

- 3 次の文章を読んで、あとの各問に答えなさい。なお、[1]～[7]は段落の番号を表している。
(*印の付いている単語・語句には、本文のあとに〔注〕がある。)

- [1] Can we make a day longer than 24 hours? Yes, we can, but how?
- [2] To find the answer, let's first think about the next question. How do we know what time it is or how much time has passed? We can often know what time it is without a clock. For example, we may wake up or feel sleepy around the same time every day without checking a clock. Why can we do so? *According to scientists, humans and other animals have a circadian rhythm, a kind of body clock. The circadian rhythm *controls body *temperatures and *hormone levels, so we can know what time it is. In the early morning, our body temperatures start to go up and our melatonin levels start to go down. Melatonin is a hormone, and it helps us to sleep. In the late evening, our body temperatures start to go down and our melatonin levels start to go up. Because of this, we can wake up or sleep at about the same time every day.
- [3] We can know how many seconds or minutes have passed without using a clock. We have another body clock called an interval timing clock. It's like a stopwatch. Because of this body clock, we can know how many seconds or minutes have passed. Scientists have found that some animals also have an interval timing clock. The interval timing clock helps animals to survive in nature. They can find food and then come home quickly.
- [4] Because of these two kinds of body clocks, we can know what time it is and how many seconds or minutes have passed. However, why do we sometimes feel time passes faster or more slowly? Scientists did an *experiment to learn how our interval timing clock changes during the day. In ⁽¹⁾the experiment, people were asked to *count to 10 seconds without using a stopwatch. When they finished counting, the scientists recorded how many seconds actually passed. They did it at 9:00, 13:00, 17:00, 21:00, 1:00, 5:00, and at 9:00 the next day. Their *core body temperatures and melatonin levels were checked every one hour. The recorded time was longer than 10 seconds in the first two tests and became shorter *toward the evening. It became shorter as their core body temperatures went up and melatonin levels went down. In the late evening, their core body temperatures started to go down and their melatonin levels started to go up. The recorded time became longer toward the early morning as their core body temperatures went down and their melatonin levels went up. In the morning, they felt time passed . From the afternoon toward the evening, they felt time passed . This shows that our circadian rhythm *affects our interval timing clock.
- [5] How we spend time also affects our *sense of time. Why do we feel time passes more slowly? Let's take a look at an example. Some years ago, an airport in the United States

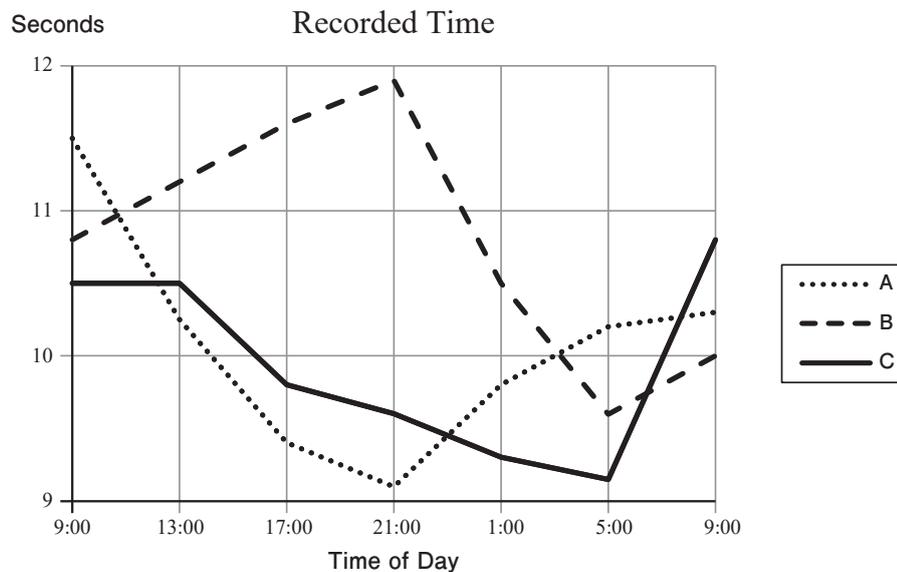
added staff at the *baggage claim to make *travelers less *stressed when they were waiting for their bags after arriving at the airport. The airport was able to reduce their waiting time, but travelers were not happy with that. Why was that? Though they were able to get their bags faster, they were standing and waiting for most of the time at the baggage claim. So ⁽³⁾ the airport tried something different. The airport moved the *arrival gates away from the baggage claim. Travelers walked to the baggage claim and only needed to wait two minutes. Travelers felt like the airport carried their bags to them quickly. The airport gave them something to do during the waiting time without making it shorter. When we do nothing special and just check our watch to know how many minutes have passed, we feel time passes more slowly.

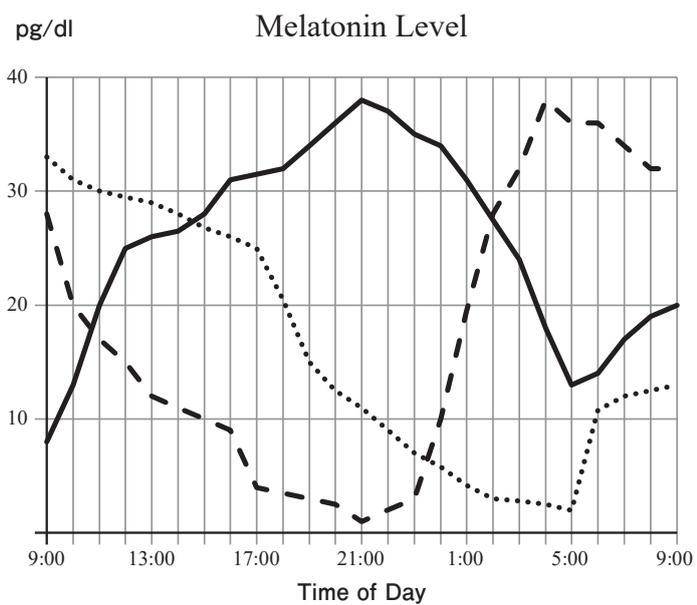
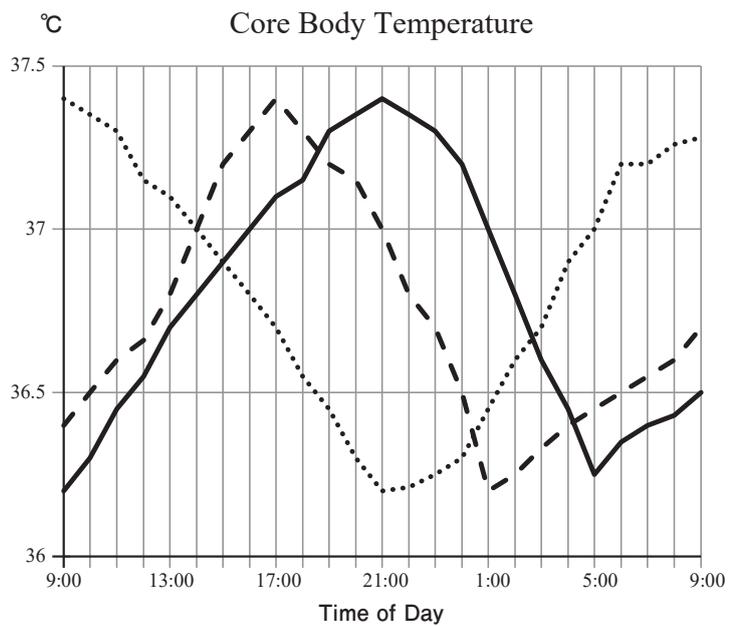
[6] Why do we feel time passes more quickly? Have you felt New Year has come faster this year than last year? Many people say that time passes more quickly when they get older. Scientists have found that there is a reason for this. How much information we receive affects our sense of time. When we receive a lot of new information, we need a long time to *process it, so we feel time passes more slowly. When we experience new things, or when we have strong *emotions, for example, when we are nervous, afraid, or excited, we pay greater attention to various things happening around us and remember more things. Because of this, we feel time passes more slowly. On the other hand, if we take in *familiar information, we feel time passes faster because we don't need much time to process it. So we think that time speeds up when we grow older. When the world becomes familiar, we get new information, and we feel time passes .

[7] Time passes so fast. How do we stop it? What can we do to make our days longer and enjoy our life? Try new things, visit new places, and meet new people. These things give us a lot of new information. If it is difficult to do these things, pay attention to everything in your daily life. Even after reading a book once, read the book carefully again. You will find out new, interesting things. You have known your family and your friends for years, even so try to find out how they are doing. You may find that you know only a little about them. If you take the same road to go to school every day, pay attention to the things around you while you are walking. You will find something new. You may feel warm wind or ⁽⁴⁾ you / the arrival / find / telling / small flowers / spring / of / about]. You can experience new things in your daily life. You can stay young and enjoy your life by continuing to learn.

〔注〕 according to ～ ～によると control 制御する temperature 温度
 hormone ホルモン experiment 実験 count to ～ ～まで数える
 core 深部 toward 向かって affect 影響する
 sense 感覚 baggage claim 手荷物受取所
 traveler 旅行者 stressed ストレスのある
 arrival 到着 process 処理する emotion 感情
 familiar よく知っている

〔問1〕 (1) the experiment とあるが、次の3つのグラフは、Recorded Time, Core Body Temperature, Melatonin Level に関するグラフである。それぞれのグラフに示された折れ線A～C, D～F, G～Iの中から、実験結果と一致するものを一つずつ選ぶとき、その組み合わせとして最も適切なものは、右のページのア～ケの中ではどれか。





	Recorded Time	Core Body Temperature	Melatonin Level
ア	A	D	I
イ	A	E	H
ウ	A	F	H
エ	B	D	G
オ	B	E	I
カ	B	F	G
キ	C	D	I
ク	C	E	G
ケ	C	F	H

〔問5〕 本文の内容に合う英文の組み合わせとして最も適切なものは、下のア～シの中ではどれか。

- ① Humans and other animals know what time it is and how many seconds or minutes have passed without checking a clock because of their body clocks.
- ② We can wake up or sleep at about the same time every day because our melatonin levels start to go up in the early morning and they start to go down in the late evening.
- ③ Some animals know how much time has passed, so they can find food and come home quickly because of a body clock called a circadian rhythm.
- ④ We sometimes feel that time passes faster or more slowly because the interval timing clock affects the circadian rhythm.
- ⑤ According to the experiment, we feel that time passes more slowly when we check our watch to know how much time has passed.
- ⑥ We feel that time moves more slowly when we are nervous, afraid, or excited because we receive a lot of information to process.
- ⑦ We should pay more attention to various new things because we need more time to remember things when we get older.
- ⑧ If it is difficult to get a lot of new information even after trying new things, we should pay attention to everything in our daily life.

ア	① ⑥	イ	② ⑤	ウ	③ ⑧
エ	④ ⑦	オ	① ⑥ ⑧	カ	② ④ ⑦
キ	③ ⑤ ⑥	ク	④ ⑤ ⑧	ケ	① ② ③ ⑧
コ	① ⑤ ⑥ ⑧	サ	② ③ ④ ⑥	シ	③ ⑥ ⑦ ⑧

- 4 次の文章を読んで、あとの各問に答えなさい。なお、[1] ～ [10]は段落の番号を表している。
(* 印の付いている単語・語句には、本文のあとに〔注〕がある。)

[1] Have you ever been lost in the streets or in the mountains? Many of you will say yes, but some of you have *probably never got lost and may say, “If I’ve been to a place before and go back 10 years later, I will remember my way.” Are such people really born with this special ability? The answer to that question is in *brain activity. They don’t get lost because they have a much better ability to find out where they are and use *spatial memory.

[2] In the last few years, scientists ⁽¹⁾ 【 we / have / the brain / use / which / discovered / part / for / of 】 finding our way around an area. They say that we use two kinds of *cells in the brain. Place cells in the *hippocampus find out where we are, and grid cells outside the hippocampus help us to understand the spatial *relationship between that place and other places. With the help of place cells and grid cells in the brain, we can have a sense of place and use *way-finding abilities.

[3] Our brain can find the way by using either or both of these cells. Some people are really good at finding their way by remembering *objects in the environment. For example, they may say, “I’ll go to the gas station and make a right turn.” Other people may *depend on spatial memory and say, “I’ll go 50 meters to the north, and then 50 meters to the east.” Though we all depend on both kinds of memory, the brain may use one over the other.

[4] This kind of human way-finding ability was not well known for a long time, but in the 21st century, scientists began to understand more about this ability by doing research into the hippocampi of taxi drivers in London. Some taxi drivers drove for more than forty years and they had much more developed hippocampi. If the taxi drivers spent more time on the job, the hippocampus began to develop more space for the large *amount of way-finding experience. This study shows that way-finding experience can have a direct influence on the brain itself.

[5] These days, however, these kinds of way-finding skills are becoming lost in the world of GPS, or global positioning systems. GPS helps people to get to their *destination. More people are losing the ability to find their way in new places by themselves. Now let’s take a look at one example.

(3)

They say the growing use of such smartphones can lead to big problems because people depend too much on technology without understanding the world around them.

[6] In fact, scientists are afraid that the use of GPS can have bad *effects on brain activity.

They worry a lot about its effects on human memories. Because of such technology, people don't have to create spatial maps of new places in their *mind, so their *mental space for remembering and *observing their environment is becoming smaller. And if technology suddenly doesn't work at all, people will not be able to find out where they are by themselves.

[7] Scientists have done studies to know how using GPS *affects people's ability to find their way through the environment around themselves. They asked two groups of people to find their way through a city on foot in different ways. One group used a smartphone with GPS, and the other group used a paper map and compass to reach their destination. The study found the GPS group walked slower, made more stops, and walked farther than the map group. The GPS group made more mistakes and took longer to reach their destination. After their walks, the people in the GPS group also did not clearly remember the shape of the land and their way to their destination when they were asked to draw a map. The map group did much better in this study. The GPS group was looking down at a smartphone a lot and not really looking around at their environment. However, the map group did not depend on technology, and using a map with a compass helped them to pay attention to the natural world around them and remember it. This *experiment found that the use of map reading and way-finding skills to move through a spatial environment can improve the brain and help some areas to grow. It also showed that the use of modern way-finding technology can have bad effects on the brain, especially on memory. This means that people need to practice map reading and way-finding skills, like any other thinking skill, to stop their brain from becoming weaker.

[8] Scientists say that such brain training may help us even in our later years. In another experiment, some people found their way to a destination through a *maze on a computer just by learning the right way after repeating it until they remembered. And much older people did the same thing just by creating mental maps and getting a sense of place in their mind. The scientists found the older people's hippocampi grew through the experiment. Today, some people gradually lose the ability to think and do things in a normal way, with their brain and memory affected when they grow older. Brain training, like in the experiment, will help us to find new ways of stopping illnesses connected to human memory.

[9] As we have seen, we can improve our way-finding ability by practicing these skills. If we get out more and go to places, it is better. We will never . Using our body improves the brain, and using our brain helps new cells in the brain to grow. We can use different skills for finding our way. The important thing is to practice those skills and *tune in to the environment. Technology is a very useful *tool, but in the end the human brain is still the greatest map reader working at a higher, more difficult level.

[10] Humans move from one place to another with or without purpose. When we find out

where we are and our *connection to a place by using our own “GPS” in the brain, we feel safe and we feel we are really living. We should not forget how true this is.

〔注〕 probably おそらく	brain ^{のう} 脳	spatial 空間の
cell 細胞	hippocampus 海馬（複数形は hippocampi）	
relationship 関係	way-finding 道を探す	object 物体
depend on ～ ～に頼る	amount 量	destination 目的地
effect 影響	mind 頭脳	mental 内的な
observe 観察する	affect 影響する	experiment 実験
maze ^{めいろ} 迷路	tune in to ～ ～になじむ	tool 道具
connection つながり		

〔問1〕 ⁽¹⁾【we / have / the brain / use / which / discovered / part / for / of】とあるが、本文の流れに合うように、【】内の単語・語句を正しく並べかえなさい。

〔問2〕 次の英文は、[4]の段落の ア ～ オ のいずれかに入る。この英文を入れるのに最も適切な場所を選びなさい。

They found that the drivers had many mental maps of the city in their memories and had larger hippocampi than other people.

〔問3〕 の中には、次のA～Dのうち三つの文が入る。本文の流れに合うように正しく並べかえたとき、その組み合わせとして最も適切なものは、下のA～クの中ではどれか。

- A Police told them to learn way-finding skills without depending only on smartphones with GPS.
- B The police thought that lost people in the mountains could not find their way without smartphones with GPS.
- C The police saved lost people in the mountains many times and thought that kind of advice was necessary to reduce the number of such people.
- D In some parts of England, many people walk long distances in the mountains.

- ア A → B → C
- イ A → D → B
- ウ B → D → A
- エ B → C → D
- オ C → A → B
- カ C → B → D
- キ D → B → A
- ク D → A → C

〔問4〕 本文の流れに合うように、 の中に本文中の英語2語を書きなさい。

〔問5〕 本文の内容に合う英文の組み合わせとして最も適切なものは、下のア～コの中ではどれか。

- ① Many people can go back to a place because they have much better spatial memory and ability to realize where they are.
- ② Grid cells find out where we are, and place cells understand the spatial relationship between a place and other places.
- ③ All of us depend on grid cells and place cells for finding our way, but the brain may use either or both of these cells.
- ④ Scientists are worried about the effects of GPS on people because they reduce space in people's minds for memory and attention to their environment.
- ⑤ The GPS group needed more time to reach their destination than the map group but easily remembered the shape of the land and their way.
- ⑥ In an experiment using a maze on a computer, older people's hippocampi became larger through the repeated process of remembering the right way.
- ⑦ People can practice skills for finding their way, but it is actually difficult to know much about their environment.
- ⑧ We should not forget that our sense of place, created by mental maps in the brain, leads us to feel safe and experience life.

ア	① ⑤	イ	② ④	ウ	③ ⑤
エ	④ ⑥	オ	⑤ ⑦	カ	⑥ ⑧
キ	① ④ ⑥	ク	② ④ ⑦	ケ	③ ④ ⑧
コ	③ ⑥ ⑦				

〔問6〕 下の質問について、あなたの考えや意見を、**40語以上50語以内の英語**で述べなさい。「.」「,」「!」「?」などは、語数に含めません。これらの符号は、解答用紙の下線部と下線部の間に入れなさい。

Technology is a very useful tool, but sometimes has bad effects on us, like GPS, if we use it too much in our daily lives. What is another example of such technology, and why?