Candidate number

Candidate name_____

INTERNATIONAL ENGLISH LANGUAGE TESTING SYSTEM

Academic Reading 1 hour

Additional materials:
Answer sheet for Listening and Reading

Time 1 hour

INSTRUCTION TO CANDIDATES

Do not open this question paper until you are told to do so.
Write your name and candidate number in the spaces at the top of this page.
Read the instruction for part carefully.
Answer all the questions.
Write your answers on the answer sheet. Use a pencil.
You **must** complete the answer sheet within the time limit.
At the end of the test, hand in both this question paper and your answer sheet.

INFORMATION FOR CANDIDATES

There are **40** questions on this question paper. Each question carries one mark.

Passage 1

Biology of Bitterness

A. There is a reason why grapefruit juice is served in little glasses: most people don't want to drink more than a few ounces at a time. Naringin, a natural chemical compound found in grapefruit, tastes bitter. Some people like that bitterness in small doses and believe it enhances the general flavor, but others would rather avoid it altogether. So juice packagers often select grapefruit with low naringin though the compound has antioxidant properties that some nutritionists contend may help prevent cancer and arteriosclerosis.

B. It is possible, however, to get the goodness of grapefruit juice without the bitter taste. I found that out by participating in a test conducted at the Linguagen Corporation, a biotechnology company in Cranbury, New Jersey. Sets of two miniature white paper cups, labeled 304and 305, were placed before five people seated around a conference table. Each of us drank from one cup and then the other, cleansing our palates between tastes with water and a soda cracker. Even the smallest sip of 304 had grapefruit 's unmistakable bitter bite. But 305 was smoother; there was the sour taste of citrus but none of the bitterness of naringin. This juice had been treated with adenosine monophosphate, or AMP, a compound that blocks the bitterness in foods without making them less nutritious.

C. Taste research is a booming business these days, with scientists delving into all five basics-sweet, bitter, sour, salty, and umami, the savory taste of protein. Bitterness is of special interest to industry because of its untapped potential in food. There are thousands of bitter -tasting compounds in nature. They defend plants by warning animals away and protect animals by letting them know when a plant may be poisonous. But the system isn't foolproof. Grapefruit and cruciferous vegetable like Brussels sprouts and kale are nutritious despite-and sometimes because of-their bitter-tasting components. Over time, many people have learned to love them, at least in small doses. "Humans are the only species that enjoys bitter taste," says Charles Zuker, a neuroscientist at the University of California School of Medicine at San Diego. "Every other species is averse to bitter because it means bad news. But we have learned to enjoy it. We drink coffee, which is bitter, and quinine [in tonic water] too. We enjoy having that spice in our lives." Because bitterness can be pleasing in small quantities but repellent when intense, bitter blockers like AMP could make a whole range of foods, drinks, and medicines more palatable-and therefore more profitable.

D. People have varying capacities for tasting bitterness, and the differences appear to be genetic. About 75 percent of people are sensitive to the taste of the bitter compounds phenylthiocarbamide and 6-n-propylthiouracil. and 25 percent are insensitive. Those who are sensitive to phenylthiocarbamide seem to be less likely than others to eat cruciferous vegetables, according to Stephen Wooding, a geneticist at the University of Utah. Some people, known as supertasters, are especially sensitive to 6-n-propylthiouraci because they have an unusually high number of taste buds. Supertasters tend to shun all kinds of bitter-tasting things, including vegetable, coffee, and dark chocolate. Perhaps as a result, they tend to be thin. They're also less fond of alcoholic drinks, which are often slightly bitter. Dewar's scotch, for instance, tastes somewhat sweet to most people. " But a supertaster tastes no sweetness at all, only bitterness," says Valerie Duffy, an associate professor of dietetics at the University of Connecticut at Storrs.

E. In one recent study, Duffy found that supertasters consume alcoholic beverages, on average, only two to three times a week, compared with five or six times for the average nontasters. Each taste bud, which looks like an onion, consists of 50 to 100 elongated cells running from the top of the bud to the bottom. At the top is a little clump of receptors that capture the taste molecules, known as tastants, in food and drink. The receptors function much like those for sight and smell. Once a bitter signal has been received, it is relayed via proteins known as G proteins. The G protein involved in the perception of bitterness, sweetness, and umami was identified in the early 1990s by Linguagen's founder, Robert Margolskee, at Mount Sinai School of Medicine in New York City. Known as gustducin, the protein triggers a cascade of chemical reactions that lead to changes in ion concentrations within the cell. Ultimately, this delivers a signal to the brain that registers as bitter. "The signaling system is like a bucket brigade," Margolskee says. "It goes from the G protein to other proteins."

F. In 2000 Zuker and others found some 30 different kinds of genes that code for bitter-taste receptors. "We knew the number would have to be large because there is such a large universe of bitter tastants," Zuker says. Yet no matter which tastant enters the mouth or which receptor it attaches to, bitter always tastes the same to us. The only variation derives from its intensity and the ways in which it can be flavored by the sense of smell "Taste cells are like a light switch," Zuker says. "They are either on or off."

G. Once they figured put the taste mechanism, scientists began to think of ways to interfere with it. They tried AMP, an organic compound found in breast milk and other substances, which is created as cells break down food. Amp has no bitterness of its own, but when put it in foods, Margolskee and his colleagues discovered, it attaches to bitter-taste receptors. As effective as it is, AMP may not be able to dampen every type pf bitter taste, because it probably doesn't attach to all 30 bitter-taste receptors. So Linguagen has scaled up the hunt for other bitter blockers with a technology called high-throughput screening. Researchers start by coaxing cells in culture to activate bitter-taste receptors. Then candidate substances, culled from chemical compound libraries, are dropped onto the receptors, and scientists look for evidence of a reaction.

H. Tin time, some taste researchers believe, compounds like AMP will help make processed foods less unhealthy. Consider, for example, that a single cup of Campbell's chicken noodle soup contains 850 milligrams of sodium chloride, or table salt-more than a third of the recommended daily allowance. The salt masks the bitterness created by the high temperatures used in the canning process, which cause sugars and amino acids to react.Part of the salt could be replaced by another salt, potassium chloride, which tends to be scarce in some people's diets. Potassium chloride has a bitter aftertaste, but that could be eliminated with a dose of AMP. Bitter blockers could also be used in place of cherry or grape flavoring to take the harshness out of children's cough syrup, and they could dampen the bitterness of antihistamines, antibiotics, certain HIV drugs, and other medications.

I. A number of foodmakers have already begun to experiment with AMP in their products, and other bitter blockers are being developed by rival firms such as Senomyx in La Jolla, California. In a few years, perhaps, after food companies have taken the bitterness from canned soup and TV dinners, they can set their sights on something more useful: a bitter blocker in a bottle that any of us can sprinkle on our brussels sprouts or stir into our grapefruit juice.

Questions 1-8

Instructions to follow

• The reading Passage has seven paragraphs A-I.

• Which paragraph contains the following information?

• Write the correct letter A-I, in boxes 1-8 on your answer sheet.

1. Experiment on bitterness conducted

2.Look into the future application

3. Bitterness means different information for human and animals

4. Spread process of bitterness inside of body

5. How AMP blocks bitterness

6. Some bitterness blocker may help lower unhealthy impact

7. Bitterness introduced from a fruit

8. Genetic feature determines sensitivity

Question 9-12

Summary

Instructions to follow

• Complete the following summary of the paragraphs of Reading Passage, using **No more than Two words** from the Reading Passage for each answer.

• Write your answers in boxes 9-12 on your answer sheet.

The reason why grapefruit tastes bitter is because a substance called (**9)** _____contained in it. However, bitterness plays a significant role for plants. It gives a signal that certain plant is **(10)**_____. For human beings, different person carries various genetic abilities of tasting bitterness. According to a scientist at the University of Utah, **(11)** _____ have exceptionally plenty of **(12)** _____, which allows them to perceive bitter compounds.

Questions 13-14

Instructions to follow

• Choose the correct letter, A, B, C or D.

• Write your answers in boxes 13-14 on your answer sheet.

13. What is the main feature of AMP according to this passage?

A. offset bitter flavour in food

B. only exist in 304 cup

C. tastes like citrus

D. chemical reaction when meets biscuit

14. What is the main function of G protein?

A. collecting taste molecule

B. identifying different flavors elements

C. resolving large molecules

D. transmitting bitter signals to the brain.

Passage 2

Franklin's Lost Expedition

A. What could have resulted in the deaths of 129 men and officers aboard the ship in Franklin's lost expedition? The fate of the ship remains a topic of investigation, still intriguing to some international researchers of today. Sir John Franklin and his crew set sail from England in 1845 in search of the Northwest Passage, a sea route that was rumored to connect the continents of Europe and Asia. Two ships, HMS Erebus and HMS Terror, headed the expedition. Franklin's wife, Lady Jane Franklin, had become worried after three years without any communication from the expedition. She then persuaded the government to begin investigating. The sites of the three first search efforts were Lancaster Sound, the Bering Strait and over land beginning at the Mackenzie River.

B. All of these searches, as well as others that followed were unsuccessful in discovering the fate of the crew. Lady Franklin began her own search in 1851, but about a year later, these searches led by McClure and Collinson and their crews also turned up missing. Collinson eventually found his way back to England, while McClure was found and returned back in 1854. That same year, searcher John Rae reported to the Admiralty that according to Inuit information and some discovered items, it seemed that Franklin and the crew had perished. In a desperate last attempt to survive, some may have even taken up cannibalism. Rae was given what would be about $400,000 Canadian dollars today as a reward. Therefore, it appeared that Admiralty would not pursue any further search efforts.

C. However, Lady Franklin did not give up there, and in 1857 she began commissioning another search with Leopold McClintock as its leader. It was McClintock who found many corpses on King William Island, along with a journal which outlined the journey of Franklin's two ships, Erebus and Terror. On May 1847, it seemed according to the journal that the ships were stuck in ice. Even so, there should have been enough food supplies onboard the ships to last three years. "All well," said the note. Another note from April 25, 1848 made the situation appear more dire. Apparently, the ships had remained stuck in ice for over a year, with several men abandoning the expedition within the days before.

D. Researchers, scientists and historians have continued to ponder this mystery for over 160 years. What had happened which had caused the men to abandon ship, rather than wait for the ice to melt? The Northwest Passage is well-known for its harsh weather and constantly changing sea ice. To the west King William Island, particularly strong gusts of wind howl over layers of thick ice, formed over periods of hundreds of years. How long did the ice trap Franklin's two unfortunate ships so that they could not move?

E. Investigators and researchers continue looking for answers to these questions regarding Franklin's lost expedition, attempting to explain what happened to the captain and his crew. From American explorer Charles Francis Hall in 1860-1863, to Frederick Schwatka in 1879, as well as the Canadian

government's search in 1930 and William Gibson's search a year later, some hints were found in the form of human remains, Inuit information and discovered items, but no certain conclusions could be reached. In 1981, along the western coast of King William Island, the University of Alberta-led Franklin Expedition Forensic Anthropology Project dug up human remains. Forensic testing at the time suggested that the cause of death was likely either lead poisoning and scurvy. Lead poisoning has continued to persist as a possible explanation for the loss of the expedition since then. However, proving this is not so simple, as surgeons' journals (the "sick books") which recorded illness on board have yet to be found.

F. Still without Franklin sick books, a team of researchers from the University of Glasgow took up a study of the sick books of Royal Naval ships which were searching for Franklin. The search ships were equipped similarly, with the same provisions as Franklin's vessels, therefore the team looked over the illnesses and fatalities within the search crews under the assumption that the conditions suffered by those crews could mirror those of the lost expedition.

G. Due to relatively high levels of lead found in some remains of the crew, it has been suggested that lead poisoning from solder that sealed the expedition's canned provisions could explain the lost expedition. However, within the other search ships who had similar provisions, no evidence of lead poisoning was found, despite the relatively high exposure to lead that was unavoidable on ships of the era and within the overall British population. So, unless Franklin's ships had a particular lead source, there is no substantial proof that lead poisoning had a role in the failed expedition. Across nine search crews, patterns in illnesses led researchers to conclude that Franklin's men would have suffered the same respiratory and gastrointestinal disorders, injuries and exposure, and that some fatalities might have been a result of respiratory, cardiovascular and tubercular conditions. Moreover, the team suggested that the abnormally high number of deaths of Franklin's officers was probably a result of non-medical circumstances such as accidents and injuries that happened when officers accepted the risky responsibility of hunting animals to provide food, or walking over difficult terrain in a severe climate, continuing their attempts at finding the route of a Northwest Passage.

H. It seems possible that the 2016 discovery by the Arctic Research Foundation made recently in the wreck of HMS Terror, along with a discovery two years before in 2014 of HMS Erebus by Parks Canada could finally allow access to some first-hand evidence of medical issues and other factors at play in the failed expedition. If any of the expedition's records in writing have been preserved on board, it's possible they could still be read if they were left in the right underwater conditions. If a 'sick book' has managed to survive aboard a ship, the events that led to the lost expedition may be revealed, allowing those speculating to finally get some closure on the matter.

Questions 15-21

Instructions to follow

• Do the following statements agree with the information given in the reading passage?

• **TRUE** if the statement agrees with the information

• **FALSE** if the statement contradicts the information

• **NOT GIVEN** if there is no information on this.

15. Franklin's lost expedition was a search party attempting to find Lady Jane Franklin

16. John Rae suspected that Franklin's lost expedition likely suffered from a food shortage aboard the ship

17. The leaders of the search parties commissioned by Lady Franklin returned to England after some time

18. It was common for people living Britain during the 19th century to be exposed to lead

19. Most of the crew aboard Franklin's lost expedition were trained to hunt wild animals

20. The most recent research from University of Glasgow suggests that some of leaders of the crew on the Franklin expedition died from lead poisoning.

21. The research into the wreck of HMS Terror may shed light on the mystery of the lost expedition.

Questions 22-26

Instructions to follow

• Complete the sentences below.

• Choose **NO MORE THAN THREE WORDS** from the passage for each answer.

• Write your answers in 22-26 on your answer sheet.

The Northwest Passage is a route which connects **(22)**_____by sea. As a reward for seemingly having discovered the fate of the Franklin expedition, **23**_____was given an amount that would equal hundreds of thousands of Canadian dollars today. Forensic testing available in the 80's suggested that either **24** _____or lead poisoning led to the deaths of the crew in the Franklin expedition. The **25** _____ made by doctors aboard the ships in the Franklin expedition still have not been recovered. Researchers have suggested that the leaders of Franklin's crew might not have been ill, but could have died from **26** _____ as a result of their behaviours.

Passage 3

Owl Secrets

A. It always appeared to fly in the face of logic. But now, the biological secrets that allow owls to rotate their heads without cutting off their blood supply have finally been unravelled. Scientists have discovered four major adaptations in owls designed to prevent injury when the animals rotate their overly large heads by up to 270 degrees.

B. The study found that the birds' unique bone structures and vascular systems let them move with increased flexibility. Scientists at John Hopkins University School of Medicine in the US studied snowy, barred and great horned owls after their deaths from natural causes. They found that the vertebral artery enters the neck higher than in other birds, creating more slack. Unlike humans, owls were found to have small vessel connections between the carotid and vertebral arteries, allowing the blood to be exchanged between the two blood vessels. This creates an uninterrupted blood flow to the brain, even if one route is blocked during extreme neck rotation.

C. The adaptation gives the birds a huge range of vision without having to move their bodies and arouse detection by prey. The lack of similar adaptations in humans could explain why humans are more vulnerable to neck injury, the experts concluded. When humans attempt sudden and violent twists of their neck they risk damaging the lining of their blood vessels, which can result in a fatal blockage or stroke. Study senior investigator Doctor Philippe Gailloud, said: 'Until now, brain imaging specialists like me who deal with human injuries caused by trauma to arteries in the head and neck have always been puzzled as to why rapid, twisting neck movements did not leave thousands of owls lying dead on the forest floor from stroke. 'The carotid and vertebral arteries in the neck of most animals - including owls and humans - are very fragile and highly susceptible to even minor tears of the vessel lining.'

D. To solve the puzzle, the researchers studied the bone and blood vessel structures in the heads and necks of the birds. An injectable contrast dye was used to highlight the birds' blood vessels, which were then dissected, drawn and scanned to allow detailed analysis.

E. The most striking finding came after researchers injected dye into the owls' arteries, mimicking blood flow, and manually turned the animals' heads. They found that when they turned the heads, the blood vessels below the jaw bone expanded as more dye entered, creating pools of blood capable of maintaining the energy supply to the brain and eyes. They showed that the big carotid arteries, instead of being on the side of the neck as in humans, are carried close to the centre of rotation just in front of the spine. As a consequence, these arteries experience much less twisting and turning. The potential for damage is therefore greatly reduced. This contrasted starkly with human anatomical ability, where arteries generally tend to get smaller and smaller, and do not balloon out as they branch out. This creates the risk of clotting after sudden neck movements such as whiplash.

F. Researchers say these contractile blood reservoirs act as a trade-off, allowing birds to pool blood to meet the energy needs of their large brains and eyes, while they rotate theirheads. The supporting vascular network, with its many interconnections and adaptations, helps minimise any interruption in blood flow. The study results demonstrate what physical properties are needed to allow such extreme head movements, and explain why injuries sustained from treatments that involve manipulating bones with the hands such as chiropractic therapy can have such serious consequences for humans. Dr Gailloud added: 'Our new study results show precisely what morphological adaptations are needed to handle such head gyrations and why humans are so vulnerable to bone injury from chiropractic therapy. Extreme manipulations of the human head are really dangerous because we lack so many of the vessel-protecting features seen in owls.'

G. Medical illustrator Fabian de Kok-Mercado said: 'In humans, the vertebral artery really hugs the brains and eyes, while they rotate their heads. The supporting vascular network, with its many interconnections and adaptations, helps minimise any interruption in blood flow. The study results demonstrate what physical properties are needed to allow such extreme head movements, and explain why injuries sustained from treatments that involve manipulating bones with the hands such as chiropractic therapy can have such serious consequences for humans. Dr Gailloud added: 'Our new study results show precisely what morphological adaptations are needed to handle such head gyrations and why humans are hollow cavities in the neck. But this is not the case in owls, whose structures are specially adapted to allow for greater arterial flexibility and movement.' It is a powerful adaptive trait, but it is not unique. Plenty of birds have a similar ability to look behind them. Red tailed hawks for example are almost as flexible as their nocturnal cousins. 'There are lots of advantages to being able to look over your shoulder and see something coming - if you're trying to avoid predators or detect prey', he added.

Question 27-34

Instructions to follow

- Complete the summary using the list of words and phrases **A-M** below.
- **NB** You may use any letter more than once.

How can owls rotate their heads by **27** ..... 270 degrees? The many small bones that make up the neck and spine enable them to achieve **28** ..... movement. A research team has discovered that in **29** ..... ,their vascular network has adapted to make the rotation possible. Owls' carotid arteries are **30** .....the spine, at the centre of rotation. This means the arteries endure **31** ..... strain when the head is turned. In addition, the vessels **32** ..... their heads can expand, creating reservoirs of blood to supply the brain when the head is turned. And the cavities in the neck vertebrae, through which the vessels pass, are extremely **33** ..... , giving the vessels space to move around when twisted. All this is necessary because their eyes can't move: owls can only look **34** .....ahead.

A. flexible

B. as much as

C. at the base of

D. in front of

E. intense

F. limited

G. far less

H. multiple

I. in excess of

J. to the side of

K. various ways

L. large

M. straight

Questions 35-40

Instructions to follow

• Complete each sentence with the correct ending, A-H below.

• Write the correct letter, A-H in boxes 35-40 on your answer sheet.

35. The bone structure and circulatory system of owls has evolved in order to

36. Humans' arteries tend to

37. Scientists injected dye into the blood vessels of dead owls in order to

38. When humans attempt sudden twists of their neck they are more likely to

39. The backup arteries of owls are designed to

40. Owls have a huge range of vision which enables them to

A collect any excess blood created in the process of turning.

B cope with their very large heads.

C damage the lining of their blood vessels.

D decrease in size.

E make them lighter.

F mimic natural blood flow.

H Offer a fresh supply of nutrients when blood vessels get closed off.

avoid detection by predators or to find prey.