

平成 18 年度大学院工学研究科（博士前期課程）
外国語試験（英語）問題

注 意 事 項

1. 試験開始の指示があるまで、この問題冊子及び別冊の解答用紙は、開かないでください。
2. 問題は、1 ページから 8 ページまであります。解答用紙は、5 枚あります。ページの脱落等に気が付いたときは、手をあげて監督者に知らせてください。
3. 監督者の指示に従って、すべての解答用紙の該当欄に必ず志望専攻及び受験番号を記入してください。
4. 時計のアラーム（時計機能以外の機能を含む。）は使用しないでください。
5. 携帯電話、PHS 等は、電源を切って、カバン等に入れてください。
6. 試験終了まで退室できませんので、試験時間中に用がある場合は、手をあげてください。
7. 試験終了後、この問題冊子は持ち帰ってください。

I Read the following text and answer the questions below.

Newton may have discovered the laws of gravity while relaxing under an apple tree, but his brain knew about them all along, (①) to an imaging study. It suggests that our brains have an internal model of gravity that helps us understand how objects move under its influence.

Francesco Lacquaniti at the Santa Lucia Foundation and University of Rome, and his colleagues came up with ②this idea after observing how poor astronauts are at predicting the motion of objects in zero gravity. Now, using brain imaging, they have pinned down the brain region involved to the vestibular cortex, (③) handles information from the balance organs in the inner ear. It lit up when subjects saw objects moving normally under the influence of gravity, but was much less active when the movements were unnatural. So the region must be (④) to gravity, not just the movement.

The vestibular cortex seems to build up an internal model of gravity to help predict an object's motion. This is much more efficient than mentally running through thousands of possible types of motion, when most objects move in quite predictable ways, says Lacquaniti. And links to the balance organs may "calibrate" the gravity model.

1. Choose the most appropriate word to fill in ①, ③, and ④.

- ① A. according B. compared C. due D. owing
③ A. that B. what C. when D. which
④ A. influenced B. influencing C. responded D. responding

2. What is ②this idea? Answer in English (within 20 words).

3. Based on the information in the text, decide if each of the following statements is true(T), false(F), or not in the text(N). Write "T", "F", or "N" on the answer sheet.

- (1) It was not Newton who found the laws of gravity.
(2) The vestibular cortex works well in natural conditions.
(3) Astronauts are good at running through various types of motion.
(4) The internal model of gravity is very efficient.
(5) The combination of the internal model of gravity and the balance organs helps predict the motion of an object.

II Read the following text and answer the questions below.

Strictly speaking, energy is not actually consumed. Rather, it is changed from one form to (①). A fundamental feature of the universe is that energy is neither created nor destroyed (law of conservation of energy). It is usually transformed as it is transferred, but the energy of the universe is (②).

The process of energy transformation in the creation of fossil fuels takes place (③) hundreds of millions of years. It involved solar energy being converted to chemical energy. This chemical energy is then transformed (④) geological time (periods often 10 – 100's millions of years) to the fossil fuels – coal, oil and gas. The resulting fossil fuels have potential energy in the chemical bonds.

When a fossil fuel is (⑤), for example, the potential chemical energy is changed into heat energy, which can be converted to (⑥) energy to run a car. When we use fossil fuels, the sun of a million yesterdays is rekindled and that energy is used in seconds. In an electrical power plant this heat is harnessed and changed into (⑦) energy, which is then converted to electrical energy for our use. Through this process, gas and the other fossil fuels are transformed into other products.

The statement above, “energy is not actually consumed” (⑧) what we would normally discuss as the consumption of fossil fuels. The combustion of fossil fuels actually degrades both the energy and the matter contained within, converting them both to less useful forms. For example, when we burn gas, heat is (⑨), and the products of this process are carbon dioxide and water. These are unusable as (⑩). Therefore, fossil fuels are commonly said to have been consumed.

1. Choose the best word from A to H to fill in ①–⑩. Use each word only once.

A. another	B. burnt	C. released	D. constant
E. fuels	F. mechanical	G. contradicts	H. over

III Read the following text and answer the questions below.

Sports shoes that work out whether their owner has done enough exercise to warrant time in front of the television have been devised in the UK.

The shoes – dubbed Square Eyes – contain an electronic pressure sensor and a tiny computer chip to record how many steps the wearer has taken in a day. A wireless transmitter passes the information to a receiver connected to a television, and this decides how much evening viewing time the wearer deserves, based on the day's exertions.

The design was inspired by a desire to combat the rapidly ballooning waistlines among British teenagers, says Gillian Swan, who developed Square Eyes as a final year design project at Brunel University in London, UK. "We looked at current issues and childhood obesity really stood out," she told *New Scientist*. "And I wanted to tackle that with my design."

Once a child has used up their daily allowance gained through exercise, the television automatically switches off. And further time in front of the TV can only be earned through more steps.

Swan calculated how exercise should translate to television time using the recommended daily amounts of both. Health experts suggest that a child take 12,000 steps each day and watch no more than two hours of television. So, every 100 steps recorded by the Square Eyes shoes equates to precisely one minute of TV time.

The first prototype has two sensors in the sole – one that records steps and another, in the heel, that can be used to send data to the receiver with a firm stamp.

"It's a good idea for integrating sensors into clothing," says Cliff Randall, at Bristol University, UK, who believes computers will routinely be built into garments in the future. But Randall says it will be more challenging to build a TV control unit that cannot easily be thwarted. "It's got to be easy to install and difficult to bypass," he adds.

Existing pedometers normally clip onto a belt or slip into a pocket and keep count of steps by measuring sudden movement. Swan says these can be easily tricked into recording steps through shaking. But her shoe has been built to be harder for lazy teenagers to dupe. "It is possible, but it would be a lot of effort," she says. "That was one of my main design considerations."

1. Choose the best title for this text.

- (1) Watching TV helps overcome obesity.
- (2) A new type of pedometers can shorten your life.
- (3) Have fun in front of TV.
- (4) More exercise will give you more TV time.

2. Based on the information in the text, decide if each of the following statements is true(T), false(F), or not in the text(N). Write "T", "F", or "N" on the answer sheet.

- (1) The shoes should be placed in front of a television set.
- (2) Swan teaches at Brunel University in London, UK.
- (3) Swan decided to design the shoes for children to do more exercise.
- (4) With the shoes, you need to gain television time through exercise.
- (5) Swan is thinking of putting sensors into food.
- (6) Unlike conventional pedometers, you cannot dupe Swan's shoes easily.

3. If you want to watch a movie that lasts one and a half hours on TV, how many steps do you have to take?

IV Read the following text and answer the questions below.

For John, 11, being poor in New York City means an empty refrigerator at home and never having enough to eat. For Shannon, 9, from rural Mississippi, poverty means squinting at the blackboard because eyeglasses are too costly. For every one of the 12.7 million American children living in poverty, growing up poor means something different.

From 1993 to 2000, the percentage of American children who are poor fell steadily. But since then, it has been (A). One out of every six children in the U.S. lives in poverty. For a family of four, that means having an (B) of \$18,850 or less. Such families often don't have enough money to pay for basic needs like food, clothing, medical care and housing.

Organizations around the country are working hard to fight child poverty. They have creative plans and ambitious programs. Habitat for Humanity uses volunteers to build houses for families who can't (C) to buy one. America's Second Harvest is a network of more than 200 food banks that provide free groceries for children in (D) families. Although programs like these help many people, others are left behind.

"We live in the wealthiest country in the world, but we still have a very high child-poverty rate," says William O'Hare, who works for the Annie E. Casey Foundation, in Baltimore, Maryland. The foundation sponsors research to help understand poverty's roots. Why is poverty (A) now? Says O'Hare: "Too many kids have parents who either don't have enough work or whose work doesn't pay enough."

The problem isn't a new one. In 1964, President Lyndon Johnson declared a war on poverty. The federal government created such programs as Medicare and Medicaid, which help people pay for health care.

Despite government efforts, the war on poverty has yet to be (E). Children from all ethnic backgrounds feel its sting. Poverty affects all parts of the country, not just big cities. In fact, 48 out of the 50 poorest counties are rural.

1. Choose the most appropriate word or phrase to fill in (A) – (E).

A 1. lowering 2. lowered 3. in the rise 4. on the rise

B 1. income 2. outcome 3. effect 4. affect

C 1. help 2. afford 3. grow 4. watch

D 1. net 2. needed 3. newly 4. needy

E 1. overcame 2. outcome 3. welcome 4. won

2. Summarize the main idea of the text in English (within 40 words).

V Read the following text and answer the questions below.

At 11:09 p.m. on March 28, the earth's crust shifted. The impact resulted in a powerful 8.7-magnitude earthquake that ravaged several small Indonesian islands. Officials fear the total death (①) could rise as high as 600.

Most of the major damage happened on Nias (nee-uhs), a small island that is home to 6,000 people. Nias is about 75 miles north of the epicenter, the area directly above the spot in the earth's crust where an earthquake starts. The epicenter was in the Indian Ocean. Geologists believe that the damage would have been worse if the center of the earthquake had been directly under land.

Indonesia is still recovering from the disaster that struck on December 26. A 9.0-magnitude earthquake rumbled deep in the Indian Ocean. The tremors created strong waves of water, called a tsunami (soo-nah-mee), which hit the coasts of 11 countries. About 174,000 people were killed, 100,000 are still (②) and 1.5 million were left homeless.

December's quake ranks fourth in the century's 10 largest earthquakes. The March quake is the seventh largest.

Both great quakes struck along the same fault line, where plates of the earth's crust meet. The quakes are certainly related. "Really, all earthquakes in some way influence the earthquakes that come after them," Mike Blanpied, a scientist at the U.S. Geological Survey, told *TFK Magazine*.

No scale can measure the (③) impact of two devastating disasters in one area in such a short time. "It was like reliving the same horror of three months ago," said Fatheena Faleel, who had to fled her home.

Several strong aftershocks, one measuring 6.3 in magnitude, rocked the region. And for several scary hours, concerns about a second tsunami swept through Asia.

Governments quickly (④) tsunami warnings. Residents of Indonesia, Thailand and Sri Lanka fled their homes along the coast to higher ground.

Most people were happy with the rapid response time of the tsunami alerts. A new system was put in place after the last disaster. "Overall, the government is satisfied with what we did last night," said Suranand Vejajiva, an official in Taiwan.

Nias was hit very hard. Many buildings were totally destroyed. In the days after the

quake, the island had limited water and electricity. A soccer field was turned into a makeshift hospital. Helicopters were able to land on the island, but large planes could not because the airport runway was damaged.

Many countries offered immediate help to Indonesia. Japan sent an emergency medical team and supplies. Singapore delivered food and water. Australia sent two military planes carrying medical supplies.

The U.S. also promised aid. Said President George W. Bush: "The people of Indonesia can know that our government is ready to assist."

1. Choose the most appropriate word to fill in ①—④.

① A. people B. toll C. numerals D. counter

② A. missing B. missed C. miss D. amiss

③ A. tiny B. good C. predicted D. emotional

④ A. withdrew B. postponed C. overtook D. issued

2. The following are words and phrases describing what constitute the earth below the surface. Match each of them with the explanations given below.

Mantle, Inner Core, Outer Core, Crust

Explanation

① A ball of solid rock is at the center of the earth.

② A layer of burning-hot liquid rock lies above ①.

③ Hot, dense rock flows slowly here.

④ This is the earth's surface layer. Its seven major plates float above ③.