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，試験途中では持ち出してはいけない。

I . Read the following passage and write the answers to the questions on the answer sheet.

The worst cancer cells don't sit still. Instead they metastasize — migrate from their original sites and establish new tumors in other parts of the body. Once a cancer spreads, it is harder to (A). A study by developmental biologists offers a fresh clue to how cancer cells acquire (1) the ability to invade other tissues — a prerequisite for metastasis. It reveals that invasion requires cells to stop dividing. Therefore, the two (B) — invasion and proliferation — are mutually exclusive. The finding could inform cancer therapies, which typically target rapidly proliferating cancer cells.

David Matus of Stony Brook University and David Sherwood of Duke University turned (C) a transparent worm to elucidate this invading process. During the worm's normal development, a cell known as the anchor cell breaks through a structure called the basement membrane, which initially separates the uterus from the vulva. The process is similar to how human cancer cells invade basement membranes to enter the bloodstream, which carries them to distant sites. So biologists have adopted *Caenorhabditis elegans* as a metastasis model organism, which they can easily image and genetically manipulate.

After turning on and off hundreds of genes in *C. elegans*, Matus's team found a gene that regulated anchor cell invasion. When it was turned off, the anchor cell failed to invade the basement membrane. But the anchor cell also did something unexpected: it began to divide. Conversely, when the researchers inhibited cell proliferation, the anchor cell stopped dividing and began to invade again. Further experiments showed that halting cell division was both necessary and sufficient for invasion. Although anecdotal (2) observations by pathologists have suggested this either/or situation might be the case, the new study is the first to uncover the genetic mechanism that explains why these two processes must be mutually exclusive. The results were published in October in the journal *Developmental Cell*.

The study also explains the long-standing but mysterious observation by cancer biologists that the invading front of many tumors does not contain dividing cells; instead the invasive cells lead the dividing cells behind them and push forward into healthy tissue as the tumor grows in size. "This research changes how we think about cancer at some level," Matus says. "We think of cancer as a disease of uncontrolled cell division, and in fact, many cancer drugs are designed to target these dividing cells. But our study suggests that we need to figure out how to target these nondividing cells, too, as these are the ones that are invasive."

Before the insight (3) makes its way into cancer treatments, however, it will need further testing. "Now we can take that simple model and go to more complex systems — like breast cancer tumors," says Andrew Ewald, a cancer cell biologist at Johns Hopkins University. Metastatic breast

cancer alone (D) about 40,000 deaths every year in the U.S., but the five-year survival rate is nearly 100 percent if caught before the cancer spreads.

[Adapted from Callier, Viviane. "Divide or Conquer." *Scientific American*, January 2016, p. 17]

1. Choose the correct word from the list to fill in blanks (A)~(D).

(A)	1. exclude	2. reject	3. discard	4. eliminate
(B)	1. processes	2. discoveries	3. methods	4. dilemmas
(C)	1. on	2. out	3. away	4. to
(D)	1. accounts for	2. takes up	3. gives up	4. comes from

2. Choose the best meaning for the underlined word.

(1)	acquire:	1. attain	2. experience	3. reach	4. proceed
(2)	anecdotal:	1. scientific	2. mysterious	3. statistical	4. subjective
(3)	insight:	1. conclusion	2. discovery	3. awareness	4. research

3. What was the purpose of this study?
   1. To find out how to prevent cancer cells from metastasizing.
   2. To clarify how cancer moves to a new part of the body.
   3. To reveal the mechanism by which cancer cells divide.
   4. To discover how to stop cancer cells from multiplying.

4. How did the scientists conduct their research?
   1. They modified anchor cells from a worm to mimic the metastasis process of cancer cells.
   2. They injected cancer cells into the basement membrane of a transparent worm so they could observe how the cells spread.
   3. They observed how certain cells in a growing worm could be induced into moving from one part of the body to another.
   4. They noticed that anchor cells of a certain worm invade the worm's basement membrane similarly to human cancer cells.

5. What did the scientists discover?

   1. Anchor cells cannot migrate through the body while they are dividing.
   2. Cancer cells can be prevented from metastasizing if a certain gene is turned off.
   3. Each cancer cell is specialized to either invade or divide but cannot do both.
   4. Anchor cells and cancer cells do not behave in the same way in the body.

6. How ought future cancer treatments be changed to be more effective?

   Answer in English using your own sentence(s).

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

Across town at Massachusetts General Hospital, Vicki Jackson cares for people with terminal illness. As a palliative care specialist, her job is not to prescribe drugs or treatments, but to talk. She confronts questions that people facing death often aren't asked: how much do they want to know about their prognosis; would they rather reduce symptoms or lengthen (a); where and how do they wish to die? Jackson's primary aim is to increase quality of life during the time that these patients have left. But in a pioneering trial published in 2010, she found that these discussions [1].

The study, led by oncologist Jennifer Temel, followed 150 patients who had just been diagnosed with terminal lung cancer. Once diagnosed, these patients typically have less than a year to live. Half of the patients in Temel's study received standard cancer care. The doctors were focused, as you might expect, on the patients' medical condition: planning their treatments, monitoring progression of their tumors and managing any complications. The rest of the patients received exactly the same treatment but [2].

During these sessions, Jackson and her colleagues focused not on the medical details of the patients' cancer (b) on their personal lives, including issues such as how they and their family were coping with the diagnosis, and with any side effects of their treatment. For example, Jackson tells me about a patient with pancreatic cancer — let's call him Peter — whom she saw the day before our interview, after his latest scan revealed bad news.

"His oncologist spent 40 minutes going over the scan results, and then I spent another hour going over it with him," she says. The message from the oncologist was that Peter is unlikely to benefit from further chemotherapy; Jackson's task was to discuss with Peter [3]. "His son is getting married in six months. I don't think he is going to make (c) to the wedding," she says. "How is he going to talk to his children, who live all over the country, especially his son?"

Jackson says she couldn't do her job without getting to know her patients as rounded people — their interests, values and families. Good palliative care isn't so (d) about helping people to die as helping them to live, she says. [4] that requires figuring out who they are as a person and what living means to them, whether it's playing golf, watching soap operas, or being well enough to attend a wedding. "For every person it's different."

On average, the lung cancer patients in Temel and Jackson's study received four sessions of palliative care. The results were striking. Compared to a control group, these patients had much better quality of life (a measure that [5]) and felt significantly less depressed. They also received much less aggressive care at the end of their lives, with fewer rounds of chemotherapy and longer hospice stays. But the researchers were surprised to find something else. The

palliative care group survived for an average of 11.6 months, compared to 8.9 months for the control group.

It'll take more and larger studies to confirm this result and pin down exactly why simply talking to a palliative care specialist had such a dramatic effect. The lower rates of depression may be one factor — in general, cancer patients who are depressed don't live as long. It's probably also because aggressive treatments given at the end of life, [6], can hasten death rather than delay it.

When patients had the opportunity to talk to someone not about their tumor but about what they wanted from the time they had left, [7]. They still chose aggressive care early on, but in their final few months switched their focus to maximizing quality of life. They received less last-ditch treatment and, alongside all the other benefits, seem to have survived longer as a result.

By contrast, in the standard model of care, argues Jackson, aggressive treatments are the only thing on offer. People with terminal cancer accept round after round of chemotherapy because in the absence of any alternative, [8].

"Intervention becomes synonymous with hope," says Jackson. "And it's not."

[Adapted from Marchant, Jo. *Cure: A Journey Into the Science of Mind over Body*. Canongate Books, 2016.]

Question A. Fill in blanks (a) to (d) with one word each that appears in the passage.

Question B. Choose the most appropriate option from the ones given below.

1. Which one of the following fills in the blank [1]?

(A) rather decrease quality of life

(B) reduce the effects of treatments

(C) are much more upsetting

(D) can do far more than that

2. Which one of the following fills in the blank [2]?

(A) were also offered monthly sessions of palliative care

(B) different medications from their fellow patients

(C) the difference was so marginal that it was ignored

(D) others rejected chemotherapy treatments early on

3. Which one of the following fills in the blank [3]?

(A) why the treatment does not work for his lung cancer

(B) what that means in terms of how he should live his life

(C) how many family members really care about his wishes

(D) how long he can live without the help of his loved ones

4. Which one of the following fills in the blank [4]?

(A) She claims it's so difficult

(B) What is important in life

(C) It is in their own jobs

(D) Working out how to do

5. Which one of the following fills in the blank [5]?

(A) includes ratings of physical symptoms

(B) degrades the well-being of individuals fairly

(C) has been used to make a scale for QOL

(D) improves the degree of wellness of living

6. Which one of the following fills in the blank [6]?

(A) associated with harmless measures

(B) which is as acute as the illness

(C) when patients are very sick

(D) caring for people who are dying

7. Which one of the following fills in the blank [7]?

(A) they made different choices

(B) their reactions were taken in

(C) they pitched in with their ideas

(D) they agreed with treatments

8. Which one of the following fills in the blank [8]?

(A) options of effective drugs are only a few

(B) not doing so basically means giving up

(C) attendance in medical studies is counted

(D) the previous intervention is the only way

III. Answer the questions based on the text below.

It's called the gambler's fallacy: After a long streak of losses, you feel you are going to win. But in reality, your odds of winning are (A) different than they were before. For years, the gambler's fallacy has been thought to be a prime example of human irrationality(1), but a new study published by researchers from the Texas A&M Health Science Center suggests that our brains naturally soak up the strange statistics of random sequences(2), causing us to commit the gambler's fallacy.

The study, which appears in the March 9 issue of the *Proceedings of the National Academy of Sciences*, was designed to help understand the gambler's fallacy at the neural (B). Researchers took a computer model of biological neurons and trained it with random sequences. They found that by simply observing a coin being tossed repeatedly, the neurons could learn to differentiate(3) and react to different patterns of heads and tails. Most interestingly, the neurons that preferred alternating patterns such as head-tail significantly outnumbered the neurons that preferred repeating patterns such as head-head.

"In other words, these neurons behaved just like the gamblers in a casino: when the outcome of a fair coin toss is a head, they are more likely to predict that the following toss will be a tail than to predict it will be a head, despite the fact that either pattern is equally (C)," said principal investigator Yanlong Sun, Ph.D., an assistant professor of microbial pathogenesis and immunology at the Texas A&M Health Science Center College of Medicine.

Hongbin Wang, Ph.D., a professor of microbial pathogenesis and immunology and a corresponding author on the paper, said the study demonstrates how neurons in our brains react to time-sensitive information. "The model's rather surprising behavior has to do with the way these neurons encounter different patterns of heads and tails at different times," Wang said. "(X), and traditional theories do not often distinguish them, which can lead to problems."

The finding that our brains may have naturally learned to commit the gambler's fallacy has implications(4) for everything from medical decision-making to building smarter machines. "Physicians have these same sort of biases in terms of probabilities, and being aware of these biases and what causes them could help us train physicians to be more accurate in their decision-making," said Jack Smith, M.D., Ph.D., professor of microbial pathogenesis and immunology and a co-author on the paper.

Smith said the research shows that we need to program machines more like neurons rather than just programming digital computers. "If a computer is going to interact with humans it has to have similar behaviors, otherwise the interaction is (D)," Smith said. "The more a computer's behavior is like the behavior we expect from people, the easier the interface between us and the

device will be."

[Adapted from "Committing 'gamblers fallacy' may be in the cards, new research shows." *ScienceDaily*, 10 March 2015. URL: www.sciencedaily.com/releases/2015/03/150310091517.htm]

1. Choose the correct word from the list to fill in blanks (A)~(D).

(A)	1. no	2. more	3. soon	4. so
(B)	1. point	2. side	3. zone	4. level
(C)	1. reported	2. difficult	3. predicted	4. probable
(D)	1. dubious	2. strained	3. impatient	4. changeable

2. Choose the best meaning for the underlined word.

(1)	irrationality:	1. habit	2. logic	3. absurdity	4. incompatibility
(2)	sequences:	1. happenings	2. orders	3. numbers	4. choices
(3)	differentiate:	1. distinguish	2. separate	3. understand	4. detach
(4)	implications:	1. solutions	2. consequences	3. decisions	4. associations

3. According to the text, how did the researchers conduct their experiment?
   1. They taught a computer simulation of neural circuits to guess the results of a coin toss.
   2. They created an artificial biological neural network out of random sequences of neurons.
   3. They made model neurons that could recognize alternating patterns of heads or tails.
   4. They made a computer model of results of tossing a coin and input it into a neural circuit.

4. According to the text, what is the gambler's fallacy?
   1. It is when a gambler finally wins after losing many times in a row because the statistical probability of winning goes up after each loss.
   2. It is the mistaken belief that the odds of winning do not change after a streak of losing.
   3. It is the phenomena of the brain absorbing random statistics in a series.
   4. It is the belief that the chances of guessing correctly increase after each wrong guess.

5. According to the text, how can this study help doctors?

1. Doctors can understand how to predict the outcomes of random events better.
2. Doctors can make more correct judgements by being mindful of their preconceptions.
3. Doctors can be more aware of any biases that they have towards their patients.
4. Doctors can learn how to interpret statistical data more precisely by getting rid of bias.

6. To fill in blank (X), complete the sentence on the answer sheet, and use the words "two" and "different."