

試験開始の指示があるまで、この問題冊子の中を見てはいけません。

①

# 外国語 [英語(リーディング)] (100点 / 80分)

ドイツ語、フランス語、中国語及び韓国語の問題冊子は、出願時にそれぞれの科目の受験を希望した者に配付します。

## 注意事項

- 1 解答用紙に、正しく記入・マークされていない場合は、採点できないことがあります。特に、解答用紙の解答科目欄にマークされていない場合又は複数の科目にマークされている場合は、0点となります。

ただし、出願時にドイツ語、フランス語、中国語及び韓国語の問題冊子の配付を希望しなかった者は英語として採点します。

- 2 この問題冊子は、39 ページあります。

試験中に問題冊子の印刷不鮮明、ページの落丁・乱丁及び解答用紙の汚れ等に気付いた場合は、手を高く挙げて監督者に知らせなさい。

- 3 解答は、解答用紙の解答欄にマークしなさい。例えば、

10
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と表示のある問いに対して③と解答する場合は、次の(例)のように解答番号10の解答欄の③にマークしなさい。

(例)

解答番号	解 答 欄
10	① ② ● ④ ⑤ ⑥ ⑦ ⑧ ⑨

- 4 問題冊子の余白等は適宜利用してよいが、どのページも切り離してはいけません。

## 5 不正行為について

- ① 不正行為に対しては厳正に対処します。
- ② 不正行為に見えるような行為が見受けられた場合は、監督者がカードを用いて注意します。
- ③ 不正行為を行った場合は、その時点で受験を取りやめさせ退室させます。

- 6 試験終了後、問題冊子は持ち帰りなさい。

**B** You are in a student group preparing for an international science presentation contest. You are using the following passage to create your part of the presentation on extraordinary creatures.

Ask someone to name the world's toughest animal, and they might say the Bactrian camel as it can survive in temperatures as high as  $50^{\circ}\text{C}$ , or the Arctic fox which can survive in temperatures lower than  $-58^{\circ}\text{C}$ . However, both answers would be wrong as it is widely believed that the tardigrade is the toughest creature on earth.

Tardigrades, also known as water bears, are microscopic creatures, which are between 0.1 mm to 1.5 mm in length. They live almost everywhere, from 6,000-meter-high mountains to 4,600 meters below the ocean's surface. They can even be found under thick ice and in hot springs. Most live in water, but some tardigrades can be found in some of the driest places on earth. One researcher reported finding tardigrades living under rocks in a desert without any recorded rainfall for 25 years. All they need are a few drops or a thin layer of water to live in. When the water dries up, so do they. They lose all but three percent of their body's water and their metabolism slows down to 0.01% of its normal speed. The dried-out tardigrade is now in a state called "tun," a kind of deep sleep. It will continue in this state until it is once again soaked in water. Then, like a sponge, it absorbs the water and springs back to life again as if nothing had happened. Whether the tardigrade is in tun for 1 week or 10 years does not really matter. The moment it is surrounded by water, it comes alive again. When tardigrades are in a state of tun, they are so tough that they can survive in temperatures as low as  $-272^{\circ}\text{C}$  and as high as  $151^{\circ}\text{C}$ . Exactly how they achieve this is still not fully understood.

Perhaps even more amazing than their ability to survive on earth—they have been on earth for some 540 million years—is their ability to survive in space. In 2007, a team of European researchers sent a number of living

tardigrades into space on the outside of a rocket for 10 days. On their return to earth, the researchers were surprised to see that 68% were still alive. This means that for 10 days most were able to survive X-rays and ultraviolet radiation 1,000 times more intense than here on earth. Later, in 2019, an Israeli spacecraft crashed onto the moon and thousands of tardigrades in a state of tun were spilled onto its surface. Whether these are still alive or not is unknown as no one has gone to collect them — which is a pity.

Tardigrades are shaped like a short cucumber. They have four short legs on each side of their bodies. Some species have sticky pads at the end of each leg, while others have claws. There are 16 known claw variations, which help identify those species with claws. All tardigrades have a place for eyes, but not all species have eyes. Their eyes are primitive, only having five cells in total — just one of which is light sensitive.

Basically, tardigrades can be divided into those that eat plant matter, and those that eat other creatures. Those that eat vegetation have a ventral mouth — a mouth located in the lower part of the head, like a shark. The type that eats other creatures has a terminal mouth, which means the mouth is at the very front of the head, like a tuna. The mouths of tardigrades do not have teeth. They do, however, have two sharp needles, called stylets, that they use to pierce plant cells or the bodies of smaller creatures so the contents can be sucked out.

Both types of tardigrade have rather simple digestive systems. The mouth leads to the pharynx (throat), where digestive juices and food are mixed. Located above the pharynx is a salivary gland. This produces the juices that flow into the mouth and help with digestion. After the pharynx, there is a tube which transports food toward the gut. This tube is called the esophagus. The middle gut, a simple stomach/intestine type of organ, digests the food and absorbs the nutrients. The leftovers then eventually move through to the anus.

Your presentation slides:

## Tardigrades: Earth's Ultimate Survivors

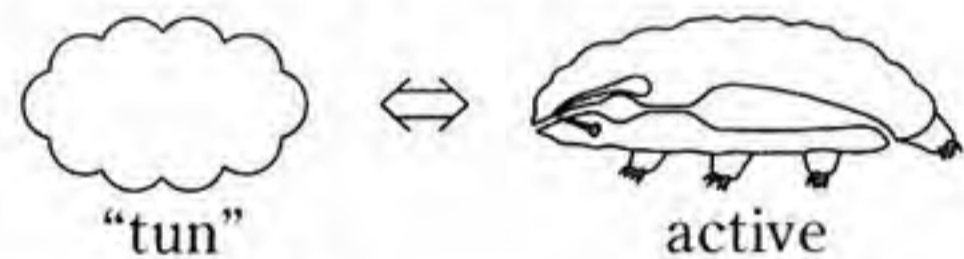
### 1. Basic Information

- 0.1 mm to 1.5 mm in length
- shaped like a short cucumber
- 
- 44
- 

### 2. Habitats

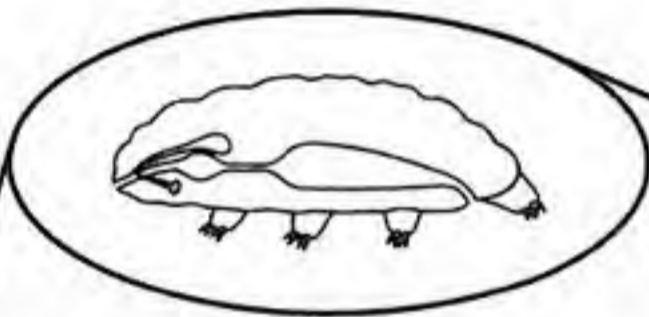
- live almost everywhere
- extreme environments such as...
  - ✓ 6 km above sea level
  - ✓ 4.6 km below sea level
  - ✓ in deserts
  - ✓  $-272^{\circ}\text{C}$  to  $151^{\circ}\text{C}$
  - ✓ in space (possibly)

### 3. Secrets to Survival



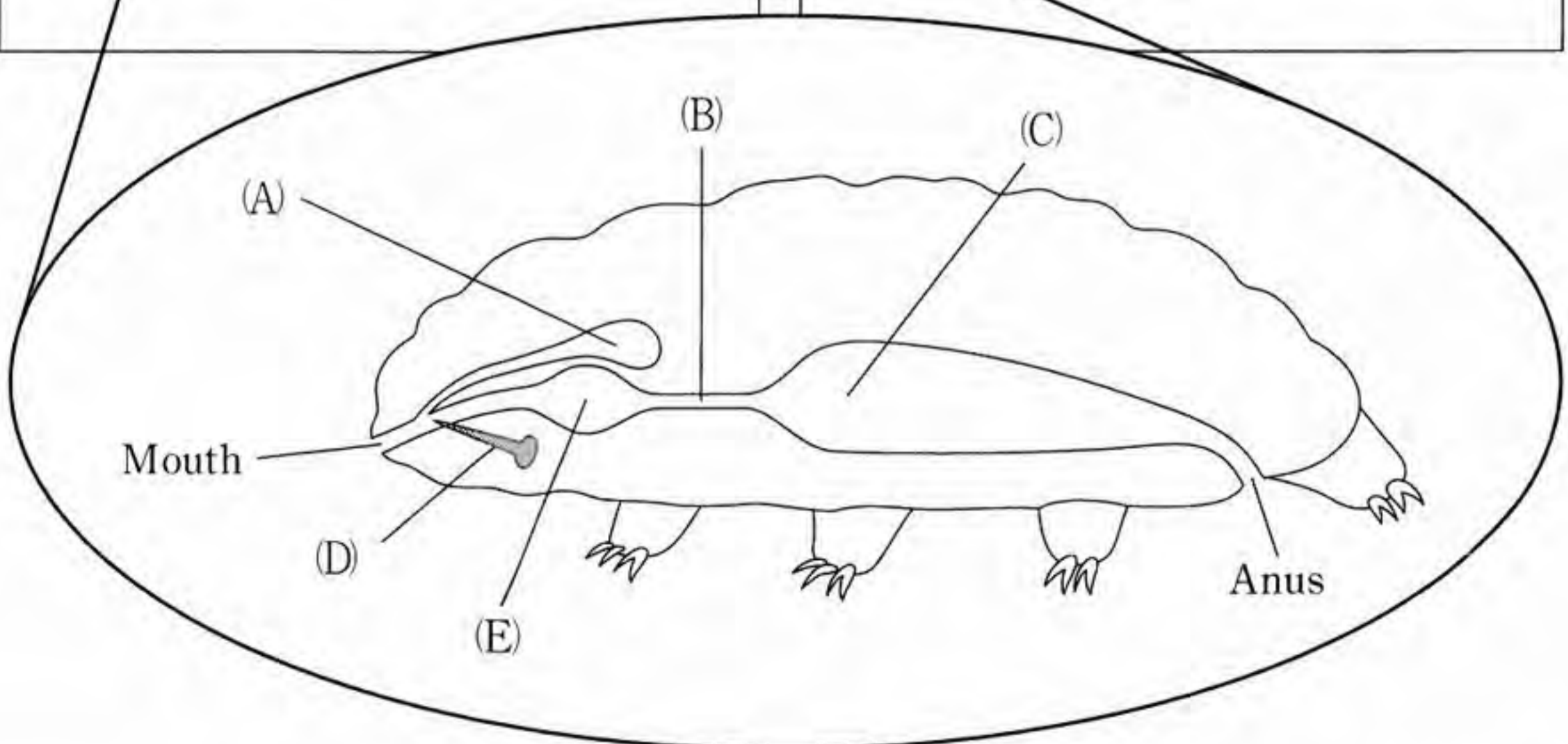
- 45
- 46

### 4. Digestive Systems 47



### 5. Final Statement 48

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問 1 Which of the following should you not include for 44 ?

- ① eight short legs
- ② either blind or sighted
- ③ plant-eating or creature-eating
- ④ sixteen different types of feet
- ⑤ two stylets rather than teeth

問 2 For the **Secrets to Survival** slide, select two features of the tardigrade which best help it survive. (The order does not matter.) 45 · 46

- ① In dry conditions, their metabolism drops to less than one percent of normal.
- ② Tardigrades in a state of tun are able to survive in temperatures exceeding 151°C.
- ③ The state of tun will cease when the water in a tardigrade's body is above 0.01%.
- ④ Their shark-like mouths allow them to more easily eat other creatures.
- ⑤ They have an ability to withstand extreme levels of radiation.

問 3 Complete the missing labels on the illustration of a tardigrade for the **Digestive Systems** slide. 47

- ① (A) Esophagus (B) Pharynx (C) Middle gut  
(D) Stylets (E) Salivary gland
- ② (A) Pharynx (B) Stylets (C) Salivary gland  
(D) Esophagus (E) Middle gut
- ③ (A) Salivary gland (B) Esophagus (C) Middle gut  
(D) Stylets (E) Pharynx
- ④ (A) Salivary gland (B) Middle gut (C) Stylets  
(D) Esophagus (E) Pharynx
- ⑤ (A) Stylets (B) Salivary gland (C) Pharynx  
(D) Middle gut (E) Esophagus

問 4 Which is the best statement for the final slide?

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- ① For thousands of years, tardigrades have survived some of the harshest conditions on earth and in space. They will live longer than humankind.
- ② Tardigrades are from space and can live in temperatures exceeding the limits of the Arctic fox and Bactrian camel, so they are surely stronger than human beings.
- ③ Tardigrades are, without a doubt, the toughest creatures on earth. They can survive on the top of mountains; at the bottom of the sea; in the waters of hot springs; and they can also thrive on the moon.
- ④ Tardigrades have survived some of the harshest conditions on earth, and at least one trip into space. This remarkable creature might outlive the human species.

問 5 What can be inferred about sending tardigrades into space?

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- ① Finding out whether the tardigrades can survive in space was never thought to be important.
- ② Tardigrades, along with other creatures that have been on earth for millions of years, can withstand X-rays and ultraviolet radiation.
- ③ The Israeli researchers did not expect so many tardigrades to survive the harsh environment of space.
- ④ The reason why no one has been to see if tardigrades can survive on the moon's surface attracted the author's attention.

英語(リーディング) (100点満点)

問題 番号 (配点)	設問	解答番号	正解	配点	問題 番号 (配点)	設問	解答番号	正解	配点		
第1問 (10)	A	1	1	1	第4問 (16)	1	24	1	3		
		2	2	4		2	2	25	1	3	
	B	1	3	3		2	2	26	2	2	
		2	4	4		2	2	27	5	2	
		3	5	3		2	3	28	1	3	
第2問 (20)	A	1	6	2	第5問 (15)	1	30	4	3		
		2	7	2		2	2	31	3	3	
		3	8	2		2	3	32	2	3*	
		4	9	4		2		33	4		
		5	10	1		2		34	5		
	B	1	11	4	2	35	3	3			
		2	12	1	2	4	36	3	3		
		3	13	1	2	5	37-38	1-5	3*		
		4	14	1	2						
		5	15	2	2						
第3問 (15)	A	1	16	2	第6問 (24)	A	1	39	3	3	
		2	17	3			3	2	40	4	3
	B	1	18	3			3*	3	41-42	4-6	3*
			19	4				4	43	1	3
			20	2		1		2	44	4	2
	21	1	3	3		B	2	45-46	1-5	3*	
	22	3	3	3			3	47	3	2	
23	2	3	3	4	48		4	2			
(注) 1 *は、全部正解の場合のみ点を与える。 2 -(ハイフン)でつながれた正解は、順序を問わない。					5	49	4	3			