-getting, commemorative, genealogical, architectural, theatrical, and phrenological" ends. Following his instructions, Bentham's own body was preserved and placed on public display in a glass case at University College, London.

Certainly, the living body has long been exploited as a commercial and marketable entity, as athletes, models, prostitutes, surrogate mothers, and beauty queens are well aware. But there is something new, strange, and troubling about the traffic in body tissue, the banking of human cells, and the patenting of genes. In the 1984 congressional hearings concerning anatomical gifts, Albert Gore, then a U.S. congressman, was troubled by a growing tendency to treat the body as a commodity in a market economy: "It is against our system of values to buy and sell parts of human beings.... The notion has perhaps superficial attraction to some because we have learned that the market system will solve lots of problems if we just stand out of the way and let it work. It is very true. (A) because you don't want to invest property rights in human beings.... It is wrong."

But what *is* troubling about the fragmentation and commodification of the body? What is the problem [X]? Why shouldn't body parts be economic units of trade? Clearly the business of bodies is driven by instrumental and commercial values; but so too, as Gore suggested, are most technological endeavors. Moreover, much of the body tissue that is useful for biotechnology innovation — hair, blood, sperm — is replenishable. The average person loses two hundred hairs each day. Blood and sperm are constantly regenerated. And body materials such as umbilical cord blood, infant foreskin, or biopsied tissue discarded after surgery are normally regarded as refuse, like bloodied bandages and other medical wastes. Why not, then, view the body as a useful and exploitable resource if these tissues can be used to advance scientific research, contribute to progress, or provide life-saving benefits to others? Why are developments in the removal, storage, and transformation of human tissue (B)? Why are there lawsuits against the commercialization of cell lines and protests against the patenting of genes?

The body is more than a utilitarian object: it is also a social, ritual, and metaphorical entity, and the only thing many people can really call their own. Indeed, our bodies and body parts are layered with ideas, images, cultural meanings, and personal associations. Definitions of the body that reduce and decontextualize it, are what allow scientists or biotechnology firms to extract, use, and patent body tissue (C) or consideration of his or her personal desires and social needs.

Biotechnological uses risk running roughshod over social values and personal beliefs.

The expanding use of human body materials poses basic and difficult dilemmas. The removal of body tissue contributes to scientific research, but it also intrudes on body boundaries, imposing on individual autonomy. Collecting samples for the expanding DNA identification systems may be an efficient means to combat crime, but it also increases the risk of a surveillance society. Storing tissue samples and extracting information from them provides a clinically useful database for health information but using tissue without the consent of the people who provided it may violate their personal privacy. Often little thought is given to people, like Moore, who are the unwitting sources of this material. And while patenting genes encourages (D) costly research, the possibility of gaining a patent can also encourage predatory behavior. Biologist Erwin Chargoff has warned that the growing ability of doctors and scientists to profit from patients' tissue can be a slippery slope to social disaster, "an Auschwitz in which valuable enzymes, hormones, and so on will be extracted instead of gold teeth."

The creation of commercial products from human tissue has raised questions of profit and property, of consent and control. Participants in a range of legal and social disputes over body parts are asking whether tissue and genes are the essence of an individual and (E) — or whether they are, as a director of Smith-Kline Beecham purportedly claimed, "the currency of the future."

[Adapted from Andrews, L. B., & Nelkin, D. (2001). *Body bazaar: the market for human tissue in the biotechnology age.* New York, Crown.]

Choose the most appropriate option from the ones given below and write the number in the space on the answer sheet.

A. Choose the best phrase to fit blank (A).

1. Indeed, you believe that partly
2. It is not because you want but
3. That's presumably the reason
4. This ought to be an exception

B. Choose the best phrase to fit blank (B).

1. used against polios and diabetes
2. so as to be such a norm
3. becoming controversial
4. as commonplace as vaccine

C. Choose the best phrase to fit blank (C).

1. in an attempt to save patients
2. not purposefully with generosity
3. taking it for granted, account
4. without reference to the individual

D. Choose the best phrase to fit blank (D).

1. the venture capital necessary to support
2. the large pharmaceuticals to interfere
3. the fundraisers to invest property rights in
4. the doctors to protect patients' privacy on

E. Choose the best phrase to fit blank (E).

1. a sacred part of the human inheritance
2. the pure and simple form of personal beliefs
3. a personal aspect useful for medical studies
4. the basic elements of chemical substances

X. Finish the question by filling in blank [X] with fewer than eight words to best fit the context of the passage.

Writing Question: In your opinion, what uses of human tissues for medical or scientific purposes should be allowed? Give reasons and examples. Answer in English.