

第 1 問から第 4 問では、問題文の中の [] 内の数字はマークシートの間番号を示している。該当する問番号の解答記入欄に答をマークしなさい。

第 1 問 次の問 1～6 の空所 [1]～[6]に入れるのに最も適切なものを(1)～(4)から 1 つ選び、その番号をマークしなさい。

問 1. All the players who [1] this team have already won a medal in the Olympic Games.

- (1) consist of (2) get together (3) include in (4) make up

問 2. I can't wait until the rainy season is over. I have had [2] of this constant rain.

- (1) any (2) enough (3) many (4) none

問 3. I wasn't sure if it was more [3] to travel there by bullet train or by plane, so I asked the travel agent about it.

- (1) cheaply (2) costly (3) expensively (4) highly

問 4. My father would often tell that funny story to [4] wanted to listen to it.

- (1) anyone (2) those (3) whoever (4) whom

問 5. The parents would often [5] each other about how to discipline their daughter.

- (1) approach to (2) argue with (3) discuss for (4) mention of

問 6. This new T-shirt you are wearing looks really good [6] you.

- (1) at (2) in (3) on (4) with

第2問 次の問1～4においては、それぞれ日本語の意味に合うように下の(1)～(7)の語句を並べかえて空所を補い、適切な文を完成させなさい。解答は[7]～[14]に入れるものの番号のみをマークしなさい。ただし文頭にくる文字も小文字にしてある。

問1. あなたの書く論文が込み入っていればいるほど、読者は混乱しやすくなる。

_____ [7] _____ [8] _____, the more likely it is for the reader to be confused.

- | | | | |
|---------|-----------------|----------|-----------|
| (1) a | (2) complicated | (3) more | (4) paper |
| (5) the | (6) write | (7) you | |

問2. 誰も彼に褒められたことがない。

_____ [9] _____ [10] _____.

- | | | | |
|-------------|-----------|-------------|---------|
| (1) anybody | (2) been | (3) by | (4) has |
| (5) him | (6) never | (7) praised | |

問3. 否定的な反応からして、彼らにはどちらの考えも極めて非現実的に思えるようだ。

Judging from their negative reactions, _____ [11] _____ [12] _____.

- | | | | |
|----------------|---------------|-----------------|-----------|
| (1) both ideas | (2) extremely | (3) seem | (4) sound |
| (5) to | (6) to them | (7) unrealistic | |

問4. 最近、他の誰の本を読み終わりましたか。

_____ [13] _____ [14] _____ lately?

- | | | | |
|-------------|------------|--------------|----------|
| (1) book | (2) else's | (3) finished | (4) have |
| (5) reading | (6) who | (7) you | |

第3問 Read the text and answer the questions that follow.

第3問の問題文は、著作権の都合により
掲載しておりません

<https://thenextweb.com/news/genius-annotated-with-genius> (改変あり)

注 excerpt: 抜粋

interplay: 相互作用

optimized: 最適化された

bit-mapped: ビットマップ形式の stylus: タッチペン

問 1. Based on the context, which word best fits (あ)? Write the number of your answer in [15].

- (1) get rid of (2) magnify (3) make use of (4) weaken

問 2. Which statement is closest to what Steve Jobs mentions about smartphones that existed at the time of this announcement? Write the number of your answer in [16].

- (1) Their e-mail function is not secure.
(2) They all have unalterable control buttons.
(3) They all need to be used with a stylus.
(4) They take too long to be shipped.

問 3. Which statement is closest to what Steve Jobs mentions about the iPhone? Write the number of your answer in [17].

- (1) It will feature completely new software at least once every five years.
(2) It will use a portable mouse that is more responsive than any stylus.
(3) Its design eliminates the necessity of having a fixed plastic keyboard.
(4) Its production and shipping will be faster than typical smartphones of that time.

問 4. Which statement is closest to what Steve Jobs mentions in the announcement? Write the number of your answer in [18].

- (1) A stylus is not the best pointing device to use with an iPhone because it can be lost.
(2) Technology developed in computers 20 years before the iPhone made the mouse obsolete.
(3) The screen of the iPhone typically reacts when it is touched unintentionally.
(4) Various physical iPhone keyboards can be developed and manufactured rapidly.

第4問 Read the article and answer the questions that follow.

You might want to bring your dumbbells on that next spaceflight.

During space missions lasting six months or longer, astronauts can experience bone loss equivalent to two decades of aging. A year of recovery in Earth's gravity rebuilds about half of that lost bone strength, researchers report June 30 in *Scientific Reports*.

Bones “are a living organ,” says Leigh Gabel, an exercise scientist at the University of Calgary in Canada. “They’re alive and active, and they’re constantly remodeling.” But (あ) gravity, bones lose strength.

Gabel and her colleagues tracked 17 astronauts, 14 men and three women with the average age of 47, who spent from four to seven months in space. The team used high-resolution peripheral quantitative computed tomography, or HR-pQCT, which can measure 3-D bone microarchitecture on scales of 61 microns, finer than the thickness of human hair, to image the bone structure of the tibia in the lower leg and the radius in the lower arm. The team took these images at four points in time — before spaceflight, when the astronauts returned from space, and then six months and one year later — and used them to calculate bone strength and density.

Astronauts in space for less than six months were able to regain their preflight bone strength after a year back in Earth's gravity. But those in space longer had permanent bone loss in their shinbones, or tibias, equivalent to a decade of aging. Their lower-arm bones, or radii, showed almost no loss, likely because these aren't weight-bearing bones, says Gabel.

Increasing weight lifting exercises in space could help alleviate bone loss, says Steven Boyd, also a Calgary exercise scientist. “A whole bunch of struts and beams all held together give your bone its overall strength,” says Boyd. “Those struts or beams are what we lose in spaceflight.” Once these microscopic tissues called trabeculae are gone, you can't rebuild them, but you can strengthen the remaining ones, he says. The researchers found the remaining bone thickened upon return to Earth's gravity.

“With longer spaceflight, we can expect bigger bone loss and probably a bigger problem with recovery,” says physiologist Laurence Vico of the University of Saint-Étienne in France, who was not part of the study. That's especially concerning given that a crewed future mission to, say, Mars would last at least two years. She adds that space agencies should also consider other bone health measures, such as nutrition, to reduce bone absorption and increase bone formation. “It's probably a cocktail of countermeasures that we will have to find,” Vico says.

Gabel, Boyd and their colleagues hope to gain insight on how spending more than seven months in space affects bones. They are part of a planned NASA project to study the effects of a year in space on more than a dozen body systems. “We really hope that people hit a plateau, that they stop losing bone after a while,” says Boyd.

<https://www.sciencenews.org/article/space-bone-loss-density-astronaut-recovery-gravity> (改変あり)

Liz Kruesi, Science News, June 30, 2022.
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注 astronaut: 宇宙飛行士	tibia: 脛骨	radius: 橈骨
shinbone: むこうずねの骨	a whole bunch of: 大量の～	strut: 支柱
beam: 梁	trabecula: 小柱	physiologist: 生理学者
crewed: 有人の	hit a plateau: 下げ止まる	

問 1. Fill in the blank for (あ) with the expression that best fits the context within the article. Write the number of your answer in [19].

- (1) against (2) pulled by (3) under (4) without

問 2. Choose the meaning of the underlined word “alleviate” that best fits the context within the article. Write the number of your answer in [20].

- (1) accelerate (2) enhance (3) relieve (4) reverse

問 3. Which of the following is the closest to what is stated in the article? Write the number of your answer in [21].

- (1) If spaceflight is shorter than six months, there is no difference between preflight and postflight bone strength levels.
- (2) If spaceflight is six months or longer, the degree of loss of bone strength depends on whether or not the bone is weight-bearing.
- (3) It takes the same period of time as the time spent in space for the bone strength lost during spaceflight to recover after returning.
- (4) When spaceflight is longer than six months, bone strength decreases but recovers to preflight levels a year after returning.

問 4. Which of the following issues is mentioned in the article as a possible future consideration for extended space exploration? Write the number of your answer in [22].

- (1) age structure of the team
- (2) appropriate duration of spaceflight
- (3) bone strength required for space missions
- (4) proper dietary intake

この後の第5問と第6問は記述用解答用紙に解答しなさい。

第5問 次の英文を読み、後の問いに答えなさい。

New York researchers transplanted pig hearts into two brain-dead people over the last month, the latest in a string of developments in the long quest to one day save human lives with animal organs.

The experiments announced Tuesday come after a historic but failed attempt earlier this year to use a pig's heart to save a dying Maryland man — sort of a rehearsal before scientists try again in the living.

Among the lessons: Practice with the deceased (brain-dead recipients) is important.

【 あ 】

“We learned so much from the first one that the second one is much better,” said Dr. Nader Moazami, who led the operations at NYU Langone Health. “You stand there in awe” when the pig heart starts to beat in a human body.

This time around, Moazami's team mimicked how heart transplants routinely are done. Once last month and once last week, researchers traveled to a facility housing genetically modified pigs, removed the needed hearts, put them on ice and flew them hundreds of miles back to New York.

They used special new methods to check for any worrisome animal viruses before sewing the heart into the chest of each deceased recipient — a Vietnam veteran from Pennsylvania with a long history of heart disease and a New York woman who'd benefited from a transplant earlier in life.

【 い 】

Already the Food and Drug Administration is considering whether to allow a small number of Americans who need a new organ to volunteer for rigorous studies of either pig hearts or kidneys. NYU Langone is among three transplant centers planning trials — and has a meeting planned with the FDA in August to discuss requirements.

Testing in the deceased could help fine-tune how the first trials in the living are designed, said Dr. David Klassen of the United Network for Organ Sharing, which oversees the nation's transplant system.

“They serve as an important sort of stepping stone,” said Klassen, who wonders if researchers next might consider tracking the organs for a week or so in a donated body rather than just three days.

【 う 】

Animal-to-human transplants, what scientists call xenotransplantation, have been tried for decades without success, as people's immune systems almost instantly attacked the foreign tissue. Now, pigs are being genetically modified so their organs are more human-like — increasing hope that they might one day help fill a shortage of donated organs. More than 100,000 people are on the national waiting list for a transplant, and thousands die every year before their turn comes.

The most ambitious attempt so far came in January, when doctors at the University of Maryland Medical Center transplanted a pig heart into a dying 57-year-old. David Bennett survived for two months, evidence that xenotransplantation was at least possible. But initial testing missed that the organ harbored an animal virus. What caused Bennett’s new heart to fail and whether that virus played any role still isn’t known, the Maryland researchers recently reported in the *New England Journal of Medicine*.

【 え 】

Months earlier, the NYU team and researchers at the University of Alabama at Birmingham separately were testing pig kidney transplants in the deceased, people who’d donated their bodies for science.

NYU’s recent heart experiments will add to the evidence as the FDA decides whether to allow formal studies in living patients.

But NYU Langone’s Dr. Robert Montgomery, a kidney transplant surgeon who received his own heart transplant, said continuing careful experiments in the deceased is critical to figuring out the best methods “in a setting where a person’s life isn’t at stake.”

【 お 】

«C) “This is not a one-and-done situation. This is going to be years of learning what’s important and what’s not important for this to work,” said Montgomery, who has a list of almost 50 people who’ve called desperate to volunteer for a pig kidney transplant.

The FDA hasn’t signaled how soon it might decide whether to allow such studies. At a recent two-day public meeting, the agency’s scientific advisers said it was time to try despite a long list of questions. They include how best to modify the pigs, as several biotech companies — including Revivicor, which supplied the NYU organs — are pursuing different options.

【 か 】

It’s not even clear which organ to attempt first in a clinical trial. If a pig kidney fails, the patient can always survive on dialysis. Yet some of the FDA’s advisers said starting with the heart might be better. Experiments with pig kidneys in deceased humans showed the organs produced urine. But still unknown is whether pig kidneys do another important job — processing medications — the same way human kidneys do.

<https://www.timesofisrael.com/scientists-put-pig-hearts-in-brain-dead-people-in-bid-to-improve-odds-for-the-living/> (改変あり)

注 deceased: 死者

mimic: ～を真似る

veteran: 退役軍人

the Food and Drug Administration: 米国食品医薬品局

kidney: 腎臓

oversee: ～を監督する

stepping stone: 足がかり

xenotransplantation: 異種移植

harbor: ～の住みかとなる

one-and-done: 一回で終わりの

dialysis: 人工透析

urine: 尿

medication: 薬物

問 1. 下線部《A》の遺伝子改変の目的について述べた以下の文が完成するよう、本文の内容に即して空欄を日本語で埋めなさい。

豚の ことで、移植を受けた人の ことを防ぐため。

問 2. 本文の内容に即し、下線部《B》の研究で移植の候補となっている 2 つの臓器のうち、腎臓を選んだ場合の良い点と悪い点を述べなさい。

問 3. 下線部《C》を日本語に訳しなさい。ただし、固有名詞はアルファベットでつづってよい。

問 4. 次の段落は本文のどの位置に置くのが最も適切か、【あ】～【か】の記号で答えなさい。

Then came three days of more intense testing than living patients could tolerate — including frequent biopsies of the organ — before doctors disconnected life support.

注 biopsy: 生体組織検査

第6問 次の英文を読み、下線部 (1) ~ (3) の日本語の内容を英語にしなさい。

Walking over water might sound like a miracle. In fact, people do it all the time. How? Almost all of the world's liquid freshwater lies underground. This stash beneath our feet is called groundwater.

Earth is a water planet, but most of its H₂O is in the oceans. Only about 2.5 percent of the planet's water is freshwater. Of that, nearly 69 percent is frozen in glaciers and ice caps. About 30 percent is groundwater — much more than the meager 1.2 percent that flows through rivers and fills lakes.

Groundwater is found almost everywhere on Earth. It lurks under mountains, plains and even deserts. Tiny gaps between rocks and soil grains soak up and hold this water like a sponge, forming buried bodies of water called aquifers.

Groundwater is a key part of Earth's water cycle. Rain and melted snow seep down into the ground. There, the water can stay for thousands of years. Some groundwater naturally leaks out onto Earth's surface through springs. It also feeds into lakes, rivers and wetlands. People extract groundwater through wells for drinking, sanitation, watering crops and other uses.

In fact, people extract more than 200 times as much groundwater from Earth as oil every year. Most groundwater is used to water crops. (1) しかしこの水は、アメリカ合衆国の人口の半分を含めて、世界中のおよそ 20 億人の渴きを癒やしてもいる。

As human-caused climate change dries out parts of the planet, demand for groundwater may rise. At the same time, climate change may intensify storms. Heavier rains are more likely to rush straight into streams and storm drains than soak into soil. So, there may be less groundwater to go around. Many of the world's aquifers already seem to be drying up. Twenty-one of Earth's 37 biggest aquifers are shrinking, satellite data show. The most dried-out aquifers are near big cities, farms or arid regions. (2) 地下水の貯蔵が少なくなると、川や小川に補充される水が少なくなり、淡水生態系を脅かすことになる。 In California, sucking the ground dry may even be triggering small earthquakes.

Meanwhile, human activity pollutes groundwater in many places. Arsenic from farming or mining seeps into aquifers. So do chemicals that are injected underground to flush out oil or gas in a process called fracking. Electronic waste from discarded devices and sewage have also tainted groundwater. What can be done? (3) 汚染を減らすことや地下水を浄化する新たな方法を発見することは、この貴重な資源を保護する助けになるかもしれない。

<https://www.sciencenewsforstudents.org/article/lets-learn-about-earths-secret-stash-of-underground-water> (改変あり)

Maria Temming, Science News, March 15, 2022.
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注 stash: 隠れている物

meager: わずか

lurk: 潜む

soil grain: 土粒子

aquifer: 帯水層

seep: 浸透する

storm drain: 雨水管

arid: 乾燥した

arsenic: ヒ素

fracking: 水圧破砕法

taint: ~を汚染する