

英 語

〔注 意 事 項〕

1. 監督者の指示があるまでは、この問題冊子を開かないこと。
2. 解答用紙は、コンピュータで処理するので、折り曲げたり汚したりしないこと。
3. 解答用紙に、氏名・受験番号を記入し、受験番号をマークする。マークがない場合や誤って記入した場合の答案は無効となる。

受験番号のマーク例(13015の場合)

受 驗 番 号				
1	3	0	1	5
万位	千位	百位	十位	一位
①	①	●	①	①
●	①	①	●	①
②	②	②	②	②
③	●	③	③	③
④	④	④	④	④
⑤	⑤	⑤	⑤	●
⑥	⑥	⑥	⑥	⑥
⑦	⑦	⑦	⑦	⑦
⑧	⑧	⑧	⑧	⑧
⑨	⑨	⑨	⑨	⑨

4. 解答用紙にマークするときは、HB または B の黒鉛筆を用いること。誤ってマークした場合には、^{ていねい}消しゴムで丁寧に消し、消しきずを完全に取り除いたうえで、新たにマークし直すこと。
5. 下記の例に従い、正しくマークすること。

(例えば c と答えたいとき)

正しいマーク例

Ⓐ	Ⓑ	●	Ⓓ	Ⓔ	Ⓕ	Ⓖ
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誤ったマーク例

Ⓐ	Ⓑ	●	Ⓓ	Ⓔ	Ⓕ	Ⓖ
Ⓐ	Ⓑ	✓	Ⓓ	Ⓔ	Ⓕ	Ⓖ
Ⓐ	Ⓑ	●	Ⓓ	Ⓔ	Ⓕ	Ⓖ
Ⓐ	Ⓑ	●	Ⓓ	Ⓔ	Ⓕ	Ⓖ

○をする

∨をする

完全にマークしない

枠からはみ出す

6. 解答は、すべて解答用紙の所定の位置に記入すること。
7. 最後の問題 四 に自由英作文があるので、時間配分に注意すること。

I

次の英文を読み、下記の設問に答えなさい。

Feb. 14 is Valentine's Day, an annual occasion which celebrates romantic love. However, love is not only a matter of the heart. Brain researchers have discovered romance has a complex biological and chemical nature.

While our thoughts and emotions seem like invisible things without shape or form, these internal states can be analyzed by monitoring blood flow in different parts of our brain using advanced imaging techniques.

Neuroscientist Lucy Brown conducted an experiment with 17 college students, who described themselves as being in the suffering state of new love. They were subjected to brain scans and asked to look at a picture of their beloved. Without exception, the picture stimulated heightened electrical activity in two key areas of the brain.

Brown, a professor at Albert Einstein College of Medicine, says these two regions comprise the brain's reward system. A primitive part of the organ also found in other mammals, it is more closely associated with the desire for food and water than with the sex drive. "And this is the system that was active, to our amazement, in the people who were in love," she says. Brown notes that this is the region of the brain that lights up during a cocaine^{注1} high, and is responsible for the desire that drives cocaine addiction.

A similar mix of happiness and longing is familiar to anyone who has ever been in love, which may help explain why romantic love is often a bitter-sweet experience. "It's not just happiness," Brown says. "You can be anxious. You can actually get angry a little. But the key, the core that remains, is this motivation toward the other person. That other person is a goal because they produce so much reward."

When the brain's reward system is aroused, it releases a special chemical called dopamine.^{注2} Helen Fisher, a professor who worked with Lucy Brown on the brain imaging and love studies, says dopamine then spreads to other parts

of the brain, each of which has its own function.

“As you reach for a piece of chocolate and want it, just as you want to do well in school, this brain system is being activated,” Fisher says. “But it is being activated with a different combination of other parts of the brain, making the experience of wanting the chocolate different than the experience of wanting a beloved.”

According to Fisher, when a person first falls in love, it usually follows a distinct pattern. Everything about their beloved takes on special meaning. “The car that they drive is different than every other car in the parking lot, the street they live on, what they wear, the music they like, the books they read. Everything about them is special—which by the way is an indication of the dopamine system in the brain.”

Fisher explains that the dopamine rush often leads to an intense focus on the beloved. That, in turn, can lead to the emotional roller coaster ride that is a common feature of romantic love. “There is intense feeling of ‘being high’ when things are going well, mood swings into horrible despair when things are going poorly. And tremendous energy. You can walk all night and talk until dawn. There are all kind of physiological responses—butterflies in the stomach, a dry mouth when you talk to the person on the phone, intense desire of possession,” she says. “In other words, the full collection of personality features that are linked with romantic love are special to that particular feeling, and the reward system is part of that experience.”

Fisher offers a straightforward evolutionary explanation as to why the drive to find sex, romance and long-term partnership can be so much more persistent and intense than most other human desires.

“Charles Darwin said, ‘If you have four children and I have no children, you live on and I die out.’ So it’s not how much money you make. It’s not how good looking you are. It’s not even how smart you are. It’s how many children you have. How much of your own DNA you pass on to tomorrow,” Fisher

says. “So parts of the brain are simply built to go out and find a lot of different partners, focus on just one at a time, fall in love with that individual, attach, then remain attached at least long enough to raise a child through infancy together as a team.”

This deeply rooted link between love and survival explains our cultural devotion to mating, for better or worse: “People live for love; they sing for love; they dance for love; they compose all kinds of myths and legends for love. But they also kill for love and they die for love. So love is a tremendously powerful brain system. In fact, I’d call it an addiction — a perfectly wonderful addiction when it’s going well and a perfectly horrible addiction when it’s going poorly.”

And like any addiction, love can cloud our judgment, leading us to peculiar behaviors, which to other people who are not in love, seem to be funny or sometimes threatening or horrifying.

注1：コカイン(麻薬の一種)

注2：ドーパミン

問 英文の内容に合うように、(1)～(5)の各文の空所を補うものとして最も適したものをそれぞれ選択肢1～4の中から選びなさい。また(6)～(10)は質問に対する答えとして最も適したものをそれぞれ選択肢1～4の中から選びなさい。

(1) Our emotion and thinking activities have some _____ basis.

1. musical
2. biological
3. visual
4. economical

(2) Students who joined the experiment conducted by Lucy Brown were those who were _____ a new love.

1. experiencing
2. rejecting
3. seeking
4. disguising

(3) None of the pictures shown in the experiment _____ to provoke the enhanced electrical activity in some areas of the brain.

1. failed
2. caused
3. appeared
4. followed

(4) When dopamine is produced, it is conveyed to different parts of the brain depending on the _____.

1. emotion
2. focus
3. function
4. person

(5) According to the article, when someone first falls in love, they tend to recognize everything linked to the beloved with special meaning, which otherwise would be just _____ things.

1. ordinary
2. useful
3. unnecessary
4. peculiar

(6) Why is our drive to find sex, romance and long-term partnership so persistent and intense?

1. Because we tend to choose money rather than having children.
2. It is because we want our children to inherit our DNA.
3. This drive comes from our fear of how much DNA we can retain tomorrow.
4. It is because we are so keenly attached to raising children.

(7) What is the “emotional roller coaster ride” during the period of romantic love?

1. It is the pleasant and happy experience of a new love.
2. It is the feeling that everything that is linked with the beloved is special.
3. It is the negative situation where you become suddenly anxious or angry without understanding the reasons.
4. It is the situation where the extreme sense of fulfillment suddenly turns into a complete depression when something works negatively.

(8) Why does a person in love sometimes walk all night or talk until dawn?

1. They do such things because these behaviors are in part triggered by our reward system.
2. Because the special feelings of romantic love very often lose our energy.
3. Because such a person has a special mix of happiness and longing caused by a roller coaster.
4. They behave this way in order for their DNA to survive, even long after their death.

(9) Why can love sometimes be dangerous or fearful?

1. Because it often leads us to strange and peculiar heart problems.
2. Because love may destroy our calm inner discipline, leading us to kill others or ourselves.
3. Because people in love will do anything to destroy the things linked with the beloved.
4. Because those who seldom fall in love have threatening or horrifying features.

(10) What is the best title for this story?

1. The Never-Ending Nature of Love
2. Love Makes Us Strange Creatures
3. Love is a Matter of the Brain
4. Invisible Love and Invisible Behavior

II

次の英文を読み、下記の設問に答えなさい。

Most eggs usually have an oval shape with one end being pointed while the other is more rounded. The reason for the unusual shape is due to the egg being forced through the oviduct^{注1} with the rounded end exiting first. During this process, the muscles of the oviduct contract behind the egg, forcing it to move forward. Since the egg's wall is still very soft and is still able to be shaped easily, this causes the pointed end to develop at the back side of the egg. This trait is likely to have come about due to evolution though natural selection.

The oval shape is very significant. A pointed egg will tend to sit on its side, with the rounded end tipping upward. The rounded end contains an air pocket, also known as an allantois^{注2}, and it has more tiny holes than the smaller end. Having the bigger end pointed upward improves the flow of oxygen to it and so this is where the head and brain will develop, while the tail will develop at the pointed end.

The structure and composition of the eggshell serves to protect the egg against damage and bacteria, and serves to regulate gas and water exchange for the growing embryo^{注3} within the egg shell.

When a hen lays an egg, all of the nutrients for the embryo are already included within the shell. These all can be found in either the egg yolk or the white. The yellow part of the egg, also known as the yolk, is a food packet that feeds the developing embryo within the egg. Half of the yolk is water and the rest is a mixture of protein, vitamins and minerals that the embryo will need during development. The yolk also contains antibodies that were transferred from the mother hen to the egg yolk in order to protect the embryo from germs that may penetrate the egg. The embryo gets these nutrients through small blood vessels. An egg also contains a transparent fluid, called the egg white, which consists of about 90 percent water, with the remainder

mostly comprised of various proteins. The main purpose of the egg white is to protect the yolk against bacteria and provide additional nutrients for the embryo.

Apart from the yolk and white, only two things are originally missing in order for an embryo to develop: warmth and oxygen. Heat will come from the hen sitting on the eggs, keeping them warm, in what is known as incubation. But, what about the oxygen and where does it come from? Eggshells have thousands of tiny holes in the shell that allow the embryo to breathe. A hen's egg usually has around 7500 tiny holes. It is these small openings that enable oxygen to enter and carbon dioxide to leave. Oxygen, which can be found all around us in the air, enters the egg through the tiny holes in the shell. Once inside, the oxygen is taken in by a tissue called the allantois, which has plenty of small blood vessels that are connected to the embryo. With the help of the allantois, the embryo is able to exchange gases and liquid waste. Oxygen will be delivered through the blood to the embryo at the same time as carbon dioxide is removed from the embryo by the blood, and then released out of the shell. The waste products are stored in the hollow air pocket in the allantois. Only when the baby chick emerges from its shell will it be able to breathe on its own.

So the next time you have some eggs for breakfast, just remember how incredible eggs are.

注1：卵管

注2：尿囊（鳥類では呼吸器官として機能する）

注3：胚

問 英文の内容から判断し、書き出しに続くものとして最も適したものとそれぞれ選択肢1～4の中から選びなさい。ただし、(3)～(5)および(10)については質問に対する答えとして最も適したものとそれぞれ選択肢1～4の中から選びなさい。

(1) It can be inferred from the reading that the rounded end

1. has the most oxygen flowing to it.
2. is more important than the pointed end.
3. is just as important as the pointed end.
4. is usually smaller than the pointed end.

(2) One example of evolution through natural selection would be

1. from an egg to a chicken.
2. from a man to a chimpanzee.
3. from an ape to a man.
4. from a man to a woman.

(3) Which of the following is the meaning of “regulate” as used in the

(a) essay?

1. change
2. move
3. arrange
4. adjust

(4) Which of the following is the meaning of “transparent” as used in the

(b) essay?

1. mirror
2. flat screen TVs
3. clear
4. clouds

(5) What is one of the purposes of the allantois within the eggshell?

1. It stores food for the embryo.
2. It helps the embryo breathe.
3. It carries heat away from the embryo.
4. It contains antibodies for the embryo.

(6) It can be inferred from the reading that the egg yolk

1. is just as important as the egg white.
2. is more important than the egg white.
3. is not as important as the egg white.
4. is the same as the egg white.

(7) From the reading, we can say the egg is pointed at one end because

1. it is shaped by the hen's oviduct contracting.
2. there is nothing inside the pointed end.
3. it stops it from rolling away.
4. it makes it easier for the hen to push it out.

(8) Two important ingredients that are first missing from an egg are

1. food and water.
2. antibodies and food.
3. proteins and oxygen.
4. heat and air.

(9) It can be inferred from the reading that, right after the baby chick emerges from its shell, it

1. continues to make its own food.
2. starts to depend on its shell for food.
3. starts looking for its own food.
4. removes the shell around it.

(10) Which paragraph describes how the embryo breathes within the shell?

1. the second paragraph starting with “The oval …”
2. the third paragraph starting with “The structure …”
3. the fourth paragraph starting with “When a …”
4. the fifth paragraph starting with “Apart from …”

III

次の英文を読み、下記の設問に答えなさい。

Ivan Pavlov, a famous Russian scientist, received the Nobel Prize in Physiology or Medicine in 1904 for his research. His notable experiment tested the saliva^注 flows of a dog. His experiment, conducted at the beginning of the twentieth century, was the first to demonstrate classical conditioning. In this experiment, two tubes are inserted into a dog's mouth. When a mixture of vinegar and water is poured through one tube, the other tube discharges the dog's digestive juice. Because salivation is not a learned response, but a natural response to the sour fluid, this salivation is called an unconditioned reflex.

Pavlov developed further experiments to study reflexes. In one experiment, he put food in front of a dog, and just before feeding the dog, he rang a bell. After repeating this action many times, he found that the dog salivated whenever the bell rang, even when the dog saw no food in front of it. This unnatural response is called a conditioned reflex. The stimulus for the dog's salivation this time was the sound of a bell, not food.

Further studies of conditioning were made by an American psychologist, B.F. Skinner, who used rats or pigeons to test responses in a chamber known as a Skinner box. He coined the term "operant conditioning," in which a subject must perform a certain action in order to get a reward. For example, a pigeon is placed in a Skinner box and when it strikes at a button located in the box, it receives a pellet of food. As this situation is repeated over and over, the pigeon learns how to get the desired result, and the behavior is reinforced. Skinner's findings from these experiments resulted in his being known as a leader of the field called behaviorism.

Skinner even applied his theories to human behavior. Although he recognized other important influences such as genetics, he advocated that rewards and punishments mainly guide human action. Whether or not

punishments are effective ways of preventing undesirable behavior is still controversial. During the first half of the twentieth century, behaviorism was (d) the dominant theory in behavioral psychology; however, cognitive psychology (e) has now gained popularity.

注：唾液

問 1 下線部(a)～(e)の単語の英文内で使われている意味として、最も適切なもの
をそれぞれ選択肢 1～4 の中から選びなさい。

(1) coined

(a)

- 1. created
- 3. prevented

- 2. manufactured
- 4. varied

(2) reinforced

(b)

- 1. supplied
- 3. strengthened

- 2. refilled
- 4. forbidden

(3) advocated

(c)

- 1. explained
- 3. provoked

- 2. proposed
- 4. justified

(4) controversial

(d)

- 1. acceptable
- 3. distributive

- 2. arguable
- 4. facilitative

(5) dominant

(e)

- 1. anticipating
- 3. existing

- 2. ruling
- 4. donating

問 2 次の質問に対する答えとして最も適したものを作り選択肢 1 ~ 4 の中から選びなさい。

- (1) What is the main topic of this passage?
 1. the beginning of psychology
 2. the experiment done by Pavlov
 3. the history of behaviorism
 4. the human's reward system

- (2) What is the finding of Pavlov's famous experiment?
 1. The experiment was first conducted using water and vinegar in 1904.
 2. When the vinegar was inserted by one tube, water was discharged by the other.
 3. The dog disliked taking water instead of vinegar.
 4. The dog produced digestive juice every time he was fed water and vinegar.

- (3) What is the main difference between an unconditioned reflex and a conditioned reflex?
 1. the nature of stimuli being used in the experiments
 2. the amount of food the animals ate
 3. the type of boxes the scientists used
 4. the number of responses from the bell

- (4) What can be inferred about Skinner?
 1. The punishments were prohibited in the Skinner's experiments.
 2. Skinner's experiments were conducted on humans.
 3. The behaviorists participated in Skinner's experiments.
 4. Skinner suggested that human actions can be guided by rewards and punishments.

(5) What can be inferred from the passage?

1. Without Pavlov, behaviorism would not have emerged.
2. Cognitive psychology was popular in the nineteenth century.
3. Currently, behaviorism is a widely accepted theory around the world.
4. The Skinner box is well known as a dog feeding tool.

IV

次の英文を読み、下記の設問に答えなさい。

Professor: Good morning James. For homework, you're going to read about the connection of sex with smell, which is highly developed in insects. During this biology laboratory period, you will be offered an insight into both the importance and the disadvantage of reliance on smell in relation to sex in the insect world. So for today's experiment, we will separate the head of a green bottle fly from its body and connect the head with this wire to an oscilloscope^{注1} that will display the waveform of any changes in electrical voltage as a line on the screen. This is similar to the machine that displays the waveform of the heartbeat that you might have seen in a hospital.

Student: But if we cut off the fly's head, won't it simply die and then we won't be able to see anything on the oscilloscope?

Professor: Not at all. Even with their heads separated, most insects can still briefly function. One example is that the female praying mantis will often cut off the head of the male during mating. While this may seem strange and you may think that it should defeat the purpose of mating, nonetheless with the brain removed this actually encourages what is left of the body of the male to continue to mate.

Student: That is very interesting, but what is the advantage of removing the fly's head from its body?

Professor: By removing its head, I am able to gain access to the olfactory organ while it is still functioning. The olfactory organ is where the sense of smell and the ability to perceive odors is located. Now let's begin our experiment. With the head removed and hooked up to the oscilloscope, I will wave some tobacco smoke in front of it. . . . Notice that there is no movement of the line on the oscilloscope. Now, with alcohol. . . . nothing. . . . Next I will try ammonia. . . . Once again, notice there is no visible movement. Now, let's try it with a very small quantity of the sex attractant^{注2} released by the female of the species. . . .

Student: Wow!!! Look, the line on the oscilloscope has really shot up! It is amazing that the fly could not smell anything except the female sex attractant. Even though only a small amount was used, the male fly could smell it very well.

Professor: Such ability to pick up the attractant by the female species is quite common in insects. For example, the male silkworm moth is able to detect the female's sex attractant molecule even if only one molecule reaches its antennae. A single female silkworm moth needs release only a hundredth of a microgram of sex attractant per second to attract every male silkworm nearby.

Student: To locate their mates only by their sense of smell sounds great, but couldn't it be used to trick the insects?

Professor: Yes, and one of the most curious aspects of the dependence on smell to find a mate and continue the species is found in South African beetles, which go into the ground during the winter. In the spring, as the ground thaws, the beetles emerge, but the male beetles come out of the ground a few weeks before the females do. In this same region of South Africa, a species of orchid has evolved which gives off an aroma identical to the sex attractant of the female beetle. The male beetles are exceedingly shortsighted^{#3}; and the orchids have evolved their petals so that, to a beetle, they resemble the female in receptive sexual posture. The male beetles (a) spend several weeks among the orchids before the females emerge from the ground.

Student: By producing and releasing the same molecule that the females produce, the orchids are able to trick the beetles into pollinating^{#4} them; therefore both organisms survive. That is a very good survival mechanism used by the orchids.
(b)

Professor: Yes, it is. But the orchids must be careful not to be too attractive; if the beetles fail to reproduce themselves, the orchids will also die out. As for the beetles, that is one limitation to purely olfactory sexual incentive. Another is that since every female beetle produces the same sex attractant, it is not easy for a male beetle to fall in love with that one special lady insect. While male insects may display themselves to attract a female, the central role of the female sex attractant in mating seems to reduce the extent of sexual selection among the insects.

Student: I'm glad we humans don't follow that way of finding a mate. It would mean the end of romance, wouldn't it?

Professor: At its simplest level, that is true, but there are several studies that suggest that humans also use various forms of smell, sight and so on, when subconsciously choosing their mate. However, that area is much more difficult to understand, and we will cover it next time.

注 1 : オシロスコープ

注 2 : 誘引物質

注 3 : 近眼で

注 4 : 受粉させる

問 英文の内容から判断し、(1)～(5)の質問に対する答えとして最も適したものを作成し、それと(6)～(10)の文を組み合わせて最も適したものを選択肢1～4の中から選びなさい。

(1) Which of the following does NOT have a correct meaning of the word “resemble”?

(a)

1. He is looking like his father more and more as the years go by.
2. He looks like his sister in appearance but not in character.
3. He takes his sister when they visit their grandmother.
4. He takes after his grandfather as he got older.

(2) Which of the following is closest in meaning to “survival mechanism”?

(b)

1. survival rate
2. survival period
3. survival technique
4. survival kit

(3) Which of the following is NOT mentioned as a way for orchids to reproduce themselves?

1. Orchids have evolved to bloom in the same season as the female beetle emerges.
2. Orchids have evolved to give off an aroma identical to that of the female beetle.
3. Orchids evolved shape of their petals that resembles the female beetle.
4. Orchids evolved at the same time as the female beetle.

(4) Why is it that the female praying mantis will cut off the head of her own mate?

1. to reduce competition after mating
2. to reduce the chance of species survival
3. to increase the chance of the species survival
4. to increase the chance of her survival after mating

(5) Which of the following groups would find it useful to have a sex attractant that can confuse male insects about the location of their female partners?

1. farmers
2. carpenters
3. researchers
4. educators

(6) It can be inferred from the reading that

1. the orchids as a species will die out in the near future.
2. the orchids as a species will outlive the beetle species because they look better than the female beetle.
3. the male beetles will mate with anything during the spring.
4. the male beetles have bad eyesight but good sense of smell.

(7) According to the reading, the key role of the female is

1. to display themselves to attract other female beetles.
2. to make babies for the species.
3. to attract the weakest male.
4. to live as long as possible.

(8) According to the professor, two of the biggest disadvantages of the male beetles are

1. they can't fall in love, but they can be tricked.
2. they emerge from the ground weeks before the female.
3. they don't fall in love and they don't care about the female beetles.
4. they can't tell the difference between an orchid and the female beetle because the female beetles are also beautiful like the orchid.

(9) It is implied in the last passage that humans and insects

1. share some of the same methods for choosing their mates.
2. sometimes choose their mates together.
3. share some advantageous methods for choosing a mate.
4. share some very different methods of choosing their mates.

(10) The best title for the reading is

1. “How Insects Rely on Sight to Find a Mate.”
2. “How Nature Uses Evolution through Natural Selection.”
3. “How Insects Can Briefly Function without their Head.”
4. “How Nature Tricks Insects into Evolution.”

V

自由英作文問題

下記のテーマについて、英語で自分の考えを述べなさい。書体は活字体でも筆記体でもよいが、解答は所定の範囲内に収めなさい。

According to the Ministry of Health and Welfare's estimate released in January 2012, Japan's population will keep declining by about one million people every year in the coming decades. What are your opinions about this situation?