

1

英文を読み、問題に答えなさい。

In 1994, an earthquake knocked out power in Los Angeles, California. In the days that followed, concerned residents reported a giant cloud of silvery light stretching across the night sky. Some worried that the mysterious sight was somehow related to the earthquake. These people had lived in the large, brightly lit city their entire lives and many of them had rarely seen stars. They certainly had never seen this night-sky cloud of light before. It was the Milky Way—our galaxy.

When artificial light spills into areas where it's not wanted, it's called light pollution. It prevents two-thirds of U.S. residents and half of those in Europe from viewing the Milky Way, and it increases every year as cities continue to grow. That doesn't mean electric lights are bad. They have allowed people to work and play beyond sundown for roughly a century. Lights along roadways can make driving safer. In many ways, lighting up the night has been a good thing. However, there can be drawbacks and they go beyond our ability to enjoy the night sky.

In our increasingly electrified world, light pollution can be tough to avoid. It comes in the following three forms. With direct glare, light travels directly from the source of light into someone's eyes and tends to distract us from other things that we might be trying to see. It's a problem for nighttime drivers faced with oncoming headlights or bright, flashy signs. It can also affect pedestrians. Although many of them think security and streetlights make them safer, direct glare from many of these can actually make it harder to spot a suspicious individual who doesn't want to be seen and might be hiding in the shadows.

Sky glow is indirect. It occurs when light is emitted directly into the atmosphere, accidentally or purposefully, where it is scattered by dust and gas molecules, creating a dome-like orange glow that covers the night sky. The glow reduces the contrast between the stars and the galaxies in the sky, making celestial objects difficult to see even with a telescope. The effect can be so great that the sky glow from some city centers can be seen from 250 kilometers away. Furthermore, since light domes affect the polarization pattern of moonlight, they disturb the sense of direction of (2) which use moonlight or the stars as celestial compass cues to determine which way to go.

Light trespass means light emitted by lighting equipment which shines beyond the boundaries of a building or area of land on which the equipment is placed. An example of light trespass is when light spilling from a security light, streetlight, or floodlight* enters a window and illuminates an indoor area. Light trespass is the most common source of citizen complaints



because it is somewhat subjective and difficult to define when, where, and how much light is unwanted. Therefore, when a problem related to light trespass occurs in a residential area, there is always an emotional or personality component involved. 3) One man's light pollution is another man's feeling of security.

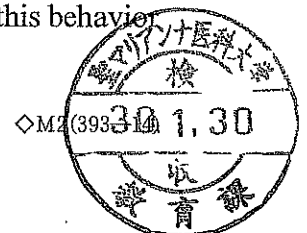
Research is now revealing that light pollution can alter the behavior of plants, animals and people. Almost all living things experience daily cycles, which repeat about every 24 hours, and this is called the circadian rhythm. When the (4) of a day-night cycle gets longer, the responses of plants and animals may change. For example, for many trees, the number of hours of darkness determines when they grow leaves in the spring, when they flower and when they later go 5) dormant in the fall. Plants that are sensitive to light-dark cycles and that live near streetlights or other all-night lights may not go dormant naturally. Instead, they grow all-year long. That can make these plants less likely to handle stressful conditions well, such as drought or leaf predation by insects and fungi.

Animals, too, are affected by lights at night, and this is not just because their body clocks have been altered. For instance, bats' hunting behaviors are troubled. Although a few species reap benefits of lights at night (they may enjoy a feast of insects attracted to streetlights), many of them avoid lighted areas. In 2014, 6) Daniel Lewanzik, a behavioral ecologist who studies bats and light pollution, and his team traveled to Costa Rica to investigate the effects of night lighting on bat dining.

Initially, the researchers caught bats for one set of tests and put them in a flight cage.** Inside the cage, there were two smaller compartments. One was well lit by a street lamp and the other was naturally dark. Inside both compartments the bats were offered their favorite fruits to harvest: pepper plants, nightshade and figs. Between 6:30 p.m. and 2:00 a.m., the researchers counted how often the bats entered each compartment. The results revealed that the bats flew into the dark compartment twice as often as the compartment lit by a street lamp. The bats also harvested fruits almost twice as often in the dark compartment.

In a second experiment, to see if bats behaved the same way in the wild, the team recorded them searching for food in a rainforest. They located some pepper plants growing deep in the wild and others were growing at a site illuminated at night by streetlights, and measured the percentage of ripe fruit which bats harvested from both locations.

Bats ate all of the ripe fruit from plants in unlit areas within three hours of sunset. They visited lighted areas only after the other fruit was gone. What's more, they didn't eat all of it, as they had in unlit areas. They only ate 78 percent of the fruit on lighted plants, and this behavior



was specific to electric lights. The natural light of a full moon did not prevent their pepper dining.

These findings suggested that light pollution could have adverse consequences for forest regeneration in the tropics. Since few other animals than bats disperse seeds into open habitats, bat-mediated seed dispersal is necessary for the rapid succession of deforested land in tropical habitats.

注)

* floodlight: a very powerful lamp that is used outside to light public buildings, sports grounds, and other places at night.

** flight cage: a huge cage where birds can fly freely

[1] 下線部 1) に関して、以下を答えなさい。

a) どのようなものか、説明しなさい。

b) 歩行者にどのような影響を与えるか、説明しなさい。

[2] 空欄 (2) に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) overnighters (b) overnight trains (c) night animals

(d) nightly satellites (e) nighttime construction workers

[3] 著者が、下線部 3) を述べた根拠を説明しなさい。

[4] 空欄 (4) に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) lighted portion (b) natural course (c) normal rhythm

(d) shining light (e) regular pattern

[5] 下線部 5) の定義を選択肢から選び、記号で答えなさい。

(a) physically harmed resulting in losing function, value, and usefulness

(b) alive but in a resting, inactive condition with suspended growth and reduced metabolism

(c) a condition in an organism's life cycle when growth, development, and physical activity are permanently stopped

(d) a state causing no symptoms but not cured and liable to recur

[6] 下線部 6) が 2014 年にコスタリカで行った 2 つの研究に関して、以下の問題に答えなさい。

a) 2 つの研究に共通する実験方法を挙げなさい。

b) 2 つ目の研究結果を、100 字以内で説明しなさい。

[7] 二重下線部 は *light pollution* のどのタイプが原因か、英語 2 語で答えなさい。



2

英文を読み、問題に答えなさい。

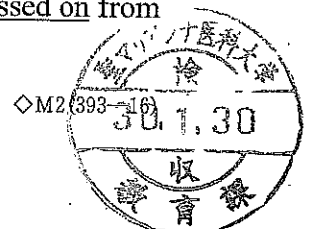
Edward Jenner (1749-1823) is an English surgeon and the (1) of the vaccination for smallpox. Jenner was born when the patterns of British medical practice and education were gradually changing. Slowly the division between the Oxford- or Cambridge-trained physicians and the less educated pharmacists or surgeons, who acquired their medical knowledge through internships, was becoming less clear. In addition, hospital work was becoming much more important.

Jenner was a country youth and was brought up by an older brother after his father died when he was five years old. Jenner acquired a love of nature that remained with him all his life. He attended grammar school and began training with a nearby surgeon at the age of 13. In the following eight years, he acquired a 2) solid knowledge of medical and surgical practice. On completing his training at the age of 21, he went to London and became the pupil of John Hunter, who was on the staff of St. George's Hospital and was one of the most outstanding surgeons in London. The strong friendship that grew between the two men lasted until Hunter's death in 1793. From Hunter, Jenner received this advice, 3) "Why think—why not try the experiment?"

In addition to his training and experience in medicine, Jenner made progress in clinical surgery. After studying in London from 1770 to 1773, he settled in rural England, outside of London, and began to practice medicine. He was capable, skillful, and popular. Besides practicing medicine, he joined two medical groups for the advancement of medical knowledge and wrote occasional medical papers.

Smallpox was widespread in the 18th century, and periodic strong outbreaks resulted in a very high death rate. The disease, a leading cause of death at the time, affected every social class, and 4) deformation of appearance was not uncommon in patients who recovered. The only means of fighting smallpox was a very basic form of vaccination called variolation—infesting a healthy person, on purpose, with the "matter" taken from a patient sick with a mild attack of the disease.

As part of his practice, Jenner performed variolation on his patients. In the rural setting, he learned that dairymaids and other individuals who contracted cowpox, a relatively harmless disease that could be caught from cattle, would not later contract smallpox. He also observed that he could not successfully inject such persons with smallpox. Noting this connection, Jenner concluded that cowpox not only protected against smallpox but could also be 5) passed on from



one person to another as a protective mechanism.

In May 1796, Jenner met a young dairymaid, Sarah Nelms, who had fresh cowpox lesions, or sores. Using material from her lesions, Jenner gave an injection to a child named James Phipps. The child developed a mild fever and lost his appetite, but after ten days he was healthy again. In July, Jenner gave another injection to the boy, this time with smallpox "matter." No disease developed and Jenner concluded that protection was complete. Jenner continued to inject children with cowpox with similar results. He named this procedure "*variolae vaccinae*," which today has been shortened to "vaccination."

The reaction to his invention was not immediately positive. However, vaccination rapidly proved its value, and the procedure quickly spread to America, the rest of Europe and then around the world. Unfortunately, there were many complications. Vaccination seemed simple, but quite often the procedure that Jenner had recommended was not followed. In addition, deliberate or unconscious innovations often damaged the effectiveness. Pure cowpox vaccine was not always easy to obtain, nor was it easy to preserve or transmit. Furthermore, the biological factors that produce immunity were not yet understood. Much information had to be gathered and a great many mistakes made before a fully effective procedure was developed.

(8), the death rate from smallpox fell sharply. Jenner received worldwide recognition and many honors. Instead of making himself rich through his discovery, he actually devoted so much time to the cause of vaccination that his private practice and personal affairs suffered severely.

[1] Which choice fits gap (1) the best?

- (a) composer (b) producer (c) explorer (d) discoverer

[2] What does the underlined word 2) mean based on the context?

- (a) not liquid or fluid (b) strongly diversified (c) substantial (d) continuous

[3] What can we infer from the underlined part 3)?

- (a) Hunter wanted to know why Jenner was more interested in thinking than doing.
(b) Unlike Jenner, John Hunter felt doctors should avoid experimenting.
(c) Instead of simply theorizing, Hunter encouraged Jenner to conduct experiments.
(d) Hunter was trying to get Jenner to participate in his experiment.

[4] From the underlined part 4), what can we understand?

- (a) Smallpox survivors often had terrible scarring.
(b) There were no lasting effects caused by the disease.
(c) Birth deformities were a consequence of smallpox.
(d) Deformation was an uncommon side effect of smallpox.



[5] Which choice can replace the underlined word 5?

- (a) transmitted (b) contracted (c) injected (d) protected

[6] Which event comes third?

- (a) An injection of smallpox material was given to James Phipps.
(b) James Phipps was injected with material from a dairymaid's sores.
(c) James Phipps experienced loss of appetite and a low fever.
(d) James Phipps recovered.

[7] Why did vaccination spread so quickly?

- (a) It was an easy thing to do.
(b) People understood its efficacy.
(c) Jenner advertised it in journals.
(d) It was Jenner who invented it.

[8] Which choice fits in gap (8) the best?

- (a) In addition (b) Of course (c) Nonetheless (d) Unfortunately

[9] Read the following statements and identify 2 true statements.

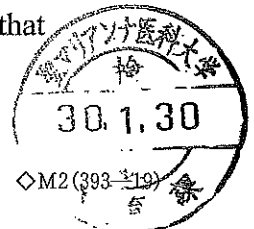
- (a) People who had had cowpox sometimes caught smallpox.
(b) Jenner's vaccination brought him both wealth and honor.
(c) Accessibility to pure cowpox vaccine and its preservation and transplantation were sometimes challenging.
(d) Jenner belonged to the group of physicians who were academically trained at universities.
(e) During the 18th century, smallpox was one of the world's most lethal diseases which affected humanity regardless of social hierarchy.
(f) Although "variola vaccinae" was a simple mechanism, the procedure was difficult to follow.



3

次の〔1〕～〔10〕の空欄に入る最も適当なものを選択肢から選び、記号で答えなさい。

- 〔1〕 The population of Japan is () small; it is the eleventh largest in the world.
(a) after all (b) at any rate (c) by no means
(d) in fact (e) on the contrary
- 〔2〕 The team is determined to win the pennant race ().
(a) afterwards (b) all set (c) at all costs
(d) by and large (e) by any chance
- 〔3〕 No one told me about the concert, but () I'm too busy to go.
(a) by the way (b) in any case (c) in practice
(d) further (e) though
- 〔4〕 Although her friend helped her (), there was still too much to do.
(a) certain way (b) for a certainty (c) on her own
(d) to some extent (e) with a chance
- 〔5〕 John has a lot of CDs, so let's make him () music for the party.
(a) by the action of (b) for want of (c) in charge of
(d) on behalf of (e) to the point of
- 〔6〕 You can go to the party on Saturday () you book a taxi home.
(a) as long as (b) except (c) even though
(d) in case (e) nevertheless
- 〔7〕 Our school trip wasn't as pleasant as we thought it would be, () the bus broke down on the way.
(a) given that (b) if only (c) provided
(d) so much that (e) whereas
- 〔8〕 Because of his sickness, the scores of his final examinations didn't add () the total that his parents expected.
(a) at last (b) in the end (c) on the contrary
(d) to the utmost (e) up to
- 〔9〕 The restaurant is known for its big dinner menu, and you can choose, (), Japanese, Chinese, and Italian.
(a) among other things (b) as the choices (c) from all accounts
(d) something other (e) with all
- 〔10〕 () exhausted after a long and hard day at work, she practiced playing the piano for three hours.
(a) In spite of (b) Despite (c) For all that
(d) Much (e) Though



4

次の〔1〕～〔5〕の空欄に入る最も適当なものを選択肢から選び、記号で答えなさい。

- 〔1〕 I can't understand this sentence because you () the verb.
 (a) left behind (b) left on (c) left out (d) left up to
- 〔2〕 My friend was angry at me, but I knew he would () soon.
 (a) get it away (b) get it out (c) get it out of (d) get over it
- 〔3〕 I () my friend's offer of a ride to the station because I wanted to walk.
 (a) turned down (b) turned out (c) turned to (d) turned up
- 〔4〕 How many people do you expect to () for the concert?
 (a) show around (b) show off (c) show through (d) show up
- 〔5〕 "Teacher, can you help us? We have () the problems several times, but we still don't understand them."
 (a) gone out (b) gone over (c) gone up (d) gone with

5

次の〔1〕～〔5〕の下線部の語句が示す意味を選択肢から選び、記号で答えなさい。

- 〔1〕 The researchers have three explanations that can account for their results.
- 〔2〕 My grandmother told me to make the most of each day so I wouldn't have any regrets.
- 〔3〕 He received the necessary information to carry out his job.
- 〔4〕 We can work off our stress from exams by playing basketball.
- 〔5〕 It was snowing so heavily that the drivers could barely make out the road.
- (a) accomplish (b) activate (c) affect (d) decline (e) distinguish
 (f) eliminate (g) explain (h) resemble (i) undergo (j) utilize

