英　　語（リーディング）

各大問の英文や図表を読み，解答番号 1 ～ 49 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）

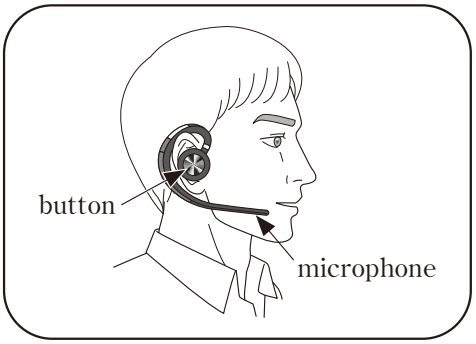
A You are waiting in line for a walking tour of a castle and are asked to test a new device. You receive the following instructions from the staff.

Audio Guide Testing
for the Westville Castle Walking Tour

Thank you for helping us test our new audio guide. We hope you will enjoy your experience here at Westville Castle.

How to use

When you put the device on your ear, it will turn on. As you walk around the castle, detailed explanations will automatically play as you enter each room. If you want to pause an explanation, tap the button on the earpiece once. The device is programmed to answer questions about the rooms. If you want to ask a question, tap the button twice and whisper. The microphone will pick up your voice and you will hear the answer.



Before you leave

Drop the device off at the collection desk to the left of the exit, then fill in a brief questionnaire, and hand it to the staff. In return, you will receive a discount coupon to use at the castle's souvenir shop.

問 1 The device is most likely to be able to answer questions about the [1].

① interiors of the castle
② length of the walking tour
③ mechanism of the device
④ prices at the souvenir shop

問 2 To get the coupon, you must [2].

① ask the staff a question about the device
② give some feedback about the device
③ leave through the exit on the left
④ submit your completed audio guide test

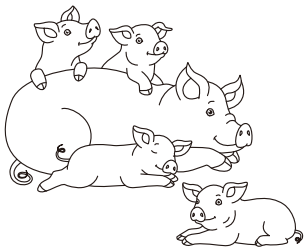
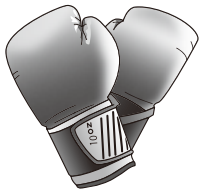
B Your English teacher has given you a flyer for an international short film festival in your city. You want to attend the festival.

Star International Short Film Festival 2023

February 10 (Fri.) -12 (Sun.)

We are pleased to present a total of 50 short films to celebrate the first decade of the festival. Below are the four films that were nominated for the Grand Prize. Enjoy a special talk by the film's director following the first screening of each finalist film.

Grand Prize Finalist Films

<table>
<tr>
<td>
My Pet Pigs, USA (27 min.)
This drama tells a heart-warming story about a family and their pets.</td>
<td>
Chase to the Tower, France (28 min.)
A police chase ends with thrilling action at the Eiffel Tower.</td>
</tr>
<tr>
<td>▸ Fri. 7 p.m. and Sat. 2 p.m.
▸ At Cinema Paradise, Screen 2</td>
<td>▸ Fri. 5 p.m. and Sun. 7 p.m.
▸ At Cinema Paradise, Screen 1</td>
</tr>
<tr>
<td>
Gold Medal Girl, China (25 min.)
This documentary highlights the life of an amazing athlete.</td>
<td>
Inside the Cave, Iran (18 min.)
A group of hikers has a scary adventure in this horror film.</td>
</tr>
<tr>
<td>▸ Sat. and Sun. 3 p.m.
▸ At Movie House, Main Screen</td>
<td>▸ Fri. 3 p.m. and Sat. 8 p.m.
▸ At Movie House, Screen 1</td>
</tr>
</table>

Festival Passes	
Type	Price (yen)
3-day	4,000
2-day	3,000
1-day	2,000

- Festival Passes are available from each theater. The theaters will also sell single tickets for 500 yen before each screening.
- Festival Pass holders are invited to attend the special reception in the lobby of Cinema Paradise on February 12 (Sun.) at 8 p.m.

For the complete schedule of the short films showing during the festival, please visit our website.

問 1 If you are free on Sunday evening, which finalist film can you see?

3

① *Chase to the Tower*
② *Gold Medal Girl*
③ *Inside the Cave*
④ *My Pet Pigs*

問 2 What will happen at Cinema Paradise on the last night of the festival?

4

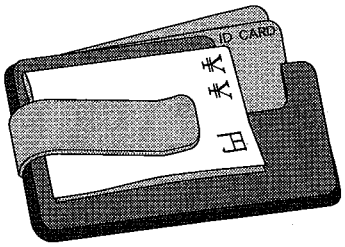
① An event to celebrate the festival will take place.
② Nominations will be made for the Grand Prize.
③ One of the directors will talk about *Chase to the Tower*.
④ The movie *My Pet Pigs* will be screened.

問 3 What is true about the short film festival? 5

① Four talks by film directors will be held.
② Passes can be bought through the website.
③ Reservations are necessary for single tickets.
④ The finalist films can be seen on the same day.

第 2 問 (配点 20)

A You are a member of a school newspaper club and received a message from Paul, an exchange student from the US.



I have a suggestion for our next issue. The other day, I was looking for a new wallet for myself and found a website selling small slim wallets which are designed to hold cards and a few bills. Weighing only 60 g, they look stylish. As I mainly use electronic money, this type of wallet seemed useful. I shared the link with my friends and asked them what they thought. Here are their comments:

- I use a similar wallet now, and it holds cards securely.
- They look perfect for me as I walk a lot, and it would be easy to carry.
- I'd definitely use one if the store near my house accepted electronic money.
- Cards take up very little space. Cashless payments make it easier to collect points.
- I use both electronic money and cash. What would I do with my coins?
- Interesting! Up to 6 cards can fit in it, but for me that is a card-holder, not a wallet.
- I like to keep things like receipts in my wallet. When I asked my brother, though, he told me he wanted one!
- They are so compact that I might not even notice if I lost mine.

When I talked with them, even those who don't like this type of wallet pointed out some merits of using cards and electronic money. This made me wonder why many students still use bills and coins, and I thought this might be a good topic for our newspaper. What do you think?

問 1 Which question did Paul probably ask his friends? [6]

① Do you carry a wallet?
② Do you use electronic money?
③ What do you keep in your wallet?
④ What do you think about these wallets?

問 2 A **fact** about a slim wallet mentioned by one of Paul's friends is that it [7].

① can hold half a dozen cards
② can slip out of a pocket easily
③ is ideal for walkers
④ is lighter than 80 g

問 3 One response shows that one of Paul's friends [8].

① finds slim wallets cool but doesn't want to use one
② prefers the capacity of a regular wallet
③ thinks slim wallets will be less popular in the future
④ uses a slim wallet with another wallet for coins

問 4 According to Paul's friend, using the wallet with electronic money makes it easier to [9].

① carry safely
② receive benefits
③ record receipts
④ use at any shop

問 5 Paul wants to find out more about [10].

① different types of electronic money

② students' reasons for using cash

③ the benefits of slim wallets for young people

④ the differences between small and large wallets

B You are reading the following article as you are interested in studying overseas.

Summer in Britain

Chiaki Suzuki

November 2022

This year, I spent two weeks studying English. I chose to stay in a beautiful city, called Punton, and had a wonderful time there. There were many things to do, which was exciting. I was never bored. It can get expensive, but I liked getting student discounts when I showed my student card. Also, I liked window-shopping and using the local library. I ate a variety of food from around the world, too, as there were many people from different cultural backgrounds living there. Most of the friends I made were from my English school, so I did not practice speaking English with the locals as much as I had expected. On the other hand, I came to have friends from many different countries. Lastly, I took public transport, which I found convenient and easy to use as it came frequently.

If I had stayed in the countryside, however, I would have seen a different side of life in Britain. My friend who stayed there had a lovely, relaxing experience. She said farmers sell their produce directly. Also, there are local theatres, bands, art and craft shows, restaurants, and some unusual activities like stream-jumping. However, getting around is not as easy, so it's harder to keep busy. You need to walk some distance to catch buses or trains, which do not come as often. In fact, she had to keep a copy of the timetables. If I had been in the countryside, I probably would have walked around and chatted with the local people.

I had a rich cultural experience and I want to go back to Britain. However, next time I want to connect more with British people and eat more traditional British food.

問 1　According to the article, Chiaki [11].

① ate food from different countries
② improved her English as she had hoped
③ kept notes on cultural experiences
④ worked in a local shop

問 2　With her student ID, Chiaki was able to [12].

① enter the local library
② get reduced prices
③ join a local student band
④ use public transport for free

問 3　Chiaki thinks [13] in Punton.

① it is easy to experience various cultures
② it is easy to make friends with the local people
③ there are many restaurants serving British food
④ there are many unusual local events

問 4　One **fact** Chiaki heard about staying in the countryside is that [14].

① local people carry the bus timetable
② people buy food from farms
③ the cost of entertainment is high
④ there are fewer interesting things to do

問 5　Which best describes Chiaki's impression of her time in Britain? [15]

① Her interest in craft shows grew.
② She enjoyed making lots of local friends.
③ She found the countryside beautiful.
④ Some of her experiences were unexpected.

第 3 問 (配点 15)

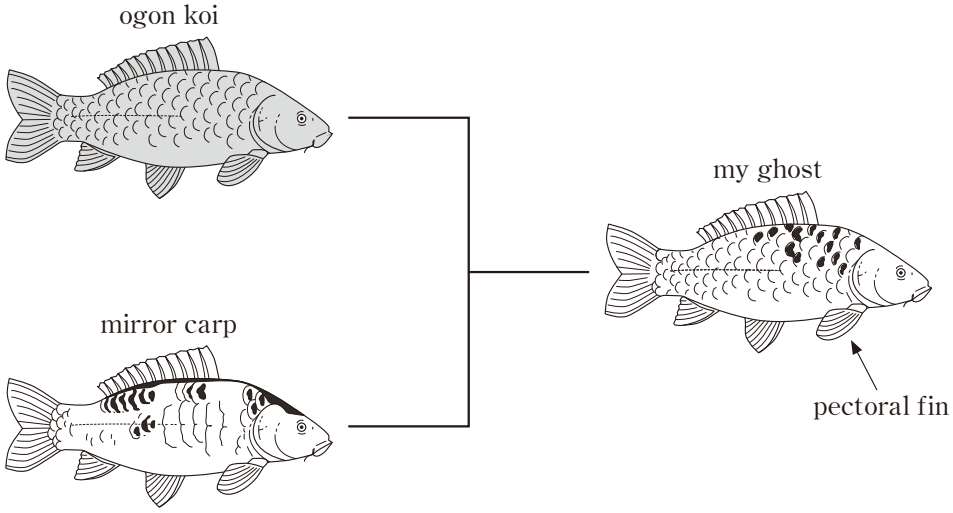
A The exchange student in your school is a koi keeper. You are reading an article he wrote for a magazine called *Young Fish-Keepers*.

My First Fish

Tom Pescatore

I joined the Newmans Koi Club when I was 13, and as part of my club's tradition, the president went with me to buy my first fish. I used money I received for my birthday and purchased a 15 cm baby ghost koi. She now lives with other members' fish in the clubhouse tank.

I love my fish, and still read everything I can about ghosts. Although not well known in Japan, they became widely owned by UK koi keepers in the 1980s. Ghosts are a hybrid type of fish. My ghost's father was a Japanese ogon koi, and her mother was a wild mirror carp. Ghosts grow quickly, and she was 85 cm and 12 kg within a couple of years. Ghosts are less likely to get sick and they can survive for more than 40 years. Mine is now a gorgeous, four-year-old, mature, platinum ghost koi.



Ghosts are not considered as valuable as their famous “pure-bred” Japanese cousins, so usually don’t cost much. This makes them affordable for a 13 year old with birthday present money. The most striking parts of my ghost are her metallic head and flashy pectoral fins that sparkle in the sunlight. As the name “ghost koi” suggests, these fish can fade in and out of sight while swimming. They are super-cool fish, so why not start with a ghost?

問 1 From the article, you know that Tom’s fish is **not** [16].

① adult
② cheap
③ pure-bred
④ tough

問 2 The species was named “ghost koi” because [17].

① their appearance is very frightening
② their shadowy fins flash when they swim
③ they can live secretly for a long time
④ they seem to mysteriously vanish in water

B You have entered an English speech contest and you are reading an essay to improve your presentation skills.

Gaining Courage

Rick Halston

In my last semester in college, I received an award for my final research presentation. I wasn't always good at speaking in front of people; in fact, one of my biggest fears was of making speeches. Since my primary school days, my shy personality had never been ideal for public speaking. From my first day of college, I especially feared giving the monthly class presentations. I would practise for hours on end. That helped somewhat, but I still sounded nervous or confused.

A significant change came before my most important presentation when I watched a music video from my favourite singer's newly released album. I noticed it sounded completely different from her previous work. She had switched from soft-rock to classical jazz, and her style of clothes had also changed. I thought she was taking a huge professional risk, but she displayed such confidence with her new style that I was inspired. I would change my sound and my look, too. I worked tirelessly to make my voice both bolder and calmer. I wore a suit jacket over my shirt, and with each practice, I felt my confidence grow.

When I started my final presentation, naturally, I was nervous, but gradually a sense of calm flowed through me. I was able to speak with clarity and answer the follow-up questions without tripping over my words. At that moment, I actually felt confident. Right then, I understood that we can either allow anxiety to control us or find new ways to overcome it. There is no single clear way to become a confident presenter, but thanks to that singer I realised that we need to uncover and develop our own courage.



問 1 Put the following events (①～④) into the order in which they happened.

18 → 19 → 20 → 21

① He felt nervous at the start of his final presentation.

② He made short presentations on a regular basis.

③ He was given a prize for his presentation.

④ He was motivated to take a risk and act more confidently.

問 2 Rick was moved by his favourite singer and 22 .

① accepted his own shy personality

② decided to go to her next concert

③ found new ways of going to class

④ learnt from her dramatic changes

問 3 From the essay, you learnt that Rick 23 .

① began to deal with his anxiety

② decided to change professions

③ improved his questioning skills

④ uncovered his talent for singing

第 4 問 (配点 16)

You and two friends have rented a section of a community garden for the first time. Your friends have written emails about their ideas for growing vegetables in the garden. Based on their ideas, you reply to finalize the garden plans.

March 23, 2023

Our Garden Plan

Hi! Daniel here! I scanned this great planting chart in a gardening book I got from the library. The black circles show when to plant seeds directly into the soil. The black squares show when to plant seedlings, which are like baby plants. The stars show when to harvest a vegetable.

Planting Schedule

	Mar.		Apr.		May		June		July		Aug.		Sept.		Oct.		Nov.	
beans			●	●	●				☆	☆								
cabbages		●	●						☆	☆		■	■			☆	☆	☆
carrots		●	●						☆	☆								
onions						☆	☆	☆					●	●				
potatoes	●	●					☆	☆			●						☆	☆
tomatoes			●	■	■					☆	☆	☆						

It's already late March, so I think we should plant the potatoes now. We can harvest them in June, and then plant them again in August. Also, I'd like to plant the carrots at the same time as the potatoes, and the cabbages the next month. After harvesting them in July, we can put in cabbage seedlings at the same time as we plant the onions. We won't be able to eat our onions until next year! I have bought tomato seedlings and would like to give them more time to grow before planting them. Let's plant the beans toward the end of April, and the tomatoes the following month.

Let's discuss the garden layout. We will have a 6 × 6 meter area and it can be divided into two halves, north and south. Beans, cabbages, and tomatoes grow above the ground so let's grow them together. How about in the southern part? We can grow the carrots, potatoes, and onions together because they all grow underground. They will go in the northern part.

March 24, 2023

Re: Our Garden Plan

Thanks, Daniel!

Rachel here. Your schedule is great, but I'd like to make some changes to your garden layout. We have six vegetables, so why don't we divide the garden into six sections?

We have to be careful about which vegetables we plant next to one another. I did a little research in a gardening book about the vegetables we'll grow. Some of our vegetables grow well together and they are called "friends." Others don't and they are "enemies." Our layout must consider this.

First, the tomatoes should go in the southern part of the garden. Tomatoes and cabbages are enemies and should be separated. Let's plant the cabbages in the southwest corner. The onions can be put in the middle because they are friends of both tomatoes and cabbages.

Next, let's think about the northern part of the garden. Let's put the beans in the western corner because beans and cabbages are friends. Carrots are friends with tomatoes so planting them in the eastern corner would be better. Potatoes can go in the middle. They are friends with beans and neutral with onions.

Well, what do you think of the layout?

March 25, 2023

Re: Re: Our Garden Plan

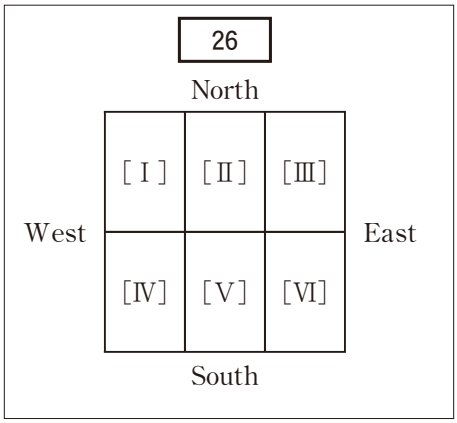
Hi!

It's me! Thanks for your excellent ideas! Below is the planting schedule Daniel suggested two days ago. First, we need to buy [24] kinds of seeds soon so we can plant them over the next two months!

[25]

Mar.	Early Apr.	Late Apr.	May	Aug.	Sept.
−[A] −potatoes	−[B]	−[C]	−[D]	−potatoes	−onions −cabbages

I made this garden layout using Rachel's idea.



It is similar to Daniel's. The vegetables in the northern and southern halves are almost the same. Only the [27] are in different areas.

Rachel did a good job of considering friends and enemies. For our reference, I have made a chart.

[28]

We have not yet discussed [29], but I think we should.

問 1 Choose the best option for [24].

① 3
② 4
③ 5
④ 6

問 2 Complete the planting schedule in your email. Choose the best option for [25].

	[A]	[B]	[C]	[D]
①	cabbages	carrots	beans	tomatoes
②	cabbages	carrots	tomatoes	beans
③	carrots	cabbages	beans	tomatoes
④	carrots	tomatoes	cabbages	beans

問 3 Complete the garden layout information in your email.

Choose the best option for [26].

	[Ⅰ]	[Ⅱ]	[Ⅲ]	[Ⅳ]	[Ⅴ]	[Ⅵ]
①	beans	onions	tomatoes	cabbages	potatoes	carrots
②	beans	potatoes	carrots	cabbages	onions	tomatoes
③	cabbages	onions	carrots	beans	potatoes	tomatoes
④	cabbages	potatoes	tomatoes	beans	onions	carrots

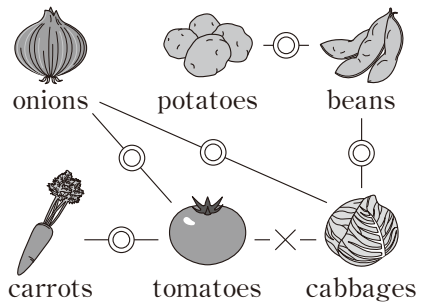
Choose the best option for [27].

① beans and onions
② cabbages and potatoes
③ carrots and tomatoes
④ onions and potatoes

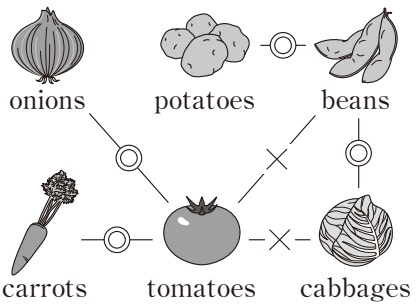
問 4　Which chart should appear in [28]?

(◎ : friends, × : enemies)

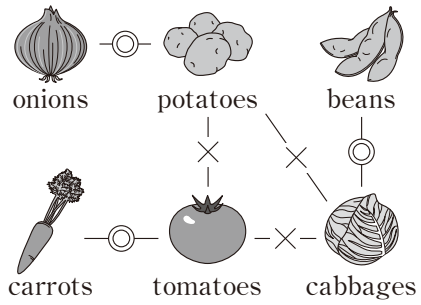
①



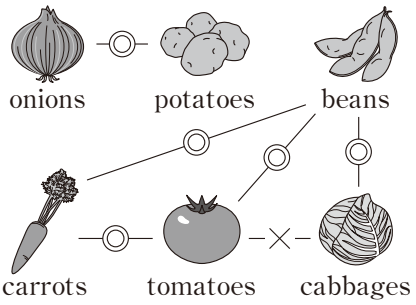
②



③



④



問 5 Choose the best option for [29].

① the difference between seeds and seedlings
② the responsibilities of caring for the garden
③ the timing for collecting the crops
④ vegetables that should be planted together

第 5 問 (配点 15)

Your English teacher has told everyone in your class to choose a short story in English to read. You will introduce the following story to your classmates, using a worksheet.

Becoming an Artist

Lucy smiled in anticipation. In a moment she would walk onto the stage and receive her prize from the mayor and the judges of the drawing contest. The microphone screeched and then came the mayor's announcement. "And the winner of the drawing contest is... Robert McGinnis! Congratulations!"

Lucy stood up, still smiling. Then, her face blazing red with embarrassment, abruptly sat down again. What? There must be a mistake! But the boy named Robert McGinnis was already on the stage, shaking hands with the mayor and accepting the prize. She glanced at her parents, her eyes filled with tears of disappointment. They had expected her to do well, especially her father. "Oh Daddy, I'm sorry I didn't win," she whispered.

Lucy had enjoyed drawing since she was a little girl. She did her first drawing of her father when she was in kindergarten. Although it was only a child's drawing, it really looked like him. He was delighted, and, from that day, Lucy spent many happy hours drawing pictures to give to Mommy and Daddy.

As she got older, her parents continued to encourage her. Her mother, a busy translator, was happy that her daughter was doing something creative. Her father bought her art books. He was no artist himself, but sometimes gave her advice, suggesting that she look very carefully at what she was drawing and copy as accurately as possible. Lucy tried hard, wanting to improve her technique and please her father.

It had been Lucy's idea to enter the town drawing contest. She thought that if she won, her artistic ability would be recognized. She practiced every

evening after school. She also spent all her weekends working quietly on her drawings, copying her subjects as carefully as she could.

Her failure to do well came as a great shock. She had worked so hard and her parents had been so supportive. Her father, however, was puzzled. Why did Lucy apologize at the end of the contest? There was no need to do so. Later, Lucy asked him why she had failed to win the competition. He answered sympathetically, "To me, your drawing was perfect." Then he smiled, and added, "But perhaps you should talk to your mother. She understands art better than I do."

Her mother was thoughtful. She wanted to give Lucy advice without damaging her daughter's self-esteem. "Your drawing was good," she told her, "but I think it lacked something. I think you only drew what you could see. When I translate a novel, I need to capture not only the meaning, but also the spirit of the original. To do that, I need to consider the meaning behind the words. Perhaps drawing is the same; you need to look under the surface."

Lucy continued to draw, but her art left her feeling unsatisfied. She couldn't understand what her mother meant. What was wrong with drawing what she could see? What else could she do?

Around this time, Lucy became friends with a girl called Cathy. They became close friends and Lucy grew to appreciate her for her kindness and humorous personality. Cathy often made Lucy laugh, telling jokes, saying ridiculous things, and making funny faces. One afternoon, Cathy had such a funny expression on her face that Lucy felt she had to draw it. "Hold that pose!" she told Cathy, laughing. She drew quickly, enjoying her friend's expression so much that she didn't really think about what she was doing.

When Lucy entered art college three years later, she still had that sketch. It had caught Cathy exactly, not only her odd expression but also her friend's kindness and her sense of humor — the things that are found under the surface.

Your worksheet:

1. Story title

"Becoming an Artist"

2. People in the story

Lucy: She loves to draw.

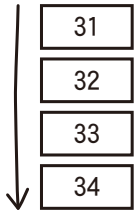
Lucy's father: He [30] .

Lucy's mother: She is a translator and supports Lucy.

Cathy: She becomes Lucy's close friend.

3. What the story is about

Lucy's growth as an artist:



Her drawing improves thanks to [35] and [36] .

4. My favorite part of the story

When the result of the contest is announced, Lucy says, "Oh Daddy, I'm sorry I didn't win."

This shows that Lucy [37] .

5. Why I chose this story

Because I want to be a voice actor and this story taught me the importance of trying to [38] to make the characters I play seem more real.

問 1 Choose the best option for [30].

① gives Lucy some drawing tips
② has Lucy make drawings of him often
③ spends weekends drawing with Lucy
④ wants Lucy to work as an artist

問 2 Choose **four** out of the five descriptions (①～⑤) and rearrange them in the order they happened. [31] → [32] → [33] → [34]

① She becomes frustrated with her drawing.
② She decides not to show anyone her drawings.
③ She draws with her feelings as well as her eyes.
④ She has fun making drawings as gifts.
⑤ She works hard to prove her talent at drawing.

問 3 Choose the best two options for [35] and [36]. (The order does not matter.)

① a friend she couldn't help sketching
② a message she got from a novel
③ advice she received from her mother
④ her attempt to make a friend laugh
⑤ spending weekends drawing indoors

問 4 Choose the best option for 37 .

① didn't practice as much as her father expected
② knew her father didn't like her entering the contest
③ thought she should have followed her father's advice
④ was worried she had disappointed her father

問 5 Choose the best option for 38 .

① achieve a better understanding of people
② analyze my own feelings more deeply
③ describe accurately what is happening around me
④ use different techniques depending on the situation

第 6 問 (配点 24)

A You belong to an English discussion group. Each week, members read an article, create a summary, and make a challenging quiz question to share. For the next meeting, you read the following article.

Getting to Know Aquatic Species

The mysteries of the deep blue sea have fascinated ocean-watchers for millennia. Aquatic beings, however, cannot easily get to us. What if we go to them? Despite what you may expect, certain ocean animals will come right up to you. Dan McSweeney, a Hawaii-based underwater research photographer, tells a fascinating story. While he was studying whales underwater, one came charging at him. Whales are huge, so he was worried. The whale stopped, opened its mouth, and "passed" him some tuna. He accepted the gift. McSweeney believes that because of the air bubbles coming from his tank, the whale recognized him as a similar animal and offered the *sashimi*. Later, the whale came back, and McSweeney returned the food.

Friendly interactions with dolphins or whales are possible, but how about octopuses? Science fiction sometimes describes aliens as looking like octopuses, so this animal group "cephalopods," which means "head-feet," may be perceived as being distant from humans. Yet, if you learn more about them, you might be convinced there is the possibility of interaction. Octopuses have long tentacles (arms/legs) extending from soft round bodies. Besides touch and motion, each tentacle experiences smell and taste and has sucking disks, called *suckers*, that grab and manipulate things. Their eyes, like two independent cameras, can move 80° and focus on two different things at once. UC Berkeley researcher, Alexander Stubbs, confirms that while octopuses sense light and color differently from humans, they do recognize color

changes. These features might indicate that they are intelligent enough to interact with us. In fact, an article in *Everyday Mysteries* begins: "Question. Can an octopus get to know you? Answer. Yes."

Octopuses are known to "return your gaze" when you look at them. They may even remember you. This notion was tested by Roland C. Anderson and his colleagues, who conducted experiments with two similar-looking people wearing the same uniforms. The friendly person, who had fed and socialized with them, got a completely different reaction from the cephalopods than the other person who had not.

When taken from their natural habitat, octopuses can be mischievous, so watch out. They can push the lids off their tanks, escape, and go for a walk. Scientists sometimes get surprise visits. A paper from the Naples Zoological Station, written in 1959, talks about trying to teach three octopuses to pull a lever down for food. Two of them, Albert and Bertram, cooperated with the experiment, but Charles, a clever cephalopod, refused to do so. He shot water at the scientists and ended the experiment by breaking the equipment.

If you are interested in seeing their natural behavior and interactions, getting into the sea and having them come to you might work better. They may even raise a tentacle to motion you over. Around 2007, Peter Godfrey-Smith, a philosophy professor teaching at Harvard University, was home on vacation in Sydney, Australia. Exploring in the ocean, he came across a giant cephalopod. Godfrey-Smith was so impressed by the behavior he witnessed that he started developing philosophy theories based on his observations. Determined to find out what humans could learn from cephalopods, Godfrey-Smith let them guide him. On one ocean trip, another cephalopod took Godfrey-Smith's colleague by the hand on a 10-minute tour of the octopus's home, "as if he were being led across the sea floor by a very small, eight-legged child!"

How can you get sea creatures to come to you if you don't swim? The

Kahn family has solved this with “Coral World” in Eilat, Israel. The lowest floor of the building is actually constructed in the Red Sea, creating a “human display.” Rather than the sea-life performances at many aquariums, you find yourself in a “people tank,” where curious fish and sea creatures, swimming freely in the ocean, come to look at you. To make a good impression, you may want to wear nice clothes.

Your summary:

Getting to Know Aquatic Species

General information

The author mainly wants to say that [39].

Human-octopus interaction

Anderson's experiment suggests octopuses can [40].

The Naples Zoological Station experiment suggests octopuses can [41].

Godfrey-Smith's story suggests octopuses can be friendly.

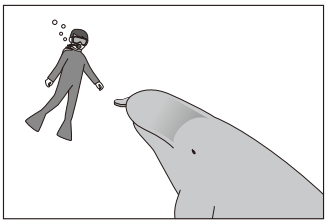
The Kahn family

Established Coral World with the idea of [42]

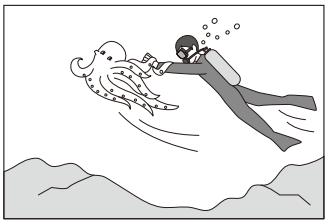
Your quiz question:

Which of the following does not represent a story or episode from the article?

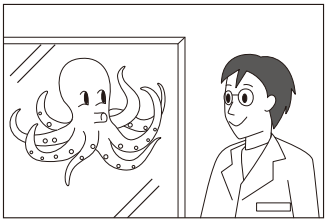
A



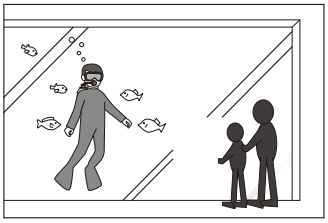
B



C



D



Answer [43]

問 1 Choose the best option for [39].

① a good place where people can interact with octopuses is the ocean
② eye contact is a key sign of friendship between different species
③ interactions with sea creatures can be started by either side
④ people should keep sea creatures at home to make friends with them

問 2 Choose the best options for [40] and [41].

① be a good source for creating philosophical theories
② be afraid of swimmers when they get close to their home
③ be uncooperative with humans in a laboratory setting
④ compete with other octopuses if they have chances to get treats
⑤ recognize that someone they have met before is kind
⑥ touch, smell, taste, and sense light and color like humans

問 3 Choose the best option for [42].

① attracting more people with a unique aquarium
② creating a convenient place to swim with sea life
③ raising more intelligent and cooperative octopuses
④ reversing the roles of people and sea creatures

問 4 The answer to your quiz question is [43].

① **A**
② **B**
③ **C**
④ **D**

B You are preparing a poster for an in-school presentation on a scientific discovery, using the following article.

As you are reading this, you probably have a pencil in your hand. In the center of every pencil is something called "lead." This dark gray material is not actually lead (Pb), but a different substance, graphite. Graphite has been a major area of research for many years. It is made up of thin layers of carbon that can be easily separated. Indeed, it is this ease of separation that enables the pencil to write. As the pencil rubs against the paper, thin layers of carbon are pulled off the pencil lead and left on the paper as lines or writing.

In 2004, two scientists, Andre Geim and Konstantin Novoselov, were investigating graphite at the University of Manchester, in the UK. They were trying to see if they could obtain a very thin slice of graphite to study. Their goal was to get a slice of carbon which was between 10 and 100 layers thick. Even though their university laboratory had the latest scientific equipment, they made their incredible breakthrough — for what was later to become a Nobel Prize-winning discovery — with only a cheap roll of sticky tape.

In a BBC News interview, Professor Geim described their technique. He said that the first step was to put sticky tape on a piece of graphite. Then, when the tape is pulled off, a flake of graphite will come off on the tape. Next, fold the tape in half, sticking the flake onto the other side of the tape. Then pull the tape apart to split the flake. You now have two flakes, roughly half as thick as before. Fold the tape together once more in a slightly different position to avoid having the flakes touch each other. Pull it apart again, and you will now have four thinner flakes than before. Repeat this procedure 10 or 20 times, and you're left with many very thin flakes attached to your tape. Finally, you dissolve the tape using chemicals so everything goes into a solution.

Geim and Novoselov then looked at the solution, and were surprised to see

that the thin flakes were flat and not rolled up — and even more surprised that the flakes were as thin as only 10 layers of graphite. As graphite conducts electricity, it was only a matter of weeks before they were studying whether these thin sheets could be used in computer chips. By 2005, they had succeeded in separating a single layer of graphite. As this does not exist naturally, this new material was given a new name: graphene. Graphene is only one atom thick, and perhaps the thinnest material in the universe. It is one of the few two-dimensional (2D) materials known, and forms a six-sided, honeycomb-patterned structure. In addition, it is possibly the lightest and strongest substance known on earth. It is also excellent at carrying electricity. In fact, at laboratory temperatures (20-25℃), graphene conducts electricity faster than any known substance. This has led to manufacturers investing in further research because graphene-based batteries could last three times longer and be charged five times faster than lithium-ion batteries.

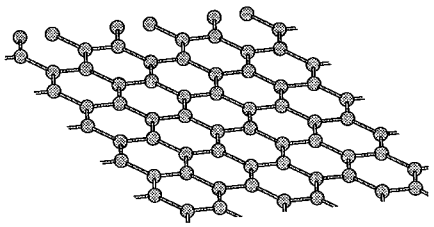


Figure 1. Structure of Graphene

Graphene has been called a super-material because of its amazing properties. It is 1,000 times lighter than paper and close to being totally transparent. It allows 98% of light to pass through it while at the same time it is so dense that even one molecule of helium gas cannot pass through it. It can also convert light into electricity. It is 200 times stronger than steel by weight: So strong in fact, that if you could make a 1 m^2 sheet of graphene, it would weigh less than a human hair and be strong enough to hold the weight of a cat. Quite simply, this material found in pencil lead has the potential to revolutionize the development of computer chips, rechargeable batteries, and strong, light-weight materials.

Your presentation poster draft:

Graphene

Basic information

44

Graphene. . .

A. is a 2D material.

B. is a separated layer of graphite.

C. is an extremely thin sheet of metal.

D. is not a naturally occurring substance.

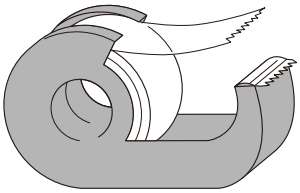
E. looks like a sheet of wire mesh.

F. was isolated without advanced equipment.

How Geim and Novoselov separated graphite (5 steps)

Step 1. Press sticky tape on graphite and remove.

Step 2.
Step 3. } 45
Step 4.



Step 5. Dissolve tape in a chemical solution and collect the flakes.

The properties of graphene

46

47

Future use

48

問 1 You are checking your poster. You spotted an error in the basic information section. Which of the following should you **remove**? 44

① **A**
② **B**
③ **C**
④ **D**
⑤ **E**
⑥ **F**

問 2 You are going to summarize the five-step process used to separate layers of graphite. Choose the best combination of steps to complete the process. 45

A. Do this process over and over again.
B. Fold tape in two again so another part of the tape touches the graphite.
C. Fold tape in two and pull it apart.
D. Place tape on the thinner flakes and press down.
E. Pull a flake of graphite off some sticky tape.

① **C → B → A**
② **C → E → D**
③ **D → C → B**
④ **D → E → A**
⑤ **E → C → A**
⑥ **E → C → D**

問 3 From the list below, select the two which best describe graphene's properties. (The order does not matter.) 46 ・ 47

① At average room temperature, it is the world's most efficient material for carrying electricity.

② Gram for gram, graphene is stronger and more resistant to electricity.

③ Graphene weighs slightly more than graphite per cm^2.

④ It allows almost all light to pass through its structure.

⑤ Its six-sided honeycomb structure allows gas particles to pass from one side to another.

問 4 From this passage, which of the following might graphene be used for in the future? 48

① A material for filtering small gas molecules from large ones

② Developing light-sensitive chips

③ Electricity resistant materials

④ Increasing the weight and strength of batteries

問 5 From this passage, we can infer that the writer 49 .

① believed that many great Nobel Prize-winning discoveries have been made with low-cost equipment

② knew about the potential of graphene to reduce the production costs and recharging times of rechargeable batteries

③ was impressed by the fact that graphene and all its properties had lain hidden in every pencil mark until being revealed by Geim and Novoselov

④ was surprised at how long it took for Geim and Novoselov to realize the potential of using thin sheets of graphene in computer chips