List of Reading Passages and their Test Dates

Test 1

William Gilbert and Magnetism	20 January 2007	20 September 2007	5 August 2010
The 2003 Heatwave	20 September 2007	10 January 2009	28 March 2009
	30 October 2010		
Amateur Naturalists	13 December 2007	2 April 2011	

Test 2

How to Spot a Liar?	31 March 2007	21 March 2009	30 January 2010
Being Left-handed in a Right-handed World	30 January 2010	17 September 2011	
What Is a Dinosaur?			

Test 3

Learning by Examples	17 November 2007	7 February 2009	15 September 2011
A New Ice Age	14 July 2007	13 October 2007	7 February 2009
	26 September 2009	19 November 2009	
The Fruit Book	20 September 2007		

Test 4

The Mozart Effect	13 December 2007	14 March 2009	
The Ant and the Mandarin	1 September 2007	25 June 2011	
Music: Language We All Speak	1 September 2007	16 September 2010	

Test 5

Wonder Plant	25 April 2009	6 March 2010	9 July 2011
Children's Literature	23 October 2008	6 March 2010	9 July 2011
Talc Powder	6 March 2010		

Test 6

The Sweet Scent of Success	10 April 2010	29 October 2011
Mrs. Carlill and the Carbolic Smoke Ball	10 April 2010	19 May 2011
Communicating Styles and Conflict	10 April 2010	

Test 7

New Zealand Seaweed	25 October 2007	9 August 2008	8 August 2009
Optimism and Health	21 April 2007	23 February 2008	31 July 2010
The Columbian Exchange	31 March 2010		

Test 8

Going Bananas	8 January 2011
Coastal Archaeology of Britain	8 January 2011
Travel Books	8 January 2011

Test 1

Reading Passage 1

You should spend about 20 minutes on Questions 1-13 which are based on Reading Passage 1 on the following page.

Questions 1-7

Reading Passage 1 has seven paragraphs A-G.

Choose the correct heading for each paragraph from the list of headings below.

Write the correct number i-x in boxes 1-7 on your answer sheet.

List of Headings

i	Early years of Gilbert
ii	What was new about his scientific research method
iii	The development of chemistry
iv	Questioning traditional astronomy
v	Pioneers of the early science
vi	Professional and social recognition
vii	Becoming the president of the Royal Science Society
viii	The great works of Gilbert
ix	His discovery about magnetism
x	His change of focus

1 Paragraph **A**
2 Paragraph **B**
3 Paragraph **C**
4 Paragraph **D**
5 Paragraph **E**
6 Paragraph **F**
7 Paragraph **G**

William Gilbert and Magnetism

A The 16th and 17th centuries saw two great pioneers of modern science: Galileo and Gilbert. The impact of their findings is eminent. Gilbert was the first modern scientist, also the accredited father of the science of electricity and magnetism, an Englishman of learning and a physician at the court of Elizabeth. Prior to him, all that was known of electricity and magnetism was what the ancients knew, nothing more than that the lodestone possessed magnetic properties and that amber and jet, when rubbed, would attract bits of paper or other substances of small specific gravity. However, he is less well known than he deserves.

B Gilbert's birth pre-dated Galileo. Born in an eminent local family in Colchester County in the UK, on May 24, 1544, he went to grammar school, and then studied medicine at St John's College, Cambridge, graduating in 1573. Later he travelled in the continent and eventually settled down in London.

C He was a very successful and eminent doctor. All this culminated in his election to the president of the Royal Science Society. He was also appointed personal physician to the Queen (Elizabeth I), and later knighted by the Queen. He faithfully served her until her death. However, he didn't outlive the Queen for long and died on November 30, 1603, only a few months after his appointment as personal physician to King James.

D Gilbert was first interested in chemistry but later changed his focus due to the large portion of mysticism of alchemy involved (such as the transmutation of metal). He gradually developed his interest in physics after the great minds of the ancient, particularly about the knowledge the ancient Greeks had about lodestones, strange minerals with the power to attract iron. In the meantime, Britain became a major seafaring nation in 1588 when the Spanish Armada was defeated, opening the way to British settlement of America. British ships depended on the magnetic compass, yet no one understood why it worked. Did the Pole Star attract it, as Columbus once speculated; or was there a magnetic mountain at the pole, as described in *Odyssey*, which ships would never approach, because the sailors thought its pull would yank out all their iron nails and fittings? For nearly 20 years, William Gilbert conducted ingenious experiments to understand magnetism. His works include *On the Magnet, Magnetic Bodies*, and *the Great Magnet of the Earth*.

E Gilbert's discovery was so important to modern physics. He investigated the nature of magnetism and electricity. He even coined the word "electric". Though the early beliefs of magnetism were also largely entangled with superstitions such as that rubbing garlic on lodestone can neutralise its magnetism, one example being that sailors even believed the smell of garlic would even interfere with the action of compass, which is why helmsmen were forbidden to eat it near a ship's compass. Gilbert also found that metals can be magnetised by rubbing materials such as fur, plastic or the like on them. He named the ends of a magnet "north pole" and "south pole". The magnetic poles can attract or repel, depending on polarity. In addition, however, ordinary iron is always attracted to a magnet. Though he started to study the relationship between magnetism and electricity, sadly he didn't complete it. His research of static electricity using amber and jet only demonstrated that objects with electrical charges can work like magnets attracting small pieces of paper and stuff. It is a French guy named du Fay that discovered that there are actually two electrical charges, positive and negative.

F He also questioned the traditional astronomical beliefs. Though a Copernican, he didn't express in his quintessential beliefs whether the earth is at the centre of the universe or in orbit around the sun. However, he believed that stars are not equidistant from the earth but have their own earth-like planets orbiting around them. The earth itself is like a giant magnet, which is also why compasses always point north. They spin on an axis that is aligned with the earth's polarity. He even likened the polarity of the magnet to the polarity of the earth and built an entire magnetic philosophy on this analogy. In his explanation, magnetism is the soul of the earth. Thus a perfectly spherical lodestone, when aligned with the earth's poles, would wobble all by itself in 24 hours. Further, he also believed that the sun and other stars wobble just like the earth does around a crystal core, and speculated that the moon might also be a magnet caused to orbit by its magnetic attraction to the earth. This was perhaps the first proposal that a force might cause a heavenly orbit.

G His research method was revolutionary in that he used experiments rather than pure logic and reasoning like the ancient Greek philosophers did. It was a new attitude towards scientific investigation. Until then, scientific experiments were not in fashion. It was because of this scientific attitude, together with his contribution to our knowledge of magnetism, that a unit of magneto motive force, also known as magnetic potential, was named Gilbert in his honour. His approach of careful observation and experimentation rather than the authoritative opinion or deductive philosophy of others had laid the very foundation for modern science.

Questions 8-10

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

In boxes 8-10 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

8 He is less famous than he should be.

9 He was famous as a doctor before he was employed by the Queen.

10 He lost faith in the medical theories of his time.

Questions 11-13

Choose THREE letters A-F.

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

Which THREE of the following are parts of Gilbert's discovery?

A Metal can be transformed into another.

B Garlic can remove magnetism.

C Metals can be magnetised.

D Stars are at different distances from the earth.

E The earth wobbles on its axis.

F There are two charges of electricity.

Reading Pasage 2

You should spend about 20 minutes on Questions 14-26 which are based on Reading Passage 2 below.

The 2003 Heatwave

It was the summer, scientists now realise, when global warming at last made itself unmistakably felt. We knew that summer 2003 was remarkable: Britain experienced its record high temperature and continental Europe saw forest fires raging out of control, great rivers drying to a trickle and thousands of heat-related deaths. But just how remarkable is only now becoming clear.

The three months of June, July and August were the warmest ever recorded in western and central Europe, with record national highs in Portugal, Germany and Switzerland as well as in Britain. And they were the warmest by a very long way. Over a great rectangular block of the earth stretching from west of Paris to northern Italy, taking in Switzerland and southern Germany, the average temperature for the summer months was 3.78°C above the long-term norm, said the Climatic Research Unit (CRU) of the University of East Anglia in Norwich, which is one of the world's leading institutions for the monitoring and analysis of temperature records.

That excess might not seem a lot until you are aware of the context – but then you realise it is enormous. There is nothing like this in previous data, anywhere. It is considered so exceptional that Professor Phil Jones, the CRU's director, is prepared to say openly – in a way few scientists have done before – that the 2003 extreme may be directly attributed, not to natural climate variability, but to global warming caused by human actions.

Meteorologists have hitherto contented themselves with the formula that recent high temperatures are "consistent with predictions" of climate change. For the great block of the map – that stretching between 35-50N and 0-20E – the CRU has reliable temperature records dating back to 1781. Using as a baseline the average summer temperature recorded between 1961 and 1990, departures from the temperature norm, or "anomalies", over the area as a whole can easily be plotted. As the graph shows, such is the variability of our climate that over the past 200 years, there have been at least half a dozen anomalies, in terms of excess temperature –

the peaks on the graph denoting very hot years – approaching, or even exceeding, 2°C. But there has been nothing remotely like 2003, when the anomaly is nearly four degrees.

"This is quite remarkable," Professor Jones told *The Independent*. "It's very unusual in a statistical sense. If this series had a normal statistical distribution, you wouldn't get this number. The return period [how often it could be expected to recur] would be something like one in a thousand years. If we look at an excess above the average of nearly four degrees, then perhaps nearly three degrees of that is natural variability, because we've seen that in past summers. But the final degree of it is likely to be due to global warming, caused by human actions."

The summer of 2003 has, in a sense, been one that climate scientists have long been expecting. Until now, the warming has been manifesting itself mainly in winters that have been less cold than in summers that have been much hotter. Last week, the United Nations predicted that winters were warming so quickly that winter sports would die out in Europe's lower-level ski resorts. But sooner or later, the unprecedented hot summer was bound to come, and this year it did.

One of the most dramatic features of the summer was the hot nights, especially in the first half of August. In Paris, the temperature never dropped below 23°C (73.4°F) at all between 7 and 14 August, and the city recorded its warmest-ever night on 11-12 August, when the mercury did not drop below 25.5°C (77.9°F). Germany recorded its warmest-ever night at Weinbiet in the Rhine Valley with a lowest figure of 27.6°C (80.6°F) on 13 August, and similar record-breaking night-time temperatures were recorded in Switzerland and Italy.

The 15,000 excess deaths in France during August, compared with previous years, have been related to the high night-time temperatures. The number gradually increased during the first 12 days of the month, peaking at about 2,000 per day on the night of 12-13 August, then fell off dramatically after 14 August when the minimum temperatures fell by about 5°C. The elderly were most affected, with a 70 per cent increase in mortality rate in those aged 75-94.

For Britain, the year as a whole is likely to be the warmest ever recorded, but despite the high temperature record on 10 August, the summer itself – defined as the June, July and August period – still comes behind 1976 and 1995, when there were longer periods of intense heat. "At the moment, the year is on course to be the third hottest ever in the global temperature record, which goes back to

1856, behind 1998 and 2002, but when all the records for October, November and December are collated, it might move into second place," Professor Jones said. The ten hottest years in the record have all now occurred since 1990. Professor Jones is in no doubt about the astonishing nature of European summer of 2003. "The temperatures recorded were out of all proportion to the previous record," he said. "It was the warmest summer in the past 500 years and probably way beyond that. It was enormously exceptional."

His colleagues at the University of East Anglia's Tyndall Centre for Climate Change Research are now planning a special study of it. "It was a summer that has not been experienced before, either in terms of the temperature extremes that were reached, or the range and diversity of the impacts of the extreme heat," said the centre's executive director, Professor Mike Hulme.

"It will certainly have left its mark on a number of countries, as to how they think and plan for climate change in the future, much as the 2000 floods have revolutionised the way the Government is thinking about flooding in the UK. The 2003 heatwave will have similar repercussions across Europe."

Questions 14-19

Do the following statements agree with the information given in Reading Passage 2?

In boxes 14-19 on your answer sheet write

YES	if the statement agrees with the information
NO	if the statement contradicts the information
NOT GIVEN	if there is no information on this

14 The average summer temperature in 2003 is almost 4 degrees higher than the average temperature of the past.

15 Global warming is caused by human activities.

16 Jones believes the temperature variation is within the normal range.

17 The temperature is measured twice a day in major cities.

18 There were milder winters rather than hotter summers before 2003.

19 Governments are building new high-altitude ski resorts.

Questions 20-21

Answer the questions below using NO MORE THAN TWO WORDS from the passage for each answer.

Write your answers in boxes 20-21 on your answer sheet.

20 What are the other two hottest years in Britain besides 2003?

21 What will also influence government policies in the future like the hot summer in 2003?

Questions 22-25

Complete the summary below using NO MORE THAN THREE WORDS from the passage for each answer.

Write your answers in boxes 22-25 on your answer sheet.

The other two hottest years around the globe were **22** _____. The ten hottest years on record all come after the year **23** _____. This temperature data has been gathered since **24** _____. Thousands of people died in the country of **25** _____.

Question 26

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

Write your answer in box 26 on your answer sheet.

26 Which one of the following can be best used as the title of this passage?

A Global Warming

B What Caused Global Warming

C The Effects of Global Warming

D That Hot Year in Europe

Reading Passage 3

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

Amateur Naturalists

From the results of an annual Alaskan betting contest to sightings of migratory birds, ecologists are using a wealth of unusual data to predict the impact of climate change.

A Tim Sparks slides a small leather-bound notebook out of an envelope. The book's yellowing pages contain bee-keeping notes made between 1941 and 1969 by the late Walter Coates of Kilworth, Leicestershire. He adds it to his growing pile of local journals, birdwatchers' lists and gardening diaries. "We're uncovering about one major new record each month," he says, "I still get surprised." Around two centuries before Coates, Robert Marsham, a landowner from Norfolk in the east of England, began recording the life cycles of plants and animals on his estate – when the first wood anemones flowered, the dates on which the oaks burst into leaf and the rooks began nesting. Successive Marshams continued compiling these notes for 211 years.

B Today, such records are being put to uses that their authors could not possibly have expected. These data sets, and others like them, are proving invaluable to ecologists interested in the timing of biological events, or phenology. By combining the records with climate data, researchers can reveal how, for example, changes in temperature affect the arrival of spring, allowing ecologists to make improved predictions about the impact of climate change. A small band of researchers is combing through hundreds of years of records taken by thousands of amateur naturalists. And more systematic projects have also started up, producing an overwhelming response. "The amount of interest is almost frightening," says Sparks, a climate researcher at the Centre for Ecology and Hydrology in Monks Wood, Cambridgeshire.

C Sparks first became aware of the army of "closet phenologists", as he describes them, when a retiring colleague gave him the Marsham records. He now spends much of his time following leads from one historical data set to

another. As news of his quest spreads, people tip him off to other historical records, and more amateur phenologists come out of their closets. The British devotion to recording and collecting makes his job easier – one man from Kent sent him 30 years' worth of kitchen calendars, on which he had noted the date that his neighbour's magnolia tree flowered.

D Other researchers have unearthed data from equally odd sources. Rafe Sagarin, an ecologist at Stanford University in California, recently studied records of a betting contest in which participants attempt to guess the exact time at which a specially erected wooden tripod will fall through the surface of a thawing river. The competition has taken place annually on the Tenana River in Alaska since 1917, and analysis of the results showed that the thaw now arrives five days earlier than it did when the contest began.

E Overall, such records have helped to show that, compared with 20 years ago, a raft of natural events now occur earlier across much of the northern hemisphere, from the opening of leaves to the return of birds from migration and the emergence of butterflies from hibernation. The data can also hint at how nature will change in the future. Together with models of climate change, amateurs' records could help guide conservation. Terry Root, an ecologist at the University of Michigan in Ann Arbor, has collected birdwatchers' counts of wildfowl taken between 1955 and 1996 on seasonal ponds in the American Midwest and combined them with climate data and models of future warming. Her analysis shows that the increased droughts that the models predict could halve the breeding populations at the ponds. "The number of waterfowl in North America will most probably drop significantly with global warming," she says.

F But not all professionals are happy to use amateur data. "A lot of scientists won't touch them, they say they're too full of problems," says Root. Because different observers can have different ideas of what constitutes, for example, an open snowdrop. "The biggest concern with ad hoc observations is how carefully and systematically they were taken," says Mark Schwartz of the University of Wisconsin, Milwaukee, who studies the interactions between plants and climate. "We need to know pretty precisely what a person's been observing – if they just say 'I noted when the leaves came out', it might not be that useful." Measuring the onset of autumn can be particularly problematic because deciding when leaves change colour is a more subjective process than noting when they appear.

G Overall, most phenologists are positive about the contribution that amateurs can make. "They get at the raw power of science: careful observation of the natural world," says Sagarin. But the professionals also acknowledge the need for careful quality control. Root, for example, tries to gauge the quality of an amateur archive by interviewing its collector. "You always have to worry – things as trivial as vacations can affect measurement. I disregard a lot of records because they're not rigorous enough," she says. Others suggest that the right statistics can iron out some of the problems with amateur data. Together with colleagues at Wageningen University in the Netherlands, environmental scientist Arnold van Vliet is developing statistical techniques to account for the uncertainty in amateur phenological data. With the enthusiasm of amateur phenologists evident from past records, professional researchers are now trying to create standardised recording schemes for future efforts. They hope that well-designed studies will generate a volume of observations large enough to drown out the idiosyncrasies of individual recorders. The data are cheap to collect, and can provide breadth in space, time and range of species. "It's very difficult to collect data on a large geographical scale without enlisting an army of observers," says Root.

H Phenology also helps to drive home messages about climate change. "Because the public understand these records, they accept them," says Sparks. It can also illustrate potentially unpleasant consequences, he adds, such as the finding that more rat infestations are reported to local councils in warmer years. And getting people involved is great for public relations. "People are thrilled to think that the data they've been collecting as a hobby can be used for something scientific – it empowers them," says Root.

Questions 27-33

Reading Passage 3 has eight paragraphs A-H.

Which paragraph contains the following information?

Write the correct letter A-H in boxes 27-33 on your answer sheet.

27 The definition of phenology
28 How Sparks first became aware of amateur records
29 How people reacted to their involvement in data collection
30 The necessity to encourage amateur data collection
31 A description of using amateur records to make predictions
32 Records of a competition providing clues to climate change
33 A description of a very old record compiled by generations of amateur naturalists

Questions 34-36

Complete the sentences below with **NO MORE THAN TWO WORDS** from the passage for each answer.

Write your answers in boxes 34-36 on your answer sheet.

34 Walter Coates's records largely contain the information of _____.
35 Robert Marsham is famous for recording the _____ of animals and plants on his land.
36 According to some phenologists, global warming may cause the number of waterfowl in North America to drop significantly due to increased _____.

Questions 37-40

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

Write your answers in boxes 37-40 on your answer sheet.

37 Why do a lot of scientists discredit the data collected by amateurs?

A Scientific methods were not used in data collection.

B Amateur observers are not careful in recording their data.

C Amateur data is not reliable.

D Amateur data is produced by wrong candidates.

38 Mark Schwartz used the example of leaves to illustrate that

A amateur records can't be used.

B amateur records are always unsystematic.

C the colour change of leaves is hard to observe.

D valuable information is often precise.

39 How do the scientists suggest amateur data should be used?

A Using improved methods

B Being more careful in observation

C Using raw materials

D Applying statistical techniques in data collection

40 What's the implication of phenology for ordinary people?

A It empowers the public.

B It promotes public relations.

C It warns people of animal infestation.

D It raises awareness about climate change in the public.

Test 2

Reading Passage 1

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

How to Spot a Liar?

However much we may abhor it, deception comes naturally to all living things. Birds do it by feigning injury to lead hungry predators away from nesting young. Spider crabs do it by disguise: adorning themselves with strips of kelp and other debris, they pretend to be something they are not – and so escape their enemies. Nature amply rewards successful deceivers by allowing them to survive long enough to mate and reproduce. So it may come as no surprise to learn that human beings – who, according to psychologist Gerald Jellison of the University of South California, are lied to about 200 times a day, roughly one untruth every five minutes – often deceive for exactly the same reasons: to save their own skins or to get something they can't get by other means.

But knowing how to catch deceit can be just as important a survival skill as knowing how to tell a lie and get away with it. A person able to spot falsehood quickly is unlikely to be swindled by an unscrupulous business associate or hoodwinked by a devious spouse. Luckily, nature provides more than enough clues to trap dissemblers in their own tangled webs – if you know where to look. By closely observing facial expressions, body language and tone of voice, practically anyone can recognise the telltale signs of lying. Researchers are even programming computers – like those used on Lie Detector – to get at the truth by analysing the same physical cues available to the naked eye and ear. "With the proper training, many people can learn to reliably detect lies," says Paul Ekman, professor of psychology at the University of California, San Francisco, who has spent the past 15 years studying the secret art of deception.

In order to know what kind of lies work best, successful liars need to accurately assess other people's emotional states. Ekman's research shows that this

same emotional intelligence is essential for good lie detectors, too. The emotional state to watch out for is stress, the conflict most liars feel between the truth and what they actually say and do.

Even high-tech lie detectors don't detect lies as such; they merely detect the physical cues of emotions, which may or may not correspond to what the person being tested is saying. Polygraphs, for instance, measure respiration, heart rate and skin conductivity, which tend to increase when people are nervous – as they usually are when lying. Nervous people typically perspire, and the salts contained in perspiration conduct electricity. That's why a sudden leap in skin conductivity indicates nervousness – about getting caught, perhaps – which might, in turn, suggest that someone is being economical with the truth. On the other hand, it might also mean that the lights in the television studio are too hot – which is one reason polygraph tests are inadmissible in court. "Good lie detectors don't rely on a single sign," Ekman says, "but interpret clusters of verbal and non-verbal clues that suggest someone might be lying."

Those clues are written all over the face. Because the musculature of the face is directly connected to the areas of the brain that process emotion, the countenance can be a window to the soul. Neurological studies even suggest that genuine emotions travel different pathways through the brain than insincere ones. If a patient paralysed by stroke on one side of the face, for example, is asked to smile deliberately, only the mobile side of the mouth is raised. But tell that same person a funny joke, and the patient breaks into a full and spontaneous smile. Very few people – most notably, actors and politicians – are able to consciously control all of their facial expressions. Lies can often be caught when the liar's true feelings briefly leak through the mask of deception. "We don't think before we feel," Ekman says. "Expressions tend to show up on the face before we're even conscious of experiencing an emotion."

One of the most difficult facial expressions to fake – or conceal, if it is genuinely felt – is sadness. When someone is truly sad, the forehead wrinkles with grief and the inner corners of the eyebrows are pulled up. Fewer than 15% of the people Ekman tested were able to produce this eyebrow movement voluntarily. By contrast, the lowering of the eyebrows associated with an angry scowl can be replicated at will by almost everybody. "If someone claims they are sad and the inner corners of their eyebrows don't go up," Ekman says, "the sadness is probably false."

The smile, on the other hand, is one of the easiest facial expressions to counterfeit. It takes just two muscles – the zygomaticus major muscles that extend from the cheekbones to the corners of the lips – to produce a grin. But there's a catch. A genuine smile affects not only the corners of the lips but also the orbicularis oculi, the muscle around the eye that produces the distinctive "crow's feet" associated with people who laugh a lot. A counterfeit grin can be unmasked if the lip corners go up, the eyes crinkle but the inner corners of the eyebrows are not lowered, a movement controlled by the orbicularis oculi that is difficult to fake. The absence of lowered eyebrows is one reason why false smiles look so strained and stiff.

Questions 1-5

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

In boxes 1-5 on your answer sheet write

YES	if the statement agrees with the information
NO	if the statement contradicts the information
NOT GIVEN	if there is no information on this

1 All living animals can lie.
2 Some people tell lies for self-preservation.
3 Scientists have used computers to analyse which part of brain is responsible for telling lies.
4 Lying as a survival skill is more important than detecting a lie.
5 To be a good liar, one has to understand other people's emotions.

Questions 6-9

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

Write your answers in boxes 6-9 on your answer sheet.

6 How does the lie detector work?

A It detects whether one's emotional state is stable.
B It detects one's brain activity level.
C It detects body behaviour during one's verbal response.
D It analyses one's verbal response word by word.

7 Lie detectors can't be used as evidence in a court of law because

A lights often cause lie detectors to malfunction.
B they are based on too many verbal and non-verbal clues.
C polygraph tests are often inaccurate.
D there may be many causes of a certain body behaviour.

8 Why does the author mention the paralysed patients?

A To demonstrate how a paralysed patient smiles
B To show the relation between true emotions and body behaviour
C To examine how they were paralysed
D To show the importance of happiness from recovery

9 The author uses politicians to exemplify that they can

A have emotions.
B imitate actors.
C detect other people's lies.
D mask their true feelings.

Questions 10-13

Classify the following facial traits as referring to

A *Sadness*
B *Anger*
C *Happiness*

Write the correct letter A, B or C in boxes 10-13 on your answer sheet.

10 Inner corners of eyebrows raised
11 The whole eyebrows lowered
12 Lines formed around eyes
13 Lines formed above eyebrows

Reading Passage 2

You should spend about 20 minutes on Questions 14-26 which are based on Reading Passage 2 below.

Being Left-handed in a Right-handed World

The world is designed for right-handed people. Why does a tenth of the population prefer the left?

Section A

The probability that two right-handed people would have a left-handed child is only about 9.5 per cent. The chance rises to 19.5 per cent if one parent is a lefty and 26 per cent if both parents are left-handed. The preference, however, could also stem from an infant's imitation of his parents. To test genetic influence, starting in the 1970s, British biologist Marian Annett of the University of Leicester hypothesised that no single gene determines handedness. Rather, during foetal development, a certain molecular factor helps to strengthen the brain's left hemisphere, which increases the probability that the right hand will be dominant, because the left side of the brain controls the right side of the body, and vice versa. Among the minority of people who lack this factor, handedness develops entirely by chance.

Research conducted on twins complicates the theory, however. One in five sets of identical twins involves one right-handed and one left-handed person, despite the fact that their genetic material is the same. Genes, therefore, are not solely responsible for handedness.

Section B

The genetic theory is also undermined by results from Peter Hepper and his team at Queen's University in Belfast, Ireland. In 2004, the psychologists used ultrasound to show that by the 15th week of pregnancy, foetuses already have a preference as to which thumb they suck. In most cases, the preference continued after birth. At 15 weeks, though, the brain does not yet have control over the

body's limbs. Hepper speculates that foetuses tend to prefer whichever side of the body is developing quicker and that their movements, in turn, influence the brain's development. Whether this early preference is temporary or holds up throughout development and infancy is unknown.

Genetic predetermination is also contradicted by the widespread observation that children do not settle on either their right or left hand until they are two or three years old.

Section C

But even if these correlations were true, they did not explain what actually causes left-handedness. Furthermore, specialisation on either side of the body is common among animals. Cats will favour one paw over another when fishing toys out from under the couch. Horses stomp more frequently with one hoof than the other. Certain crabs motion predominantly with the left or right claw. In evolutionary terms, focusing power and dexterity in one limb is more efficient than having to train two, four or even eight limbs equally. Yet for most animals, the preference for one side or the other is seemingly random. The overwhelming dominance of the right hand is associated only with humans. That fact directs attention towards the brain's two hemispheres and perhaps towards language.

Section D

Interest in hemispheres dates back to at least 1836. That year, at a medical conference, French physician Marc Dax reported on an unusual commonality among his patients. During his many years as a country doctor, Dax had encountered more than 40 men and women for whom speech was difficult, the result of some kind of brain damage. What was unique was that every individual suffered damage to the left side of the brain. At the conference, Dax elaborated on his theory, stating that each half of the brain was responsible for certain functions and that the left hemisphere controlled speech. Other experts showed little interest in the Frenchman's ideas.

Over time, however, scientists found more and more evidence of people experiencing speech difficulties following injury to the left brain. Patients with damage to the right hemisphere most often displayed disruptions in perception or concentration. Major advancements in understanding the brain's asymmetry were made in the 1960s as a result of the so-called split-brain surgery,

developed to help patients with epilepsy. During this operation, doctors severed the corpus callosum – the nerve bundle that connects the two hemispheres. The surgical cut also stopped almost all normal communication between the two hemispheres, which offered researchers the opportunity to investigate each side's activity.

Section E

In 1949, neurosurgeon Juhn Wada devised the first test to provide access to the brain's functional organisation of language. By injecting an anaesthetic into the right or left carotid artery, Wada temporarily paralysed one side of a healthy brain, enabling him to more closely study the other side's capabilities. Based on this approach, Brenda Milner and the late Theodore Rasmussen of the Montreal Neurological Institute published a major study in 1975 that confirmed the theory that country doctor Dax had formulated nearly 140 years earlier: in 96 per cent of right-handed people, language is processed much more intensely in the left hemisphere. The correlation is not as clear in lefties, however. For two thirds of them, the left hemisphere is still the most active language processor. But for the remaining third, either the right side is dominant or both sides work equally, controlling different language functions.

That last statistic has slowed acceptance of the notion that the predominance of right-handedness is driven by left-hemisphere dominance in language processing. It is not at all clear why language control should somehow have dragged the control of body movement with it. Some experts think one reason the left hemisphere reigns over language is because the organs of speech processing – the larynx and tongue – are positioned on the body's symmetry axis. Because these structures were centred, it may have been unclear, in evolutionary terms, which side of the brain should control them, and it seems unlikely that shared operation would result in smooth motor activity.

Language and handedness could have developed preferentially for very different reasons as well. For example, some researchers, including evolutionary psychologist Michael C. Corballis of the University of Auckland in New Zealand, think that the origin of human speech lies in gestures. Gestures pre-dated words and helped language emerge. If the left hemisphere began to dominate speech, it would have dominated gestures, too, and because the left brain controls the right side of the body, the right hand develops more strongly.

Section F

Perhaps we will know more soon. In the meantime, we can revel in what, if any, differences handedness brings to our human talents. Popular wisdom says right-handed, left-brained people excel at logical, analytical thinking. Left-handed, right-brained individuals are thought to possess more creative skills and may be better at combining the functional features emergent in both sides of the brain. Yet some neuroscientists see such claims as pure speculation.

Fewer scientists are ready to claim that left-handedness means greater creative potential. Yet lefties are prevalent among artists, composers and the generally acknowledged great political thinkers. Possibly if these individuals are among the lefties whose language abilities are evenly distributed between hemispheres, the intense interplay required could lead to unusual mental capabilities.

Section G

Or perhaps some lefties become highly creative simply because they must be more clever to get by in our right-handed world. This battle, which begins during the very early stages of childhood, may lay the groundwork for exceptional achievements.

Questions 14-18

Reading Passage 2 has seven sections A-G.

Which section contains the following information?

Write the correct letter A-G in boxes 14-18 on your answer sheet.

14 Preference for using one side of the body in animal species
15 How likely one handedness is born
16 The age when the preference for using one hand is settled
17 Occupations usually found in left-handed population
18 A reference to an early discovery of each hemisphere's function

Questions 19-22

Look at the following researchers (Questions 19-22) and the list of findings below.

Match each researcher with the correct finding.

Write the correct letter A-G in boxes 19-22 on your answer sheet.

19 Marian Annett
20 Peter Hepper
21 Brenda Milner & Theodore Rasmussen
22 Michael Corballis

List of Findings

A Early language evolution is correlated to body movement and thus affecting the preference for use of one hand.
B No single biological component determines the handedness of a child.
C Each hemisphere of the brain is in charge of different body functions.
D Language process is mainly centred in the left hemisphere of the brain.
E Speech difficulties are often caused by brain damage.
F The rate of development of one side of the body has influence on hemisphere preference in foetus.
G Brain function already matures by the end of the foetal stage.

Questions 23-26

Do the following statements agree with the information given in Reading Passage 2?

In boxes 23-26 on your answer sheet write

YES	if the statement agrees with the information
NO	if the statement contradicts the information
NOT GIVEN	if there is no information on this

23 The study of twins shows that genetic determination is not the only factor for left-handedness.
24 Marc Dax's report was widely accepted in his time.
25 Juhn Wada based his findings on his research of people with language problems.
26 There tend to be more men with left-handedness than women.

Reading Passage 3

You should spend about 20 minutes on Questions 27-40 which are based on Reading Passage 3 on the next page.

Questions 27-33

Reading Passage 3 has eight paragraphs A-H.

Choose the correct heading for each paragraph from the list of headings below.

Write the correct number i-xiii in boxes 27-33 on your answer sheet.

List of Headings

i 165 million years
ii The body plan of archosaurs
iii Dinosaurs – terrible lizards
iv Classification according to pelvic anatomy
v The suborders of Saurischia
vi Lizards and dinosaurs – two distinct superorders
vii Unique body plan helps identify dinosaurs from other animals
viii Herbivore dinosaurs
ix Lepidosaurs
x Frills and shelves
xi The origins of dinosaurs and lizards
xii Bird-hipped dinosaurs
xiii Skull bones distinguish dinosaurs from other archosaurs

27 Paragraph **A**
28 Paragraph **B**
29 Paragraph **C**
30 Paragraph **D**
31 Paragraph **E**
32 Paragraph **F**
33 Paragraph **G**

Example	*Answer*
Paragraph **H**	x

What Is a Dinosaur?

A Although the name dinosaur is derived from the Greek for "terrible lizard", dinosaurs were not, in fact, lizards at all. Like lizards, dinosaurs are included in the class Reptilia or reptiles, one of the five main classes of Vertebrata, animals with backbones. However, at the next level of classification, within reptiles, significant differences in the skeletal anatomy of lizards and dinosaurs have led scientists to place these groups of animals into two different superorders: Lepidosauria or lepidosaurs, and Archosauria or archosaurs.

B Classified as lepidosaurs are lizards and snakes and their prehistoric ancestors. Included among the archosaurs or "ruling reptiles" are prehistoric and modern crocodiles, and the now extinct thecodonts, pterosaurs and dinosaurs. Palaeontologists believe that both dinosaurs and crocodiles evolved, in the later years of the Triassic Period (c248-208 million years ago), from creatures called pseudosuchian thecodonts. Lizards, snakes and different types of thecodont are believed to have evolved earlier in the Triassic Period from reptiles known as eosuchians.

C The most important skeletal differences between dinosaurs and other archosaurs are in the bones of the skull, pelvis and limbs. Dinosaur skulls are found in a great range of shapes and sizes, reflecting the different eating habits and lifestyles of a large and varied group of animals that dominated life on Earth for an extraordinary 165 million years. However, unlike the skulls of any other known animals, the skulls of dinosaurs had two long bones known as vomers. These bones extended on either side of the head, from the front of the snout to the level of the holes in the skull known as the antorbital fenestra, situated in front of the dinosaur's orbits, or eye sockets.

D All dinosaurs, whether large or small, quadrupedal or bipedal, fleet-footed or slow-moving, shared a common body plan. Identification of this plan makes it possible to differentiate dinosaurs from any other types of animal, even other archosaurs. Most significantly, in dinosaurs, the pelvis and femur had evolved so that the hind limbs were held vertically beneath the body, rather than sprawling out to the sides like the limbs of a lizard. The femur of a dinosaur had a sharply in-turned neck and a ball-shaped head, which slotted into a fully open acetabulum or hip socket. A supra-acetabular crest helped prevent dislocation of the femur. The position of the knee joint,

aligned below the acetabulum, made it possible for the whole hind limb to swing backwards and forwards. This unique combination of features gave dinosaurs what is known as a "fully improved gait". Evolution of this highly efficient method of walking also developed in mammals, but among reptiles it occurred only in dinosaurs.

E For the purpose of further classification, dinosaurs are divided into two orders: Saurischia or saurischian dinosaurs, and Ornithischia or ornithischian dinosaurs. This division is made on the basis of their pelvic anatomy. All dinosaurs had a pelvic girdle with each side comprised of three bones: the pubis, ilium and ischium. However, the orientation of these bones follows one of two patterns. In saurischian dinosaurs, also known as lizard-hipped dinosaurs, the pubis points forwards, as is usual in most types of reptile. By contrast, in ornithischian or bird-hipped dinosaurs, the pubis points backwards towards the rear of the animal, which is also true of birds.

F Of the two orders of dinosaurs, the Saurischia was the larger and the first to evolve. It is divided into two suborders: Therapoda or therapods, and Sauropodomorpha or sauropodomorphs. The therapods or "beast feet" were bipedal, predatory carnivores. They ranged in size from the mighty Tyrannosaurus rex, 12m long, 5.6m tall and weighing an estimated 6.4 tonnes, to the smallest known dinosaur, Compsognathus, merely 1.4m long and estimated 3kg in weight when fully grown. The sauropodomorphs or "lizard feet forms" included both bipedal and quadrupedal dinosaurs. Some sauropodomorphs were carnivorous or omnivorous, but later species were typically herbivorous. They included some of the largest and best known of all dinosaurs, such as Diplodocus, a huge quadruped with an elephant-like body, a long, thin tail and neck that gave it a total length of 27m and a tiny head.

G Ornithischian dinosaurs were bipedal or quadrupedal herbivores. They are now usually divided into three suborders: Ornithopoda, Thyreophora and Marginocephalia. The ornithopods or "bird feet", both large and small, could walk or run on their long hind legs, balancing their body by holding their tails stiffly off the ground behind them. An example is Iguanodon, up to 9m long, 5m tall and weighing 4.5 tonnes. The thyreophorans or "shield bearers", also known as armoured dinosaurs, were quadrupeds with rows of protective bony spikes, studs, or plates along their backs and tails. They included Stegosaurus, 9m long and weighing 2 tonnes.

H The marginocephalians or "margined heads" were bipedal or quadrupedal ornithischians with a deep bony frill or narrow shelf at the back of the skull. An example is Triceratops, a rhinoceros-like dinosaur, 9m long, weighing 5.4 tonnes and bearing a prominent neck frill and three large horns.

Questions 34-36

Complete the sentences below with NO MORE THAN THREE WORDS from the passage for each answer.

Write your answers in boxes 34-36 on your answer sheet.

34 Lizards and dinosaurs are classified into two different superorders because of the difference in their _____.

35 In the Triassic Period, _____ evolved into thecodonts, for example, lizards and snakes.

36 Dinosaur skulls differed from those of any other known animals because of the presence of vomers: _____.

Questions 37-40

Choose one phrase A-H from the list of features on the next page to match with the dinosaurs listed below.

Write the appropriate letter A-H in boxes 37-40 on your answer sheet.

NB You may use each letter once only.

Dinosaurs

37 Dinosaurs differed from lizards because ...

38 Saurischian and ornithischian dinosaurs ...

39 Unlike therapods, sauropodomorphs ...

40 Some dinosaurs used their tails to balance, others ...

List of Features

A	are both divided into two orders
B	the former had a "fully improved gait"
C	were not usually very heavy
D	could walk or run on their back legs
E	their hind limbs sprawled out to the sides
F	walked or ran on four legs rather than two
G	both had a pelvic girdle comprising six bones
H	did not always eat meat

Test 3

Reading Passage 1

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

Learning by Examples

A Learning Theory is rooted in the work of Ivan Pavlov, the famous scientist who discovered and documented the principles governing how animals (humans included) learn in the 1900s. Two basic kinds of learning or conditioning occur, one of which is famously known as the classical conditioning. Classical conditioning happens when an animal learns to associate a neutral stimulus (signal) with a stimulus that has intrinsic meaning based on how closely in time the two stimuli are presented. The classic example of classical conditioning is a dog's ability to associate the sound of a bell (something that originally has no meaning to the dog) with the presentation of food (something that has a lot of meaning to the dog) a few moments later. Dogs are able to learn the association between bell and food, and will salivate immediately after hearing the bell once this connection has been made. Years of learning research have led to the creation of a highly precise learning theory that can be used to understand and predict how and under what circumstances most any animal will learn, including human beings, and eventually help people figure out how to change their behaviours.

B Role models are a popular notion for guiding child development, but in recent years very interesting research has been done on learning by examples in other animals. If the subject of animal learning is taught very much in terms of classical or operant conditioning, it places too much emphasis on how we allow animals to learn and not enough on how they are equipped to learn. To teach a course of mine, I have been dipping profitably into a very interesting and accessible compilation of papers on social learning in mammals, including chimps and human children, edited by Heyes and Galef (1996).

C The research reported in one paper started with a school field trip to Israel to a pine forest where many pine cones were discovered, stripped to the central core. So the investigation started with no weighty theoretical intent, but was directed at finding out what was eating the nutritious pine seeds and how they managed to get them out of the cones. The culprit proved to be the versatile and athletic black rat (Rattus rattus), and the technique was to bite each cone scale off at its base, in sequence from base to tip following the spiral growth pattern of the cone.

D Urban black rats were found to lack the skill and were unable to learn it even if housed with experienced cone strippers. However, infants of urban mothers cross-fostered by stripper mothers acquired the skill, whereas infants of stripper mothers fostered by an urban mother could not. Clearly the skill had to be learned from the mother. Further elegant experiments showed that naive adults could develop the skill if they were provided with cones from which the first complete spiral of scales had been removed; rather like our new photocopier which you can work out how to use once someone has shown you how to switch it on. In the case of rats, the youngsters take cones away from the mother when she is still feeding on them, allowing them to acquire the complete stripping skill.

E A good example of adaptive bearing we might conclude, but let's see the economies. This was determined by measuring oxygen uptake of a rat stripping a cone in a metabolic chamber to calculate energetic cost and comparing it with the benefit of the pine seeds measured by calorimeter. The cost proved to be less than 10% of the energetic value of the cone. An acceptable profit margin.

F A paper in 1996, *Animal Behaviour* by Bednekoff and Balda, provides a different view of the adaptiveness of social learning. It concerns the seed caching behaviour of Clark's Nutcracker (Nucifraga columbiana) and the Mexican Jay (Aphelocoma ultramarina). The former is a specialist, caching 30,000 or so seeds in scattered locations that it will recover over the months of winter; the Mexican Jay will also cache food but is much less dependent upon this than the Nutcracker. The two species also differ in their social structure: the Nutcracker being rather solitary while the Jay forages in social groups.

G The experiment is to discover not just whether a bird can remember where it hid a seed but also if it can remember where it saw another bird hide a

seed. The design is slightly comical with a cacher bird wandering about a room with lots of holes in the floor hiding food in some of the holes, while watched by an observer bird perched in a cage. Two days later, cachers and observers are tested for their discovery rate against an estimated random performance. In the role of cacher, not only the Nutcracker but also the less specialised Jay performed above chance; more surprisingly, however, jay observers were as successful as jay cachers whereas nutcracker observers did no better than chance. It seems that, whereas the Nutcracker is highly adapted at remembering where it hid its own seeds, the social living Mexican Jay is more adept at remembering, and so exploiting, the caches of others.

Questions 1-4

Reading Passage 1 has seven paragraphs A-G.

Which paragraph contains the following information?

Write the correct letter A-G in boxes 1-4 on your answer sheet.

1 A comparison between rats' learning and human learning
2 A reference to the earliest study in animal learning
3 The discovery of who stripped the pine cone
4 A description of a cost-effectiveness experiment

Questions 5-8

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

In boxes 5-8 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

5 The field trip to Israel was to investigate how black rats learn to strip pine cones.
6 The pine cones were stripped from bottom to top by black rats.
7 It can be learned from other relevant experiences to use a photocopier.
8 Stripping the pine cones is an instinct of the black rats.

Questions 9-13

Complete the summary below using words from the box.

Write your answers in boxes 9-13 on your answer sheet.

While the Nutcracker is more able to cache seeds, the Jay relies **9** _____ on caching food and is thus less specialised in this ability, but more **10** _____. To study their behaviour of caching and finding their caches, an experiment was designed and carried out to test these two birds for their ability to remember where they hid the seeds.

In the experiment, the cacher bird hid seeds in the ground while the other **11** _____. As a result, the Nutcracker and the Mexican Jay showed different performance in the role of **12** _____ at finding the seeds – the observing **13** _____ didn't do as well as its counterpart.

less	social	remembered	Nutcracker
more	cacher	watched	
solitary	observer	Jay	

Reading Passage 2

You should spend about 20 minutes on Questions 14-26 which are based on Reading Passage 2 below.

A New Ice Age

William Curry is a serious, sober climate scientist, not an art critic. But he has spent a lot of time perusing Emanuel Gottlieb Leutze's famous painting "George Washington Crossing the Delaware", which depicts a boatload of colonial American soldiers making their way to attack English and Hessian troops the day after Christmas in 1776. "Most people think these other guys in the boat are rowing, but they are actually pushing the ice away," says Curry, tapping his finger on a reproduction of the painting. Sure enough, the lead oarsman is bashing the frozen river with his boot. "I grew up in Philadelphia. The place in this painting is 30 minutes away by car. I can tell you, this kind of thing just doesn't happen anymore."

But it may again soon. And ice-choked scenes, similar to those immortalised by the 16th-century Flemish painter Pieter Brueghel the Elder, may also return to Europe. His works, including the 1565 masterpiece "Hunters in the Snow", make the now-temperate European landscapes look more like Lapland. Such frigid settings were commonplace during a period dating roughly from 1300 to 1850 because much of North America and Europe was in the throes of a little ice age. And now there is mounting evidence that the chill could return. A growing number of scientists believe conditions are ripe for another prolonged cooldown, or small ice age. While no one is predicting a brutal ice sheet like the one that covered the Northern Hemisphere with glaciers about 12,000 years ago, the next cooling trend could drop average temperatures 5 degrees Fahrenheit over much of the United States and 10 degrees in the Northeast, northern Europe, and northern Asia.

"It could happen in 10 years," says Terrence Joyce, who chairs the Woods Hole Physical Oceanography Department. "Once it does, it can take hundreds of years to reverse." And he is alarmed that Americans have yet to take the threat seriously.

A drop of 5 to 10 degrees entails much more than simply bumping up the thermostat and carrying on. Both economically and ecologically, such quick, persistent chilling could have devastating consequences. A 2002 report titled "Abrupt Climate

Change: Inevitable Surprises", produced by the National Academy of Sciences, pegged the cost from agricultural losses alone at $100 billion to $250 billion while also predicting that damage to ecologies could be vast and incalculable. A grim sampler: disappearing forests, increased housing expenses, dwindling fresh water, lower crop yields, and accelerated species extinctions.

The reason for such huge effects is simple. A quick climate change wreaks far more disruption than a slow one. People, animals, plants, and the economies that depend on them are like rivers; says the report: "For example, high water in a river will pose few problems until the water runs over the bank, after which levees can be breached and massive flooding can occur. Many biological processes undergo shifts at particular thresholds of temperature and precipitation."

Political changes since the last ice age could make survival far more difficult for the world's poor. During previous cooling periods, whole tribes simply picked up and moved south, but that option doesn't work in the modern, tense world of closed borders. "To the extent that abrupt climate change may cause rapid and extensive changes of fortune for those who live off the land, the inability to migrate may remove one of the major safety nets for distressed people," says the report.

But first things first. Isn't the earth actually warming? Indeed it is, says Joyce. In his cluttered office, full of soft light from the foggy Cape Cod morning, he explains how such warming could actually be the surprising culprit of the next mini-ice age. The paradox is a result of the appearance over the past 30 years in the North Atlantic of huge rivers of fresh water – the equivalent of a 10-foot-thick layer – mixed into the salty sea. No one is certain where the fresh torrents are coming from, but a prime suspect is melting Arctic ice, caused by a build-up of carbon dioxide in the atmosphere that traps solar energy.

The freshwater trend is major news in ocean-science circles. Bob Dickson, a British oceanographer who sounded an alarm at a February conference in Honolulu, has termed the drop in salinity and temperature in the Labrador Sea – a body of water between northeastern Canada and Greenland that adjoins the Atlantic – "arguably the largest full-depth changes observed in the modern instrumental oceanographic record".

The trend could cause a little ice age by subverting the northern penetration of Gulf Stream waters. Normally, the Gulf Stream, laden with heat soaked up in the tropics, meanders up the east coasts of the United States and Canada. As it flows northward, the stream surrenders heat to the air. Because the prevailing North

Atlantic winds blow eastward, a lot of the heat wafts to Europe. That's why many scientists believe winter temperatures on the Continent are as much as 36 degrees Fahrenheit warmer than those in North America at the same latitude. Frigid Boston, for example, lies at almost precisely the same latitude as balmy Rome. And some scientists say the heat also warms Americans and Canadians. "It's a real mistake to think of this solely as a European phenomenon," says Joyce.

Having given up its heat to the air, the now-cooler water becomes denser and sinks into the North Atlantic by a mile or more in a process oceanographers call thermohaline circulation. This massive column of cascading cold is the main engine powering a deep-water current called the Great Ocean Conveyor that snakes through all the world's oceans. But as the North Atlantic fills with fresh water, it grows less dense, making the waters carried northward by the Gulf Stream less able to sink. The new mass of relatively fresh water sits on top of the ocean like a big thermal blanket, threatening the thermohaline circulation. That in turn could make the Gulf Stream slow or veer southward. At some point, the whole system could simply shut down, and do so quickly. "There is increasing evidence that we are getting closer to a transition point, from which we can jump to a new state."

Questions 14-17

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

Write your answers in boxes 14-17 on your answer sheet.

14 The writer uses paintings in the first paragraph to illustrate

A possible future climate change.
B climate change of the last two centuries.
C the river doesn't freeze in winter anymore.
D how George Washington led his troops across the river.

15 Which of the following do scientists believe to be possible?

A The temperature may drop over much of the Northern Hemisphere.
B It will be colder than 12,000 years ago.
C The entire Northern Hemisphere will be covered in ice.
D Europe will look more like Lapland.

16 Why is it difficult for the poor to survive the next ice age?

A People don't live in tribes anymore.

B Politics are changing too fast today.

C Abrupt climate change causes people to live off their land.

D Migration has become impossible because of closed borders.

17 Why is continental Europe much warmer than North America in winter?

A Wind blows most of the heat of tropical currents to Europe.

B Europe and North America are at different latitudes.

C The Gulf Stream has stopped yielding heat to the air.

D The Gulf Stream moves north along the east coast of North America.

Questions 18-22

Look at the following statements (Questions 18-22) and the list of people in the box below.

Match each statement with the correct person A-D.

Write the appropriate letter A-D in boxes 18-22 on your answer sheet.

NB You may use any letter more than once.

18 Most Americans are not prepared for the next ice age.

19 The result of abrupt climate change is catastrophic.

20 The world is not as cold as it used to be.

21 Global warming is closely connected to the ice age.

22 Alerted people to the change of ocean water in a conference

List of People

A William Curry

B Terrence Joyce

C Bob Dickson

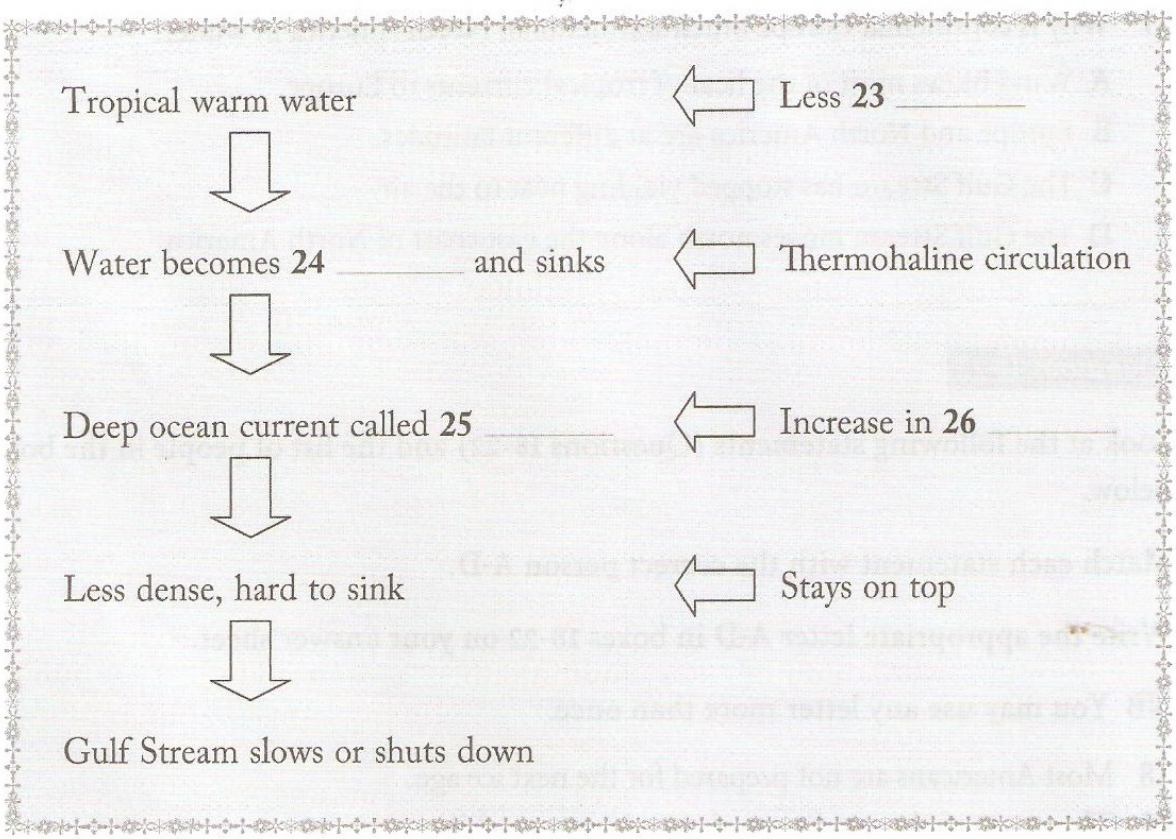
D National Academy of Sciences

Questions 23-26

Complete the flow chart below.

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

Write your answers in boxes 23-26 on your answer sheet.



Reading Passage 3

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

The Fruit Book

It's not every scientist who writes books for people who can't read. And how many scientists want their books to look as dog-eared as possible? But Patricia Shanley, an ethnobotanist, wanted to give something back. After the poorest people of the Amazon allowed her to study their land and its ecology, she turned her research findings into a picture book that tells the local people how to get a good return on their trees without succumbing to the lure of a quick buck from a logging company. It has proved a big success.

A The book is called *Fruit Trees and Useful Plants in the Lives of Amazonians*, but is better known simply as the "fruit book". The second edition was produced at the request of politicians in western Amazonia. Its blend of hard science and local knowledge on the use and trade of 35 native forest species has been so well received (and well used) that no less a dignitary than Brazil's environment minister, Marina Silva, has written the foreword. "There is nothing else like the Shanley book," says Adalberto Verrísimo, director of the Institute of People and the Environment of the Amazon. "It gives science back to the poor, to the people who really need it."

B Shanley's work on the book began a decade ago, with a plea for help from the Rural Workers' Union of Paragominas, a Brazilian town whose prosperity is based on exploitation of timber. The union realised that logging companies would soon be knocking on the doors of the caboclos, peasant farmers living on the Rio Capim, an Amazon tributary in the Brazilian state of Pará. Isolated and illiterate, the caboclos would have little concept of the true value of their trees; communities downstream had already sold off large blocks of forest for a pittance. "What they wanted to know was how valuable the forests were," recalls Shanley, then a researcher in the area for the Massachusetts-based Woods Hole Research Centre.

C The Rural Workers' Union wanted to know whether harvesting wild fruits would make economic sense in the Rio Capim. "There was a lot of interest

in trading non-timber forest products (NTFPs)," Shanley says. At the time, environmental groups and green-minded businesses were promoting the idea. This was the view presented in a seminal paper, *Valuation of an Amazonian Rainforest*, published in *Nature* in 1989. The researchers had calculated that revenues from the sale of fruits could far exceed those from a one-off sale of trees to loggers. "The union was keen to discover whether it made more sense conserving the forest for subsistence use and the possible sale of fruit, game and medicinal plants, than selling trees for timber," says Shanley. Whether it would work for the caboclos was far from clear.

D Although Shanley had been invited to work in the Rio Capim, some caboclos were suspicious. "When Patricia asked if she could study my forest," says Joao Fernando Moreira Brito, "my neighbours said she was a foreigner who'd come to rob me of my trees." In the end, Moreira Brito, or Mangueira as he is known, welcomed Shanley and worked on her study. His land, an hour's walk from the Rio Capim, is almost entirely covered with primary forest. A study of this and other tracts of forest selected by the communities enabled Shanley to identify three trees, found throughout the Amazon, whose fruit was much favoured by the caboclos: *bacuri* (Platonia insignis), *uxi* (Endopleura uchi) and *piquia* (Cayocas villosum). The caboclos used their fruits, extracted oils, and knew what sort of wildlife they attracted. But, in the face of aggressive tactics from the logging companies, they had no measure of the trees' financial worth. The only way to find out, Shanley decided, was to start from scratch with a scientific study. "From a scientific point of view, hardly anything was known about these trees," she says. But six years of field research yielded a mass of data on their flowering and fruiting behaviour. During 1993 and 1994, 30 families weighed everything they used from the forest – game, fruit, fibre, medicinal plants – and documented its source.

E After three logging sales and a major fire in 1997, the researchers were also able to study the ecosystem's reaction to logging and disturbance. They carried out a similar, though less exhaustive, study in 1999, this time with 15 families. The changes were striking. Average annual household consumption of forest fruit had fallen from 89 to 28 kilogrammes between 1993 and 1999. "What we found," says Shanley, "was that fruit collection could coexist with a certain amount of logging, but after the forest fire it dropped dramatically." Over the same period, fibre use also dropped from around 20 to 4 kilogrammes. The fire and logging also changed the nature of the caboclo diet. In 1993 most households ate game two or three times a month. By 1999 some were fortunate if they ate game more than two or three times a year.

F The loss of certain species of tree was especially significant. Shanley's team persuaded local hunters to weigh their catch, noting the trees under which the animals were caught. Over the year, they trapped five species of game averaging 232 kilogrammes under *piquia* trees. Under *copaiba*, they caught just two species averaging 63 kilogrammes; and under *uxi*, four species weighing 38 kilogrammes. At last, the team was getting a handle on which trees were worth keeping, and which could reasonably be sold. "This showed that selling *piquia* trees to loggers for a few dollars made little sense," explains Shanley. "Their local value lies in providing a prized fruit, as well as flowers which attract more game than any other species."

G As a result of these studies, Shanley had to tell the Rural Workers' Union of Paragominas that the *Nature* thesis could not be applied wholesale to their community – harvesting NTFPs would not always yield more than timber sales. Fruiting patterns of trees such as *uxi* were unpredictable, for example. In 1994, one household collected 3,654 *uxi* fruits; the following year, none at all.

H This is not to say that wild fruit trees were unimportant. On the contrary, argues Shanley, they are critical for subsistence, something that is often ignored in much of the current research on NTFPs, which tends to focus on their commercial potential. Geography was another factor preventing the Rio Capim caboclos from establishing a serious trade in wild fruit: villagers in remote areas could not compete with communities collecting NTFPs close to urban markets, although they could sell them to passing river boats.

I But Shanley and her colleagues decided to do more than just report their results to the union. Together with two of her research colleagues, Shanley wrote the fruit book. This, the *Bible* and a publication on medicinal plants co-authored by Shanley and designed for people with minimal literacy skills are about the only books you will see along this stretch of the Rio Capim. The first print ran to only 3,000 copies, but the fruit book has been remarkably influential, and is used by colleges, peasant unions, industries and the caboclos themselves. Its success is largely due to the fact that people with poor literacy skills can understand much of the information it contains about the non-timber forest products, thanks to its illustrations, anecdotes, stories and songs. "The book doesn't tell people what to do," says Shanley, "but it does provide them with choices." The caboclos who have used the book now have a much better understanding of which trees to sell to the loggers, and which to protect.

Questions 27-32

Reading Passage 3 has nine paragraphs A-I.

Which paragraph contains the following information?

Write the correct letter A-I in boxes 27-32 on your answer sheet.

27 A description of Shanley's initial data collection
28 Why a government official also contributes to the book
29 Reasons why the community asked Shanley to conduct the research
30 Reference to the starting point of her research
31 Two factors that alter food consumption patterns
32 Why the book is successful

Questions 33-40

Complete the summary below.

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

Write your answers in boxes 33-40 on your answer sheet.

Forest fire has caused local villagers to consume less:
33 _____
34 _____
Game

There is the least amount of game hunted under **35** _____, and its fruit yield is also **36** _____. Thus, it is more reasonable to keep **37** _____.

All the trees can also be used for **38** _____ besides selling them to loggers. But this is often ignored, because most researches usually focus on the **39** _____ of the trees.

The purpose of the book:
To give information about **40** _____.

Test 4

Reading Passage 1

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

The Mozart Effect

A Music has been used for centuries to heal the body. In the *Ebers Papyrus* (one of the earliest medical documents, circa 1550 BC), it was recorded that physicians chanted to heal the sick (Castleman, 1994). In various cultures, we have observed singing as part of healing rituals. In the world of Western medicine, however, using music in medicine lost popularity until the introduction of the radio. Researchers then started to notice that listening to music could have significant physical effects. Therapists noticed music could help calm anxiety, and researchers saw that listening to music could cause a drop in blood pressure. In addition to these two areas, music has been used with cancer chemotherapy to reduce nausea, during surgery to reduce stress hormone production, during childbirth, and in stroke recovery (Castleman, 1994 and Westley, 1998). It has been shown to decrease pain as well as enhance the effectiveness of the immune system. In Japan, compilations of music are used as medication of sorts. For example, if you want to cure a headache or migraine, the album suggested is Mendelssohn's "Spring Song", Dvorak's "Humoresque", or part of George Gershwin's "An American in Paris" (Campbell, 1998). Music is also being used to assist in learning, in a phenomenon called the Mozart Effect.

B Frances H. Rauscher, PhD, first demonstrated the correlation between music and learning in an experiment in 1993. His experiment indicated that a 10-minute dose of Mozart could temporarily boost intelligence. Groups of students were given intelligence tests after listening to silence, relaxation tapes, or Mozart's "Sonata for Two Pianos in D Major" for a short time. He found that after silence, the average IQ score was 110, and after the relaxation tapes, the score rose a point. After listening to Mozart's music, however, the score jumped to 119 (Westley, 1998). Even students who did

not like the music still had an increased score in the IQ test. Rauscher hypothesised that "listening to complex, non-repetitive music, like Mozart's, may stimulate neural pathways that are important in thinking" (Castleman, 1994).

C The same experiment was repeated on rats by Rauscher and Hong Hua Li from Stanford. Rats also demonstrated enhancement in their intelligence performance. These new studies indicate that rats that were exposed to Mozart's showed "increased gene expression of BDNF (a neural growth factor), CREB (a learning and memory compound), and Synapsin I (a synaptic growth protein)" in the brain's hippocampus, compared with rats in the control group, which heard only white noise (e.g. the whooshing sound of a radio tuned between stations).

D How exactly does the Mozart Effect work? Researchers are still trying to determine the actual mechanisms for the formation of these enhanced learning pathways. Neuroscientists suspect that music can actually help build and strengthen connections between neurons in the cerebral cortex in a process similar to what occurs in brain development despite its type. When a baby is born, certain connections have already been made – like connections for heartbeat and breathing. As new information is learned and motor skills develop, new neural connections are formed. Neurons that are not used will eventually die while those used repeatedly will form strong connections. Although a large number of these neural connections require experience, they must also occur within a certain time frame. For example, a child born with cataracts cannot develop connections within the visual cortex. If the cataracts are removed by surgery right away, the child's vision develops normally. However, after the age of 2, if the cataracts are removed, the child will remain blind because those pathways cannot establish themselves.

E Music seems to work in the same way. In October of 1997, researchers at the University of Konstanz in Germany found that music actually rewires neural circuits (Begley, 1996). Although some of these circuits are formed for physical skills needed to play an instrument, just listening to music strengthens connections used in higher-order thinking. Listening to music can then be thought of as "exercise" for the brain, improving concentration and enhancing intuition.

F If you're a little sceptical about the claims made by supporters of the Mozart Effect, you're not alone. Many people accredit the advanced learning of some children who take music lessons to other personality traits, such as motivation and persistence, which are required in all types of learning. There have also been claims of that influencing the results of some experiments.

G Furthermore, many people are critical of the role the media had in turning an isolated study into a trend for parents and music educators. After the Mozart Effect was published to the public, the sales of Mozart CDs stayed on the top of the hit list for three weeks. In an article by Michael Linton, he wrote that the research that began this phenomenon (the study by researchers at the University of California, Irvine) showed only a temporary boost in IQ, which was not significant enough to even last throughout the course of the experiment. Using music to influence intelligence was used in Confucian civilisation and Plato alluded to Pythagorean music when he described its ideal state in *The Republic*. In both of these examples, music did not cause any overwhelming changes, and the theory eventually died out. Linton also asks, "If Mozart's music were able to improve health, why was Mozart himself so frequently sick? If listening to Mozart's music increases intelligence and encourages spirituality, why aren't the world's smartest and most spiritual people Mozart specialists?" Linton raises an interesting point, if the Mozart Effect causes such significant changes, why isn't there more documented evidence?

H The "trendiness" of the Mozart Effect may have died out somewhat, but there are still strong supporters (and opponents) of the claims made in 1993. Since that initial experiment, there has not been a surge of supporting evidence. However, many parents, after playing classical music while pregnant or when their children are young, will swear by the Mozart Effect. A classmate of mine once told me that listening to classical music while studying will help with memorisation. If we approach this controversy from a scientific aspect, although there has been some evidence that music does increase brain activity, actual improvements in learning and memory have not been adequately demonstrated.

Questions 1-5

Reading Passage 1 has eight paragraphs A-H.

Which paragraph contains the following information?

Write the correct letter A-H in boxes 1-5 on your answer sheet.

1 A description of how music affects the brain development of infants
2 Public's first reaction to the discovery of the Mozart Effect
3 The description of Rauscher's original experiment
4 The description of using music for healing in other countries
5 Other qualities needed in all learning

Questions 6-8

Complete the summary below.

Choose NO MORE THAN ONE WORD from the passage for each answer.

Write your answers in boxes 6-8 on your answer sheet.

During the experiment conducted by Frances Rauscher, subjects were exposed to the music for a **6** _____ period of time before they were tested. And Rauscher believes the enhancement in their performance is related to the **7** _____ nature of Mozart's music. Later, a similar experiment was also repeated on **8** _____.

Questions 9-13

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

In boxes 9-13 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

9 All kinds of music can enhance one's brain performance to somewhat extent.

10 There is no neural connection made when a baby is born.

11 There are very few who question the Mozart Effect.

12 Michael Linton conducted extensive research on Mozart's life.

13 There is not enough evidence in support of the Mozart Effect today.

Reading Passage 2

You should spend about 20 minutes on Questions 14-26 which are based on Reading Passage 2 below.

The Ant and the Mandarin

In 1476, the farmers of Berne in Switzerland decided there was only one way to rid their fields of the cutworms attacking their crops. They took the pests to court. The worms were tried, found guilty and excommunicated by the archbishop. In China, farmers had a more practical approach to pest control. Rather than relying on divine intervention, they put their faith in frogs, ducks and ants. Frogs and ducks were encouraged to snap up the pests in the paddies and the occasional plague of locusts. But the notion of biological control began with an ant. More specifically, it started with the predatory yellow citrus ant Oecophylla smaragdina, which has been polishing off pests in the orange groves of southern China for at least 1,700 years. The yellow citrus ant is a type of weaver ant, which binds leaves and twigs with silk to form a neat, tent-like nest. In the beginning, farmers made do with the odd ants' nests here and there. But it wasn't long before growing demand led to the development of a thriving trade in nests and a new type of agriculture – ant farming.

For an insect that bites, the yellow citrus ant is remarkably popular. Even by ant standards, Oecophylla smaragdina is a fearsome predator. It's big, runs fast and has a powerful nip – painful to humans but lethal to many of the insects that plague the orange groves of Guangdong and Guangxi in southern China. And for at least 17 centuries, Chinese orange growers have harnessed these six-legged killing machines to keep their fruit groves healthy and productive.

Citrus fruits evolved in the Far East and the Chinese discovered the delights of their flesh early on. As the ancestral home of oranges, lemons and pomelos, China also has the greatest diversity of citrus pests. And the trees that produce the sweetest fruits, the mandarins – or kan – attract a host of plant-eating insects, from black ants and sap-sucking mealy bugs to leaf-devouring caterpillars. With so many enemies, fruit growers clearly had to have some way of protecting their orchards.

The West did not discover the Chinese orange growers' secret weapon until the early 20th century. At the time, Florida was suffering an epidemic of citrus canker and in 1915 Walter Swingle, a plant physiologist working for the US Department of Agriculture, was sent to China in search of varieties of orange that were resistant to the disease. Swingle spent some time studying the citrus orchards around Guangzhou, and there he came across the story of the cultivated ant. These ants, he was told, were "grown" by the people of a small village nearby who sold them to the orange growers by the nestful.

The earliest report of citrus ants at work among the orange trees appeared in a book on tropical and subtropical botany written by Hsi Han in AD 304. "The people of Chiao-Chih sell in their markets ants in bags of rush matting. The nests are like silk. The bags are all attached to twigs and leaves which, with the ants inside the nests, are for sale. The ants are reddish-yellow in colour, bigger than ordinary ants. In the south, if the kan trees do not have this kind of ant, the fruits will all be damaged by many harmful insects, and not a single fruit will be perfect."

Initially, farmers relied on nests which they collected from the wild or bought in the market where trade in nests was brisk. "It is said that in the south orange trees which are free of ants will have wormy fruits. Therefore, people race to buy nests for their orange trees," wrote Liu Hsun in *Strange Things Noted in the South* in about 890.

The business quickly became more sophisticated. From the 10th century, country people began to trap ants in artificial nests baited with fat. "Fruit-growing families buy these ants from vendors who make a business of collecting and selling such creatures," wrote Chuang Chi-Yu in 1130. "They trap them by filling hogs' or sheep's bladders with fat and placing them with the cavities open next to the ants' nests. They wait until the ants have migrated into the bladders and take them away. This is known as 'rearing orange ants'." Farmers attached the bladders to their trees, and in time the ants spread to other trees and built new nests.

By the 17th century, growers were building bamboo walkways between their trees to speed the colonisation of their orchards. The ants ran along these narrow bridges from one tree to another and established nests "by the hundreds of thousands".

Did it work? The orange growers clearly thought so. One authority, Chhii Ta-Chun, writing in 1700, stressed how important it was to keep the fruit trees free of insect pests, especially caterpillars. "It is essential to eliminate them so that the trees are not injured. But hand labour is not nearly as efficient as ant power..."

Swingle was just as impressed. Yet despite his reports, many Western biologists were sceptical. In the West, the idea of using one insect to destroy another was new and highly controversial. The first breakthrough had come in 1888, when the infant orange industry in California had been saved from extinction by the Australian vedalia beetle. This beetle was the only thing that had made any inroads into the explosion of cottony cushion scale that was threatening to destroy the state's citrus crops. But, as Swingle now knew, California's "first" was nothing of the sort. The Chinese had been expert in biocontrol for many centuries.

The long tradition of ants in the Chinese orchards only began to waver in the 1950s and 1960s with the introduction of powerful organic insecticides. Although most fruit growers switched to chemicals, a few hung onto their ants. Those who abandoned ants in favour of chemicals quickly became disillusioned. As costs soared and pests began to develop resistance to the chemicals, growers began to revive the old ant patrols in the late 1960s. They had good reason to have faith in their insect workforce.

Research in the early 1960s showed that as long as there were enough ants in the trees, they did an excellent job of dispatching some pests – mainly the larger insects – and had modest success against others. Trees with yellow ants produced almost 20 per cent more healthy leaves than those without. More recent trials have shown that these trees yield just as big a crop as those protected by expensive chemical sprays.

One apparent drawback of using ants – and one of the main reasons for the early scepticism by Western scientists – was that citrus ants do nothing to control mealy bugs, waxy-coated scale insects which can do considerable damage to fruit trees. In fact, the ants protect mealy bugs in exchange for the sweet honeydew they secrete. The orange growers always denied this was a problem but Western scientists thought they knew better.

Research in the 1980s suggests that the growers were right all along. Where mealy bugs proliferate under the ants' protection, they are usually heavily parasitised and this limits the harm they can do.

Orange growers who rely on carnivorous ants rather than poisonous chemicals maintain a better balance of species in their orchards. While the ants deal with the bigger insect pests, other predatory species keep down the numbers of smaller pests such as scale insects and aphids. In the long run, ants do a lot less damage than chemicals – and they're certainly more effective than excommunication.

Questions 14-18

Look at the following events (Questions 14-18) and the list of dates below.

Match each event with the correct time A-G.

Write the correct letter A-G in boxes 14-18 on your answer sheet.

14 The first description of citrus ants is traded in the marketplace.
15 Swingle came to Asia for research.
16 The first record of one insect is used to tackle other insects in the western world.
17 Chinese fruit growers started to use pesticides in place of citrus ants.
18 Some Chinese farmers returned to the traditional bio-method.

List of Dates

A	1888
B	AD 890
C	AD 304
D	1950s
E	1960s
F	1915
G	1130

Questions 19-26

Do the following statements agree with the information given in Reading Passage 2?

In boxes 19-26 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

19 China has more citrus pests than any other country in the world.

20 Swingle came to China to search for an insect to bring back to the US.

21 Many people were very impressed by Swingle's discovery.

22 Chinese farmers found that pesticides became increasingly expensive.

23 Some Chinese farmers abandoned the use of pesticide.

24 Trees with ants had more leaves fall than those without.

25 Fields using ants yield as large a crop as fields using chemical pesticides.

26 Citrus ants often cause considerable damage to the bio-environment of the orchards.

Reading Passage 3

You should spend about 20 minutes on Questions 27-40 which are based on Reading Passage 3 on the following page.

Questions 27-31

Reading Passage 3 has five sections A-E.

Choose the correct heading for each section from the list of headings below.

Write the correct number i-viii in boxes 27-31 on your answer sheet.

List of Headings

i Communication in music with animals
ii New discoveries on animal music
iii Music and language contrasted
iv Current research on music
v Music is beneficial for infants.
vi Music transcends cultures.
vii Look back at some of the historical theories
viii Are we genetically designed for music?

27 Section **A**
28 Section **B**
29 Section **C**
30 Section **D**
31 Section **E**

Music: Language We All Speak

Section A

Music is one of the human species' relatively few universal abilities. Without formal training, any individual, from Stone Age tribesman to suburban teenager, has the ability to recognise music and, in some fashion, to make it. Why this should be so is a mystery. After all, music isn't necessary for getting through the day, and if it aids in reproduction, it does so only in highly indirect ways. Language, by contrast, is also everywhere – but for reasons that are more obvious. With language, you and the members of your tribe can organise a migration across Africa, build reed boats and cross the seas, and communicate at night even when you can't see each other. Modern culture, in all its technological extravagance, springs directly from the human talent for manipulating symbols and syntax.

Scientists have always been intrigued by the connection between music and language. Yet over the years, words and melody have acquired a vastly different status in the lab and the seminar room. While language has long been considered essential to unlocking the mechanisms of human intelligence, music is generally treated as an evolutionary frippery – mere "auditory cheesecake", as the Harvard cognitive scientist Steven Pinker puts it.

Section B

But thanks to a decade-long wave of neuroscience research, that tune is changing. A flurry of recent publications suggests that language and music may equally be able to tell us who we are and where we're from – not just emotionally, but biologically. In July, the journal *Nature Neuroscience* devoted a special issue to the topic. And in an article in the 6 August issue of the *Journal of Neuroscience*, David Schwartz, Catherine Howe, and Dale Purves of Duke University argued that the sounds of music and the sounds of language are intricately connected.

To grasp the originality of this idea, it's necessary to realise two things about how music has traditionally been understood. First, musicologists have long emphasised that while each culture stamps a special identity onto its music, music itself has some universal qualities. For example, in virtually all cultures, sound is divided into some or all of the 12 intervals that make up the chromatic scale – that is, the scale represented by the keys on a piano. For centuries, observers have attributed this preference for certain combinations of tones to the mathematical properties of sound itself.

Some 2,500 years ago, Pythagoras was the first to note a direct relationship between the harmoniousness of a tone combination and the physical dimensions of the object that produced it. For example, a plucked string will always play an octave lower than a similar string half its size, and a fifth lower than a similar string two thirds its length. This link between simple ratios and harmony has influenced music theory ever since.

Section C

This music-is-math idea is often accompanied by the notion that music, formally speaking at least, exists apart from the world in which it was created. Writing recently in *The New York Review of Books*, pianist and critic Charles Rosen discussed the long-standing notion that while painting and sculpture reproduce at least some aspects of the natural world, and writing describes thoughts and feelings we are all familiar with, music is entirely abstracted from the world in which we live. Neither idea is right, according to David Schwartz and his colleagues. Human musical preferences are fundamentally shaped not by elegant algorithms or ratios but by the messy sounds of real life, and of speech in particular – which in turn is shaped by our evolutionary heritage. "The explanation of music, like the explanation of any product of the mind, must be rooted in biology, not in numbers per se," says Schwartz.

Schwartz, Howe, and Purves analysed a vast selection of speech sounds from a variety of languages to reveal the underlying patterns common to all utterances. In order to focus only on the raw sounds, they discarded all theories about speech and meaning, and sliced sentences into random bites. Using a database of over 100,000 brief segments of speech, they noted which frequency had the greatest emphasis in each sound. The resulting set of frequencies, they discovered, corresponded closely to the chromatic scale. In short, the building blocks of music are to be found in speech.

Far from being abstract, music presents a strange analogue to the patterns created by the sounds of speech. "Music, like visual arts, is rooted in our experience of the natural world," says Schwartz. "It emulates our sound environment in the way that visual arts emulate the visual environment." In music we hear the echo of our basic sound-making instrument – the vocal tract. The explanation for human music is simpler still than Pythagoras's mathematical equations: We like the sounds that are familiar to us – specifically, we like the sounds that remind us of us.

This brings up some chicken-or-egg evolutionary questions. It may be that music imitates speech directly, the researchers say, in which case it would seem that language evolved first. It's also conceivable that music came first and language is in effect an imitation of song – that in everyday speech we hit the musical notes we especially like. Alternately, it may be that music imitates the general products of the human sound-making system, which just happens to be mostly speech. "We can't know this," says Schwartz. "What we do know is that they both come from the same system, and it is this that shapes our preferences."

Section D

Schwartz's study also casts light on the long-running question of whether animals understand or appreciate music. Despite the apparent abundance of "music" in the natural world – birdsong, whalesong, wolf howls, synchronised chimpanzee hooting – previous studies have found that many laboratory animals don't show a great affinity for the human variety of music making.

Marc Hauser and Josh McDermott of Harvard argued in the July issue of *Nature Neuroscience* that animals don't create or perceive music the way we do. The fact that laboratory monkeys can show recognition of human tunes is evidence, they say, of shared general features of the auditory system, not any specific chimpanzee musical ability. As for birds, those most musical beasts, they generally recognise their own tunes – a narrow repertoire – but don't generate novel melodies like we do. There are no avian Mozarts.

But what's been played to animals, Schwartz notes, is human music. If animals evolve preferences for sound as we do – based upon the soundscape in which they live – then their "music" would be fundamentally different from ours. In the same way our scales derive from human utterances, a cat's idea of a good tune would derive from yowls and meows. To demonstrate that animals don't appreciate sound the way we do, we'd need evidence that they don't respond to "music" constructed from their own sound environment.

Section E

No matter how the connection between language and music is parsed, what is apparent is that our sense of music, even our love for it, is as deeply rooted in our biology and in our brains as language is. This is most obvious with babies, says Sandra Trehub at the University of Toronto, who also published a paper in the *Nature Neuroscience* special issue.

For babies, music and speech are on a continuum. Mothers use musical speech to "regulate infants' emotional states", Trehub says. Regardless of what language they speak, the voice all mothers use with babies is the same: "something between speech and song". This kind of communication "puts the baby in a trance-like state, which may proceed to sleep or extended periods of rapture". So if the babies of the world could understand the latest research on language and music, they probably wouldn't be very surprised. The upshot, says Trehub, is that music may be even more of a necessity than we realise.

Questions 32-38

Look at the following people (Questions 32-38) and the list of statements below.

Match each person with the correct statement.

Write the correct letter A-G in boxes 32-38 on your answer sheet.

32 Steven Pinker
33 Musicologists
34 Greek philosopher Pythagoras
35 Schwartz, Howe, and Purves
36 Marc Hauser and Josh McDermott
37 Charles Rosen
38 Sandra Trehub

List of Statements

A Music exists outside of the world it is created in.
B Music has a universal character despite cultural influences on it.
C Music is a necessity for humans.
D Music preference is related to the surrounding influences.
E He discovered the mathematical basis of music.
F Music doesn't enjoy the same status of research interest as language.
G Humans and monkeys have similar traits in perceiving sound.

Questions 39-40

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

Write your answers in boxes 39-40 on your answer sheet.

39 Why was the study of animal music inconclusive?

A Animals don't have the same auditory system as humans.
B Tests on animal music are limited.
C Animals can't make up new tunes.
D There aren't enough tests on a wide range of animals.

40 What is the main theme of this passage?

A Language and learning
B The evolution of music
C The role of music in human society
D Music for animals

Test 5

Reading Passage 1

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

Wonder Plant

The wonder plant with an uncertain future: more than a billion people rely on bamboo for either their shelter or income, while many endangered species depend on it for their survival. Despite its apparent abundance, a new report says that many species of bamboo may be under serious threat.

Section A

Every year, during the rainy season, the mountain gorillas of Central Africa migrate to the foothills and lower slopes of the Virunga Mountains to graze on bamboo. For the 650 or so that remain in the wild, it's a vital food source. Although they eat almost 150 types of plant, as well as various insects and other invertebrates, at this time of year bamboo accounts for up to 90 per cent of their diet. Without it, says Ian Redmond, chairman of the Ape Alliance, their chances of survival would be reduced significantly.

Gorillas aren't the only locals keen on bamboo. For the people who live close to the Virungas, it's a valuable and versatile raw material used for building houses and making household items such as mats and baskets. But in the past 100 years or so, resources have come under increasing pressure as populations have exploded and large areas of bamboo forest have been cleared to make way for farms and commercial plantations.

Section B

Sadly, this isn't an isolated story. All over the world, the ranges of many bamboo species appear to be shrinking, endangering the people and animals that depend upon them. But despite bamboo's importance, we know surprisingly little about it. A recent report published by the UN Environment Programme (UNEP) and

the International Network for Bamboo and Rattan (INBAR) has revealed just how profound our ignorance of global bamboo resources is, particularly in relation to conservation.

There are almost 1,600 recognised species of bamboo, but the report concentrated on the 1,200 or so woody varieties distinguished by the strong stems, or culms, that most people associate with this versatile plant. Of these, only 38 'priority species' identified for their commercial value have been the subject of any real scientific research, and this has focussed mostly on matters relating to their viability as a commodity.

This problem isn't confined to bamboo. Compared to the work carried out on animals, the science of assessing the conservation status of plants is still in its infancy. "People have only started looking hard at this during the past 10-15 years, and only now are they getting a handle on how to go about it systematically," says Dr. Valerie Kapos, one of the report's authors and a senior adviser in forest ecology and conservation to the UNEP.

Section C

Bamboo is a type of grass. It comes in a wide variety of forms, ranging in height from 30 centimetres to more than 40 metres. It is also the world's fastest growing woody plant; some species can grow more than a metre in a day. Bamboo's ecological role extends beyond providing food and habitat for animals. Bamboo tends to grow in stands made up of groups of individual plants that grow from root systems known as rhizomes. Its extensive rhizome systems, which lie in the top layers of the soil, are crucial in preventing soil erosion. And there is growing evidence that bamboo plays an important part in determining forest structure and dynamics. "Bamboo's pattern of mass flowering and mass death leaves behind large areas of dry biomass that attract wildfire," says Kapos. "When these burn, they create patches of open ground within the forest far bigger than would be left by a fallen tree." Patchiness helps to preserve diversity because certain plant species do better during the early stages of regeneration when there are gaps in the canopy.

Section D

However, bamboo's most immediate significance lies in its economic value. Modern processing techniques mean that it can be used in a variety of ways, for example, as flooring and laminates. One of the fastest growing bamboo products

is paper – 25 per cent of paper produced in India is made from bamboo fibre, and in Brazil, 100,000 hectares of bamboo are grown for its production.

Of course, bamboo's main function has always been in domestic applications, and as a locally traded commodity it's worth about US$4.5 billion annually. Because of its versatility, flexibility and strength (its tensile strength compares to that of some steel), it has traditionally been used in construction. Today, more than one billion people worldwide live in bamboo houses. Bamboo is often the only readily available raw material for people in many developing countries, says Chris Stapleton, a research associate at the Royal Botanic Gardens. "Bamboo can be harvested from forest areas or grown quickly elsewhere, and then converted simply without expensive machinery or facilities," he says. "In this way, it contributes substantially to poverty alleviation and wealth creation."

Section E

Given bamboo's value in economic and ecological terms, the picture painted by the UNEP report is all the more worrying. But keen horticulturists will spot an apparent contradiction here. Those who've followed the recent vogue for cultivating exotic species in their gardens will point out that if it isn't kept in check, bamboo can cause real problems. "In a lot of places, the people who live with bamboo don't perceive it as being endangered in any way," says Kapos. "In fact, a lot of bamboo species are actually very invasive if they've been introduced." So why are so many species endangered?

There are two separate issues here, says Ray Townsend, vice president of the British Bamboo Society and arboretum manager at the Royal Botanic Gardens. "Some plants are threatened because they can't survive in the habitat – they aren't strong enough or there aren't enough of them, perhaps. But bamboo can take care of itself – it is strong enough to survive if left alone. What is under threat is its habitat." It is the physical disturbance that is the threat to bamboo, says Kapos. "When forest goes, it is converted into something else: there isn't anywhere for forest plants such as bamboo to grow if you create a cattle pasture."

Section F

Around the world, bamboo species are routinely protected as part of forest ecosystems in national parks and reserves, but there is next to nothing that protects bamboo in the wild for its own sake. However, some small steps are being taken to address this situation. The UNEP-INBAR report will help conservationists to establish effective measures aimed at protecting valuable wild bamboo species.

Townsend, too, sees the UNEP report as an important step forwards in promoting the cause of bamboo conservation. "Until now, bamboo has been perceived as a second-class plant. When you talk about places such as the Amazon, everyone always thinks about the hardwoods. Of course these are significant, but there is a tendency to overlook the plants they are associated with, which are often bamboo species. In many ways, it is the most important plant known to man. I can't think of another plant that is used so much and is so commercially important in so many countries." He believes that the most important first step is to get scientists into the field. "We need to go out there, look at these plants and see how they survive, and then use that information to conserve them for the future."

Questions 1-7

Reading Passage 1 has six sections A-F.

Which section contains the following information?

Write the correct letter A-F in boxes 1-7 on your answer sheet.

NB You may use any letter more than once.

1 Comparison of bamboo with other plant species
2 Commercial products of bamboo
3 Limited extent of existing research
4 A human development that destroyed large areas of bamboo
5 How bamboos are put to a variety of uses
6 An explanation of how bamboo can help the survival of a range of plants
7 The methods used to study bamboo

Questions 8-11

Look at the statements (Questions 8-11) and the list of people on the next page.

Match each statement with the correct person A, B, C or D.

Write the correct letter A, B, C or D in boxes 8-11 on your answer sheet.

NB You may use any letter more than once.

8 Destroying bamboo poses a threat to wildlife.
9 People have very limited knowledge of bamboo.
10 Some people think bamboo is not really endangered.
11 Bamboo has immeasurable commercial potentials.

List of People

A	Ian Redmond
B	Valerie Kapos
C	Ray Townsend
D	Chris Stapleton

Questions 12-13

Answer the questions below using NO MORE THAN TWO WORDS from the passage for each answer.

Write your answers in boxes 12-13 on your answer sheet.

12 What environmental problem does the unique root system of bamboo prevent?
13 Which bamboo product is experiencing market expansion?

Reading Passage 2

You should spend about 20 minutes on Questions 14-26 which are based on Reading Passage 2 below.

Children's Literature

Stories and poems aimed at children have an exceedingly long history: lullabies, for example, were sung in Roman times, and a few nursery games and rhymes are almost as ancient. Yet so far as written-down literature is concerned, while there were stories in print before 1700 that children often seized on when they had the chance, such as translations of Aesop's fables, fairy stories and popular ballads and romances, these were not aimed at young people in particular. Since the only genuinely child-oriented literature at this time would have been a few instructional works to help with reading and general knowledge, plus the odd Puritanical tract as an aid to morality, the only course for keen child readers was to read adult literature. This still occurs today, especially with adult thrillers or romances that include more exciting, graphic detail than is normally found in the literature for younger readers.

By the middle of the 18th century, there were enough eager child readers, and enough parents glad to cater to this interest, for publishers to specialise in children's books whose first aim was pleasure rather than education or morality. In Britain, a London merchant named Thomas Boreham produced *Cajanus, The Swedish Giant* in 1742, while the more famous John Newbery published *A Little Pretty Pocket Book* in 1744. Its contents – rhymes, stories, children's games plus a free gift ('A ball and a pincushion') – in many ways anticipated the similar lucky-dip contents of children's annuals this century. It is a tribute to Newbery's flair that he hit upon a winning formula quite so quickly, to be pirated almost immediately in America.

Such pleasing levity was not to last. Influenced by Rousseau, whose *Emile* (1762) decreed that all books for children save *Robinson Crusoe* were a dangerous diversion, contemporary critics saw to it that children's literature should be instructive and uplifting. Prominent among such voices was Mrs. Sarah Trimmer, whose magazine *The Guardian of Education* (1802) carried the first regular reviews of children's books. It was she who condemned fairy tales for their violence and general absurdity; her own stories *Fabulous Histories* (1786) described talking animals who were always models of sense and decorum.

So the moral story for children was always threatened from within, given the way children have of drawing out entertainment from the sternest moralist. But the greatest blow to the improving children's book was to come from an unlikely source indeed: early 19th-century interest in folklore. Both nursery rhymes, selected by James Orchard Halliwell for a folklore society in 1842, and a collection of fairy stories by the scholarly Grimm brothers, swiftly translated into English in 1823, soon rocket to popularity with the young, quickly leading to new editions, each one more child-centred than the last. From now on, younger children could expect stories written for their particular interest and with the needs of their own limited experience of life kept well to the fore.

What eventually determined the reading of older children was often not the availability of special children's literature as such but access to books that contained characters, such as young people or animals, with whom they could more easily empathise, or action, such as exploring or fighting, that made few demands on adult maturity or understanding.

The final apotheosis of literary childhood as something to be protected from unpleasant reality came with the arrival in the late 1930s of child-centred best-sellers intent on entertainment at its most escapist. In Britain, novelists such as Enid Blyton and Richmal Crompton described children who were always free to have the most unlikely adventures, secure in the knowledge that nothing bad could ever happen to them in the end. The fact that war broke out again during her books' greatest popularity fails to register at all in the self-enclosed world inhabited by Enid Blyton's young characters. Reaction against such dreamworlds was inevitable after World War II, coinciding with the growth of paperback sales, children's libraries, and a new spirit of moral and social concern. Urged on by committed publishers and progressive librarians, writers slowly began to explore new areas of interest while also shifting the settings of their plots from the middle-class world to which their chiefly adult patrons had always previously belonged.

Critical emphasis, during this development, has been divided. For some the most important task was to rid children's books of the social prejudice and exclusiveness no longer found acceptable. Others concentrated more on the positive achievements of contemporary children's literature. That writers of these works are now often recommended to the attention of adult as well as child readers echoes the 19th-century belief that children's literature can be shared by the generations, rather than being a defensive barrier between childhood and the necessary growth towards adult understanding.

Questions 14-18

Complete the table below.

Choose **NO MORE THAN TWO WORDS** from Reading Passage 2 for each answer.

Write your answers in boxes 14-18 on your answer sheet.

DATE	FEATURE	AIM	EXAMPLE
Before 1700	Not aimed at young children	Education and morality	Puritanical tract
By the middle of 18th century	Collection of **14** _____ and games	Read for pleasure	*A Little Pretty Pocket Book* (exported to **15** _____)
Early 19th century	Growing interest in **16** _____	To be more children-centred	Nursery rhymes and **17** _____
Late 1930s	Stories of harm-free **18** _____	Entertainment	Enid Blyton and Richmal Crompton's novels

Questions 19-21

Look at the following people (Question 19-21) and the list of statements on the next page.

Match each person with the correct statement A-E.

Write the correct letter A-E in boxes 19-21 on your answer sheet.

19 Thomas Boreham

20 Mrs. Sarah Trimmer

21 Grimm Brothers

List of Statements

A	Wrote criticisms of children's literature
B	Used animals to demonstrate the absurdity of fairy tales
C	Was not a writer originally
D	Translated a book into English
E	Didn't write in the English language

Questions 22-26

Do the following statements agree with the information given in Reading Passage 2?

In boxes 22-26 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

22 Children didn't start to read books until 1700.

23 Sarah Trimmer believed that children's books should set good examples.

24 Parents were concerned about the violence in children's books.

25 An interest in the folklore changed the direction of the development of children's books.

26 Today children's book writers believe their works should appeal to both children and adults.

Reading Passage 3

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

Talc Powder

Peter Brigg discovers how talc from Luzenac's Trimouns in France finds its way into food and agricultural products – from chewing gum to olive oil.

High in the French Pyrenees, some 1,700m above sea level, lies Trimouns, a huge deposit of hydrated magnesium silicate – talc to you and me. Talc from Trimouns, and from ten other Luzenac mines across the globe, is used in the manufacture of a vast array of everyday products extending from paper, paint and plaster to cosmetics, plastics and car tyres. And of course there is always talc's best known end use: talcum powder for babies' bottoms. But the true versatility of this remarkable mineral is nowhere better displayed than in its sometimes surprising use in certain niche markets in the food and agriculture industries.

Take, for example, the chewing gum business. Every year, Talc de Luzenac France – which owns and operates the Trimouns mine and is a member of the international Luzenac Group (part of Rio Tinto Minerals) – supplies about 6,000 tonnes of talc to chewing gum manufacturers in Europe. "We've been selling to this sector of the market since the 1960s," says Laurent Fournier, sales manager in Luzenac's Specialties business unit in Toulouse. "Admittedly, in terms of our total annual sales of talc, the amount we supply to chewing gum manufacturers is relatively small, but we see it as a valuable niche market: one where customers place a premium on securing supplies from a reliable, high-quality source. Because of this, long-term allegiance to a proven supplier is very much a feature of this sector of the talc market. "Switching sources – in the way that you might choose to buy, say, paper clips from Supplier A rather than from Supplier B – is not an easy option for chewing gum manufacturers," Fournier says. "The cost of reformulating is high, so when customers are using a talc grade that works, even if it's expensive, they are understandably reluctant to switch."

But how is talc actually used in the manufacture of chewing gum? Patrick Delord, an engineer with a degree in agronomics, who has been with Luzenac for 22 years and is now senior market development manager, Agriculture and Food, in Europe, explains that chewing gum has four main components. "The most important of them is the gum base," he says. "It's the gum base that puts the chew into chewing gum. It binds all the ingredients together, creating a soft, smooth texture. To this the manufacturer then adds sweeteners, softeners and flavourings. Our talc is used as a filler in the gum base. The amount varies between, say, 10 and 35 per cent, depending on the type of gum. Fruit-flavoured chewing gum, for example, is slightly acidic and would react with the calcium carbonate that the manufacturer might otherwise use as a filler. Talc, on the other hand, makes an ideal filler because it's non-reactive chemically. In the factory, talc is also used to dust the gum base pellets and to stop the chewing gum sticking during the lamination and packing processes," Delord adds.

The chewing gum business is, however, just one example of talc's use in the food sector. For the past 20 years or so, olive oil processors in Spain have been taking advantage of talc's unique characteristics to help them boost the amount of oil they extract from crushed olives. According to Patrick Delord, talc is especially useful for treating what he calls "difficult" olives. After the olives are harvested – preferably early in the morning because their taste is better if they are gathered in the cool of the day – they are taken to the processing plant. There they are crushed and then stirred for 30-45 minutes. In the old days, the resulting paste was passed through an olive press but nowadays it's more common to add water and centrifuge the mixture to separate the water and oil from the solid matter. The oil and water are then allowed to settle so that the olive oil layer can be decanted off and bottled. "Difficult" olives are those that are more reluctant than the norm to yield up their full oil content. This may be attributable to the particular species of olive, or to its water content and the time of year the olives are collected – at the beginning and the end of the season, their water content is often either too high or too low. These olives are easy to recognise because they produce a lot of extra foam during the stirring process, a consequence of an excess of a fine solid that acts as a natural emulsifier. The oil in this emulsion is lost when the water is disposed of. Not only that, if the waste water is disposed of directly into local fields – often the case in many smaller processing operations – the emulsified oil may take some time to biodegrade and so be harmful to the environment.

"If you add between a half and two per cent of talc by weight during the stirring process, it absorbs the natural emulsifier in the olives and so boosts the amount of oil you can extract," says Delord. "In addition, talc's flat, 'platy' structure helps increase the size of oil droplets liberated during stirring, which again improves the yield. However, because talc is chemically inert, it doesn't affect the colour, taste, appearance or composition of the resulting olive oil."

If the use of talc in olive oil processing and in chewing gum is long established, new applications in the food and agriculture industries are also constantly being sought by Luzenac. One such promising new market is fruit crop protection, being pioneered in the US. Just like people, fruit can get sunburned. In fact, in very sunny regions, up to 45 per cent of a typical crop can be affected by heat stress and sunburn. However, in the case of fruit, it's not so much the ultraviolet rays which harm the crop as the high surface temperature that the sun's rays create.

To combat this, farmers normally use either chemicals or spray a continuous fine canopy of mist above the fruit trees or bushes. The trouble is, this uses a lot of water – normally a precious commodity in hot, sunny areas – and it is therefore expensive. What's more, the ground can quickly become waterlogged. "So our idea was to coat the fruit with talc to protect it from the sun," says Greg Hunter, a marketing specialist who has been with Luzenac for ten years. "But to do this, several technical challenges had first to be overcome. Talc is very hydrophobic: it doesn't like water. So in order to have a viable product, we needed a wettable powder – something that would go readily into suspension so that it could be sprayed onto the fruit. It also had to break the surface tension of the cutin (the natural waxy, waterproof layer on the fruit) and of course, it had to wash off easily when the fruit was harvested. No one's going to want an apple that's covered in talc."

Initial trials in the State of Washington in 2003 showed that when the product was sprayed onto Granny Smith apples, it reduced their surface temperature and lowered the incidence of sunburn by up to 60 per cent. Today the new product, known as Invelop® Maximum SPF, is in its second commercial year on the US market. Apple growers are the primary target although Hunter believes grape growers represent another sector with long-term potential. He is also hopeful of extending sales to overseas markets such as Australia, South America and southern Europe.

Questions 27-32

Classify the following uses of talc powder as referring to

A Chewing gum manufacture
B Olive oil extraction
C Fruit crop protection

Write the correct letter A, B or C in boxes 27-32 on your answer sheet.

27 Talc is used to prevent foaming.
28 Talc is used to prevent stickiness.
29 Talc is used to boost production.
30 Talc is used as a filler to provide a base.
31 Talc is used to prevent sunburn.
32 Talc is used to help increase the size of the product.

Questions 33-38

Complete the summary below using NO MORE THAN TWO WORDS from the passage for each answer.

Write your answers in boxes 33-38 on your answer sheet.

The use of talc powder in the olive oil industry in Spain has been around for **33** _____ years. It is extremely useful in dealing with "difficult" olives which often produce a lot of **34** _____ due to the high content of solid matter.

The traditional method of oil extraction used in some smaller plants often produces **35** _____, which contains emulsified oil, and if it is directly disposed of, it may be **36** _____ to the environment, because it cannot **37** _____. But adding talc powder can absorb the emulsifier and increase the production, because the size of oil **38** _____ grows.

Questions 39-40

Answer the questions below using NO MORE THAN TWO WORDS from the passage for each answer.

Write your answers in boxes 39-40 on your answer sheet.

39 What are the last two stages of chewing gum manufacturing process?

40 Which group of farmers does Invelop® intend to target next?

Test 6

Reading Passage 1

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

The Sweet Scent of Success

Many innovations end up as lemons – OzKleen turned lemons into a winning formula.

A Innovation and entrepreneurship, in the right mix, can bring spectacular results and propel a business ahead of the pack. Across a diverse range of commercial successes, from the Hills Hoist clothes line to the Cochlear ear implant, it is hard to generalise beyond saying the creators tapped into something consumers could not wait to get their hands on. However, most ideas never make it to the market. Some ideas that innovators are spruiking to potential investors include new water-saving shower heads, a keyless locking system, ping-pong balls that keep pollution out of rainwater tanks, making teeth grow from stem cells inserted in the gum, and technology to stop LPG tanks from exploding. Grant Kearney, chief executive of the Innovation Xchange, which connects businesses to innovation networks, says he hears of great business ideas that he knows will never get on the market. "Ideas by themselves are absolutely useless," he says. "An idea only becomes innovation when it is connected to the right resources and capabilities."

B One of Australia's latest innovation successes stems from a lemon-scented bathroom cleaner called Shower Power, the formula for which was concocted in a factory in Yatala, Queensland. In 1995, Tom Quinn and John Heron bought a struggling cleaning products business, OzKleen, for $250,000. It was selling 100 different kinds of cleaning products, mainly in bulk. The business was in bad shape, the cleaning formulas were ineffective and environmentally harsh, and there were few regular clients. Now Shower Power is claimed to be the top-selling bathroom cleaning product in the country. In the past 12 months, almost four million bottles of OzKleen's Power products have been sold, and the company forecasts 2004 sales of

ten million bottles. The company's sales in 2003 reached $11 million, with 70% of business being exports. In particular, Shower Power is making big inroads on the British market.

C OzKleen's turnround began when Quinn and Heron hired an industrial chemist to revitalise the product line. Market research showed that people were looking for a better cleaner for the bathroom, universally regarded as the hardest room in the home to clean. The company also wanted to make the product formulas more environmentally friendly. One of Tom Quinn's sons, Peter, aged 24 at the time, began working with the chemist on the formulas, looking at the potential for citrus-based cleaning products. He detested all the chlorine-based cleaning products that dominated the market. "We didn't want to use chlorine, simple as that," he says. "It offers bad working conditions and there's no money in it." Peter looked at citrus ingredients, such as orange peel, to replace the petroleum by-products in cleaners. He is credited with finding the Shower Power formula. "The recipe is in a vault somewhere and in my head," he says. The company is the sole owner of the intellectual property.

D To begin with, Shower Power was sold only in commercial quantities but Tom Quinn decided to sell it in 750ml bottles after the constant "raves" from customers at their retail store at Beenleigh, near Brisbane. Customers were travelling long distances to buy supplies. Others began writing to OzKleen to say how good Shower Power was. "We did a dummy label and went to see Woolworths," Tom Quinn says. The Woolworths buyer took a bottle home and was able to remove a stain from her basin that had been impossible to shift. From that point on, she championed the product and OzKleen had its first supermarket order, for a palette of Shower Power worth $3,000. "We were over the moon," says OzKleen's financial controller, Belinda McDonnell.

E Shower Power was released in Australian supermarkets in 1997 and became the top-selling product in its category within six months. It was all hands on deck at the factory, labelling and bottling Shower Power to keep up with demand. OzKleen ditched all other products and rebuilt the business around Shower Power. This stage, recalls McDonnell, was very tough. "It was hand-to-mouth, cash flow was very difficult," she says. OzKleen had to pay new-line fees to supermarket chains, which also squeezed margins.

F OzKleen's next big break came when the daughter of a Coles Myer executive used the product while on holidays in Queensland and convinced her father that Shower Power should be in Coles supermarkets. Despite the product success, Peter Quinn says the company was wary of how long the sales would last and hesitated to spend money on upgrading the manufacturing process. As a result, he remembers long periods of working round the clock to keep up with orders. Small tanks were still being used, so batches were small and bottles were labelled and filled manually. The privately owned OzKleen relied on cash flow to expand. "The equipment could not keep up with demand," Peter Quinn says. Eventually a new bottling machine was bought for $50,000 in the hope of streamlining production, but he says: "We got ripped off." Since then, he has been developing a new automated bottling machine that can control the amount of foam produced in the liquid, so that bottles can be filled more effectively – "I love coming up with new ideas." The machine is being patented.

G Peter Quinn says OzKleen's approach to research and development is open slather. "If I need it, I get it. It is about doing something simple that no one else is doing. Most of these things are just sitting in front of people ... it's just seeing the opportunities." With a tried and tested product, OzKleen is expanding overseas and developing more Power-brand household products. Tom Quinn, who previously ran a real estate agency, says: "We are competing with the same market all over the world, the cleaning products are sold everywhere." Shower Power, known as Bath Power in Britain, was launched four years ago with the help of an export development grant from the Federal Government. "We wanted to do it straight away because we realised we had the same opportunities worldwide." OzKleen is already number three in the British market, and the next stop is France. The Power range includes cleaning products for carpets, kitchens and pre-wash stain removal. The Quinn and Heron families are still involved. OzKleen has been approached with offers to buy the company, but Tom Quinn says he is happy with things as they are. "We're having too much fun."

Questions 1-7

Reading Passage 1 has seven paragraphs A-G.

Which paragraph contains the following information?

Write the correct letter A-G in boxes 1-7 on your answer sheet.

1 The description of one family member persuading another of selling cleaning products
2 An account of the co-operation of all factory staff to cope with sales increase
3 An account of the creation of the formula of Shower Power
4 An account of buying the original OzKleen company
5 The description of Shower Power's international expansion
6 The reason for changing the packaging size of Shower Power
7 An example of some innovative ideas

Questions 8-11

Look at the following people (Questions 8-11) and the list of statements below.

Match each person with the correct statement.

Write the correct letter A-E in boxes 8-11 on your answer sheet.

8 Grant Kearney
9 Tom Quinn
10 Peter Quinn
11 Belinda McDonnell

List of Statements

A Described his story of selling his products to a chain store
B Explained there was a shortage of money when sales suddenly increased
C Thinks innovations need support to succeed
D Believes new products like Shower Power may incur risks
E Says businesses won't succeed without innovations

Questions 12-13

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

Write your answers in boxes 12-13 on your answer sheet.

12 Tom Quinn changed the bottle size to 750ml to make Shower Power

A easier to package.
B appealing to individual customers.
C popular in foreign markets.
D attractive to supermarkets.

13 Why did Tom Quinn decide not to sell OzKleen?

A No one wanted to buy OzKleen.
B New products were being developed in OzKleen.
C He couldn't make an agreement on the price with the buyer.
D He wanted to keep things unchanged.

Reading Passage 2

You should spend about 20 minutes on Questions 14-26 which are based on Reading Passage 2 below.

Mrs. Carlill and the Carbolic Smoke Ball

On 14 January 1892, Queen Victoria's grandson Prince Albert Victor, second in line to the British throne, died from flu. He had succumbed to the third and most lethal wave of the Russian flu pandemic sweeping the world. The nation was shocked. The people mourned. Albert was relegated to a footnote in history.

Three days later, London housewife Louisa Carlill went down with flu. She was shocked. For two months, she had inhaled thrice daily from a carbolic smoke ball, a preventive measure guaranteed to fend off flu – if you believed the advert. Which she did. And why shouldn't she when the Carbolic Smoke Ball Company had promised to cough up £100 for any customer who fell ill? Unlike Albert, Louisa recovered, claimed her £100 and set in train events that would win her lasting fame.

It started in the spring of 1889. The first reports of a flu epidemic came from Russia. By the end of the year, the world was in the grip of the first truly global flu pandemic. The disease came in waves, once a year for the next four years, and each worse than the last.

Whole cities came to a standstill. London was especially hard-hit. As the flu reached each annual peak, normal life stopped. The postal service ground to a halt, trains stopped running, banks closed. Even courts stopped sitting for lack of judges. At the height of the third wave in 1892, 200 people were buried every day at just one London cemetery. This flu was far more lethal than previous epidemics, and those who recovered were left weak, depressed, and often unfit for work. It was a picture repeated across the continent.

Accurate figures for the number of the sick and dead were few and far between but Paris, Berlin and Vienna all reported a huge upsurge in deaths. The newspapers took an intense interest in the disease, not just because of the scale of it but because of who it attacked. Most epidemics carried off the poor and weak, the old and frail. This flu was cutting as great a swathe through the upper classes, dealing death to the rich and famous, and the young and fit.

The newspaper-reading public was fed a daily diet of celebrity victims. The flu had worked its way through the Russian imperial family and invaded the royal palaces of Europe. It carried off the Dowager Empress of Germany and the second son of the king of Italy, as well as England's future king. Aristocrats and politicians, poets and opera singers, bishops and cardinals – none escaped the attentions of the Russian flu.

The public grew increasingly fearful. The press might have been overdoing the doom and gloom, but their hysterical coverage had exposed one terrible fact. The medical profession had no answer to the disease. This flu, which might not even have begun in Russia, was a mystery. What caused it and how did it spread? No one could agree on anything.

By now, the theory that micro-organisms caused disease was gaining ground, but no one had identified an organism responsible for flu (and wouldn't until 1933). In the absence of a germ, many clung to the old idea of bad airs, or miasmas, possibly stirred by some great physical force – earthquakes, perhaps, or electrical phenomena in the upper atmosphere, even a passing comet.

Doctors advised people to eat well avoiding "unnecessary assemblies", and if they were really worried, to stuff cotton wool up their nostrils. If they fell ill, they should rest, keep warm and eat a nourishing diet of "milk, eggs and farinaceous puddings". Alcohol figured prominently among the prescriptions: one eminent English doctor suggested champagne, although he conceded "brandy in considerable quantities has sometimes been given with manifest advantages". French doctors prescribed warm alcoholic drinks, arguing that they never saw an alcoholic with flu. Their prescription had immediate results: over a three-day period, 1,200 of the 1,500 drunks picked up on the streets of Paris claimed they were following doctor's orders.

Some doctors gave drugs to ease symptoms – quinine for fever, salicin for headache, heroin for an "incessant cough". But nothing in the pharmacy remotely resembled a cure. Not surprisingly, people looked elsewhere for help. Hoping to cash in while the pandemic lasted, purveyors of patent medicines competed for the public's custom with ever more outrageous advertisements. One of the most successful was the Carbolic Smoke Ball Company.

The carbolic smoke ball was a hollow rubber ball, 5 centimetres across, with a nozzle covered by gauze. Inside was a powder treated with carbolic acid, or phenol. The idea was to clutch it close to the nose and squeeze gently, inhaling deeply

from the emerging cloud of pungent powder. This, the company claimed, would disinfect the mucous membranes, curing any condition related to "taking cold". In the summer of 1890, sales were steady at 300 smoke balls a month. In January 1891, the figure skyrocketed to 1,500.

Eager to exploit the public's mounting panic, the Carbolic Smoke Ball Company made increasingly extravagant claims. On 13 November 1892, its latest advert in the Pall Mall Gazette caught the eye of south London housewife Louisa Carlill. "Carbolic Smoke Ball," it declared, "will positively cure colds, coughs, asthma, bronchitis, hoarseness, influenza, croup, whooping cough ...". And the list went on. But it was the next part Mrs. Carlill found compelling. "A £100 reward will be paid by the Carbolic Smoke Ball Company to any person who contracts the increasing epidemic influenza, colds or any disease caused by taking cold, after having used the carbolic smoke ball according to the printed directions supplied with each ball. £1,000 is deposited with the Alliance bank, Regent Street, showing our sincerity in the matter."

Mrs. Carlill hurried off to buy a smoke ball, price 10 shillings. After carefully reading the instructions, she diligently dosed herself thrice daily until 17 January – when she fell ill.

On 20 January, Louisa's husband wrote to the Carbolic Smoke Ball Company. Unfortunately for them, Mr. Carlill happened to be a solicitor. His wife, he wrote, had seen their advert and bought a smoke ball on the strength of it. She had followed the instructions to the letter, and yet now – as their doctor could confirm – she had flu.

There was no reply. But £100 was not a sum to be sneezed at. Mr. Carlill persisted. The company resisted. Louisa recovered and sued. In June, Mr. Justice Hawkins found in Mrs. Carlill's favour. The company's main defence was that adverts were mere "puffery" and only an idiot would believe such extravagant claims. Judge Hawkins pointed out that adverts were not aimed at the wise and thoughtful, but at the credulous and weak. A vendor who made a promise "must not be surprised if occasionally he is held to his promise".

Carbolic appealed. In December, three lord justices considered the case. Carbolic's lawyers tried several lines of defence. But in the end, the case came down to a single matter: not whether the remedy was useless, or whether Carbolic had committed fraud, but whether its advert constituted a contract – which

the company had broken. A contract required agreement between two parties, argued Carbolic's lawyers. What agreement had Mrs. Carlill made with them?

There were times, the judges decided, when a contract could be one-sided. The advert had made a very specific offer to purchasers: protection from flu or £100. By using the smoke ball as instructed, Mrs. Carlill had accepted that offer. The company might just have wriggled out of it if it hadn't added the bit about the £1,000 deposit. That, said the judges, gave buyers reason to believe Carbolic meant what it said. "It seems to me that if a person chooses to make extravagant promises of this kind, he probably does so because it pays him to make them, and, if he has made them, the extravagance of the promises is no reason in law why he should not be bound by them," pronounced Lord Justice Bowen.

Louisa got her £100. The case established the principle of the unilateral contract and is frequently cited today.

Questions 14-17

Do the following statements agree with the information given in Reading Passage 2?

In boxes 14-17 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

14 Cities rather than rural areas were badly affected by the pandemic flu.

15 At the time of the flu pandemic, people didn't know the link between micro-organisms and illnesses.

16 People used to believe flu was caused by miasmas.

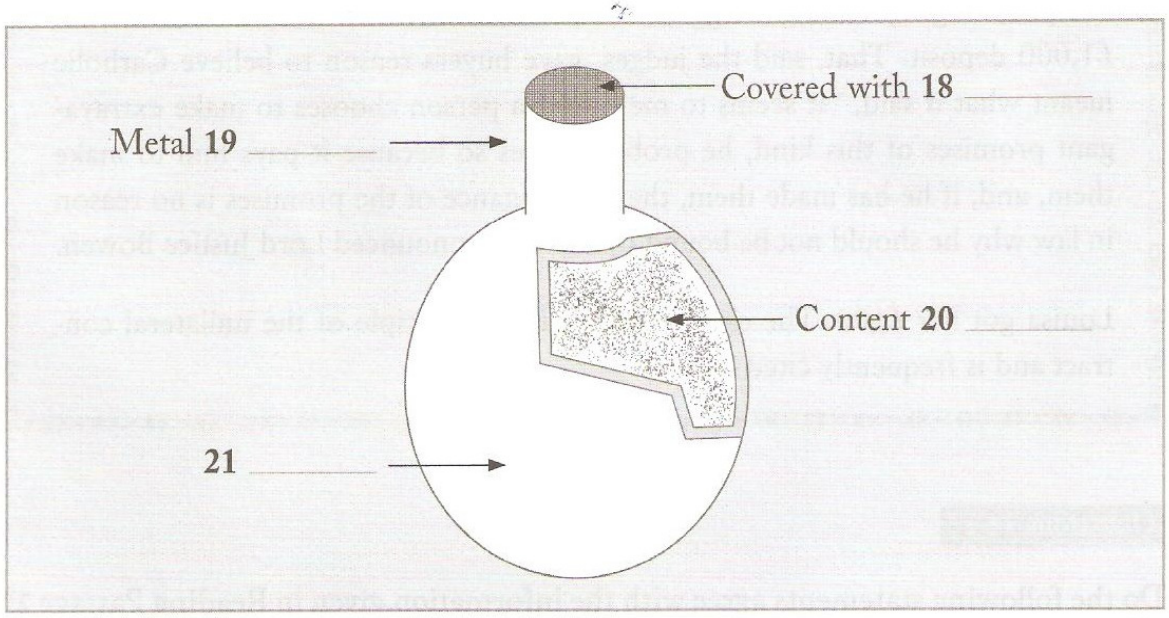
17 Flu prescriptions often contained harmful ingredients.

Questions 18-21

Complete the diagram below.

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

Write your answers in boxes 18-21 on your answer sheet.



Questions 22-25

Look at the following people (Questions 22-25) and the list of statements on the next page.

Match each person with the correct statement.

Write the correct letter A-F in boxes 22-25 on your answer sheet.

22 Mrs. Carlill
23 Mrs. Carlill's husband
24 Judge Hawkins
25 Lord Justice Bowen

List of Statements

A	Filed a complaint which was never responded to
B	Broke the contract made with Carbolic Smoke Ball Company
C	Initiated a legal case
D	Described the audience of advertisement
E	Claimed that most advertisements are fraudulent
F	Treated advertisement as a type of contract

Question 26

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

Write your answer in box 26 on your answer sheet.

26 Why is Mrs. Carlill's case often cited in present-day court trials?

A It proved the untrustworthiness of advertisements.

B It established the validity of one-sided contract.

C It explained the nature of contract.

D It defended the rights of consumers.

Reading Passage 3

You should spend about 20 minutes on Questions 27-40 which are based on Reading Passage 3 on the following page.

Questions 27-34

Reading Passage 3 has eight sections A-H.

Choose the correct heading for each section from the list of headings below.

Write the correct number i-x in boxes 27-34 on your answer sheet.

List of Headings

i Summarising personality types
ii Combined styles for workplace
iii Physical explanation
iv A lively person who encourages
v Demanding and unsympathetic personality
vi Lazy and careless personality
vii The benefits of understanding communication styles
viii Cautious and caring
ix Factual and analytical personality
x Self-assessment determines one's temperament

27 Section A
28 Section B
29 Section C
30 Section D
31 Section E
32 Section F
33 Section G
34 Section H

Communicating Styles and Conflict

Knowing your communication style and having a mix of styles on your team can provide a positive force for resolving conflict.

Section A

As far back as Hippocrates' time (460-370 BC), people have tried to understand other people by characterising them according to personality types or temperaments. Hippocrates believed there were four different body fluids that influenced four basic types of temperament. His work was further developed 500 years later by Galen (130-200 AD). These days there are a number of self-assessment tools that relate to the basic descriptions developed by Galen, although we no longer believe the source to be the types of body fluid that dominate our systems.

Section B

The value in self-assessments that help determine personality styles, learning styles, communication styles, conflict-handling styles, or other aspects of individuals is that they help depersonalise conflicts in interpersonal relationships.

The depersonalisation occurs when you realise that others aren't trying to be difficult, but they need different or more information than you do. They're not intending to be rude; they are so focused on the task they forget about greeting people. They would like to work faster but not at the risk of damaging the relationships needed to get the job done. They understand there is a job to do, but it can only be done right with the appropriate information, which takes time to collect.

When used appropriately, understanding communication styles can help resolve conflicts on teams. Very rare are conflicts of true personality issues. Usually, they are issues of style, information needs, or focus.

Section C

Hippocrates and later Galen determined there were four basic temperaments: sanguine, phlegmatic, melancholic, and choleric. These descriptions were developed centuries ago and are still somewhat apt, although you could update the wording. In today's world, they translate into the four fairly common communication styles described below:

Section D

The sanguine person would be the expressive or spirited style of communication. These people speak in pictures. They invest a lot of emotion and energy in their communication and often speak quickly, putting their whole body into it. They are easily sidetracked onto a story that may or may not illustrate the point they are trying to make. Because of their enthusiasm they are great team motivators. They are concerned about people and relationships. Their high levels of energy can come on strong at times and their focus is usually on the bigger picture, which means they sometimes miss the details or the proper order of things. These people find conflict or differences of opinion invigorating and love to engage in a spirited discussion. They love change and are constantly looking for new and exciting adventures.

Section E

The phlegmatic person – cool and persevering – translates into the technical or systematic communication style. This style of communication is focused on facts and technical details. Phlegmatic people have an orderly, methodical way of approaching tasks, and their focus is very much on the task, not on the people, emotions, or concerns that the task may evoke. The focus is also more on the details necessary to accomplish a task. Sometimes the details overwhelm the big picture and focus needs to be brought back to the context of the task. People with this style think the facts should speak for themselves, and they are not as comfortable with conflict. They need time to adapt to change and need to understand both the logic of it and the steps involved.

Section F

The melancholic person, who is soft-hearted and oriented towards doing things for others, translates into the considerate or sympathetic communication style. A person with this communication style is focused on people and relationships. They are good listeners and do things for other people – sometimes to the detriment of getting things done for themselves. They want to solicit everyone's opinion and make sure everyone is comfortable with whatever is required to get the job done. At times this focus on others can distract from the task at hand. Because they are so concerned with the needs of others and smoothing over issues, they do not like conflict. They believe that change threatens the status quo and tends to make people feel uneasy, so people with this communication style, like phlegmatic people, need time to consider the changes in order to adapt to them.

Section G

The choleric temperament translates into the bold or direct style of communication. People with this style are brief in their communication – the fewer words the better. They are big picture thinkers and love to be involved in many things at once. They are focused on tasks and outcomes and often forget that the people involved in carrying out the tasks have needs. They don't do detail work easily and as a result can often underestimate how much time it takes to achieve the task. Because they are so direct, they often seem forceful and can be very intimidating to others. They would usually welcome someone challenging them, but most other styles are afraid to do so. They also thrive on change, the more the better.

Section H

A well-functioning team should have all of these communication styles for true effectiveness. All teams need to focus on tasks, and they need to take care of relationships in order to achieve those tasks. They need the big picture perspective or the context of their work, and they need the details to be identified and taken care of for success.

We all have aspects of each style within us. Some of us can easily move from one style to another and adapt our style to the needs of the situation at hand – whether the focus is on tasks or relationships. For others, a dominant style is very evident, and it is more challenging to see the situation from the perspective of another style.

The work environment can influence communication styles either by the type of work that is required or by the predominance of one style reflected in that environment. Some people use one style at work and another at home.

The good news about communication styles is that we all have the ability to develop flexibility in our styles. The greater the flexibility we have, the more skilled we usually are at handling possible and actual conflicts. Usually it has to be relevant to us to do so, either because we think it is important or because there are incentives in our environment to encourage it. The key is that we have to want to become flexible with our communication styles. As Henry Ford said, "Whether you think you can or you can't, you're right!"

Questions 35-39

Do the following statements agree with the information given in Reading Passage 3?

In boxes 35-39 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

35 It is believed that sanguine people dislike variety.

36 Melancholic and phlegmatic people have similar characteristics.

37 Managers often select their best employees according to personality types.

38 It is possible to change one's personality type.

39 Workplace environment can affect which communication style is most effective.

Question 40

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

Write your answer in box 40 on your answer sheet.

40 The writer believes using self-assessment tools can

A help to develop one's personality.

B help to understand colleagues' behaviour.

C improve one's relationship with the employer.

D directly resolve conflicts.

Test 7

Reading Passage 1

You should spend about 20 minutes on Questions 1-13 which are based on Reading Passage 1 on the following page.

Questions 1-6

Reading Passage 1 has six sections A-F.

Choose the correct heading for each section from the list of headings below.

Write the correct number i-x in boxes 1-6 on your answer sheet.

List of Headings

i	Locations and features of different seaweeds
ii	Various products of seaweeds
iii	Use of seaweeds in Japan
iv	Seaweed species around the globe
v	Nutritious value of seaweeds
vi	Why it doesn't dry or sink
vii	Where to find red seaweeds
viii	Underuse of native species
ix	Mystery solved
x	How seaweeds reproduce and grow

1 Section A
2 Section B
3 Section C
4 Section D
5 Section E
6 Section F

New Zealand Seaweed

Call us not weeds; we are flowers of the sea.

Section A

Seaweed is a particularly nutritious food, which absorbs and concentrates traces of a wide variety of minerals necessary to the body's health. Many elements may occur in seaweed – aluminium, barium, calcium, chlorine, copper, iodine and iron, to name but a few – traces normally produced by erosion and carried to the seaweed beds by river and sea currents. Seaweeds are also rich in vitamins: indeed, Eskimos obtain a high proportion of their bodily requirements of vitamin C from the seaweeds they eat.

The nutritive value of seaweed has long been recognised. For instance, there is a remarkably low incidence of goitre amongst the Japanese, and for that matter, amongst our own Maori people, who have always eaten seaweeds, and this may well be attributed to the high iodine content of this food. Research into old Maori eating customs shows that jellies were made using seaweeds, fresh fruit and nuts, fuchsia and tutu berries, cape gooseberries, and many other fruits which either grew here naturally or were sown from seeds brought by settlers and explorers.

Section B

New Zealand lays claim to approximately 700 species of seaweed, some of which have no representation outside this country. Of several species grown worldwide, New Zealand also has a particularly large share. For example, it is estimated that New Zealand has some 30 species of *Gigartina*, a close relative of carrageen or Irish moss. These are often referred to as the New Zealand carrageens. The gel-forming substance called agar which can be extracted from this species gives them great commercial application in seameal, from which seameal custard is made, and in cough mixture, confectionery, cosmetics, the canning, paint and leather industries, the manufacture of duplicating pads, and in toothpaste. In fact, during World War II, New Zealand *Gigartina* were sent to Australia to be used in toothpaste.

Section C

Yet although New Zealand has so much of the commercially profitable red seaweeds, several of which are a source of agar (*Pterocladia, Gelidium, Chondrus, Gigartina*), before 1940 relatively little use was made of them. New Zealand used to import the Northern Hemisphere Irish moss (*Chondrus crispus*) from England and ready-made agar from Japan. Although distribution of the *Gigartina* is confined to certain areas according to species, it is only on the east coast of the North Island that its occurrence is rare. And even then, the east coast, and the area around Hokiangna, have a considerable supply of the two species of *Pterocladia* from which agar is also available. Happily, New Zealand-made agar is now obtainable in health food shops.

Section D

Seaweeds are divided into three classes determined by colour – red, brown and green – and each tends to live in a specific location. However, except for the unmistakable sea lettuce (*Ulva*), few are totally one colour; and especially when dry, some species can change colour quite significantly – a brown one may turn quite black, or a red one appear black, brown, pink or purple.

Identification is nevertheless facilitated by the fact that the factors which determine where a seaweed will grow are quite precise, and they therefore tend to occur in very well-defined zones. Although there are exceptions, the green seaweeds are mainly shallow-water algae; the browns belong to medium depths, and the reds are plants of the deeper water. Flat rock surfaces near mid-level tides are the most usual habitat of sea bombs, Venus' necklace and most brown seaweeds. This is also the location of the purple laver or Maori karengo, which looks rather like a reddish-purple lettuce. Deep-water rocks on open coasts, exposed only at very low tide, are usually the site of bull kelp, strap weeds and similar tough specimens. Those species able to resist long periods of exposure to the sun and air are usually found on the upper shore, while those less able to stand such exposure occur nearer to or below the low-water mark. Radiation from the sun, the temperature level, and the length of time immersed all play a part in the zoning of seaweeds.

Section E

Propagation of seaweeds occurs by spores, or by fertilisation of egg cells. None have roots in the usual sense; few have leaves, and none have flowers, fruits or seeds. The plants absorb their nourishment through their fronds when they are

surrounded by water: the base or "holdfast" of seaweeds is purely an attaching organ, not an absorbing one.

Section F

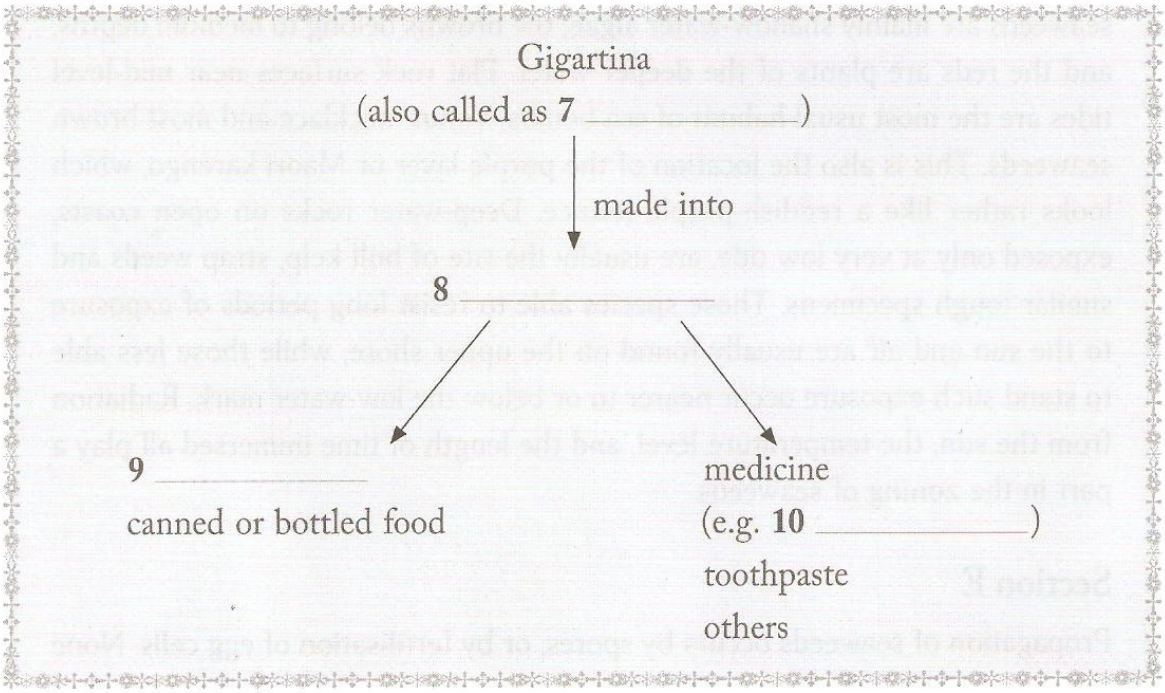
Some of the large seaweeds maintain buoyancy with air-filled floats; others, such as bull kelp, have large cells filled with air. Some, which spend a good part of their time exposed to the air, often reduce dehydration either by having swollen stems that contain water, or they may (like Venus' necklace) have swollen nodules, or they may have distinctive shape like a sea bomb. Others, like the sea cactus, are filled with slimy fluid or have coating of mucilage on the surface. In some of the larger kelps, this coating is not only to keep the plant moist but also to protect it from the violent action of waves.

Questions 7-10

Complete the flow chart below.

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

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



Questions 11-13

Classify the following description as relating to

A Green seaweeds
B Brown seaweeds
C Red seaweeds

Write the correct letter A, B, or C in boxes 11-13 on your answer sheet.

11 Can resist exposure to sunlight at high-water mark
12 Grow in far open sea water
13 Share their habitat with karengo

Reading Passage 2

You should spend about 20 minutes on Questions 14-26 which are based on Reading Passage 2 below.

Optimism and Health

Mindset is all. How you start the year will set the template for the rest, and two scientifically backed character traits hold the key: optimism and resilience (if the prospect leaves you feeling pessimistically spineless, the good news is that you can significantly boost both of these qualities).

Faced with 12 months of plummeting economics and rising human distress, staunchly maintaining a rosy view might seem deludedly Pollyannaish. But here we encounter the optimism paradox. As Brice Pitt, an emeritus professor of the psychiatry of old age at Imperial College, London, told me: "Optimists are unrealistic. Depressive people see things as they really are, but that is a disadvantage from an evolutionary point of view. Optimism is a piece of evolutionary equipment that carried us through millennia of setbacks."

Optimists have plenty to be happy about. In other words, if you can convince yourself that things will get better, the odds of it happening will improve – because you keep on playing the game. In this light, optimism "is a habitual way of explaining your setbacks to yourself", reports Martin Seligman, the psychology professor and author of *Learned Optimism*. The research shows that when times get tough, optimists do better than pessimists – they succeed better at work, respond better to stress, suffer fewer depressive episodes, and achieve more personal goals.

Studies also show that belief can help with the financial pinch. Chad Wallens, a social forecaster at the Henley Centre who surveyed middle-class Britons' beliefs about income, has found that "the people who feel wealthiest, and those who feel poorest, actually have almost the same amount of money at their disposal. Their attitudes and behaviour patterns, however, are different from one another."

Optimists have something else to be cheerful about – in general, they are more robust. For example, a study of 660 volunteers by the Yale University

psychologist Dr. Becca Levy found that thinking positively adds an average of seven years to your life. Other American research claims to have identified a physical mechanism behind this. A Harvard Medical School study of 670 men found that the optimists have significantly better lung function. The lead author, Dr. Rosalind Wright, believes that attitude somehow strengthens the immune system. "Preliminary studies on heart patients suggest that, by changing a person's outlook, you can improve their mortality risk," she says.

Few studies have tried to ascertain the proportion of optimists in the world. But a 1995 nationwide survey conducted by the American magazine *Adweek* found that about half the population counted themselves as optimists, with women slightly more apt than men (53 per cent versus 48 per cent) to see the sunny side.

Of course, there is no guarantee that optimism will insulate you from the crunch's worst effects, but the best strategy is still to keep smiling and thank your lucky stars. Because (as every good sports coach knows) adversity is character-forming – so long as you practise the skills of resilience. Research among tycoons and business leaders shows that the path to success is often littered with failure: a record of sackings, bankruptcies and blistering castigation. But instead of curling into a foetal ball beneath the coffee table, they resiliently pick themselves up, learn from their pratfalls and march boldly towards the next opportunity.

The American Psychological Association defines resilience as the ability to adapt in the face of adversity, trauma or tragedy. A resilient person may go through difficulty and uncertainty, but he or she will doggedly bounce back.

Optimism is one of the central traits required in building resilience, say Yale University investigators in the *Annual Review of Clinical Psychology*. They add that resilient people learn to hold on to their sense of humour and this can help them to keep a flexible attitude when big changes of plan are warranted. The ability to accept your lot with equanimity also plays an important role, the study adds.

One of the best ways to acquire resilience is through experiencing a difficult childhood, the sociologist Steven Stack reports in the *Journal of Social Psychology*. For example, short men are less likely to commit suicide than tall guys, he says, because shorties develop psychological defence skills to handle the

bullies and mickey-taking that their lack of stature attracts. By contrast, those who enjoyed adversity-free youths can get derailed by setbacks later on because they've never been inoculated against aggro.

If you are handicapped by having had a happy childhood, then practising proactive optimism can help you to become more resilient. Studies of resilient people show that they take more risks; they court failure and learn not to fear it.

And despite being thick-skinned, resilient types are also more open than average to other people. Bouncing through knock-backs is all part of the process. It's about optimistic risk-taking – being confident that people will like you. Simply smiling and being warm to people can help. It's an altruistic path to self-interest – and if it achieves nothing else, it will reinforce an age-old adage: hard times can bring out the best in you.

Questions 14-17

Complete the summary below using NO MORE THAN THREE WORDS from Reading Passage 2 for each answer.

Write your answers in boxes 14-17 on your answer sheet.

A study group from Yale University had discovered that optimism can stretch one's life length by **14** _____ years. And another group from Harvard thinks they have found the biological basis – optimists have better **15** _____ because an optimist outlook boosts one's **16** _____. The study on **17** _____ was cited as evidence in support of this claim.

Questions 18-22

Complete each sentence with the correct ending A-H on the next page.

Write the correct letter A-H in boxes 18-22 on your answer sheet.

18 Brice Pitt believes

19 The research at Henley Centre discovers

20 The study conducted by *Adweek* finds
21 The *Annual Review of Clinical Psychology* reports
22 Steven Stack says in his report

A	material wealth doesn't necessarily create happiness.
B	optimists tend to be unrealistic about human evolution.
C	optimism is advantageous for human evolution.
D	adversity is the breeding ground of resilience.
E	feelings of optimism vary according to gender.
F	good humour means good flexibility.
G	evenness of mind under stress is important to building resilience.
H	having an optimistic outlook is a habit.

Questions 23-26

Do the following statements agree with the claims of the writer in Reading Passage 2?

In boxes 23-26 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 it is impossible to say what the writer thinks about this

23 The benefits of optimism on health have been long known.
24 Optimists have better relationships with people than pessimists.
25 People with happy childhoods won't be able to practise optimism.
26 Resilient people are often open, and even thick-skinned.

Reading Passage 3

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

The Columbian Exchange

A Millions of years ago, continental drift carried the Old World and New World apart, splitting North and South America from Eurasia and Africa. That separation lasted so long that it fostered divergent evolution; for instance, the development of rattlesnakes on one side of the Atlantic and of vipers on the other. After 1492, human voyagers in part reversed this tendency. Their artificial re-establishment of connections through the commingling of Old and New World plants, animals, and bacteria, commonly known as the Columbian Exchange, is one of the more spectacular and significant ecological events of the past millennium.

B When Europeans first touched the shores of the Americas, Old World crops such as wheat, barley, rice, and turnips had not travelled west across the Atlantic, and New World crops such as maize, white potatoes, sweet potatoes, and manioc had not travelled east to Europe. In the Americas, there were no horses, cattle, sheep, or goats, all animals of Old World origin. Except for the llama, alpaca, dog, a few fowl, and guinea pig, the New World had no equivalents to the domesticated animals associated with the Old World, nor did it have the pathogens associated with the Old World's dense populations of humans and such associated creatures as chickens, cattle, black rats, and *Aedes aegypti mosquitoes*. Among these germs were those that carried smallpox, measles, chickenpox, influenza, malaria, and yellow fever.

C As might be expected, the Europeans who settled on the east coast of the United States cultivated crops like wheat and apples, which they had brought with them. European weeds, which the colonists did not cultivate, and, in fact, preferred to uproot, also fared well in the New World. John Josselyn, an Englishman and amateur naturalist who visited New England twice in the seventeenth century, left us a list, "Of Such Plants as Have Sprung Up since the English Planted and Kept Cattle in New England," which included couch grass, dandelion, shepherd's purse, groundsel, sow thistle, and chickweed.

One of these, a plantain (Plantago major), was named "Englishman's Foot" by the Amerindians of New England and Virginia who believed that it would grow only where the English "have trodden, and was never known before the English came into this country". Thus, as they intentionally sowed Old World crop seeds, the European settlers were unintentionally contaminating American fields with weed seeds. More importantly, they were stripping and burning forests, exposing the native minor flora to direct sunlight, and the hooves and teeth of Old World livestock. The native flora could not tolerate the stress. The imported weeds could, because they had lived with large numbers of grazing animals for thousands of years.

D Cattle and horses were brought ashore in the early 1600s and found hospitable climate and terrain in North America. Horses arrived in Virginia as early as 1620 and in Massachusetts in 1629. Many wandered free with little more evidence of their connection to humanity than collars with a hook at the bottom to catch on fences as they tried to leap over them to get at crops. Fences were not for keeping livestock in, but for keeping livestock out.

E Native American resistance to the Europeans was ineffective. Indigenous peoples suffered from white brutality, alcoholism, the killing and driving off of game, and the expropriation of farmland, but all these together are insufficient to explain the degree of their defeat. The crucial factor was not people, plants, or animals, but germs. Smallpox was the worst and the most spectacular of the infectious diseases mowing down the Native Americans. The first recorded pandemic of that disease in British North America detonated among the Algonquin of Massachusetts in the early 1630s. William Bradford of Plymouth Plantation wrote that the victims "fell down so generally of this disease as they were in the end not able to help one another, no, not to make a fire nor fetch a little water to drink, nor any to bury the dead". The missionaries and the traders who ventured into the American interior told the same appalling story about smallpox and the indigenes. In 1738 alone, the epidemic destroyed half the Cherokee; in 1759 nearly half the Catawbas; in the first years of the next century, two thirds of the Omahas and perhaps half the entire population between the Missouri River and New Mexico; in 1837-38 nearly every last one of the Mandans and perhaps half the people of the high plains.

F The export of America's native animals has not revolutionised Old World agriculture or ecosystems as the introduction of European animals to the New World did. America's grey squirrels and muskrats and a few others have established

themselves east of the Atlantic and west of the Pacific, but that has not made much of a difference. Some of America's domesticated animals are raised in the Old World, but turkeys have not displaced chickens and geese, and guinea pigs have proved useful in laboratories, but have not usurped rabbits in the butcher shops.

G The New World's great contribution to the Old is in crop plants. Maize, white potatoes, sweet potatoes, various squashes, chiles, and manioc have become essentials in the diets of hundreds of millions of Europeans, Africans, and Asians. Their influence on Old World peoples, like that of wheat and rice on New World peoples, goes far to explain the global population explosion of the past three centuries. The Columbian Exchange has been an indispensable factor in that demographic explosion.

H All this had nothing to do with superiority or inferiority of biosystems in any absolute sense. It has to do with environmental contrasts. Amerindians were accustomed to living in one particular kind of environment, Europeans and Africans in another. When the Old World peoples came to America, they brought with them all their plants, animals, and germs, creating a kind of environment to which they were already adapted, and so they increased in number. Amerindians had not adapted to European germs, and so initially their numbers plunged. That decline has reversed in our time as Amerindian populations have adapted to the Old World's environmental influence, but the demographic triumph of the invaders, which was the most spectacular feature of the Old World's invasion of the New, still stands.

Questions 27-34

Reading Passage 3 has eight paragraphs A-H.

Which paragraph contains the following information?

Write the correct letter A-H in boxes 27-34 on your answer sheet.

27 A description of an imported species that is named after the English colonists

28 The reason why both the New World and Old World experienced population growth

29 The formation of new continents explained

30 The reason why the indigenous population declined

31 An overall description of the species lacked in the Old World and New World
32 A description of some animal species being ineffective in affecting the Old World
33 An overall explanation of the success of the Old World species invasion
34 An account of European animals taking roots in the New World

Questions 35-38

Do the following statements agree with the information given in Reading Passage 3?

In boxes 35-38 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

35 European settlers built fences to keep their cattle and horses inside.
36 The indigenous people had been brutally killed by the European colonists.
37 America's domesticated animals, such as turkey, became popular in the Old World.
38 Crop exchange between the two worlds played a major role in world population growth.

Questions 39-40

Answer the questions below using NO MORE THAN THREE WORDS from the passage for each answer.

Write your answers in boxes 39-40 on your answer sheet.

39 Who reported the same story of European diseases among the indigenes from the American interior?
40 What is the still existing feature of the Old World's invasion of the New?

Test 8

Reading Passage 1

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

Going Bananas

The world's favourite fruit could disappear forever in 10 years' time.

The banana is among the world's oldest crops. Agricultural scientists believe that the first edible banana was discovered around ten thousand years ago. It has been at an evolutionary standstill ever since it was first propagated in the jungles of South-East Asia at the end of the last ice age. Normally the wild banana, a giant jungle herb called Musa acuminata, contains a mass of hard seeds that make the fruit virtually inedible. But now and then, hunter-gatherers must have discovered rare mutant plants that produced seedless, edible fruits. Geneticists now know that the vast majority of these soft-fruited plants resulted from genetic accidents that gave their cells three copies of each chromosome instead of the usual two. This imbalance prevents seeds and pollen from developing normally, rendering the mutant plants sterile. And that is why some scientists believe the world's most popular fruit could be doomed. It lacks the genetic diversity to fight off pests and diseases that are invading the banana plantations of Central America and the smallholdings of Africa and Asia alike.

In some ways, the banana today resembles the potato before blight brought famine to Ireland a century and a half ago. But "it holds a lesson for other crops, too," says Emile Frison, top banana at the International Network for the Improvement of Banana and Plantain in Montpellier, France. "The state of the banana," Frison warns, "can teach a broader lesson: the increasing standardisation of food crops round the world is threatening their ability to adapt and survive."

The first Stone Age plant breeders cultivated these sterile freaks by replanting cuttings from their stems. And the descendants of those original cuttings are

the bananas we still eat today. Each is a virtual clone, almost devoid of genetic diversity. And that uniformity makes it ripe for disease like no other crop on Earth. Traditional varieties of sexually reproducing crops have always had a much broader genetic base, and the genes will recombine in new arrangements in each generation. This gives them much greater flexibility in evolving responses to disease – and far more genetic resources to draw on in the face of an attack. But that advantage is fading fast, as growers increasingly plant the same few, high-yielding varieties. Plant breeders work feverishly to maintain resistance in these standardised crops. Should these efforts falter, yields of even the most productive crop could swiftly crash. "When some pest or disease comes along, severe epidemics can occur," says Geoff Hawtin, director of the Rome-based International Plant Genetic Resources Institute.

The banana is an excellent case in point. Until the 1950s, one variety, the Gros Michel, dominated the world's commercial banana business. Found by French botanists in Asia in the 1820s, the Gros Michel was by all accounts a fine banana, richer and sweeter than today's standard banana and without the latter's bitter aftertaste when green. But it was vulnerable to a soil fungus that produced a wilt known as Panama disease. "Once the fungus gets into the soil, it remains there for many years. There is nothing farmers can do. Even chemical spraying won't get rid of it," says Rodomiro Ortiz, director of the International Institute for Tropical Agriculture in Ibadan, Nigeria. So plantation owners played a running game, abandoning infested fields and moving to "clean" land – until they ran out of clean land in the 1950s and had to abandon the Gros Michel. Its successor, and still the reigning commercial king, is the Cavendish banana, a 19th-century British discovery from southern China. The Cavendish is resistant to Panama disease and, as a result, it literally saved the international banana industry. During the 1960s, it replaced the Gros Michel on supermarket shelves. If you buy a banana today, it is almost certainly a Cavendish. But even so, it is a minority in the world's banana crop.

Half a billion people in Asia and Africa depend on bananas. Bananas provide the largest source of calories and are eaten daily. Its name is synonymous with food. But the day of reckoning may be coming for the Cavendish and its indigenous kin. Another fungal disease, black Sigatoka, has become a global epidemic since its first appearance in Fiji in 1963. Left to itself, black Sigatoka – which causes brown wounds on leaves and premature fruit ripening – cuts fruit yields by 50 to 70 per cent and reduces the productive lifetime of banana plants from 30 years to as little as 2 or 3. Commercial growers keep black

Sigatoka at bay by a massive chemical assault. Forty sprayings of fungicide a year is typical. But despite the fungicides, diseases such as black Sigatoka are getting more and more difficult to control. "As soon as you bring in a new fungicide, they develop resistance," says Frison. "One thing we can be sure of is that black Sigatoka won't lose in this battle." Poor farmers, who cannot afford chemicals, have it even worse. They can do little more than watch their plants die. "Most of the banana fields in Amazonia have already been destroyed by the disease," says Luadir Gasparotto, Brazil's leading banana pathologist with the government research agency EMBRAPA. Production is likely to fall by 70 per cent as the disease spreads, he predicts. The only option will be to find a new variety.

But how? Almost all edible varieties are susceptible to the diseases, so growers cannot simply change to a different banana. With most crops, such a threat would unleash an army of breeders, scouring the world for resistant relatives whose traits they can breed into commercial varieties. Not so with the banana. Because all edible varieties are sterile, bringing in new genetic traits to help cope with pests and diseases is nearly impossible. Nearly, but not totally. Very rarely, a sterile banana will experience a genetic accident that allows an almost normal seed to develop, giving breeders a tiny window for improvement. Breeders at the Honduran Foundation of Agricultural Research have tried to exploit this to create disease-resistant varieties. Further back-crossing with wild bananas yielded a new seedless banana resistant to both black Sigatoka and Panama disease.

Neither Western supermarket consumers nor peasant growers like the new hybrid. Some accuse it of tasting more like an apple than a banana. Not surprisingly, the majority of plant breeders have till now turned their backs on the banana and got to work on easier plants. And commercial banana companies are now washing their hands of the whole breeding effort, preferring to fund a search for new fungicides instead. "We supported a breeding programme for 40 years, but it wasn't able to develop an alternative to the Cavendish. It was very expensive and we got nothing back," says Ronald Romero, head of research at Chiquita, one of the Big Three companies that dominate the international banana trade.

Last year, a global consortium of scientists led by Frison announced plans to sequence the banana genome within five years. It would be the first edible

fruit to be sequenced. Well, almost edible. The group will actually be sequencing inedible wild bananas from East Asia because many of these are resistant to black Sigatoka. If they can pinpoint the genes that help these wild varieties to resist black Sigatoka, the protective genes could be introduced into laboratory tissue cultures of cells from edible varieties. These could then be propagated into new disease-resistant plants and passed on to farmers.

It sounds promising, but the big banana companies have, until now, refused to get involved in GM research for fear of alienating their customers. "Biotechnology is extremely expensive and there are serious questions about consumer acceptance," says David McLaughlin, Chiquita's senior director for environmental affairs. With scant funding from the companies, the banana genome researchers are focusing on the other end of the spectrum. Even if they can identify the crucial genes, they will be a long way from developing new varieties that smallholders will find suitable and affordable. But whatever biotechnology's academic interest, it is the only hope for the banana. Without it, banana production worldwide will head into a tailspin. We may even see the extinction of the banana as both a lifesaver for hungry and impoverished Africans and the most popular product on the world's supermarket shelves.

Questions 1-3

Complete the sentences below with NO MORE THAN THREE WORDS from the passage for each answer.

Write your answers in boxes 1-3 on your answer sheet.

1 Banana was first eaten as a fruit by humans almost _____ years ago.
2 Banana was first planted in _____.
3 Wild banana's taste is adversely affected by its _____.

Questions 4-10

Look at the statements (Questions 4-10) and the list of people on the next page.

Match each statement with the correct person A-F.

Write the correct letter A-F in boxes 4-10 on your answer sheet.

NB You may use any letter more than once.

4 A pest invasion may seriously damage banana industry.
5 The effect of fungal infection in soil is often long-lasting.
6 A commercial manufacturer gave up on breeding bananas for disease-resistant species.
7 Banana disease may develop resistance to chemical sprays.
8 A banana disease has destroyed a large number of banana plantations.
9 Consumers would not accept genetically altered crops.
10 Lessons can be learned from bananas for other crops.

List of People

A Rodomiro Ortiz
B David McLaughlin
C Emile Frison
D Ronald Romero
E Luadir Gasparotto
F Geoff Hawtin

Questions 11-13

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

In boxes 11-13 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

11 Banana is the oldest known fruit.
12 Gros Michel is still being used as a commercial product.
13 Banana is the main food in some countries.

Reading Passage 2

You should spend about 20 minutes on Questions 14-26 which are based on Reading Passage 2 below.

Coastal Archaeology of Britain

The recognition of the wealth and diversity of England's coastal archaeology has been one of the most important developments of recent years. Some elements of this enormous resource have long been known. The so-called 'submerged forests' off the coasts of England, sometimes with clear evidence of human activity, had attracted the interest of antiquarians since at least the eighteenth century, but serious and systematic attention has been given to the archaeological potential of the coast only since the early 1980s.

It is possible to trace a variety of causes for this concentration of effort and interest. In the 1980s and 1990s, scientific research into climate change and its environmental impact spilled over into a much broader public debate as awareness of these issues grew; the prospect of rising sea levels over the next century, and their impact on current coastal environments, has been a particular focus for concern. At the same time, archaeologists were beginning to recognise that the destruction caused by natural processes of coastal erosion and by human activity was having an increasing impact on the archaeological resource of the coast.

The dominant process affecting the physical form of England in the post-glacial period has been the rise in the altitude of sea level relative to the land, as the glaciers melted and the land mass readjusted. The encroachment of the sea, the loss of huge areas of land now under the North Sea and the English Channel, and especially the loss of the land bridge between England and France, which finally made Britain an island, must have been immensely significant factors in the lives of our prehistoric ancestors. Yet the way in which prehistoric communities adjusted to these environmental changes has seldom been a major theme in discussions of the period. One factor contributing to this has been that, although the rise in relative sea level is comparatively well documented, we know little about the constant reconfiguration of the coastline. This was affected by many processes, mostly quite localised, which have not yet been adequately researched. The detailed reconstruction of coastline histories and the changing environments available for human use will be an important theme for future research.

So great has been the rise in sea level and the consequent regression of the coast that much of the archaeological evidence now exposed in the coastal zone, whether being eroded or exposed as a buried land surface, is derived from what was originally terrestrial occupation. Its current location in the coastal zone is the product of later unrelated processes, and it can tell us little about past adaptation to the sea. Estimates of its significance will need to be made in the context of other related evidence from dry land sites. Nevertheless, its physical environment means that preservation is often excellent, for example, in the case of the Neolithic structure excavated at the Stumble in Essex.

In some cases, these buried land surfaces do contain evidence for human exploitation of what was a coastal environment, and elsewhere along the modern coast there is similar evidence. Where the evidence does relate to past human exploitation of the resources and the opportunities offered by the sea and the coast, it is both diverse and as yet little understood. We are not yet in a position to make even preliminary estimates of answers to such fundamental questions as the extent to which the sea and the coast affected human life in the past, what percentage of the population at any time lived within reach of the sea, or whether human settlements in coastal environments showed a distinct character from those inland.

The most striking evidence for use of the sea is in the form of boats, yet we still have much to learn about their production and use. Most of the known wrecks around our coast are not unexpectedly of post-medieval date, and offer an unparalleled opportunity for research which has as yet been little used. The prehistoric sewn-plank boats such as those from the Humber estuary and Dover all seem to belong to the second millennium BC; after this there is a gap in the record of a millennium, which cannot yet be explained, before boats reappear, but built using a very different technology. Boatbuilding must have been an extremely important activity around much of our coast, yet we know almost nothing about it. Boats were some of the most complex artefacts produced by pre-modern societies, and further research on their production and use made an important contribution to our understanding of past attitudes to technology and technological change.

Boats needed landing places, yet here again our knowledge is very patchy. In many cases, the natural shores and beaches would have sufficed, leaving little or no archaeological trace, but especially in later periods, many ports and harbours, as well as smaller facilities such as quays, wharves, and jetties, were built. Despite a growth of interest in the waterfront archaeology of some of our more important Roman and medieval towns, very little attention has been paid to the multitude of smaller landing places. Redevelopment of harbour sites and other development

and natural pressures along the coast are subjecting these important locations to unprecedented threats, yet few surveys of such sites have been undertaken.

One of the most important revelations of recent research has been the extent of industrial activity along the coast. Fishing and salt production are among the better documented activities, but even here our knowledge is patchy. Many forms of fishing will leave little archaeological trace, and one of the surprises of recent surveys has been the extent of past investment in facilities for procuring fish and shellfish. Elaborate wooden fish weirs, often of considerable extent and responsive to aerial photography in shallow water, have been identified in areas such as Essex and the Severn estuary. The production of salt, especially in the late Iron Age and early Roman periods, has been recognised for some time, especially in the Thames estuary and around the Solent and Poole Harbour, but the reasons for the decline of that industry and the nature of later coastal salt working are much less well understood. Other industries were also located along the coast, either because the raw materials outcropped there or for ease of working and transport: mineral resources such as sand, gravel, stone, coal, ironstone, and alum were all exploited. These industries are poorly documented, but their remains are sometimes extensive and striking.

Some appreciation of the variety and importance of the archaeological remains preserved in the coastal zone, albeit only in preliminary form, can thus be gained from recent work, but the complexity of the problem of managing that resource is also being realised. The problem arises not only from the scale and variety of the archaeological remains, but also from two other sources: the very varied natural and human threats to the resource, and the complex web of organisations with authority over, or interests in, the coastal zone. Human threats include the redevelopment of historic towns and old dockland areas, and the increased importance of the coast for the leisure and tourism industries, resulting in pressure for the increased provision of facilities such as marinas. The larger size of ferries has also caused an increase in the damage caused by their wash to fragile deposits in the intertidal zone. The most significant natural threat is the predicted rise in sea level over the next century, especially in the south and east of England. Its impact on archaeology is not easy to predict, and though it is likely to be highly localised, it will be at a scale much larger than that of most archaeological sites. Thus protecting one site may simply result in transposing the threat to a point further along the coast. The management of the archaeological remains will have to be considered in a much longer timescale and a much wider geographical scale than is common in the case of dry land sites, and this will pose a serious challenge for archaeologists.

Questions 14-16

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

Write your answers in boxes 14-16 on your answer sheet.

14 What has caused public interest in coastal archaeology in recent years?

A The rapid development of England's coastal archaeology
B The rising awareness of climate change
C The discovery of an underwater forest
D The systematic research conducted on coastal archaeological findings

15 What does the passage say about the evidence of boats?

A There's enough knowledge of the boatbuilding technology of the prehistoric people.
B Many of the boats discovered were found in harbours.
C The use of boats had not been recorded for a thousand years.
D Boats were first used for fishing.

16 What can be discovered from the air?

A Salt mines
B Roman towns
C Harbours
D Fisheries

Questions 17-23

Do the following statements agree with the information given in Reading Passage 2?

In boxes 17-23 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

17 England lost much of its land after the ice age due to the rising sea level.
18 The coastline of England has changed periodically.
19 Coastal archaeological evidence may be well protected by sea water.

20 The design of boats used by pre-modern people was very simple.
21 Similar boats were also discovered in many other European countries.
22 There are few documents relating to mineral exploitation.
23 Large passenger boats are causing increasing damage to the seashore.

Questions 24-26

Choose THREE letters A-G.

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

Which THREE of the following statements are mentioned in the passage?

A How coastal archaeology was originally discovered
B It is difficult to understand how many people lived close to the sea.
C How much the prehistoric communities understand the climate change
D Our knowledge of boat evidence is limited.
E Some fishing ground was converted to ports.
F Human development threatens the archaeological remains.
G Coastal archaeology will become more important in the future.

Reading Passage 3

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

Travel Books

There are many reasons why individuals have travelled beyond their own societies. Some travellers may have simply desired to satisfy curiosity about the larger world. Until recent times, however, travellers did start their journey for reasons other than mere curiosity. While the travellers' accounts give much valuable information on these foreign lands and provide a window for the understanding of the local cultures and histories, they are also a mirror to the travellers themselves, for these accounts help them to have a better understanding of themselves.

Records of foreign travel appeared soon after the invention of writing, and fragmentary travel accounts appeared in both Mesopotamia and Egypt in ancient times. After the formation of large, imperial states in the classical world, travel accounts emerged as a prominent literary genre in many lands, and they held especially strong appeal for rulers desiring useful knowledge about their realms. The Greek historian Herodotus reported on his travels in Egypt and Anatolia in researching the history of the Persian wars. The Chinese envoy Zhang Qian described much of central Asia as far west as Bactria (modern-day Afghanistan) on the basis of travels undertaken in the first century BCE while searching for allies for the Han dynasty. Hellenistic and Roman geographers such as Ptolemy, Strabo, and Pliny the Elder relied on their own travels through much of the Mediterranean world as well as reports of other travellers to compile vast compendia of geographical knowledge.

During the post-classical era (about 500 to 1500 CE), trade and pilgrimage emerged as major incentives for travel to foreign lands. Muslim merchants sought trading opportunities throughout much of the eastern hemisphere. They described lands, peoples, and commercial products of the Indian Ocean basin from East Africa to Indonesia, and they supplied the first written accounts of societies in sub-Saharan West Africa. While merchants set out in search of trade and profit, devout Muslims travelled as pilgrims to Mecca to make their

hajj and visit the holy sites of Islam. Since the prophet Muhammad's original pilgrimage to Mecca, untold millions of Muslims have followed his example, and thousands of hajj accounts have related their experiences. East Asian travellers were not quite so prominent as Muslims during the post-classical era, but they too followed many of the highways and sea lanes of the eastern hemisphere. Chinese merchants frequently visited South-East Asia and India, occasionally venturing even to East Africa, and devout East Asian Buddhists undertook distant pilgrimages. Between the 5th and 9th centuries CE, hundreds and possibly even thousands of Chinese Buddhists travelled to India to study with Buddhist teachers, collect sacred texts, and visit holy sites. Written accounts recorded the experiences of many pilgrims, such as Faxian, Xuanzang, and Yijing. Though not so numerous as the Chinese pilgrims, Buddhists from Japan, Korea, and other lands also ventured abroad in the interests of spiritual enlightenment.

Medieval Europeans did not hit the roads in such large numbers as their Muslim and East Asian counterparts during the early part of the post-classical era, although gradually increasing crowds of Christian pilgrims flowed to Jerusalem, Rome, Santiago de Compostela (in northern Spain), and other sites. After the 12th century, however, merchants, pilgrims, and missionaries from medieval Europe travelled widely and left numerous travel accounts, of which Marco Polo's description of his travels and sojourn in China is the best known. As they became familiar with the larger world of the eastern hemisphere – and the profitable commercial opportunities that it offered – European peoples worked to find new and more direct routes to Asian and African markets. Their efforts took them not only to all parts of the eastern hemisphere, but eventually to the Americas and Oceania as well.

If Muslim and Chinese peoples dominated travel and travel writing in post-classical times, European explorers, conquerors, merchants, and missionaries took centre stage during the early modern era (about 1500 to 1800 CE). By no means did Muslim and Chinese travel come to a halt in early modern times. But European peoples ventured to the distant corners of the globe, and European printing presses churned out thousands of travel accounts that described foreign lands and peoples for a reading public with an apparently insatiable appetite for news about the larger world. The volume of travel literature was so great that several editors, including Giambattista Ramusio, Richard Hakluyt, Theodore de Bry, and Samuel Purchas, assembled numerous travel accounts and made them available in enormous published collections.

During the 19th century, European travellers made their way to the interior regions of Africa and the Americas, generating a fresh round of travel writing as they did so. Meanwhile, European colonial administrators devoted numerous writings to the societies of their colonial subjects, particularly in Asian and African colonies they established. By mid-century, attention was flowing also in the other direction. Painfully aware of the military and technological prowess of European and Euro-American societies, Asian travellers in particular visited Europe and the United States in hopes of discovering principles useful for the organisation of their own societies. Among the most prominent of these travellers who made extensive use of their overseas observations and experiences in their own writings were the Japanese reformer Fukuzawa Yukichi and the Chinese revolutionary Sun Yat-sen.

With the development of inexpensive and reliable means of mass transport, the 20th century witnessed explosions both in the frequency of long-distance travel and in the volume of travel writing. While a great deal of travel took place for reasons of business, administration, diplomacy, pilgrimage, and missionary work, as in ages past, increasingly effective modes of mass transport made it possible for new kinds of travel to flourish. The most distinctive of them was mass tourism, which emerged as a major form of consumption for individuals living in the world's wealthy societies. Tourism enabled consumers to get away from home to see the sights in Rome, take a cruise through the Caribbean, walk the Great Wall of China, visit some wineries in Bordeaux, or go on safari in Kenya. A peculiar variant of the travel account arose to meet the needs of these tourists: the guidebook, which offered advice on food, lodging, shopping, local customs, and all the sights that visitors should not miss seeing. Tourism has had a massive economic impact throughout the world, but other new forms of travel have also had considerable influence in contemporary times.

Questions 27-28

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

Write your answers in boxes 27-28 on your answer sheet.

27 What were most people travelling for in the early days?

A Studying their own cultures
B Business
C Knowing other people and places better
D Writing travel books

28 Why did the author say writing travel books is also "a mirror" for travellers themselves?

A Because travellers record their own experiences.
B Because travellers reflect upon their own society and life.
C Because it increases knowledge of foreign cultures.
D Because it is related to the development of human society.

Questions 29-36

Complete the table on the next page.

Choose NO MORE THAN TWO WORDS from Reading Passage 3 for each answer.

Write your answers in boxes 29-36 on your answer sheet.

TIME	TRAVELLER	DESTINATION	PURPOSE OF TRAVEL
Classical Greece	Herodotus	Egypt and Anatolia	To gather information for the study of **29** _____
Han Dynasty	Zhang Qian	Central Asia	To seek **30** _____
Roman Empire	Ptolemy, Strabo, Pliny the Elder	The Mediterranean	To acquire **31** _____
Post-classical era (about 500 to 1500 CE)	Muslims	From East Africa to Indonesia, Mecca	For trading and **32** _____
5th to 9th centuries CE	Chinese Buddhists	**33** _____	To collect Buddhist texts and for spiritual enlightenment
Early modern era (about 1500 to 1800 CE)	European explorers	The New World	To satisfy public curiosity for the New World
During 19th century	Colonial administrators	Asia, Africa	To provide information for the **34** _____ they set up
By mid-century of the 1800s	Sun Yat-sen, Fukuzawa Yukichi	Europe and the United States	To study the **35** _____ of their societies
20th century	People from **36** _____ countries	Mass tourism	For entertainment and pleasure

Questions 37-40

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

Write your answers in boxes 37-40 on your answer sheet.

37 Why were the imperial rulers especially interested in these travel stories?

A Reading travel stories was a popular pastime.
B The accounts are often truthful rather than fictional.
C Travel books played an important role in literature.
D They desired knowledge of their empire.

38 Who were the largest group to record their spiritual trips during the post-classical era?

A Muslim traders
B Muslim pilgrims
C Chinese Buddhists
D Indian Buddhist teachers

39 During the early modern era, a large number of travel books were published to

A meet the public's interest.
B explore new business opportunities.
C encourage trips to the new world.
D record the larger world.

40 What's the main theme of the passage?

A The production of travel books
B The literary status of travel books
C The historical significance of travel books
D The development of travel books

Answer Key

Test 1

Each question correctly answered scores 1 mark. CORRECT SPELLING IS NEEDED IN ALL ANSWERS.

Reading Passage 1

1 v
2 i
3 vi
4 x
5 ix
6 iv
7 ii
8 True
9 True
10 Not Given
11-13 **in any order**
C
D
E

Reading Passage 2

14 Yes
15 Yes
16 No
17 Not Given
18 Yes
19 Not Given
20 1976, 1995
21 2000 floods / flooding
22 1998 and 2002
23 1990
24 1856
25 France
26 D

Reading Passage 3

27 B
28 C
29 H
30 G
31 E
32 D
33 A
34 bee-keeping
35 life cycles
36 droughts
37 C
38 D
39 A
40 D

If you score...

0-12	13-26	27-40
you are highly unlikely to get an acceptable score under examination conditions and we recommend that you spend a lot of time improving your English before you take IELTS.	you may get an acceptable score under examination conditions but we recommend that you think about having more practice or lessons before you take IELTS.	you are likely to get an acceptable score under examination conditions but remember that different institutions will find different scores acceptable.

Test 2

Each question correctly answered scores 1 mark. CORRECT SPELLING IS NEEDED IN ALL ANSWERS.

Reading Passage 1

1 Yes
2 Yes
3 Not Given
4 No
5 Yes
6 C
7 D
8 B
9 D
10 A
11 B
12 C
13 A

Reading Passage 2

14 C
15 A
16 B
17 F
18 D
19 B
20 F

21 D
22 A
23 Yes
24 No
25 Not Given
26 Not Given

Reading Passage 3

27 vi
28 xi
29 xiii
30 vii
31 iv
32 v
33 viii
34 skeletal anatomy
35 eosuchians
36 two long bones
37 B
38 G
39 H
40 F

If you score...

0-12	13-26	27-40
you are highly unlikely to get an acceptable score under examination conditions and we recommend that you spend a lot of time improving your English before you take IELTS.	you may get an acceptable score under examination conditions but we recommend that you think about having more practice or lessons before you take IELTS.	you are likely to get an acceptable score under examination conditions but remember that different institutions will find different scores acceptable.

Test 3

Each question correctly answered scores 1 mark. CORRECT SPELLING IS NEEDED IN ALL ANSWERS.

Reading Passage 1

1 D
2 A
3 C
4 E
5 False
6 True
7 True
8 False
9 less
10 social
11 watched
12 observer
13 Nutcracker

Reading Passage 2

14 B
15 A
16 D
17 A
18 B
19 D
20 A
21 B
22 C
23 heat
24 denser
25 Great Ocean Conveyor
26 fresh water

Reading Passage 3

27 D
28 A
29 C
30 B
31 E
32 I
33-34 **in any order**
Fruit
Fibre
35 uxi
36 unpredictable
37 piquia
38 subsistence
39 commercial potential
40 NTFPs / non-timber forest products

If you score...

0-12	13-26	27-40
you are highly unlikely to get an acceptable score under examination conditions and we recommend that you spend a lot of time improving your English before you take IELTS.	you may get an acceptable score under examination conditions but we recommend that you think about having more practice or lessons before you take IELTS.	you are likely to get an acceptable score under examination conditions but remember that different institutions will find different scores acceptable.

Test 4

Each question correctly answered scores 1 mark. CORRECT SPELLING IS NEEDED IN ALL ANSWERS.

Reading Passage 1

1 D
2 G
3 B
4 A
5 F
6 short
7 complex
8 rats
9 True
10 False
11 False
12 Not Given
13 True

Reading Passage 2

14 C
15 F
16 A
17 D
18 E
19 True
20 False
21 False
22 True
23 True
24 False
25 True
26 False

Reading Passage 3

27 iii
28 vii
29 iv
30 i
31 viii
32 F
33 B
34 E
35 D
36 G
37 A
38 C
39 C
40 C

If you score...

0-12	13-26	27-40
you are highly unlikely to get an acceptable score under examination conditions and we recommend that you spend a lot of time improving your English before you take IELTS.	you may get an acceptable score under examination conditions but we recommend that you think about having more practice or lessons before you take IELTS.	you are likely to get an acceptable score under examination conditions but remember that different institutions will find different scores acceptable.

Test 5

Each question correctly answered scores 1 mark. CORRECT SPELLING IS NEEDED IN ALL ANSWERS.

Reading Passage 1

1 E
2 D
3 B
4 A
5 D
6 C
7 B
8 A
9 B
10 B
11 D
12 soil erosion
13 paper

Reading Passage 2

14 stories
15 America
16 folklore
17 fairy tales / fairy stories
18 adventures
19 C
20 A

21 E
22 False
23 True
24 Not Given
25 True
26 True

Reading Passage 3

27 B
28 A
29 B
30 A
31 C
32 B
33 20
34 foam
35 waste water
36 harmful
37 biodegrade
38 droplets
39 lamination, packing
40 grape growers

If you score...

0-12	13-26	27-40
you are highly unlikely to get an acceptable score under examination conditions and we recommend that you spend a lot of time improving your English before you take IELTS.	you may get an acceptable score under examination conditions but we recommend that you think about having more practice or lessons before you take IELTS.	you are likely to get an acceptable score under examination conditions but remember that different institutions will find different scores acceptable.

Test 6

Each question correctly answered scores 1 mark. CORRECT SPELLING IS NEEDED IN ALL ANSWERS.

Reading Passage 1

1 F
2 E
3 C
4 B
5 G
6 D
7 A
8 C
9 A
10 D
11 B
12 B
13 D

Reading Passage 2

14 Not Given
15 False
16 True
17 Not Given
18 gauze
19 nozzle
20 powder
21 Rubber ball
22 C
23 A
24 D
25 F
26 B

Reading Passage 3

27 iii
28 vii
29 i
30 iv
31 ix
32 viii
33 v
34 ii
35 False
36 True
37 Not Given
38 True
39 True
40 B

If you score...

0-12	13-26	27-40
you are highly unlikely to get an acceptable score under examination conditions and we recommend that you spend a lot of time improving your English before you take IELTS.	you may get an acceptable score under examination conditions but we recommend that you think about having more practice or lessons before you take IELTS.	you are likely to get an acceptable score under examination conditions but remember that different institutions will find different scores acceptable.

Test 7

Each question correctly answered scores 1 mark. CORRECT SPELLING IS NEEDED IN ALL ANSWERS.

Reading Passage 1

1 v
2 ii
3 viii
4 i
5 x
6 vi
7 New Zealand carrageen
8 agar
9 seameal
10 cough mixture
11 A
12 C
13 B

Reading Passage 2

14 7 / seven
15 lung function
16 immune system
17 heart patients
18 C
19 A
20 E

21 G
22 D
23 Not Given
24 Not Given
25 No
26 Yes

Reading Passage 3

27 C
28 G
29 A
30 E
31 B
32 F
33 H
34 D
35 False
36 True
37 False
38 True
39 missionaries and traders
40 demographic triumph

If you score...

0-12	13-26	27-40
you are highly unlikely to get an acceptable score under examination conditions and we recommend that you spend a lot of time improving your English before you take IELTS.	you may get an acceptable score under examination conditions but we recommend that you think about having more practice or lessons before you take IELTS.	you are likely to get an acceptable score under examination conditions but remember that different institutions will find different scores acceptable.

Test 8

Each question correctly answered scores 1 mark. CORRECT SPELLING IS NEEDED IN ALL ANSWERS.

Reading Passage 1

1 ten thousand
2 South-East Asia
3 hard seeds
4 F
5 A
6 D
7 C
8 E
9 B
10 C
11 Not Given
12 False
13 True

Reading Passage 2

14 B
15 C
16 D
17 True
18 False
19 True
20 False

21 Not Given
22 True
23 True
24-26 **in any order**
B
D
F

Reading Passage 3

27 C
28 B
29 Persian wars
30 allies
31 geographical knowledge
32 pilgrimage
33 India
34 colonies
35 organisation
36 wealthy
37 D
38 B
39 A
40 D

If you score...

0-12	13-26	27-40
you are highly unlikely to get an acceptable score under examination conditions and we recommend that you spend a lot of time improving your English before you take IELTS.	you may get an acceptable score under examination conditions but we recommend that you think about having more practice or lessons before you take IELTS.	you are likely to get an acceptable score under examination conditions but remember that different institutions will find different scores acceptable.