英　語

第１問　次の英文を読んで、後の問いに答えなさい。

Suicide is a puzzle. Fewer than 10% of people with depression attempt suicide, and about 10% of those who kill themselves were never diagnosed with any mental-health condition. Now, a study is trying to determine what happens in the brain when a person attempts suicide, and what sets such people apart. The results could help researchers to understand whether suicide is driven by certain brain biology — and is not just a symptom of a recognized mental disorder.

The project, which launched last month, will recruit 50 people who have attempted suicide in the two weeks before enrolling in the study. Carlos Zarate, a psychiatrist at the US National Institute of Mental Health in Bethesda, Maryland, and his colleagues will compare these people's brain structure and function [　ア　] that of 40 people who attempted suicide more than a year ago, 40 people with depression or anxiety who have never attempted suicide and a control group of 40 healthy people. In doing so, (　あ　).

Zarate's team will also give ketamine, a psychoactive 'party drug', to the group that has recently attempted suicide. Ketamine, which is sometimes used to treat depression, can quickly arrest suicidal thoughts and behaviour — even in cases when it does not affect other symptoms of depression. The effect is known to last for about a week. To some researchers, such findings suggest that ketamine affects brain circuits that are specific to suicidal thinking. But John Mann, a psychiatrist at Columbia University in New York City, says that (　い　). "They're part of the person, they're a trait," Mann says. "They just get more important when the person gets ill."

Written in the genes?

There is evidence that genetics influences a person's suicide risk. For instance, (　う　).

Fabrice Jollant, a psychiatrist at McGill University in Montreal, Canada, suggests that this genetic influence is related to impulsivity and flawed judgement, rather than a specific mental illness. He has found that close relatives of people who killed themselves were more impulsive than a control group when playing a gambling game designed to test decision-making. "It seems that this is something transmitted," Jollant says.

Other researchers are seeking 《A》biomarkers that would allow clinicians to spot people most at risk of suicide. Alexander Niculescu, a psychiatrist at Indiana University in Indianapolis, and his colleagues have identified a set of six genes whose expression is altered in the blood of people who have killed themselves. The team has found that combining these biomarkers with data from an app that tracks mood and risk factors can predict, with more than 90% accuracy, whether people with bipolar disorder or schizophrenia will eventually be hospitalized for a suicide attempt.

And Mann is using positron emission tomography to track the best-studied biomarker, for the signalling molecule serotonin, in the brains of people who have attempted suicide. Their altered serotonin patterns are similar to those seen after death in the brains of those who have killed themselves, says Mann. Although serotonin levels are altered in people with depression,

医学部　一般後期

Mann has found differences between people who attempt suicide and those who are depressed but have no history of suicide attempts. He has also shown that serotonin levels are altered to a greater degree in those who make more serious suicide attempts — such as taking an entire bottle of painkillers — [イ].

Ethical challenges

Researchers hope that a better understanding of the biology underlying suicide will lead to more effective treatments for suicidal impulses. But studies such as Zarate's present difficult logistical and ethical challenges. Researchers must consider whether a person who has just attempted suicide can make informed decisions about whether to participate in research.

Michael Minzenberg, a psychiatrist at the University of California, San Francisco, knows these concerns all too well: he studies suicidal people with schizophrenia. Many of these people struggle with basic life skills, such as keeping a job or finding housing. "They're a challenging group to treat, (B)let alone to study," Minzenberg says.

He and other researchers who study suicidal people say that they treat them with special care — and that (C)the overall benefits of such studies outweigh any risks. "In most clinical trials, people at high risk of suicide are excluded, so we don't know how to treat them," Jollant says. "We need to assess this population, not just say 'exclude them from trials'."

http://www.nature.com/news/brain-study-seeks-roots-of-suicide-1.18870?WT.mc_id=FBK_NatureNews (一部改変)

注 control group: 対照群　psychoactive: 精神に作用する　expression: 発現
app: アプリケーション　bipolar disorder: 双極性障害（躁うつ病）
schizophrenia: 統合失調症　positron emission tomography: 陽電子放射断層撮影（PET）
serotonin: セロトニン　logistical: 実行上の

問 1. 空所 [ア] に入れるのに最も適切な語を 1 つ選び、その番号を答えなさい。

(1) for　(2) in　(3) of　(4) to

問 2. 空所（ あ ）、（ い ）、（ う ）にはそれぞれ次の (1)〜(3) のどれかが入る。各空所に入るものの番号を答えなさい。（注 predispose: する気にさせる）

(1) abnormal brain chemistry and genetics could also predispose a person to attempt suicide in times of great stress, such as after a job loss

(2) biological relatives of adopted children who kill themselves are several times more likely to take their lives than the general population

(3) the researchers hope to clarify the brain mechanisms associated with the impulse to kill oneself

問 3. 下線部《A》の自殺リスクの評価を可能にする biomarker にはどのようなものがあるか。本文に記述されている 2 つの具体例をそれぞれ 20 字から 30 字の日本語で答えなさい（句読点も 1 文字に数える）。

問 4. [イ] には次の語句をある順番に並べ替えた表現が入る。2 番目と 5 番目に入る語句の番号を答えなさい。

(1) are	(2) attempts	(3) in
(4) less drastic	(5) than	(6) those whose

問 5. 下線部《B》の 'let alone' とほぼ同じ意味を持つものとして最も適切な表現を 1 つ選び、その番号を答えなさい。

(1) at best	(2) much less than
(3) not to mention	(4) setting aside

問 6. 下線部《C》が表す意味として最も適切なものを 1 つ選び、その番号を答えなさい。

(1) the overall benefits of such studies are as great as any risk
(2) the overall benefits of such studies are great without any risk
(3) the overall benefits of such studies are greater than any risk
(4) the overall benefits of such studies are not as great as any risk

問 7. 本文の内容に合致するものを 2 つ選び、その番号を答えなさい。

(1) A study on the brains of people who have attempted suicide could be useful in clarifying whether a cause of suicide lies in brain biology.

(2) The study led by Zarate involves analyzing the brain structure and function of people who killed themselves because of a mental disorder.

(3) Although ketamine doesn't treat any symptoms of depression, it can affect brain circuits of people who have suicidal thoughts and behaviour.

(4) According to Jollant, what contributes to a greater risk of suicide is a person's inherited impulsivity and defective decision-making.

(5) Jollant suggests that people at high risk of suicide should not be included in clinical trials because there is no knowing how to treat them.

第２問　次の英文を読んで、後の問いに答えなさい。

Anti-ageing pills are no longer drugs of the future—the first trial in people could begin as early as next year. Last month, the scientists behind the trial began talks with the US Food and Drug Administration to hammer out the practicalities. The trial aims to test whether a diabetes drug called metformin also delays death and age-related conditions such as heart disease, cancer and mental decline. It would be the first time a medicine has been tested specifically for delaying ageing in a human trial. "It's groundbreaking," says Sue Peschin of the US-based non-profit organisation the Alliance for Aging Research. "It's significant that the FDA has opened their doors to researchers about the idea."

For a long time the field of lifespan extension has had a flaky reputation, with most of the ideas mooted being either unappealing or impractical, such as near-starvation diets or somehow lengthening the tips of our chromosomes.

Drug regulators do not even officially recognise ageing as a condition in need of treatment, which could make it hard to get medicines approved. But this isn't an insurmountable problem and repurposing an existing drug could help, because we already have long-term safety data. Metformin has been used to treat type 2 diabetes for decades. That means the researchers could go straight to large-scale testing in people. New drugs typically have to be tested on animals first and then small groups of people. This one aims to follow 3000 people in their 70s for five years, and positive results should be enough for the FDA to 《A》approve it, says lead researcher Nir Barzilai of the Albert Einstein College of Medicine in New York.

The chief hurdle is a lack of funding, to the tune of $50 million. The American Federation for Aging Research is supporting the planning stages, and the team is in talks with several potential backers, including the US National Institutes of Health, so Barzilai is confident. "We have interest from multiple sources, so one way or another this trial is going on," he says. After all, if the drug is approved, there is likely to be huge 《B》demand for it.

After meeting with the FDA in June, Barzilai says the regulator had only "minor suggestions" and was supportive in principle. The trial does not actually need FDA permission to go ahead, but talking to the agency now means it can be designed to smooth the path to licensing later on. To begin the trial, all Barzilai needs is the go-ahead from the various ethics committees involved. He says this should be relatively easy as metformin is seen as such a safe drug. The compound helps people with diabetes by reducing how much glucose the liver makes. Its most common side effects are nausea and diarrhoea, but these can be lessened by raising the dose slowly and taking it with meals.

Interest in metformin's possible anti-ageing effects arose because diabetics taking the drug have lower rates of cancer and heart disease and, in one study, lived 15 per cent longer than people without diabetes. The explanation is unclear as the compound has multiple effects on cells but one theory is that it mimics the effects of calorie restriction, which delays ageing in many

animals. When (　あ　), (　い　), and (　う　).

The proposed metformin trial is not the only sign of progress in the anti-ageing field. This month a trial in dogs is due to begin of a drug called rapamycin. This is already used in people to suppress the immune system, for example, after an organ transplant, but at lower doses it may also mimic calorie restriction. Unusually, the study's subjects are not lab animals but middle-aged pet dogs, partly to reduce the time and expense of a trial involving large, long-lived animals. Team member Matt Kaeberlein of the University of Washington in Seattle thinks that dogs could gain an extra two to five years of life. The work will likely be popular, Peschin says: "It's going to have a warm and fuzzy effect that mice studies simply don't have"—which may help attract money for follow-up work.

According to Richard Faragher of the University of Brighton, UK, who researches the mechanisms of ageing, another recent boost to the field has been the arrival of drug giant Novartis. Last year the firm reported results showing an anti-ageing effect in a drug called everolimus, which works in a similar way to rapamycin. It was a trial of the medicine's ability to enhance older people's response to flu vaccination—which it did—but it also suggests that the drug could prolong life by reducing the normal decline of the immune system with age. Faragher thinks Novartis's involvement shows anti-ageing is a field to be taken seriously. "We are not trying to be immortal," he says. "All we are trying to do is make sure that we have some extra years without disease."

Clare Wilson "The age of the longevity drug", *NewScientist*, 11 July 2015（一部改変）

注　Food and Drug Administration：食品医薬品局（FDA）　hammer out：解決する、詰める
practicalities：現実的問題　diabetes：糖尿病　flaky：あてにならない
moot：提出する　chromosome：染色体　insurmountable：克服できない
repurpose：転用する　American Federation for Aging Research：米国高齢化研究連合会
nausea：悪心、吐き気　diarrhoea：下痢　mimic：まねる
immune system：免疫系　vaccination：ワクチン接種

問 1. 長寿薬が認可されてこなかった理由としてもっとも適切なものを 1 つ選び、その番号を答えなさい。

(1) 寿命を延ばしても、QOL(生活の質)の低下を防止できなければ無益だから
(2) 長寿薬の開発より緊急性の高い、解決すべき差し迫った病気がたくさんあるから
(3) 長年にわたって根拠も実績もない長寿法が主張され続けてきたから
(4) 老化は生物にとって避けることが不可能なことだと考えられているから
(5) 老化は治療を必要とする病気ではないと考えられていたから

問 2. 下線部《A》の 'approve' の名詞形（ただし、'-ing'、'-er' を語尾とするものは除外する）と、下線部《B》の 'demand' の対義語（反意語）を、それぞれ英語で書きなさい。

問 3. 6 月に行われた Barzilai と FDA との折衝の目的は何であったかを、20 字から 30 字の日本語で説明しなさい（句読点も 1 文字と数える）。

問 4. 次に示す表について、以下の A～D の各問いに答えなさい。

	metformin	rapamycin	everolimus
本来は何の薬であるか	A1	A2	A3
長寿効果を示す仕組みとして考えられること	B1	B2	B3
被験者・被験動物	C1	C2	C3
各薬の試験がもっている利点	D1	D2	D3

問 A. 表の A1 から A3 に入れるのにもっとも適切なものを次の (1) ～ (4) よりそれぞれ 1 つ選び、その番号を答えなさい。

(1) インフルエンザの治療薬
(2) 吐き気と下痢の治療薬
(3) 糖尿病の治療薬
(4) 免疫抑制剤

問 B. 表の B1 から B3 に入れるのにもっとも適切なものを次の (1) ～ (4) よりそれぞれ 1 つ選び、その番号を答えなさい。

(1) 加齢に伴う免疫系の衰えを軽減することによる
(2) カロリー制限効果による
(3) 血液の循環を良くすることによる
(4) 染色体の端部を延長することによる

問 C. 表の C1 と C2 には計画されている試験での被験者・被験動物が、C3 にはすでに実施されて長寿効果が示された試験での被験者・被験動物が入る。C1 から C3 に入れるのにもっとも適切なものを次の (1) ～ (4) よりそれぞれ 1 つ選び、その番号を答えなさい。

(1) 犬
(2) うさぎ
(3) 人間
(4) マウス

問 D. 表の D1 から D3 に入れるのにもっとも適切なものを次の (1) ～ (4) よりそれぞれ 1 つ選び、その番号を答えなさい。

(1) 研究費の獲得が容易になる
(2) すぐに人間を使った大規模試験に入ることができる
(3) 他よりも顕著な老化防止効果が得られる
(4) 長寿薬がまじめに取り上げられるようになる

問 5. 空所（　あ　）～（　う　）にはそれぞれ次の 3 つのいずれかが入る。各空所に入るものの番号を答えなさい。（注　knock-on effect：波及効果）

(1) cells shift into energy-conserving mode
(2) food is scarce
(3) this seems to have knock-on effects on lifespan

問 6. Faragher たちの研究が目指していることとしてもっとも適切なものを 1 つ選び、その番号を答えなさい。

(1) 健康寿命の延長
(2) 寿命の延長
(3) 不死
(4) 若返り

第３問　次の英文の空所 ア～シ に、それぞれ与えられた文字で始まる単語を入れなさい。

Learning changes the brain because it can rewire itself with each new stimulation, experience, and behavior. Scientists are unsure precisely how this happens, but (ア: t___) have some ideas what happens. (イ: F___), some kind of stimulus to the brain starts the process. It could be internal or it could be a new experience, like solving a jigsaw puzzle. Then, the stimulus is sorted and processed at several levels. Finally, there's the formation of a potential memory. That simply (ウ: m___) the pieces are in place so that the memory can be easily activated. As educators, it's well (エ: w___) our time to understand the basics of these steps. It may give us some useful insights into how (オ: s___) learn.

To our brain, we are either doing something we already know how to do (カ: o___) we are doing something new. If we are (キ: r___) an earlier learning, there's a good (ク: c___) the neural pathways will become more and more efficient. Washington University School of Medicine researchers discovered that while many areas of the brain will "light up" on a PET scan when a new task is initiated, the brain "lights up" less and is used less the better the task is learned. Novices use (ケ: m___) of their brain, but they are less efficient at how they use it. This quality illustrates how quickly our brain adapts and rewires itself.

While exercise is doing what we already know how to do, stimulation is doing something new. Seeing a new movie, listening to new music, singing a new song, visiting a new place, (コ: s___) a new problem, or making new friends can all stimulate the brain. As long as it's coherent, this novel mental or motor stimulation (サ: p___) greater beneficial electrical energy than the old-hat stuff. This (シ: i___) is converted to nervous impulses. They travel to extraction and sorting stations like the thalamus, located in the middle of the brain.

Eric Jensen, *Teaching with the brain in mind*（一部改変）

注　PET scan: 陽電子放射断層撮影　　novice: 初学者　　motor stimulation: 運動刺激
old-hat: 新味がない　　thalamus: 視床