1 英文を読み、問題に答えなさい。

Roller coasters may seem like a very modern type of entertainment—constantly getting bigger, faster and scarier thanks to advances in technology. But they actually date back to the mid-1800s. The birth of the modern American roller coaster gathered inspiration from the first railroads. One railway in particular, the Mauch Chunk Switchback Railway of Pennsylvania, became America's first 1)roller coaster-like ride. It started transporting coal from the mountains down to the town using only gravity to move the railway carriages. The 9-mile* trip took only half an hour, while the trip back up the mountain, which relied on mules** for power, took four hours. The railway attracted quite a few tourists to the area, and 2)before long, cars were carrying passengers down the scenic mountain route. In the morning, the railway was reserved for coal, but the afternoon was dedicated to the exciting downhill ride for the tourists. It was this railway that would inspire the first roller coasters at Brooklyn's Coney Island.

Today theme parks are big business. But with queues occasionally as long as eight hours for an average ride of under two minutes—even though there are reports of riders suffering strokes, brain deformation and serious injury due to crashes—how come we put ourselves through it? What is it about roller coasters that some love so much?

Enjoying roller coasters is linked to sensation seeking—the tendency to enjoy unusual and intense physical experiences such as rock climbing and parachute jumping. 3)But what sensation do roller coasters provide that is so attractive? At first glance, it may seem to be down to the experience of speed. But the evidence for linking sensation seeking to speed is not persuasive. For example, when it comes to driving at speeds above the legal limit, many people do it, not just sensation seekers. Perhaps the attraction of roller coasters is the enjoyment of the natural sensation of fear itself, much like watching a horror movie. Physical signs of fear such as a rapid heartbeat, faster breathing and an increase in energy caused by the release of glucose are known collectively as the "(A1) response," which evolved as a survival mechanism, enabling people and other mammals to react quickly to life-threatening situations.

In another thrill seeking pastime, first time bungee jumpers not only reported an increased uplifting feeling like excitement just after completing a jump, but they also had raised levels of endorphins in the blood, a type of hormone well known to produce feelings of intense pleasure and happiness. Interestingly, the higher the levels of endorphins that were present, the more excited the jumper reported feeling. Here, then, is clear evidence that people enjoy the sensations that accompany the (A2) response within a nonthreatening environment. And yet,

paradoxically, these bungee jumpers also showed increased levels of the hormone cortisol, known to increase when people experience stress. How, then, can a person simultaneously experience stress and pleasure? The answer is that not all stress is bad. Eustress—"eu" meaning good in Greek—is a positive kind of stress that people actively seek out.

We know that a roller coaster ride can be experienced as a "eustressful" experience thanks to an intriguing study carried out by two Dutch psychologists. They were interested in asthma,*** and specifically its relationship with stress. Having noted previous research findings that stress leads asthma sufferers to perceive their asthma symptoms as more severe, they wondered whether 4)an opposite effect might be possible by applying eustress.

And so, in the name of science, some asthmatic student volunteers were transported to a theme park and rode a roller coaster while their respiratory function was checked. 5)The research findings were remarkable. While lung function predictably reduced from the screaming and impact on the body, so did the feeling of shortness of breath. This suggests that thrill seekers riding roller coasters perceive the experience as stressful in a positive way.

But roller coasters are not everybody's cup of tea. 6)Could differences in brain chemistry explain sensation seeking behaviors? An experiment with bungee jumping lovers suggests that people with higher levels of endorphins feel higher levels of excitement. But there is no evidence that higher levels of endorphins might explain sensation seeking nature. They are more likely a response to the thrill than a predictor of whether we enjoy it.

A recent review instead which looked at the role of dopamine, another chemical messenger substance in the brain that is important in the functioning of neurological reward pathways,**** found that individuals who happen to have higher levels of dopamine also have higher levels of sensation seeking behavior. Meanwhile, another study found that taking a substance called haloperidol, which disrupts dopamine's effects within the brain, led to a significant decrease in sensation seeking behavior. All this research suggests the interesting possibility that enjoyment of intense physical experiences such as riding on roller coasters may reflect individual differences in brain chemistry.

Though hard to pin down, people enjoy roller coasters thanks to a combination of speed, conquering fear and the positive effects associated with a 7)massive rise in physiological arousal. A roller coaster ride is a legal, generally safe and relatively cheap means of experiencing a natural high. Understandably, people have been happy to pay money in exchange for doing it for centuries, and there is no sign of any decline in the appreciation of a bit of eustress.

注)
*約 15km　　**ラバ（ロバとウマの交雑種）　***喘息　　****脳の報酬経路

〔1〕 the Mauch Chunk Switchback Railway が下線部 1)のように表現された理由を説明しなさい。

〔2〕 下線部 2)と同じ意味を表す語を選択肢から選び、記号で答えなさい。

(a) earlier on　　(b) directly　　(c) immediately
(d) by and by　　(e) previously

〔3〕 下線部 3)に関して、筆者はどのように考えているか説明しなさい。

〔4〕 空欄 (A1)(A2)には同じ語句が入る。最も適切なものを選択肢から選び、記号で答えなさい。

(a) attack and destroy　　(b) capture and release　　(c) fight or flight
(d) hide and seek　　(e) pursue or chase

〔5〕 下線部 4)はどのような事か説明しなさい。

〔6〕 下線部 5)に関して、研究方法、結果及び考察を説明しなさい。

〔7〕 下線部 6)に関して、以下の指示に従い表を完成させなさい。

指示: 化学物質を言及されている順番に英語で抜き出し、それぞれの結果／考察を答えなさい。尚、一部は与えられている。

言及されている化学物質		結果／考察
あ		結果: 値が高い人の興奮度は高かった。 考察:
い		結果:
う		結果:

〔8〕 下線部7)と同じ内容を表している英語を2語で最終段落から選び、答えなさい。

2 英文を読み、問題に答えなさい。

Shiny green slices of jalapeño pepper decorate a plate of nachos. Eating one of those innocent-looking chilies will make a person's mouth explode with spicy fireworks. Some people dread and avoid the painful, eye-watering, mouth-burning sensation. Others love the spicy sensation. "A quarter of the world's population eats chilies every day," notes Joshua Tewksbury, a (1) who spent 10 years studying wild chili peppers.

Chili peppers do much more than burn people's mouths. Scientists have discovered many uses for the chemical called capsaicin that gives these veggies their energy. Some people use this weapon—pepper spray—for self-defense. The spray's high levels of capsaicin will burn the eyes and throats of attackers, but won't kill people.

So why would anyone willingly eat something that causes pain? 2)Capsaicin triggers a rush of stress hormones. These will make the skin redden and sweat. It can also make someone feel energized. Some people enjoy this feeling. But there is another reason why chilies show up on dinner plates the world over. Hot peppers make food safer to eat.

When food sits out in warm weather, bacteria on the food start to multiply. If people eat food with too many of these germs, they risk getting very sick. The cold temperature inside a refrigerator stops most bacteria from growing. That's why most people today rely on refrigerators to keep their food fresh. But long ago, those 3)appliances weren't available. Chilies were. Their capsaicin and other chemicals, it turns out, can slow or stop bacterial growth.

Before refrigerators, people living in most hot parts of the world developed a taste for spicy foods. Examples include hot Indian curries and fiery Mexican tamales. This preference emerged over time. The people who first added hot peppers to their recipes probably had no idea chilies could make their food safer; they just liked the stuff. But people who ate the spicy food tended to get sick less often. In time, these people would be more likely to raise healthy families. This led to populations of hot-spice lovers. People who came from cold parts of the world tended to stick with milder recipes. 4)They didn't need those spices to keep their food safe.

The burning feeling of a chili pepper 5)originates in the body's pain response system. Capsaicin inside the pepper activates a protein in people's cells called TRPV1. This protein's job is to sense heat. When it does, it alerts the brain. The brain then responds by sending a shock of pain back to the affected part of the body. Normally, the body's pain response helps prevent serious injury. If a person accidentally places fingers on a hot stove, the pain makes him or her

pull that hand back quickly. The result: a minor burn, not permanent skin damage.

Biting into a jalapeño pepper has the same effect on the brain as touching a hot stove. "Peppers trick our brain into thinking we are being burned," says Tewksbury. Pepper plants likely evolved this technique to keep certain animals from eating up their fruit, according to Tewksbury's research.

People, mice and other mammals feel the burn when they eat peppers. Birds do not. Why would peppers develop a way to keep mammals away but attract birds? It ensures the plants' survival. Mammals have teeth that smash seeds, destroying them. Birds swallow pepper seeds whole. After the seeds pass through the birds, the unbroken seeds land in a new place. That lets the plant spread.

Capsaicin does not actually damage the body in the same way that a hot stovetop will—at least not in small amounts. In fact, the chemical can be used as a medicine to help relieve pain. It may seem bizarre that what causes pain might also make pain go away. Yet it's true. Tibor Rohacs is a medical researcher at New Jersey Medical School in the United States. He recently studied how capsaicin works to ease pain. Researchers already knew that when capsaicin turns on the TRPV1 protein, the person experiences pain. Rohacs and his colleagues then uncovered a chemical chain reaction that later stops this pain. "Essentially, it's like turning on a bright light. The light shines so brightly that after a while, the (6)bulb burns out," he says. Once the TRPV1 protein stops its action, it can't turn back on again. When this happens, the brain no longer finds out about painful sensations. The human body is good at repairing itself, however. (7), the pain will fix this pain system and can once again send pain alerts to the brain.

Capsaicin may be the most exciting chemical inside a chili pepper, but it isn't the only reason to spice up your diet. Both hot and sweet peppers also have important vitamins and minerals that the body needs. Some researchers are now studying how chilies change the bacteria living in the human gut. Outside the body, spices help keep dangerous germs from growing on food, and inside the body, they may fight bad germs. They might also help good bacteria grow well. As scientists continue to uncover the secret powers of chili peppers, people will keep spicing up their soups, stews, stir-fries and other favorite dishes. Next time you see a jalapeño on a plate, take a deep breath, then take a bite.

〔 1 〕 Which choice fits gap (1) the best?

(a) zoologist (b) biologist (c) physicist (d) meteorologist

〔2〕 From the underlined part 2), what can we understand?

(a) After consuming the chemical capsaicin, people move energetically.
(b) Some stress hormones in the body are created by capsaicin.
(c) Eating capsaicin causes the body to suddenly release stress hormones.
(d) Capsaicin stresses the body, making us develop an appetite for hormone.

〔3〕 Which choice can replace the underlined word 3)?

(a) attachments (b) machines (c) instruments (d) utensils

〔4〕 What can we infer from the underlined part 4)?

(a) People didn't use cooking spices because they do not grow in cold places.
(b) Because fewer germs grow in colder regions, spices were unnecessary.
(c) People in northern Europe disliked eating hot, spicy foods such as curries.
(d) Spices were unavailable, so people in those areas used refrigerators instead.

〔5〕 Which choice can replace the underlined phrase 5)?

(a) comes by (b) comes with (c) comes to (d) comes from

〔6〕 According to the text, what helps pepper plants to survive?

(a) the distribution of their seeds by birds
(b) the ability of mammals to break their seeds
(c) the attractive colors of the pepper plant
(d) the evolution of the mouths of animals

〔7〕 Which choice does the underlined word 6) refer to?

(a) medicine
(b) capsaicin
(c) TRPV1 protein
(d) brain

〔8〕 Which choice fits in gap (7) the best?

(a) Nonetheless (b) Eventually (c) In addition (d) For instance

〔9〕 Read the following statements and identify 2 true statements.

(a) Capsaicin has multiple uses, ranging from defense to medicine.
(b) Long ago humans began using chilies because their germ-killing properties were well-known.
(c) The brain responds the same way to eating hot peppers and to coming into contact with something hot.
(d) Tibor Rohacs is the one who discovered that TRPV1 is the protein responsible for pain.
(e) Spicy dishes made with jalapeño peppers cause good germs to grow in our stomachs.
(f) All varieties of peppers are important sources of vitamins and minerals for humans and other mammals.

3 空欄に入る最も適切ものを選択肢から選び、記号で答えなさい。

〔1〕 ABC Hospital is located (　　) on Daigaku Street in downtown Tokyo.

(a) center　(b) central　(c) centering　(d) centrally

〔2〕 (　　) I was about to leave the shop, I spotted a pair of shoes on sale in the window.

(a) During　(b) Just as　(c) While　(d) In time

〔3〕 Medical office staff should report to work as usual (　　) otherwise directed by their supervisor.

(a) even not　(b) if only　(c) if necessary　(d) if not

〔4〕 It's almost one o'clock, which is when our presentation begins, so we have only five more minutes (　　).

(a) at least　(b) at last　(c) at most　(d) at the end

〔5〕 (　　) the high maintenance cost, it was a wonderful, old house.

(a) Apart from　(b) Furthermore　(c) As much as　(d) Because of

〔6〕 The new Japanese restaurant caused a great sensation (　　) the town magazine article.

(a) according　(b) following　(c) observing　(d) respecting

〔7〕 The river bank protection work is expected to continue (　　) next month.

(a) in　(b) on　(c) toward　(d) until

〔8〕 There were police officers standing at every corner of the street for (　　) could be seen.

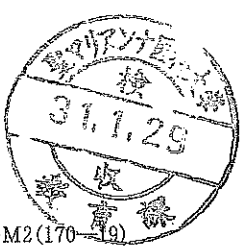
(a) as far as　(b) as long as　(c) as many as　(d) as well as

〔9〕 That bakery makes bread with no additives or preservatives (　　).

(a) whenever　(b) moreover　(c) whatsoever　(d) meanwhile

〔10〕 If you decide to (　　) the surgery, remember to leave time to recover.

(a) work on　(b) make a start　(c) go along to　(d) go through with



〔11〕(　　) the ABC Children's Hospital serves as a leading treatment center for children with severe illnesses, the efforts to rebuild this hospital are crucial.

(a) As　　(b) When　　(c) Because of　　(d) Although

〔12〕The members of our school basketball team could not (　　) to the new coaching, and left the team one after another.

(a) accept　　(b) acquire　　(c) adapt　　(d) approve

〔13〕Some researchers say that gesturing is (　　) to thinking and communicating.

(a) criticized　　(b) critically　　(c) critical　　(d) criticism

〔14〕It is estimated that about 900 million people all over the world do not have adequate (　　) to safe drinking water.

(a) effort　　(b) access　　(c) obligation　　(d) way

〔15〕Many ants (　　) scents called pheromones to give information to other ants through smell or taste.

(a) send off　　(b) show off　　(c) put off　　(d) give off

4

Aに対する最も適切な返答を選択肢から選び、記号で答えなさい。

〔1〕A: How about taking part in a volunteer activity in the areas affected by the disaster on the next holiday?

B: (　　　　)

〔2〕A: How can you ignore the fact that she spoils the harmony among the members of our club? You should tell her to withdraw from the club.

B: (　　　　)

〔3〕A: I just got an email from Tom. His mother's surgery was a success.

B: (　　　　)

〔4〕A: You should have refrained from laughing so loudly at the theater, even if the performance was humorous.

B: (　　　　)

〔5〕A: Oh, no! I dropped my phone in the toilet bowl.

B: (　　　　)

(a) After all, they should do their own thing.

(b) Indeed, I guess they couldn't understand the situation.

(c) First of all, it is my desire not to make the matter worse.

(d) I know, but I couldn't help it.

(e) I'd like that. Let me recruit some people for it.

(f) I'm sorry, but I'm afraid not. In fact, it is too tall.

(g) I'm so relieved to hear that. I was so anxious about the result.

(h) That's fine, but it's too bad you'll miss the chance.

(i) That's nice. It always depends on their desire.

(j) What a pity. It can't be helped.

以上