

READING PASSAGE 1

You should spend about 20 minutes on questions 1–13.

Vines in the sky

- A** The farms of the future may be built right in the centre of your city. Suburban sprawl, combined with the vast economies of scale in operation in agriculture, have typically driven food production far from populated centres, with an increase in the cost of transport and risk of spoilage en route. However, the days of market gardens on the edges of urban areas supplying fresh food straight to your table may soon be over; mass city-centre farming may soon replace them. A visionary microbiologist and environmental lecturer, Dickson Despommier from Columbia University in New York, sees our future cities populated by a new kind of market garden. The creator of this radical 'vertical farming' idea describes the evolution of the concept from an older project involving rooftop gardening in Manhattan. While that was interesting, it couldn't be sustained on a mass scale. But it planted the seed of another idea. Looking at greenhouse projects in New York, the resulting concept was large-scale, indoor, urban agriculture in skyscrapers.
- B** Following this, Despommier set up laboratory projects aimed at different design challenges and attracted a wide range of enthusiastic collaborators and contributors. He believes this vertical farming method could be a solution to some of the world's most pressing issues. The world population is expected to grow by three billion to 8.6 billion over the next half century. By then, some 80 per cent of the world's population will live in cities, and they will need to eat. At the same time, conventional farm and grazing land takes up an enormous amount of space, with over one-third of the world's surface currently used for agriculture. Despommier figures that in the next five decades an area of new arable land roughly the size of Brazil will be required to feed the world's growing population – land that simply doesn't exist.
- C** Despommier's concept relies on using green methods of architecture and materials to build skyscrapers that house, grow and produce crops. New materials and technologies such as cheaper reflectors, which reflect sunlight where it's needed, more efficient solar panels for energy and system-wide recycling are integral to the plan. One unusual feature is the use of a type of shellfish to filter water. These can clean urban sewage to a state suitable for irrigation.
- D** 'Outside, one acre (0.4 of a hectare) of land means one crop a year,' says Despommier. 'Indoors, you can grow one crop every three months. You can get four crops a year.' He suggests that 150 such buildings could feed the entire city of New York for a year. Indoor crops require less pesticide and are less subject to the problems in nature, such as drought. Some academics say that a single skyscraper farm covering 1.3 hectares could produce enough food to feed 35,000 people for a year – the same as a 420-hectare farm. Each floor of the design would be rigged up with hydroponic watering systems and

artificial lighting, and solar panels to provide electricity. However, vertical farming is not without its challenges. One is light – artificial lighting uses a great deal of electricity and generates considerable heat. Another is cost, with some A\$93 million per building for construction and A\$5.5 million a year for operation.

E Among experts, opinions vary on whether the project can succeed. Creating conditions suitable for growth is a serious challenge, and some think the crop yield would be too low to make economic sense. 'My biggest reservation is that the basic premise is flawed. We already know how to increase food production from existing land resources, particularly in areas with surplus land such as sub-Saharan Africa. It's just that we do it incredibly badly at the moment,' says Rob Brook, a rural development researcher at the University of Wales in Bangor. 'This is a rich person's pipe dream.'

F Yet there is strong support elsewhere. Luc Mougeout, an advocate of urban agriculture at Canada's International Development Research Centre, says the vertical farm is not only possible, but will happen within this generation. 'It would collect at one site a diversity of elements already at work in some form or another around the world,' he says. Despommier has the backing of his university as well as venture capitalists from the Middle East, China and the Netherlands.

If the vertical farming vision becomes a reality, we could find ourselves once again enjoying fresh fruit and vegetables sourced from just around the corner, except these might come from the 45th floor.

Questions 1–6

Reading Passage 1 has six sections, **A–F**.

Which section contains the following information?

Write the correct letter, A–F, in boxes 1–6 on your answer sheet.

NB You may use any letter more than once.

- 1 doubts about the feasibility of the project
- 2 the idea of moving market gardens from the outskirts to inner-city areas
- 3 how the system would avoid current agricultural problems
- 4 a previous program that was not practical for widespread use
- 5 sources of financial assistance to the proposal
- 6 a method of dealing with waste matter

Questions 7–10

Complete the notes below.

*Choose **NO MORE THAN THREE WORDS AND/OR A NUMBER** from the passage for each answer.*

Write your answers in boxes 7–10 on your answer sheet.

Despommier's solution to a world problem

Population within 50 years

- ▼ thought to reach **7**
- ▼ **8** living in urban areas

Land

- ▼ Proportion of Earth's area now used for farming: **9**
- ▼ Will need an extra area as large as **10** to provide food

Questions 11–13

Answer the questions below.

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

Write your answers in boxes 11–13 on your answer sheet.

- 11** How will the indoor farms get energy?
- 12** Besides the expense, what other challenge for indoor farms must be dealt with?
- 13** When does Luc Mougeout believe that Despommier's idea will become a reality?

READING PASSAGE 2

You should spend about 20 minutes on questions 14–27.

Movements of the planets

People have pondered the movements of stars and planets for as long as humans have been on this Earth. Long ago it was noticed that some of the lights in the sky seemed permanent in relation to each other and these were known as the 'fixed stars', whereas other lights moved about much more freely and were called 'the wanderers'. We now know the latter as the planets and we also know that the stars are by no means fixed but move in predictable patterns. That both stars and planets circled the sky over 24 hours was thought to be because they revolved around the Earth.

One early theory described the 'music of the spheres'. It was believed that the stars and planets were fixed on glass-like spheres that were centred on the Earth and created heavenly music as they moved, this latter belief possibly originating from the humming in the ears at high altitude. The Greek astronomer, mathematician and geographer Ptolemy was one of the first to suggest a pattern to these movements and in his Ptolemaic system the Sun, the Moon and the planets each had a sphere that moved independently of the others, and the stars were all fixed on the outermost sphere. This system was thus able to account for the differing movements then observed.

By the 16th century, more accurate measuring instruments were available, and using these, even before the telescope was developed, a Polish monk, Nicolaus Copernicus, spent much of his life making far more exact observations of the heavens. He tried to explain the mathematics behind the planets' movements but found that the circular movement of a sphere could not explain why, for example, Mars apparently stopped and went backwards for a short time. He discovered that the planets' movements could be far more easily predicted if not the Earth but the Sun were placed in the

centre of the system, and the planets circled the Sun rather than the Earth. The problem with this explanation was that many people believed that man was the centre of the universe, and so not everyone accepted it. Copernicus avoided this difficulty by suggesting the theory merely as a method of more accurately working out the dates of important celebration days. The theory got strong support in the 17th century, when the eminent Italian mathematician and astronomer Galileo Galilei taught the Copernican system to his students.

The telescope was invented in the Netherlands in the early 17th century and this allowed far more accurate measurements of planetary motion to be taken. The German astronomer Johannes Kepler used it to discover that the Copernican observations were not quite correct and so could not be used to predict the orbits of the planets. Copernicus had assumed that the planets moved in a circular path around the Sun, but Kepler found that they did not; they moved in ellipses. He then developed his three laws of planetary motion, which gave a more exact method of estimating their orbits. The eccentric Danish astronomer Tycho Brahe had been appointed as the court astronomer to the Holy Roman Emperor and had made a large number of important observations that Kepler needed for his theories. However, although Kepler's three laws explained *how* the planets moved, they did not explain *why*. This was left to Isaac Newton in the 18th century.

Isaac Newton's invention of the reflecting telescope is often seen as a defining moment in the study of astronomy, but in fact he only enhanced it; the original telescope was invented in 1608 by the Dutchman Lippershey who used a convex lens in a tube focusing light into an eyepiece. The first telescopes

continued ►

were seen as an important military invention to detect the distant approach of enemy soldiers before Galileo used one to observe the night sky. Newton discovered that a concave mirror reflecting light onto a flat secondary mirror gave an enhanced image, which allowed a much more accurate view of the heavens. Furthermore, mirrors were easier to manufacture than lenses and could be made larger, thus increasing the ability of

astronomers to chart the movements of the stars and planets. Yet it was Newton's discovery of the laws of gravity that explained why the planets move the way they do. It also enabled two astronomers in the 20th century to predict the existence, before it was seen in telescopes, of another small, outer asteroid, Pluto (at first classified as a planet), by observing slight variations in the orbit of Uranus.

Questions 14–19

Look at the following statements (questions 14–19) and the list of people below.

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

Write the correct letter, A–E, in boxes 14–19 on your answer sheet.

NB You may use any letter more than once.

- 14 An alteration in the design led to an improvement in a scientific instrument.
- 15 The planets took an egg-shaped route.
- 16 The science at the time did not accord with what was observed in the sky.
- 17 The planets revolved around a different object than was previously thought.
- 18 A revolutionary theory provided reasons for the manner in which the planets travelled.
- 19 The use of a telescope provided evidence that amended what an earlier observer had found.

List of people

- A Ptolemy
- B Nicolaus Copernicus
- C Galileo Galilei
- D Johannes Kepler
- E Isaac Newton

Questions 20–23

Complete the sentences below.

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

Write your answers in boxes 20–27 on your answer sheet.

- 20 Early observers used the term to refer to features that appeared to be motionless in the sky.
- 21 Objects that appeared to be mobile are now referred to as
- 22 According to an early way of thinking, was made by the motion of celestial bodies.
- 23 Ptolemy believed that each planet moved within its own

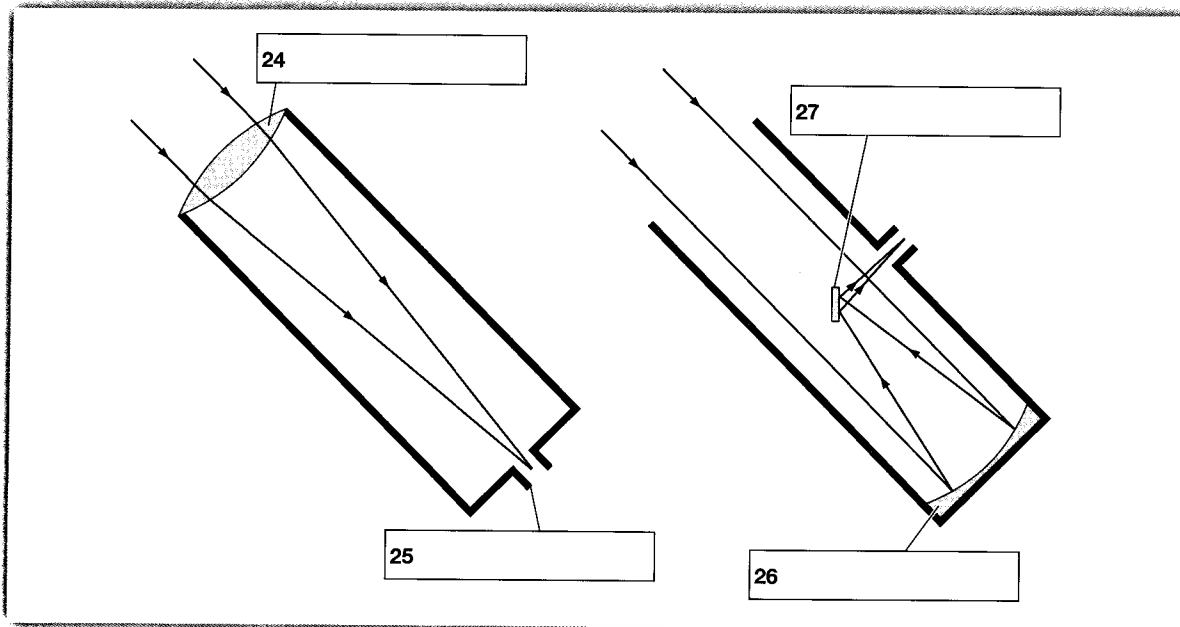
Questions 24–27

The diagrams show the basic differences between Lippershey's and Newton's designs for a telescope.

Label the diagrams below.

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

Write your answers in boxes 24–27 on your answer sheet.



READING PASSAGE 3

You should spend about 20 minutes on questions 28–40.

How and why does language change?

During the latter part of the 19th century, it was believed that a sound change affected the whole of a language at the same time: one sound system would smoothly develop into the next, and all words that contained a particular sound would be affected in the same way. We now know that such a change does not operate in a simple manner. Some speakers introduce the change into their speech before others; some use it more frequently and consistently than others and some words are affected before others. A more accurate view is to think of a change gradually spreading through the words of a language. At first just a few people use the change occasionally in common words; then a large number of words are affected, with the sound gradually being used more consistently; then the majority of the words take up the change.

The evidence for this kind of process has largely come from sociolinguistic studies of the variations in modern languages. These studies proceed on the assumption that variation in language use, which is found in any community, is evidence of the change in progress in a language. Detailed observations are made of the way in which different kinds of people speak in different social situations. The parameters that demonstrate these differences are known as *linguistic variables*. Examination of the frequency with which different people used a variable led to conclusions about the motivation, direction and rate of change in the language.

These are small-scale studies, but they have large-scale implications. It is likely that the same gradual process of change affects whole languages as well as dialects. The metaphor of a wave has proved particularly attractive since the late 19th century: a change spreads through a language in much the same way as a stone sends ripples across a pool. But even this implies too regular a movement to account for the reality of sociolinguistic variation.

It is easy to recognize a change in language – but only *after* it has taken place. It is not difficult to reflect on how people spoke several years ago to point to a new word that has recently entered the language. What is almost impossible is to *predict* a language change. Which sounds, words or grammatical construction will change in the next ten, twenty years?

It is just as difficult to be precise about the origins of a change in language. Who first used the new form? Where was it used? And when exactly? Historical dictionaries always give an approximate date of entry for a new word or meaning – but these dates invariably reflect the earliest known use of that word in the *written* language. The first use of the word in speech is always an unknown number of years previous to that.

To obtain answers to these questions, we need to know more about why language changes. If we understood the causes of change, we could begin to make predictions

about when a change was likely to take place, and observe it while it was happening. There has long been imaginative speculation on the matter, with suggested causes coming from fields as far apart as theology and climatology (which is a consequence of human physical location – the mountain dweller having a physiologically different capacity for speech compared with the valley dweller). Some scholars have adopted a highly pessimistic view, feeling that the causes can never be found.

These days, the speculation and pessimism are being replaced by an increasing amount of scientific research, which has shown that there is no single reason for language change. Several factors turn out to be implicated, some to do with the nature of society, and some to do with the nature of language structure. When people move away from each other, their language will diverge. The two groups will have different experiences, and at the very least their vocabulary will change. Similarly, when people come into contact with each other, their language will converge. The sounds, grammar and vocabulary of one group are likely to exercise some influence on the other. These days, the increased mobility of people, within and between countries, makes this a major factor.

New objects and ideas are constantly being created, and language changes to accept them. At the same time, old objects and ideas fall out of daily use, and the language related to them becomes obsolete. Some change is the result of one population imperfectly learning the language of another. This is a common occurrence, as illustrated by many immigrant groups, or the levels of bilingualism found in contact areas. The minority language forms a small group that in the long term influences majority usage. For example, several varieties of American English display the influence of the West African linguistic background of its black population.

People come to talk like those they identify with or admire – a process that may be conscious or subconscious. Conscious change can be observed in those cases where people go out of their way to use or avoid certain features of their spoken or written language – such as happened with the English pronoun *whom*. Subconscious change, where people are not aware of the direction in which their speech is moving, is less noticeable, but far more common. The movement may be towards a favoured accent or dialect (one that has positive prestige), or away from one that is held in low esteem. The speakers are usually aware of the existence of linguistic differences (saying such things as *I don't like the way those people talk*), but unaware of any trend in their own speech related to their attitude.

Questions 28–34

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

Write the correct letter in boxes 28–34 on your answer sheet.

- 28** What do 'linguistic variables' do?
- A** They show how language is used differently by people.
 - B** They prove that changes in languages are unpredictable.
 - C** They record laws about how people should speak.
 - D** They show which people introduce linguistic change.
- 29** What does the writer say is the relationship between changes in languages and in dialects?
- A** A minor change in a dialect will signal a major change in a language.
 - B** Changes in languages are closely followed by changes in dialects.
 - C** They begin rapidly then slow down.
 - D** Neither of them happens suddenly.
- 30** When does the writer assert that a general language change can be recognised?
- A** when an item of vocabulary first comes into a language
 - B** after a decade of usage in the language
 - C** when the majority of people in a group have changed their way of speaking
 - D** only following the occurrence of the change
- 31** According to the writer, why may location influence language change?
- A** Those from warmer places are more creative.
 - B** Different environments may affect people's bodies.
 - C** People living in hills need different expressions from those in valleys.
 - D** Altitude affects the speed of language change.
- 32** What has recent scientific research illustrated?
- A** Influential people can dictate new language patterns.
 - B** Difficult relationships between groups slow down change in language.
 - C** Social aspects of language are the main influence on change.
 - D** Language change has multiple causes.
- 33** How does increased mobility seem to affect language change?
- A** It speeds up the rate at which new languages are learnt.
 - B** Those who travel can struggle to adopt the new language.
 - C** People's language changes when they leave other members of their group.
 - D** Dominant language traits are more easily transported.
- 34** Which aspect of language change is most often found?
- A** changes that the users themselves do not notice
 - B** deliberate imitations to achieve status
 - C** attempts by newcomers to improve pronunciation
 - D** efforts to keep vocabulary up to date

Questions 35–40

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

In boxes 35–40 on your answer sheet write

YES if the statement agrees with the claims of the writer

NO if the statement contradicts the claims of the writer

NOT GIVEN if there is no information on this

- 35 Linguistic change occurs when a new pronunciation is adopted evenly.
- 36 Patterns in water are too even to be properly compared to patterns in language.
- 37 Historical dictionaries record the first spoken use of a new word.
- 38 In recent times, new vocabulary has primarily been introduced through the electronic media.
- 39 Change can happen when new speakers of a language make mistakes.
- 40 An established language can be influenced by an introduced language.

Reading Test 3

ALL ANSWERS MUST BE WRITTEN ON THE ANSWER SHEET.

The test is divided as follows:

- | | |
|-------------------|--------------------|
| Reading Passage 1 | Questions 1 to 14 |
| Reading Passage 2 | Questions 15 to 28 |
| Reading Passage 3 | Questions 29 to 40 |

Start at the beginning of the test and work through it. You should answer all the questions. If you cannot do a particular question leave it and go on to the next one. You can return to it later.

TIME ALLOWED: 60 MINUTES

NUMBER OF QUESTIONS: 40