

READING

READING PASSAGE 1

You should spend about 20 minutes on **Questions 1–13**, which are based on Reading Passage 1 below.

Archaeologists discover evidence of prehistoric island settlers

In early April 2019, Dr Ceri Shipton and his colleagues from Australian National University became the first archaeologists to explore Obi, one of many tropical islands in Indonesia's Maluku Utara province. The research team's discoveries suggest that the prehistoric people who lived on Obi were adept on both land and sea, hunting in the dense rainforest, foraging on the seashore, and possibly even voyaging between islands.

The excavations were part of a project to learn more about how people first dispersed from mainland Asia, through the Indonesian archipelago and into the prehistoric continent that once connected Australia and New Guinea. The team's earlier research suggested that the northernmost islands in the group, known as the Wallacean islands, including Obi, would have offered the easiest migration route. It also seemed likely that these islands were crucial 'stepping stones' on humans' island-hopping voyages through this region millennia ago. But to support this idea, they needed archaeological evidence for humans living in this remote area in the ancient past. So, they travelled to Obi to look for sites that might reveal evidence of early occupation.

Just inland from the village of Kelo on Obi's northern coast, Shipton and his colleagues found two caves containing prehistoric rock shelters that were suitable for excavation. With the permission and help of the local people of Kelo, they dug a small test excavation in each shelter. There they found numerous artefacts, including fragments of axes, some dating to about 14,000 years ago. The earliest axes at Kelo were made using clam shells. Axes made from clam shells from roughly the same time had also previously been found elsewhere in this region, including on the nearby island of Gebe to the northeast. As on Gebe, it is highly likely that Obi's axes were used in the construction of canoes, thus allowing these early peoples to maintain connections between communities on neighbouring islands.

The oldest cultural layers from the Kelo site provided the team with the earliest record for human occupation on Obi, dating back around 18,000 years. At this time the climate was drier and colder than today, and the island's dense rainforests would likely have been much less impenetrable than they are now. Sea levels were about 120 metres lower, meaning Obi was a much larger island, encompassing what is today the separate island of Bisa, as well as several other small islands nearby.

Roughly 11,700 years ago, as the most recent ice age ended, the climate became significantly warmer and wetter, no doubt making Obi's jungle much thicker. According to the researchers, it is no coincidence that around this time the first axes crafted from stone rather than sea shells appear, likely in response to their heavy-duty use for clearing and modification of the increasingly dense rainforest. While stone takes about twice as long to grind into an axe compared to shell, the harder material keeps its sharp edge for longer.

Judging by the bones which the researchers unearthed in the Kelo caves, people living there mainly hunted the Rothschild's cuscus, a possum-like creature that still lives on Obi today. As the forest grew more dense, people probably used axes to clear patches of forest and make hunting easier.

Shipton's team's excavation of the shelters at the Kelo site unearthed a volcanic glass substance called obsidian, which must have been brought over from another island, as there is no known source on Obi. It also revealed particular types of beads, similar to those previously found on islands in southern Wallacea. These finds again support the idea that Obi islanders routinely travelled to other islands.

The excavations suggest people successfully lived in the two Kelo shelters for about 10,000 years. But then, about 8,000 years ago, both were abandoned. Did the residents leave Obi completely, or move elsewhere on the island? Perhaps the jungle had grown so thick that axes were no longer a match for the dense undergrowth. Perhaps people simply moved to the coast and turned to fishing rather than hunting as a means of survival.

Whatever the reason for the departure, there is no evidence for use of the Kelo shelters after this time, until about 1,000 years ago, when they were re-occupied by people who owned pottery as well as items made out of gold and silver. It seems likely, in view of Obi's location, that this final phase of occupation also saw the Kelo shelters used by people involved in the historic trade in spices between the Maluku islands and the rest of the world.

Questions 1–7

Do the following statements agree with the information given in Reading Passage 1?

In boxes 1–7 on your answer sheet, write

TRUE if the statement agrees with the information
FALSE if the statement contradicts the information
NOT GIVEN if there is no information on this

- 1 Archaeological research had taken place on the island of Obi before the arrival of Ceri Shipton and his colleagues.
- 2 At the Kelo sites, the researchers found the first clam shell axes ever to be discovered in the region.
- 3 The size of Obi today is less than it was 18,000 years ago.
- 4 A change in the climate around 11,700 years ago had a greater impact on Obi than on the surrounding islands.
- 5 The researchers believe there is a connection between warmer, wetter weather and a change in the material used to make axes.
- 6 Shipton's team were surprised to find evidence of the Obi islanders' hunting practices.
- 7 It is thought that the Kelo shelters were occupied continuously until about 1,000 years ago.

Questions 8–13

Complete the notes below.

Choose **ONE WORD ONLY** from the passage for each answer.

Write your answers in boxes 8–13 on your answer sheet.

Archaeological findings on Obi

Excavations of rock shelters inside 8 near the village of Kelo revealed:

- axes from around 14,000 years ago, probably used to make canoes
- axes made out of 9 , dating from around 11,700 years ago
- 10 of an animal: evidence of what ancient islanders ate
- evidence of travel between islands:
 - obsidian: a material that is not found naturally on Obi
 - 11 which resembled ones found on other islands.

It is thought that from 8,000 years ago, Obi islanders:

- may have switched from hunting to fishing
- had 12 as well as items made out of metal
- probably took part in the production and sale of 13

READING PASSAGE 2

You should spend about 20 minutes on **Questions 14–26**, which are based on Reading Passage 2.

Deep-sea mining

Bacteria from the ocean floor can beat superbugs and cancer. But habitats are at risk from the hunger for marine minerals

A When Professor Mat Upton found that a microbe from a deep-sea sponge was killing pathogenic bugs in his laboratory, he realised it could be a breakthrough in the fight against antibiotic-resistant superbugs, which are responsible for thousands of deaths a year in the UK alone. Further tests confirmed that an antibiotic from the sponge bacteria, found living more than 700 metres under the sea at the Rockall trough in the north-east Atlantic, was previously unknown to science, boosting its potential as a life-saving medicine. But Upton, and other scientists who view the deep ocean and its wealth of unique and undocumented species as a prospecting ground for new medicines, fear such potential will be lost in the rush to exploit the deep sea's equally rich metal and mineral resources.

B 'We're looking at the bioactive potential of marine resources, to see if there are any more medicines or drugs down there before we destroy it for ever,' says Upton, a medical microbiologist at the University of Plymouth. He is among many scientists urging a halt to deep-sea mining, asking for time to weigh up the pros and cons. 'In sustainability terms, this could be a better way of exploiting the economic potential of the deep sea,' he argues. Oceanographers using remotely operated vehicles have spotted many new species. Among them have been sea cucumbers with tails allowing them to sail along the ocean floor, and a rare 'Dumbo' octopus, found 3,000 metres under the Pacific Ocean, off the coast of California. Any one of these could offer lifesaving potential. Upton estimates it could take up to a decade for a newly discovered antibiotic to become a medicine – but the race towards commercial mining in the ocean abyss has already begun.

C The deep sea contains more nickel, cobalt and rare earth metals than all land reserves combined, according to the US Geological Survey. Mining corporations argue that deep-sea exploration could help diversify the supply of metals and point to the fact that demand for resources such as copper, aluminium, cobalt for electric car batteries and other metals to power technology and smartphones, is soaring. They say that deep-sea mining could yield far superior ore to land mining with little, if any, waste. Different methods of extraction exist, but most involve employing some form of converted machinery previously used in terrestrial mining to excavate materials from the sea floor, at depths of up to 6,000 metres, then drawing a seawater slurry, containing rock and other solid particles, from the sea floor to ships on the surface. The slurry is then 'de-watered' and transferred to another vessel for shipping. Extracted seawater is pumped back down and discharged close to the sea floor.

D But environmental and legal groups have urged caution, arguing there are potentially massive and unknown ramifications for the environment and for nearby communities, and that the global regulatory framework is not yet drafted. ‘Despite arising in the last half century, the “new global gold rush” of deep-sea mining shares many features with past resource scrambles – including a general disregard for environmental and social impacts, and the marginalisation of indigenous peoples and their rights,’ a paper, written by Julie Hunter and Julian Aguon, from Blue Ocean Law, and Pradeep Singh, from the Center for Marine Environmental Sciences, Bremen, argues. The authors say that knowledge of the deep seabed remains extremely limited. ‘The surface of the Moon, Mars and even Venus have all been mapped and studied in much greater detail, leading marine scientists to commonly remark that, with respect to the deep sea, “We don’t yet know what we need to know.”’

E Scientific research – including a recent paper in *Marine Policy* journal – has suggested the deep seabed, and hydrothermal vents, which are created when seawater meets volcanic magma, have crucial impacts upon biodiversity and the global climate. The mineral-rich vents and their surrounds are also home to many well-known animals including crustaceans, tubeworms, clams, slugs, anemones and fish. ‘It is becoming increasingly clear that deep-sea mining poses a grave threat to these vital seabed functions,’ the paper says. ‘Extraction methods would produce large sediment plumes and involve the discharge of waste back into the ocean, significantly disturbing seafloor environments,’ the paper continues. ‘On deep sea vents, scientists are clear,’ says Dr Jon Copley of the National Oceanography Centre, Southampton: ‘we don’t want mining on them.’

F The oceans occupy around 70% of the planet and are relatively unexplored, says Mike Johnston, chief executive of Nautilus, a Canadian underwater exploration company: ‘It makes sense to explore this untapped potential in an environmentally sustainable way, instead of continually looking at the fast depleting land resources of the planet to meet society’s rising needs.’ Those leading the global rush to place giant mining machines thousands of metres below the sea surface say the environmental impacts will be far lower than on land. But critics say exotic and little-known ecosystems in the deep oceans could be destroyed and must be protected. ‘Mining will be the greatest assault on deep-sea ecosystems ever inflicted by humans,’ according to hydrothermal vent expert Verena Tunnicliffe, at the University of Victoria in Canada. She argues that active vents must be off-limits for mining to protect the new knowledge and biotechnology spin-offs they can deliver, and that strict controls must be in place elsewhere.

Questions 14–17

Reading Passage 2 has six paragraphs, A–F.

Which paragraph contains the following information?

Write the correct letter, A–F, in boxes 14–17 on your answer sheet.

- 14 reference to the rapidly increasing need for one raw material in the transport industry
- 15 a rough estimate of the area of the Earth covered by the oceans
- 16 how a particular underwater habitat, where minerals and organisms co-exist, is formed
- 17 reference to the fact that the countries of the world have yet to agree on rules for the exploration of the seabed

Questions 18–23

Look at the following statements (Questions 18–23) and the list of people below.

Match each statement with the correct person or people, A–E.

Write the correct letter, A–E, in boxes 18–23 on your answer sheet.

NB You may use any letter more than once.

- 18 A move away from the exploration of heavily mined reserves on land is a good idea.
- 19 The negative effects of undersea exploration on local areas and their inhabitants are being ignored.
- 20 There are more worthwhile things to extract from the sea than minerals.
- 21 No other form of human exploration will have such a destructive impact on marine life as deep-sea mining.
- 22 More is known about outer space than about what lies beneath the oceans.
- 23 There is one marine life habitat where experts agree mining should not take place.

List of People

- A Professor Mat Upton
- B Julie Hunter, Julian Aguon and Pradeep Singh
- C Dr Jon Copley
- D Mike Johnston
- E Verena Tunnicliffe

Questions 24–26

Complete the summary below.

Choose **ONE WORD ONLY** from the passage for each answer.

Write your answers in boxes 24–26 on your answer sheet.

Mining the sea floor

Mining corporations believe that the mineral resources lying under the sea may be superior to those found in the earth. They also say that these can be removed without producing much 24

The extraction is often done by adapting the 25 that has already been used to work on land. The method of excavation involves removing the seawater from the slurry that is brought up to ships and returning it to the seabed. However, concerned groups strongly believe that 26 is necessary due to the possible number of unidentified consequences.

READING PASSAGE 3

You should spend about 20 minutes on **Questions 27–40**, which are based on Reading Passage 3 below.

Is the era of artificial speech translation upon us?

Once the stuff of science fiction, technology that enables people to talk using different languages is now here. But how effective is it?

Noise, Alex Waibel tells me, is one of the major challenges that artificial speech translation has to meet. A device may be able to recognise speech in a laboratory, or a meeting room, but will struggle to cope with the kind of background noise I can hear in my office surrounding Professor Waibel as he speaks to me from Kyoto station in Japan. I'm struggling to follow him in English, on a scratchy line that reminds me we are nearly 10,000 kilometres apart – and that distance is still an obstacle to communication even if you're speaking the same language, as we are. We haven't reached the future yet. If we had, Waibel would have been able to speak more comfortably in his native German and I would have been able to hear his words in English.

At Karlsruhe Institute of Technology, where he is a professor of computer science, Waibel and his colleagues already give lectures in German that their students can follow in English via an electronic translator. The system generates text that students can read on their laptops or phones, so the process is somewhat similar to subtitling. It helps that lecturers speak clearly, don't have to compete with background chatter, and say much the same thing each year.

The idea of artificial speech translation has been around for a long time. Douglas Adams' science fiction novel, *The Hitchhiker's Guide to the Galaxy*, published in 1979, featured a life form called the 'Babel fish' which, when placed in the ear, enabled a listener to understand any language in the universe. It came to represent one of those devices that technology enthusiasts dream of long before they become practically realisable, like TVs flat enough to hang on walls: objects that we once could only dream of having but that are now commonplace. Now devices that look like prototype Babel fish have started to appear, riding a wave of advances in artificial translation and voice recognition.

At this stage, however, they seem to be regarded as eye-catching novelties rather than steps towards what Waibel calls 'making a language-transparent society'. They tend to be domestic devices or applications suitable for hotel check-ins, for example, providing a practical alternative to speaking traveller's English. The efficiency of the translator is less important than the social function. However, 'Professionals are less inclined to be patient in a conversation,' founder and CEO at Waverly Labs, Andrew Ochoa, observes. To redress this, Waverly is now preparing a new model for professional applications, which entails performance improvements in speech recognition, translation accuracy and the time it takes to deliver the translated speech.

For a conversation, both speakers need to have devices called Pilots (translator earpieces) in their ears. ‘We find that there’s a barrier with sharing one of the earphones with a stranger,’ says Ochoa. That can’t have been totally unexpected. The problem would be solved if earpiece translators became sufficiently prevalent that strangers would be likely to already have their own in their ears. Whether that happens, and how quickly, will probably depend not so much on the earpieces themselves, but on the prevalence of voice-controlled devices and artificial translation in general.

Waibel highlights the significance of certain Asian nations, noting that voice translation has really taken off in countries such as Japan with a range of systems. There is still a long way to go, though. A translation system needs to be simultaneous, like the translator’s voice speaking over the foreign politician being interviewed on the TV, rather than in sections that oblige speakers to pause after every few remarks and wait for the translation to be delivered. It needs to work offline, for situations where internet access isn’t possible, and to address apprehensions about the amount of private speech data accumulating in the cloud, having been sent to servers for processing.

Systems not only need to cope with physical challenges such as noise, they will also need to be socially aware by addressing people in the right way. Some cultural traditions demand solemn respect for academic status, for example, and it is only polite to respect this. Etiquette-sensitive artificial translators could relieve people of the need to know these differing cultural norms. At the same time, they might help to preserve local customs, slowing the spread of habits associated with international English, such as its readiness to get on first-name terms.

Professors and other professionals will not outsource language awareness to software, though. If the technology matures into seamless, ubiquitous artificial speech translation, it will actually add value to language skills. Whether it will help people conduct their family lives or relationships is open to question – though one noteworthy possibility is that it could overcome the language barriers that often arise between generations after migration, leaving children and their grandparents without a shared language.

Whatever uses it is put to, though, it will never be as good as the real thing. Even if voice-morphing technology simulates the speaker’s voice, their lip movements won’t match, and they will look like they are in a dubbed movie. The contrast will underline the value of shared languages, and the value of learning them. Sharing a language can promote a sense of belonging and community, as with the international scientists who use English as a lingua franca, where their predecessors used Latin. Though the practical need for a common language will diminish, the social value of sharing one will persist. And software will never be a substitute for the subtle but vital understanding that comes with knowledge of a language.

Questions 27–30

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

Write the correct letter in boxes 27–30 on your answer sheet.

27 What does the reader learn about the conversation in the first paragraph?

A The speakers are communicating in different languages.
B Neither of the speakers is familiar with their environment.
C The topic of the conversation is difficult for both speakers.
D Aspects of the conversation are challenging for both speakers.

28 What assists the electronic translator during lectures at Karlsruhe Institute of Technology?

A the repeated content of lectures
B the students' reading skills
C the languages used
D the lecturers' technical ability

29 When referring to *The Hitchhiker's Guide to the Galaxy*, the writer suggests that

A the Babel fish was considered undesirable at the time.
B this book was not seriously intending to predict the future.
C artificial speech translation was not a surprising development.
D some speech translation techniques are better than others.

30 What does the writer say about sharing earpieces?

A It is something people will get used to doing.
B The reluctance to do this is understandable.
C The equipment will be unnecessary in the future.
D It is something few people need to worry about.

Questions 31–34

Complete each sentence with the correct ending, **A–F**, below.

Write the correct letter, **A–F**, in boxes 31–34 on your answer sheet.

- 31 Speech translation methods are developing fast in Japan
- 32 TV interviews that use translation voiceover methods are successful
- 33 Future translation systems should address people appropriately
- 34 Users may be able to maintain their local customs

- A** but there are concerns about this.
- B** as systems do not need to conform to standard practices.
- C** but they are far from perfect.
- D** despite the noise issues.
- E** because translation is immediate.
- F** and have an awareness of good manners.

Questions 35–40

Do the following statements agree with the views of the writer in Reading Passage 3?

In boxes 35–40 on your answer sheet, write

YES

if the statement agrees with the views of the writer

NO

if the statement contradicts the views of the writer

NOT GIVEN

if it is impossible to say what the writer thinks about this

- 35 Language translation systems will be seen as very useful throughout the academic and professional worlds.
- 36 The overall value of automated translation to family life is yet to be shown.
- 37 Automated translation could make life more difficult for immigrant families.
- 38 Visual aspects of language translation are being considered by scientists.
- 39 International scientists have found English easier to translate into other languages than Latin.
- 40 As far as language is concerned, there is a difference between people's social and practical needs.