

リスニング問題音声配信について

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※最新版

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リーディング 第1回

時間 80分

100点 満点

- 1 解答にあたっては、実際に試験を受けるつもりで、時間を厳守し真剣に取りくむこと。
- 2 巻末にマークシートをつけてあるので、切り離しのうえ練習用として利用すること。
- 3 解答終了後には、自己採点により学力チェックを行い、別冊の解答・解説をじっくり読んで、弱点補強、知識や考え方の整理などに努めること。

※「リーディング」問題構成について

2022年に大学入試センターにて実施された「2025年度大学入学共通テスト試作問題モニター調査」では、大問数が第8問構成へと変更されています。ただしこの問題構成はモニター調査で必要な情報を収集するために構成したもので、本番に向けて問題構成は今後も引き続き検討をするとの付記があります。この問題集では新しい第8問構成の問題（第5回）とこれまで通りの第6問構成の問題（第1～4回）の両パターンの問題を収録しています。

英語（リーディング）

各大問の英文や図表を読み、解答番号 ～ にあてはまるものとして最も適当な選択肢を選びなさい。

第1問（配点 10）

A Your classmate Irene has sent a text message to the group chat of an upcoming musical.

Hello, members!

Thank you for joining us in the production of our musical for the upcoming school festival in fall. About the casting, we have decided to hold auditions for the following popular roles. Please check the date, time, and location, and leave a message in this chat if you would like to apply. You may also send me a private message.

Anne, April 26, 12:20 p.m. in room C302

Eliza, April 28, 12:20 p.m. in room C310

Olag, May 1, 4:00 p.m. in the audio-visual room in Building A

Christopher, May 1, 3:50 p.m. at the gym in Building D

We would like to see singing and dancing for Anne and Eliza, simple acting for Olag, and simple acting and physical ability for Christopher. For the role of Olag, we would like someone with a charming and cheerful personality. If you have any special skills, please write them in your application message.

We look forward to receiving lots of applications!

問1 According to the schedule, you cannot attend the auditions for both .

- ① Anne and Eliza
- ② Anne and Olag
- ③ Christopher and Olag
- ④ Eliza and Olag

問2 If you really want to win the role of Olag, you should .

- ① put on a funny act to make the judges laugh
- ② send a personal message that you've taken singing lessons for six years
- ③ show the judges how elegantly you can dance
- ④ tell people in this group chat that you are tall and can do a backflip

B You are planning to see the major summer festivals in Tohoku, including Nebuta in Aomori. You are looking at the website of a travel agency.

Tohoku Great Summer Festivals Tour from Tokyo

Aomori Nebuta Festival + Akita Kanto Festival

2 nights & 3 days for just 49,800 yen!!

Enjoy the two major summer festivals in Tohoku. Aomori Nebuta Festival, Akita Kanto Festival and beautiful Tohoku sightseeing spots are all packed into three days! Experience the energy of each festival! The tour will also take you to Lake Tazawa, home to the statue of Princess Tatsuko, and many other attractive sightseeing spots in Tohoku.

Day	Schedule	Meals included in the price
1	6:00 Depart from Tokyo terminal 16:30 Arrive at Aomori bus terminal Enjoy the night at the Aomori Nebuta Festival ~Stay at a hotel near Aomori Station~	breakfast: × lunch: ○ (Bento box in the bus) dinner: ×
2	7:30 Depart from Aomori Station 8:30 Arrive at Hirosaki Castle Enjoy sightseeing in Hirosaki city 13:00 Depart for Akita City 16:40 Arrive at Akita bus terminal Enjoy the night at the Akita Kanto Festival ~Stay at a hotel in Akita City~	breakfast: ○ lunch: ○ (in Hirosaki City) dinner: ×
3	8:30 Depart for Lake Tazawa Enjoy the beautiful lake 13:00 Depart for Tokyo 22:50 Arrive at Tokyo terminal	breakfast: ○ lunch: ○ (at Lake Tazawa) dinner: × (There'll be a 50-min break at the Gunma SA)

◇ All seats on the bus are reserved. There is no need to line up early at the bus stop, as seats are not determined on a first-come, first-served basis. You will always have the same seat during the tour. We do not accept any seat requests from passengers.

◇ The tour guide will accompany you on the tour of Hirosaki Castle and Lake Tazawa, but not on the night festivals on Day 1 and Day 2.

◇ Day 1 and Day 2, you will be free to explore the city upon arrival. For this reason, dinner is not included in the price for both days. We do not serve any alcohol with meals.

◇ Dinner for Day 3 is not included in the price, but we will have a stop at Gunma Service Area on the way back. Toilet facilities are also available near the rear seats of the bus.

問1 If you leave Tokyo on August 5, you will be at noon of August 7.

- ① arriving at Tokyo Terminal
- ② enjoying the Kanto Festival
- ③ having lunch in Hirosaki City
- ④ walking around a beautiful lake

問2 Which of the following is included in the price?

- ① A beer at the souvenir shop in Lake Tazawa
- ② The bento box on the bus to Aomori
- ③ The breakfast for Day 1 and Day 2
- ④ Yakisoba noodles eaten at a stall during the Nebuta Festival

問3 Which of the following is appropriate based on what you learn from the website?

- ① If you get injured during the Akita Kanto Festival, you can ask the tour guide to help you.
- ② If you want to get a good seat on the bus, you should get in line early.
- ③ There will be plenty of time to pick up souvenirs if you don't have dinner at the Gunma SA on the way back.
- ④ You will have a breakfast break on the way to Aomori.

第2問 (配点 20)

A You are attending an educational programme held at the Institute for Research on Learning in the UK. You are reading the information about the programme and the Institute's facilities.

Institute for Research on Learning

Monday - Friday: 9 am - 9 pm

Entrance Pass: When visiting the institute, please print out the entrance pass attached to the welcome email in A4 size and in colour and bring it to the institute.

Study Counselling

We support you in your quest to become a globally competent person. Develop your likes, strengths, interests and concerns, and maximise your ability to be active in the world. Counselling is offered, from 10 am to 8 pm in the Interview Area to the right of the ground floor entrance, to find out what topics interest you and work on exercises to give shape to your ideas.

Learning Records

You are required to write a *Learning Record* for every visit to the Institute, so that you can record what you learnt that day. The form can be found in the Study Areas on the second and third floors. Staff with expertise in many fields are available for 20 to 60 minutes a day to conduct lessons designed for you so take advantage of this when filling in the form.

Facility Information

You are required to show your entrance pass when visiting the institute. Wi-Fi access is available on all floors. The password that you need will be given to you when you arrive at the institute. The Computer Areas are located on the first floor on the left and on the second floor and are available all day.

Comments from Past Students

- This programme is so awesome. It gives you an idea as to how your studying contributes to society, regardless of your school grades.
- Taking lessons is easier in the morning or during the day, and lessons are crowded in the evening. The racks for learning record forms on the second floor are crowded, so you should get them on the third floor.
- There is a library of about 20,000 books so research work is never a problem. You can't bring in food, but bottled drinks are allowed.
- The building has calm background music and lots of plants, so just being there is relaxing. It is a headache to have to get an entrance pass every time you use the photocopier, though.
- The photocopier located next to the Interview Area is free to use, so you can photocopy the pages you need in any book. Some books can be borrowed, others cannot.

問1 are two things you can do at the institute.

- A : bring your own food and eat it in the library
- B : get an entry pass on the ground floor
- C : receive counselling in the Study Area
- D : research on your area of interest
- E : use a photocopier to copy parts of books

- ① A and B
- ② B and C
- ③ C and D
- ④ C and E
- ⑤ D and E

問2 You are now in the Computer Area on the first floor and want to get a learning record form. You can to get one.

- ① go down one floor
- ② go up two floors
- ③ go up three floors
- ④ stay on the same floor

問3 is right next to where the photocopier is located.

- ① One of the Computer Areas
- ② One of the Study Areas
- ③ The Interview Area
- ④ The Wi-Fi base station

問4 If you want a 50-minute lesson and want to avoid the crowds, you could

9 .

- ① start your lesson no later than 3:00 pm
- ② start your lesson no later than 7:10 pm
- ③ take your lesson 25 minutes in the morning and 25 minutes in the evening
- ④ take your lesson 30 minutes during the day and 20 minutes in the evening

問5 One fact stated by a previous student is that 10 .

- ① the entrance pass can be printed out in colour in the Computer Area
- ② the institute has a collection of less than 30,000 books
- ③ the institute's calm music helps heal students' headaches from long studying hours
- ④ the learning record forms are easier to get on the third floor

B You are the editor of your school's English language newspaper. Bill, an exchange student from the U.S., has written an article for the newspaper.

The history of school lunches in Japan dates back to the Meiji era, but it was not until after World War II that it made the most progress. In the late 1940s, *koppepan*, or hot dog buns, and skimmed milk powder became a major part of the school lunch menu. The Japanese diet changed dramatically when bread, made from wheat imported from the United States, began to be eaten throughout the country.

As Japanese society became more affluent in the 1960s, fried bread, raisin bread and soft noodles, or soupless udon noodles topped with curry or meat sauce, were added to the school lunch menu. Around that time, skimmed milk powder, which wasn't popular among children, was replaced by milk. These newly added food items helped to enrich the variety of school lunches.

Eventually, in the 1980s, rice became the staple food of school lunches as it was served more than bread, and since then the school lunch menu has become even more diverse.

In a survey conducted in 2020, people in their 20s to 50s were asked, "What is your favorite food on the school lunch menu that you ate as a child?" The following are the top four food items mentioned by the four generations, extracted from their answers to that question.

- ▶50s—1. fried bread 2. curry rice 3. soft noodles 4. deep-fried whale
- ▶40s—1. curry rice 2. fried bread 3. soft noodles 4. frozen mandarin oranges
- ▶30s—1. curry rice 2. fried bread 3. soft noodles 4. seaweed rice
- ▶20s—1. fried bread 2. curry rice 3. fried chicken 4. seaweed rice

In the latter part of the 1980s, commercial whaling was prohibited and deep-fried whale disappeared from school lunches, but before then it had been among children's favorite lunch menu items. Similarly, soft noodles were quite popular among people in their 30s through 50s. They stopped being served at school lunches sometime in the 1990s, so the youngest generation didn't know how they tasted.

問1 According to Bill's article, which of the following food items are NOT currently on the Japanese school lunch menu?

- ① Curry rice, fried bread, soft noodles, and seaweed rice
- ② Deep-fried whale, frozen mandarin oranges, and milk
- ③ Fried bread, soft noodles, and skimmed milk powder
- ④ *Koppepan*, fried bread, and raisin bread
- ⑤ Skimmed milk powder, deep-fried whale, and soft noodles
- ⑥ Soft noodles, fried bread, and seaweed rice

問2 According to Bill, which of the following events was a part of the most significant change in the history of Japanese school lunches?

- ① A variety of bread and noodles were added to the school lunch menu.
- ② *Koppepan* appeared on the school lunch menu.
- ③ Rice became a staple food of the school lunch.
- ④ Skimmed milk powder was replaced by milk.

問3 Which of the following statements about the difference between the generations is correct?

- ① Curry rice is the most popular food at school among people in their 30s or older.
- ② People in their 20s didn't eat soft noodles at school.
- ③ People in their 30s and 40s ate seaweed rice lunches.
- ④ People in their 30s were the last generation that ate whale meat at school.

問4 Which of the following statements is true about Bill's article about Japanese school lunches?

- ① As Japan became affluent, school lunches became more varied.
- ② Bread and rice are both equally important food items for school lunches.
- ③ Eating whale meat should not be banned for any cultural reasons.
- ④ Soft noodles should be revived because they were so popular and tasty.

問5 Which is the most suitable title for the article?

- ① Do the Japanese Love Their School Lunches?
- ② How Has School Lunch Evolved in Japan?
- ③ What Is the Japanese School Lunch Like?
- ④ Why Has Bread Become So Popular in Japan?

第3問 (配点 15)

A You are interested in the sewage system. You are reading a blog post by a university student in the UK studying engineering.

Michael Wilson

I am interested in sewage. I know I have a strange hobby, but I think it's an interesting one. I recently attended an event called the Sewage Disposal Works Exhibition held in London with a friend of mine.

We first visited the booth of a company that manufactures manholes. I once slipped on a manhole while riding my bicycle. We were impressed to see that manholes nowadays are non-slip and have various designs including local ones.

Next, we listened to a presentation on attempts to repair sewer lines efficiently with digital technology. I thought this technology would be more useful if combined with AI and robotics in the future. Though I found the presentation interesting, the way the presenter spoke was somewhat monotonous and my friend did not seem to be interested.

Finally, we experienced a virtual reality system where we could see a sewage construction site. Wearing special goggles, we felt like we were actually there at the site.

After lunch, we stopped at a gift shop to buy some unique biscuits in the shape of sewage pipes. We were planning to buy five for each of us and give them as souvenirs to our friends. However, they were so popular that we could buy only one per person, much to our disappointment.

Various other new technologies were also introduced at the exhibition, which reminded us that sewage is an important infrastructure that is also related to problems such as heavy rains caused by global warming. We enjoyed the exhibition very much.

問1 According to Michael's blog, you know that both he and his friend 16.

- ① felt the construction site seen through the goggles was very real
- ② found the presentation on digital technology boring
- ③ thought manholes nowadays to be monotonous
- ④ were able to buy as many biscuits as they had planned

問2 Michael and his friend thought that 17.

- ① the digital technology was of little use in sewage repairs
- ② the manholes still need to improve because they are slippery
- ③ the presenter made the presentation well
- ④ the sewage system had to do with environmental problems

B You are planning to visit the UK this summer and have found an interesting article introducing day trip destinations from London in a travel magazine.

Best Day Trips from London

by Daniel Johnson

London is known around the world as a metropolis full of tourist attractions. However, there are many other attractive cities around this gigantic one. I recommend you visit the following tourist places: Oxford, Bath, and Liverpool.

Oxford: This city is home to 40 old and historic universities. A particularly famous tourist attraction is "Christ Church College," founded in 1546. Its dining hall, "the Great Hall," was used as a filming location for the Harry Potter movies. Oxford is also home to "The Bodleian Library," which boasts a collection of more than 7 million volumes. "St. Mary's Church," located in the centre of the Oxford colleges, is famous for its beautiful stained-glass windows. The church's observation deck overlooks this beautiful city.



Bath: The whole city of Bath is listed as a World Heritage site for its historical and architectural values. The biggest tourist attraction is "The Roman Baths." This ancient public bath was built by the Romans about 2,000 years ago. Also worth visiting is "Bath Abbey," a Gothic church. You will see beautiful arches and stained glass inside the church. "The Royal Crescent," today used as a luxury hotel, was built between 1767 and 1774. The entire building was originally made up of 30 houses laid out in a curve.

Liverpool: This city in northwest England is known as the birthplace of the Beatles. Even today, their fans come from all over the world. "The Beatles Story" is a museum dedicated to the Beatles, where visitors can see photographs and rare items of the most important rock band in history. Tourists can also visit the café "Penny Lane," which appears in the lyrics of the Beatles' songs, and the nightclub "The Cavern Club," where the four young musicians played live in the 1960s. The club first opened in 1957.

These three cities can be reached by train from London. For example, about an

hour train ride will take you to Oxford, and it will take about an hour and twenty minutes to get to Bath. Liverpool can be reached by train in a little over two hours. Yet, there is another means of transport called "Coach." This long-distance bus service connects prominent cities such as these throughout the UK. It takes more than two hours to get to Oxford by coach, but the fare is much lower.

問1 Put the following sightseeing spots (①~④) in the order they were built.

18 → 19 → 20 → 21

- ① Christ Church College
- ② The Roman Baths
- ③ The Royal Crescent
- ④ The Cavern Club

問2 Which building has a fine view of the whole city? 22

- ① Bath Abbey
- ② Christ Church College
- ③ St. Mary's Church
- ④ The Royal Crescent

問3 Which of the following statements is true about transport from London?

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- ① It takes an hour and a half to get to Oxford from London by train.
- ② Travelling by coach is more expensive than using the train.
- ③ You can get to Liverpool in one hour and a half by train.
- ④ You can get to Oxford, Bath or Liverpool by taking a coach.

第4問 (配点 16)

You are a new student at Garvard University in the US. You are reading the blogs of two students, Luis and Gerald, and you are reading them to find useful information.

Having trouble starting your first year at Garvard University?

Posted by Luis at 3:00 a.m. on September 1st, 2024

Are you excited about starting your very first university year? There are lots of new things you can do, whether joining a new club, applying for an internship, but most importantly going to the gym and gaining muscle. University years are the best time in life to do so. But before taking your first step to the gym, you may wonder what to buy to start your long journey into bodybuilding or fitness successfully. Not to worry as there is a store that has all the products you need. The store is called Gymgear. Although they do not sell online and there are no shipping options, their wide selection of products attracts many students of gym goers from beginner to advanced every day. Here are some items worth checking out especially for beginners.

Recommended items at Gymgear		
	Protein Powder (1kg) \$80	EAA (0.5kg) \$55
		
Wrist wraps \$55	Weight belt \$110	Knee wraps \$60

<https://gymgear.web>

I would like to mention that the gym equipment items above are not mandatory but if you want to gain muscle efficiently and avoid injury, I highly recommend you buy them. You won't regret it!

Welcome to Garvard University!

Posted by Gerald at 1:00 a.m. on September 13th, 2024

To the new freshman eagerly waiting to start his/her university life at Garvard University, I would like to say, welcome! There are many different activities you can do in the university, but my top choice is going to the gym.

You're going to be here for four years, so why not gain muscle as much as possible before graduating and entering the workforce? I heard that once you start working, it is difficult to gain muscle as you have to wake up everyday early in a punctual manner and work under stress daily. The great thing about university life is that you're in a stress-free environment and you have the freedom to plan your daily life. The downside is that you're always on a budget. My struggle when I first started working out was that I bought whatever I needed at one shop. A year or two later, I found there were multiple options that were cheaper. I wish I had compared the prices before purchasing.

I found a site called savemoneyforgymtools.com, which was very useful for comparing the prices of different e-shops. Let's look at the site's table and compare the prices of the popular products from the 3 sites.

Item	Monster Gear.com	Bomb Muscle.com	All Hard.com
Protein Powder (1kg)	\$70	\$60	\$45
EAA(0.5kg)	\$55	\$60	\$65
Wrist Wraps	\$45	\$50	\$55
Weight Belt	\$120	\$135	\$125
Knee Wraps	\$48	\$50	\$45

<https://savemoneyforgymtools.com>

Monster Gear and Bomb Muscle has an optional annual membership, with discounts and free shipping. Monster Gear's membership fee is \$80 per year with a 20-dollar discount for every item price. Bomb Muscle's membership fee is \$100 per year with a 10-dollar discount for every item price. You cannot cancel the membership during the year. Without joining the membership, the shipping cost for both sites are \$30 per item. As for All Hard.com, they do not offer membership and the shipping cost is \$20 per item.

問1 Luis recommends buying from Gymgear because .

- ① it has a wide variety of items for gym goers of all levels
- ② it offers discounts for university students
- ③ it will help with the store's reputation
- ④ the items are necessary for gym exercise

問2 Gerald believes it's better to buy .

- ① all your items from one shop
- ② items from stores with membership discounts
- ③ items online as it saves time
- ④ the cheapest items from several options

問3 Both Luis and Gerald think that .

- ① buying gym items is important, especially if you are a beginner
- ② it is best to start training before graduating from university
- ③ it is important to choose the cheapest option when buying gym items
- ④ purchasing gym equipment is important for gaining muscle in the least amount of time

問4 You are planning to buy a weight belt but since it is heavy, you would like for it to be shipped to your house. Without joining any membership, the cheapest option with shipping cost included is buying from .

- ① All Hard.com
- ② Bomb Muscle.com
- ③ Gymgear
- ④ Monster Gear.com

問5 Without joining any membership, the cheapest option to buy only a single order of 1kg protein powder is buying from . With the membership fees and free shipping taken into consideration, the cheapest option to buy 1kg of protein powder once every 2 months for a year is buying from .

- ① All Hard.com
- ② Bomb Muscle.com
- ③ Gymgear
- ④ Monster Gear.com

第5問 (配点 15)

Your group is preparing a poster presentation of "The Man Who Spread Potatoes" using information from the magazine article below.

Antoine-Augustin Parmentier was born in 1737 in a small town called Montdidier in northern France. He was a pharmacist by profession, but also an agronomist and nutritionist. He is credited with several accomplishments, the most prominent of which is the promotion of the potato in France and Europe.

Below is the story of how he became a potato advocate and how he promoted the potato. While serving as a pharmacist in the French army during the Seven Years' War (1756-1763), he was taken prisoner by the Prussian army. While in prison in Prussia (now Germany), he was forced to eat potatoes, which were known only as pig feed to the French. Potatoes were brought to Europe from South America by the Spanish around the 16th century; by 1640 they had been introduced to the rest of Europe, but outside of Ireland they were generally used only as livestock feed. King Frederick II of Prussia (1712-1786), who had noticed that the potato could grow even in cold, barren lands, required farmers to cultivate it under strict penalties.

In France, on the other hand, potatoes were thought to cause disease, and in 1748 the cultivation of potatoes was even banned. After returning to Paris in 1763, Parmentier conducted nutritional research on the potato; following famines in 1769 and 1770, a contest was held in 1771 with a prize for a food that would be useful in the event of a famine. Parmentier proposed the use of potatoes and won the prize in 1773. Also, thanks to his efforts, the medical faculty of the University of Paris approved the potato for human consumption in 1772. However, resistance to potatoes still continued, and he experienced hardships, including being forbidden to use the test farm at the hospital where he worked as a pharmacist and being prevented from taking the post he had hoped for at the hospital, but still, he never gave up.

Parmentier's way of promoting the potato was unique. First, he did so by inviting celebrities to dinner parties, serving potato dishes, and presenting bouquets of potatoes to the king and queen. The most interesting way was to have soldiers guard the potato fields during the day to make people believe that they were growing a valuable crop, and then have them pulled out at night to let people steal them. The year 1785 was a bad harvest year, but the potatoes helped northern France escape famine. This was the beginning of the spread of the potato in France.

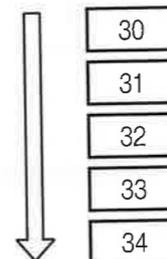
Today, Parmentier's name remains among us in two forms. One is that many potato dishes are named in honor of him, such as Hachis parmentier, a French home-style dish of minced beef and potatoes. Another is that the Paris metro has a station called Parmentier to commemorate his achievements. On the platform of this station stands a statue of him handing out potatoes to farmers.

From the end of the 17th century to the 19th century, not only Europe but the entire globe was in a period of unusually low temperatures. The potato, which could be grown even in barren and cold areas, saved many people from starvation. It can be said that Parmentier's success in eliminating people's prejudice against the potato was a great achievement.

Your presentation notes:

The Man Who Spread Potatoes

■ Sequence of Key Events



■ Potatoes in Europe before Parmentier

• They were brought from South America by the Spanish around the 16th century.

•

■ Parmentier and potatoes

•

•

⇒ He succeeded in getting rid of Europeans' bias toward potatoes.

■ Parmentier's personality

Parmentier's personality can be described as : .

問1 Members of your group listed important events related to Parmentier's life. Put the events into the boxes ~ in the order that they happened.

- ① Cultivation of potatoes was prohibited in France.
- ② Parmentier was given a prize for his proposal.
- ③ Parmentier was made to eat potatoes as a prisoner.
- ④ Parmentier returned from Prussia to France.
- ⑤ The University of Paris declared potatoes to be good for human consumption.

問2 Choose the best item for .

- ① Potatoes were generally not used for human consumption.
- ② Potatoes became popular soon after they were introduced.
- ③ Potatoes were prohibited from being grown by the King of Prussia.
- ④ Potatoes were regarded as pig feed by the Irish people.

問3 Choose the best items for · . (The order does not matter.)

- ① He gave the French king and queen the flowers of potatoes.
- ② He gave the name Parmentier to the dishes he created.
- ③ He had citizens steal the potatoes to spread them.
- ④ He invited ordinary people to dinner parties to serve potatoes.
- ⑤ He threatened people to grow potatoes under strict penalties.

問4 Choose the best item for .

- ① ambitious and strict
- ② cheerful and friendly
- ③ conservative and gentle
- ④ ingenious and strong-willed

第6問 (配点 24)

A Your study group is learning about how "decisions are made." You have found an article you want to share. Complete the summary notes for your next meeting.

Brain Makes Decisions Before You Even Know It

Your brain makes up its mind up to ten seconds before you realize it, according to researchers. By looking at brain activity while making a decision, the researchers could predict what choice people would make before they themselves were even aware of having made a decision. The work calls into question the 'consciousness' of our decisions and may even challenge ideas about how 'free' we are to make a choice at a particular point in time.

"We think our decisions are conscious, but these data show that consciousness is just the tip of the iceberg," says John-Dylan Haynes, a neuroscientist at the Max Planck Institute in Germany, who led the study. "The results are quite dramatic," says Frank Tong, a neuroscientist at Vanderbilt University. Ten seconds is "a lifetime" in terms of brain activity, he adds.

Haynes and his colleagues imaged the brains of 14 volunteers while they performed a decision-making task. The volunteers were asked to press one of two buttons when they felt the urge to. Each button was operated by a different hand. At the same time, a stream of letters was presented on a screen at half-second intervals, and the volunteers had to remember which letter was showing when they decided to press their button.

When the researchers analyzed the data, the earliest signal the team could pick up started seven seconds before the volunteers reported having made their decision. Because there is a delay of a few seconds in the imaging, this means that the brain activity could have begun as much as ten seconds before the conscious decision. The signal came from a region called the frontopolar cortex, at the front of the brain, immediately behind the forehead. This area may well be the brain region where decisions are initiated, says Haynes, who reports the results online in *Nature Neuroscience*.

The next step is to speed up the data analysis to allow the team to predict people's choices as their brains are making them. The results build on some well-known work on free will done in the 1980s by the late neurophysiologist Benjamin

Libet, then at the University of California, San Francisco. Libet used a similar experimental set-up to Haynes, but with just one button and measuring electrical activity in his subjects' brains. He found that the regions responsible for movement reacted a few hundred milliseconds before a conscious decision was made.

But Libet's study has been criticized in the intervening decades for its method of measuring time, and because the brain response might merely have been a general preparation for movement, rather than activity relating to a specific decision. Haynes and his team improved the method by asking people to choose between two alternatives — left and right. Because moving the left and right hands generates distinct brain signals, the researchers could show that activity genuinely reflected one of the two decisions.

But the experiment could limit how 'free' people's choices really are, says Chris Frith, who studies consciousness at University College London. Although subjects are free to choose when and which button to press, the experimental set-up restricts them to only these actions and nothing more, he says. "The subjects hand over their freedom to the experimenter when they agree to enter the scanner," he says. What might this mean, then, for the unclear concept of free will? If choices really are being made several seconds ahead of awareness, "there's not much space for free will to operate", Haynes says.

But results aren't enough to convince Frith that free will is an illusion. "We already know our decisions can be unconsciously controlled," he says. The brain activity could be part of this control, as opposed to the decision process, he adds.

Part of the problem is defining what we mean by 'free will'. But results such as these might help us settle on a definition. It is likely that "neuroscience will alter what we mean by free will", says Tong.

Your summary notes:

Brain Makes Decisions Before You Even Know It

Vocabulary

consciousness: things you are aware of

frontopolar cortex:

The Main Points

- Research is needed to find out whether the will is truly free when people make decisions.
- A scientist says that in decision-making, consciousness is only a small factor.
- For the brain, ten seconds is as long as a human life, according to a neuroscientist.
- A series of experiments has shown that .
- People may make decisions out of unconscious habits before they make conscious decisions.

Interesting Details

- In his experiment, Haynes had volunteers press buttons on their left and right hands in order to .
- Tong thinks neuroscience will change the definition of ''.

問1 Choose the best option for .

- ① immediately behind the brain
- ② the front of the forehead
- ③ the most forward part of the brain
- ④ the signal from the cortex

問2 Choose the best option for .

- ① human hand responses are based on the signals delivered from the brain
- ② unlike your conscious mind, your brain makes decisions in hundreds of milliseconds
- ③ when there is awareness of a decision to do something, the brain evaluates many options before choosing one
- ④ your brain has already made the decision before you are even aware that you have made any decision

問3 Choose the best option for .

- ① confirm that brain responses are linked to specific conscious decision-making
- ② demonstrate that the speed of the brain response differs by the hand being used
- ③ ensure that there is consciousness and subconsciousness in the human mind
- ④ show that hand movements can be separated from the workings of consciousness

問4 Choose the best options for .

- ① brain activity
- ② creativity
- ③ free will
- ④ illusion
- ⑤ sense of self

B You are in a student group preparing a poster for a scientific presentation with the theme "What we should do to improve our health." You have been using the following passage to create the poster.

Essential Amino Acids

Protein is the essential building block of the human body. It is found throughout the bones, muscles, eyes, nails and even hair. Protein can be broken down into smaller substances called amino acids. Amino acids make up about 20% of the body and there are 20 types in total. Eleven of them are called non-essential amino acids and the rest are called essential amino acids (EAA). While our bodies can produce non-essential amino acids, this is not the case for EAA. The only way to obtain EAA is by eating food that contains them. Animal protein such as meat and soy products such as tofu and edamame are major sources of EAA. When food containing protein is consumed, the protein is broken down into amino acids.

Out of the essential amino acids, three of them are called leucine, isoleucine, and valine. They are characterized by a molecular structure in the form of branches and are called branched-chain amino acids (BCAA). BCAAs are popular among athletes as they have common functions in our bodies, which are muscle growth and recovery. When examined closely, however, there are certain differences in how they affect our body. For example, leucine has the ability to support making proteins within our bodies. Leucine consumption has been shown to improve liver function and balance blood sugar. It may also promote weight loss as leucine supplements have shown to increase leptin, a hormone that controls hunger cravings. Isoleucine has the same function as leucine in strengthening muscles, improving liver function and blood sugar control. Isoleucine, however, differs from leucine in that it helps build hemoglobin in the red blood cells, making it an important amino acid for blood loss recovery. Hemoglobin is a protein molecule that combines with oxygen and carries it throughout the body. Valine supports liver function and controls the amount of nitrogen in the blood. It is also said to

contribute to skin firmness, as it is one of the main compositions of elastin, which is a type of protein that strengthens the bonds of collagen in the skin. Lack of elastin may result in sagging skin.

Other EAAs excluding BCAAs also contribute greatly to the human body as well. Histidine is unique in that it is the only essential amino acid that can be generated by the body. However, it can only be done in adults and not in children. A study showed that taking histidine supplements can reduce body fat. Another research showed that the body uses histidine to create urocanic acid in the skin, a substance that absorbs UV rays from the sunlight, thus protecting the skin from damage. Threonine is known to prevent fat build-up in the liver. In addition, threonine contributes to stomach health as it is said to play a major role in producing a sticky liquid that protects the stomach. Phenylalanine is known to facilitate recovery from skin disorders, and it is the material for making dopamine, which contributes to physical and mental health. Because phenylalanine has the effect of raising blood pressure, it should not be taken in too large amounts. Methionine is unique in that it is the only EAA containing sulfur. Therefore, the human body requires methionine to create molecules that require sulfur. One example is a protein called keratin, the main component of hair. A study shows lack of methionine to cause hair loss. Tryptophan is an amino acid originally discovered from milk. The human body uses tryptophan to produce a substance called serotonin in the brain, which help us maintain mental health. When at night, the body makes melatonin from serotonin, which helps correct the body's sleep/wake cycle. Lysine, like tryptophan, is found in milk and contains about 2-10% of the body's protein. Some research suggests that lysine consumption helps the human body absorb more calcium. Also, both methionine and lysine are helpful material for burning fat as the body uses them to create carnitine, a substance that helps the body turn fat into energy.

The knowledge of each of the essential amino acids presented above is useful for faster recovery from the disorders caused by insufficient amino acids. When it comes to muscle building and maintenance, taking concentrated BCAAs is common

knowledge in the fitness industry. However, research has shown that EAAs allow the body to absorb BCAAs more efficiently, so taking EAAs all in one is gradually becoming the mainstream. Whether you are an athlete or not, learning about amino acids is highly beneficial to your physical and mental health.

Your presentation poster draft:

Essential Amino Acids

What are essential amino acids?

43

Types of essential amino acids and their functions

Type	Name	Functions
Non-BCAA	Threonine	Prevention of fat build-up in liver, contribution to stomach health as it helps produce a liquid that protects stomach
BCAA	44	Skin health maintenance, etc.
Non-BCAA	Tryptophan	45

Essential amino acids with common functions

46

47

問1 Under the first poster heading, your group wants to introduce the essential amino acids as explained in the passage. Which of the following is the most appropriate?

- ① They are certain types of protein that can only be obtained from soy products, each type contributing to health improvement in their own way.
- ② They are molecules that are made from 20 different types of protein and essential for muscle gaining and recovery.
- ③ They are smaller substances of protein that the human body cannot create on its own and must obtain from outside sources.
- ④ They are the 11 different types of protein molecules which the human body can make on its own.

問2 Choose the best options for · .

- ① Isoleucine
- ② Histidine
- ③ Phenylalanine
- ④ Valine

- ① Absorption of melatonin to create serotonin, which contributes to mental health and correct sleep/wake cycle
- ② Contribution in creating serotonin for good mental health and to carry melatonin throughout the body to correct sleep/wake cycle
- ③ Contribution in creating serotonin for good mental health, which is then changed to melatonin for correcting sleep/wake cycle
- ④ Removal of serotonin and melatonin for good mental health and correct sleep/wake cycle

問3 You are making statements about some essential amino acids which share common properties. According to the article, which two of the following are appropriate? (The order does not matter.) ·

- ① Both histidine and phenylalanine are proven to facilitate urocanic acid production.
- ② Both isoleucine and leucine help regulate blood sugar level.
- ③ Both lysine and methionine help the body store energy.
- ④ Taking isoleucine and leucine supports producing red blood cells.
- ⑤ Taking keratin and methionine may prevent hair loss.
- ⑥ When it comes to depression, taking phenylalanine and tryptophan is beneficial.