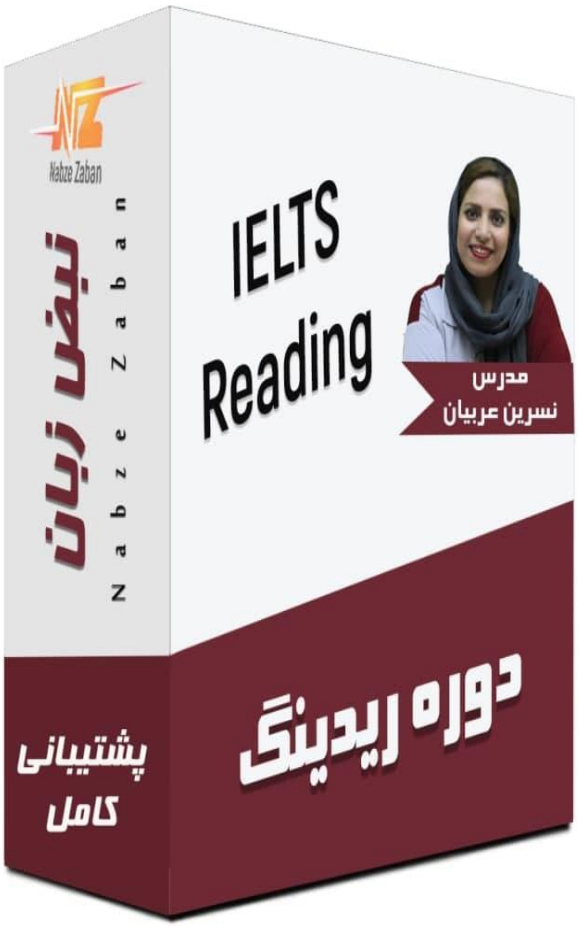
IELTS READING TESTS



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Session 1 Questions

Matching Heading Question

Test 1

Choose the correct heading for A-G from the list of headings below.

Write the correct number, h-x, in boxes 14-20 on your answer sheet.

List of Headings

- **i.** A comparison between similar buildings
- **ii.** The negative reaction of local residents
- **iii.** An unusual job for a psychologist
- **iv.** A type of building benefiting from prescribed guidelines
- **v.** The need for government action
- **vi.** A failure to use available information in practical ways
- **vii.** Academics with an unhelpful attitude
- **viii.** A refusal by architects to accept criticism
- **ix.** A unique co-operative scheme
- **x.** The expanding scope of environmental psychology

14. Paragraph A

15. Paragraph B

16. Paragraph C

17. Paragraph D

18. Paragraph E

19. Paragraph F

20. Paragraph G

Is there a psychologist in the building?

— CHRISTIAN JARRETT reports on psychology's place in new architectural development. —

A. The space around us affects us profoundly – rebuilding of one south London school as a striking emotionally, behaviorally, cognitively. In Britain, that example of how building design can affect human space is changing at a pace not seen for a generation. But is anyone listening? 'This is a hugely recognised country's psychology research that is not only relevant but improved schools. At the moment we're talking to ourselves,' says Chris Spencer, professor of environmental psychology at the University of Sheffield. Spencer recalls a recent talk he gave in which he called on fellow researchers to make a greater effort to communicate their findings to architects and planners. 'I was amazed at the response of many of the senior researchers, who would say: "I'm doing my research for pure science, the industry can take it or leave it". But there are models of how to apply environmental psychology to real problems if you know where to look Professor Frances Kuo is an example.

B. Kuo's website provides pictures and plain English " The collaborative project currently summaries of the research conducted by her Human stands as a one-off experiment. " Among these is trainee architects will now go away with some a study using police records that found inner-city surrounded by more vegetation suffered 52 per cent fewer crimes than apartment blocks with little or no greenery. Frances Kuo and her co-researcher William Sullivan believe that greenery reduces crime – so long as visibility is preserved – because it reduces aggression, brings local residents together outdoors, and the conspicuous presence of people deters criminals.

C. 'Environmental psychologists are increasingly in demand,' says David Uzzell, professor of environmental psychology. 'We're asked to contribute to the planning, design and management of many different environments, ranging from neighbourhoods, offices, schools, health, transport, traffic and leisure environments for the purpose of improving quality of life and creating a better people-environment fit.' Uzzell points to the rebuilding of one south London school as a striking example of how building design can affect human behaviour positively. Before its redesign, it was ranked as the worst school in the area – now it is recognised as one of the country's twenty most improved schools.

D. Uzzell has been involved in a pioneering project between M.Sc students in England and Scotland. Architecture students in Scotland acted as designers while environmental psychology students in England acted as consultants, as together they worked on a community project in a run-down area of Glasgow. The psychology students encouraged the architecture students to think about who their client group was, to consider issues of crowding and social cohesion, and they introduced them to psychological methodologies, for example, observation and interviewing local residents about their needs.' The collaborative project currently stands as a one-off experiment. 'Hopefully, these trainee architects will now go away with some understanding of the psychological issues involved in the design and will take into account people's needs,' says Uzzell.

E. Hilary Barker, a recent graduate in psychology, now works for a design consultancy. She's part of a four-person research team that contributes to the overall work of the company in helping clients use their office space more productively. Her team all have backgrounds in psychology or social science, but the rest of the firm consists mainly of architects and interior designers. 'What I do is pretty rare, to be honest,' Barker says. 'I feel very privileged to be able to use my degree in such a way.' Barker explains that the team carries out observational studies on behalf of companies, to identify exactly how occupants are using their building. The companies are often surprised by the findings, for example, that staff use meeting rooms for quiet, individual work.

F. One area where the findings from the environment- behaviour research have certainly influenced building is in hospital design. The government has a checklist of criteria that must be met in the design of new hospitals, and these are derived largely from the work of the behavioural scientist Professor Roger Ulrich,' Chris Spencer says. Ulrich's work has shown, for example, how the view from a patient's window can affect their recovery. Even a hospital's layout can impact on people's health, according to Dr John Zeisel. 'If people get lost in hospitals, they get stressed, which lowers their immune system and means their medication works less well. You might think that way-finding around the hospital is the responsibility of the person who puts all the signs up, but the truth is that the basic layout of a building is what helps people find their way around,' he says.

G. Zeisel also points to the need for a better balance between private and shared rooms in hospitals. 'Falls are reduced and fewer medication errors occur' in private rooms, he says. There's also research showing how important it is that patients have access to the outdoors

and that gardens in hospitals are a major contributor to well-being. However, more generally, Zeisel shares Chris Spencer's concerns that the lessons from environmental psychology research are not getting through. 'There is certainly a gap between what we in social science knowledge and the world of designers and architects,' says Zeisel. He believes that most industries, from sports to film- making, have now recognised the importance of an evidence-based approach and that the building trade needs to formulate itself more in that vein and to recognise that there is relevant research out there. 'It would be outrageous, silly, to go ahead with huge building projects without learning the lessons from the new towns established between 30 and 40 years ago,' he warns.

Test 2

Reading Passage 2 has five paragraphs A-E.

Choose the correct heading for each paragraph, A-E from the list of headings below.

Write the correct number, i-viii in boxes 14-18 on your answer sheet.

List of Headings

i. A lack of consistent policy

ii. Learning from experience

iii. The greatest advantage

iv. The role of research

v. A unique material

vi. An irrational anxiety

vii. Avoiding the real challenges

viii. A sign of things to come

1. Paragraph A
2. Paragraph B
3. Paragraph C
4. Paragraph D
5. Paragraph E

Is it time to halt the rising tide of plastic packaging?

A. Close up, plastic packaging can be a marvellous thing. Those who make a living from it call it a forgotten infrastructure that allows modem urban life to exist. Plastics have helped society defy natural limits such as the seasons, the rotting of food and the distance most of us live from where our food is produced. And yet we do not like it. Partly we do not like waste, but plastic waste, with its hydrocarbon roots and industrial manufacture, is especially galling. In 2008, the UK, for example, produced around two million tonnes of plastic waste, twice as much as in tire the early 1990s. The very qualities of plastic – its cheapness, its indestructible aura – make it a reproachful symbol of an unsustainable way of life.

B. The facts, however, do not justify our unease. All plastics are, at least theoretically, recyclable. Plastic packaging makes up just 6 to 7 per cent of the contents of British dustbins by weight and less than 3 per cent of landfills. Supermarkets and brands, which are under pressure to reduce the quantity of packaging of all types that they use, are finding good environmental reasons to turn to plastic: it is lighter, so requires less energy for transportation than glass, for example; it requires relatively little energy to produce, and it is often re-usable. An Austrian study found that if plastic packaging were removed from the tire supply chain, another packaging would have to increase fourfold to make up for it. So are we just wrong about plastic packaging?

C. Is it time to stop worrying and learn to love the disposable plastic wrapping around sandwiches? Certainly, there are bigger targets for environmental savings such as improving household insulation and energy emissions. Naturally, the tire plastics industry is keen to point them out. What's more, concern over plastic packaging has produced a squall of conflicting initiatives from retailers, manufacturers, and local authorities. It's a squall that dies down and then blows harder from one month to the next. 'It is being left to the individual conscience and supermarkets playing the market,' says Tim Lang, a professor specializing in food polio'. 'It's a mess.'

D. Dick Scarle of the Packaging Federation points out that societies without sophisticated packaging lose hall their food before it reaches consumers and that in the UK, waste in supply chains is about 3 per cent. In India, it is more titan 50 per cent. The difference comes

later: the British throw out 30 per cent of the food they buy – an environmental cost in terms of emissions equivalent to a fifth of the cars on their roads. Packagers agree that cardboard, metals, and glass all have their good points, but there's nothing quite like plastic. With more than 20 families of polymers to choose from and then sometimes blend, packaging designers and manufacturers have a limitless variety of qualities to play with.

E. But if there is one law of plastic that, in environmental terms at least, prevails over all others, it is this: a little goes a long way. This means, first, that plastic is relatively cheap to use – it represents just over one-third of the UK packaging market by value but it wraps more than half the total number of items bought. Second, it means that even though plastic encases about 53 per cent of products bought, it only makes up 20 per cent by weight of the packaging consumed. And in the packaging equation, weight is the main issue because the heavier something is, the more energy you expend moving it around. Because of this, righteous indignation against plastic can look foolish.

F. One store commissioned a study to find precise data on which had a less environmental impact: selling apples lose or ready-wrapped. Helene Roberts, head of packaging, explains that in fact, they found apples in fours on a tray covered by plastic film needed 27 per cent less packaging in transportation than those sold loose. Sieve Kelsey, a packaging designer, finds die debate frustrating. He argues that the hunger to do something quickly is diverting effort away from more complicated questions about how you truly alter supply chains. Rather than further reducing the weight of a plastic bottle, more thought should be given to how packaging can be recycled. Helene Roberts explains that their greatest packaging reduction came when the company switched to reusable plastic crates and stopped consuming 62,000 tonnes of cardboard boxes every year.

G. Plastic packaging is important, and it might provide a way of thinking about broader questions of sustainability. To target plastic on its own is to evade the complexity' of the issues. There seems to be a universal eagerness to condemn plastic. Is this due to an inability to make the general changes in society that are really required? 'Plastic as a lightweight food wrapper is now built-in as the logical thing,' Lang says. 'Does that make it an environmentally sound system of packaging? It only makes sense if you have a structure such as exists now. An environmentally-driven packaging system would look completely different' Dick Scarle put the challenge another way. "The amount of packaging used today is a reflection of modern life."

Test 3

Questions 14-19

Reading Passage 2 has six paragraphs, **A-F.**

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

Write the correct number, i-viii, in boxes 14-19 on your answer sheet.

List of Headings
A contrast between two historic approaches to documentary film making
ii Disagreement between two individual documentary makers
iii A wide range of opportunities to promote documentary films
iv A number of criticisms about all documentary film making in the past
v One film that represented a fresh approach to documentary filmmaking
vi Some probable future trends in documentary film making
vii The debate about the origins of documentary film making
viii The ability of ordinary people to create documentary films for the first time

14. Paragraph A

15. Paragraph B

16. Paragraph C

17. Paragraph D

18. Paragraph E

19. Paragraph F

Making documentary films

A

For much of the 20th century, documentary films were overshadowed by their more successful Hollywood counterparts. For a number of reasons, documentaries were frequently ignored by critics and film studies courses at universities. Firstly, the very idea of a documentary film made some people suspicious. As the critic Dr Helmut Fischer put it, 'documentary might have ambitions to tell the "truth" and show only "facts" but there is no such thing as a non-fiction film. That's because, as soon as you record an incident on camera, you are altering it's reality in a fundamental way.' Secondly, even supporters of documentaries could not agree on a precise definition, which did little to improve the reputation of the genre. Lastly there were also concerns about the ethics of filming subjects without their consent, which is a necessity in many documentary films.

B

None of this prevented documentaries from being produced, though exactly when the process started is open to question. It is often claimed that *Nanook of the North* was the first documentary. Made by the American filmmaker Robert J. Flaherty in 1922, the film depicts the hard, sometimes heroic lives of Native American peoples in the Canadian Arctic. *Nanook of the north* is said to have set off a trend that continued through the 1920s with the films of Dziga Vertov in the Soviet Union and works by other filmmakers around the world. However, that 1922 starting point has been disputed by supports of an earlier date. Among this group is film historian Anthony Berwick, who argues that the genre can be traced back as early as 1895, when similar films started to appear, including newsreels, scientific films and accounts of journeys of exploration.

C

In the years following 1922, one particular style of documentary started to appear. These films adopted a serious tone while depicting the lives of actual people. Cameras were mounted and tripods and subjects rehearsed and repeated activities for the purposes of the film. British filmmaker John Grierson was an important member of this group. Grierson's career lasted nearly 40 years, beginning with *Drifters* (1929) and culminating with *I remember I remember* (1968). However, by the 1960s Grierson's style of film was being rejected by the Direct Cinema movement, which wanted to produce more natural and authentic films: cameras were hand-held; no additional lighting or sound was used; and the

subjects did not rehearse. According to film writer Paula Murphy, the principles and methods of Direct Cinema brought documentaries to the attention of universities and film historians as never before. Documentaries started to be recognised as a distinct genre worthy of serious scholarly analysis.

D

Starting in the 1980s, the widespread availability of first video and then digital cameras transformed filmmaking. The flexibility and low cost of these devices meant that anyone could now be a filmmaker. Amateurs working from home could compete with professionals in ways never possible before. The appearance of online film-sharing platforms in the early 2000s only increased the new possibilities for amateur filmmakers. Nonetheless, while countless amateur documentaries were being made, perhaps the most popular documentary of 2006 was still the professionally made *An inconvenient truth.* New cameras and digital platforms revolutionized the making of films. but as critic Maria Fiala has pointed out,' The argument sometimes put forward that these innovations immediately transformed what the public expected to see in a documentary isn't entirely accurate.'

E

However, a new generation of documentary filmmakers then emerged, and with them came a new philosophy of the genre. These filmmakers moved away from highlighting political themes or urgent social issues. Instead the focus moved inwards, exploring personal lives, relationships and emotions. It could be argued that *Catfish* (2010) was a perfect example of this new trend. The film Chronicles the everyday lives and interactions of the social media generation and was both a commercial and critical success. Filmmaker Josh Camberwell maintains that *Catfish* embodies a new realisation that documentaries are inherently subjective and that this should be celebrated. Says Camberwell, 'it is a requirement for documentary makers to express a particular viewpoint and give personal responses to the material they are recording.'

F

The popularity and variety of documentaries today is illustrated by the large number of film festivals focusing on the genre around the world. The biggest of all must be the Hot Docs Festival in Canada, which over the years has showcased hundreds of documentaries from more than 50 different countries. Even the older is the Hamburg international Short Film Festival. As its name suggests, Hamburg specialises in short films, but one category takes this

to its limits- entries may not exceed 3 minutes in duration. The Short and Sweet Festival is a slightly smaller event held in Utah, USA. The small size of the festival means that for first-timers this is the deal venue to try to get some recognition for their films. Then there is the Atlanta Shorts fest, which is a great event for a wide variety of filmmakers. Atlanta welcomes all established types of documentaries and recognises the growing popularity of animations, with a category specifically for films of this type. These are just a few of the scores of film festivals on offer, and there are more being established every year. All in all, it has never been easier for documentary makers to get their films in front of an audience.

Test 4

Questions 14-19

Reading Passage 2 has six paragraphs, A-F.

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

Write the correct number, i-viii, in boxes 14-19 on your answer sheet.

List of Headings
i Al can improve the profitability of sporting businesses
ii Responses to criticisms of Al in sports coaching
iii A contrast between coaching today and in the past
iv An academic outlines some of the advantages of Al in sport
v The businesses responsible for creating Al software
vi The use of Al to decide the results of a competition
vii An academic study into a team sport in one country
viii The uses of Al in coaching a range of different sp

14. Paragraph A

15. Paragraph B

16. Paragraph C

17. Paragraph D

18. Paragraph E

19. Paragraph F

Artificial Intelligence in Sport

A

The first sports game was televised in the USA more than fifty years ago. Over the following decades television provided sports coaches with a wealth of information to analyse. By viewing recordings, they could study the number of passes received, tackles avoided, distances covered, speeds achieved and a host of other factors relating to the performance of their teams or athletes. Most of this data, though, consisted of bare statistics without any meaningful context. However, the use of artificial intelligence (Al) is now enabling an alternative approach to coaching. Al means the development of computer systems that can perform tasks usually associated with human intelligence, such as decision making. Increasingly, computers are being trained to understand the rules and objectives of sports so they can coach more directly. Al can analyse not only a player's actions, but also relate those actions to the wider context, including the directives of the coach and the actions of other players. Sports scientists believe that Al is revolutionising sports coaching by analysing patterns of behaviour in ways simply not possible before.

B

There may be limitless ways in which Al technology can be developed, but certain practical applications are already apparent. Recently, a research experiment was conducted into the Spanish football league using an Al algorithm to analyse the passing strategies of 20 teams. The research revealed that two teams, Barcelona and Real Madrid, had more than 150 recurring passing patterns. However, the algorithm detected just 31 passing patterns used by Atletico Madrid. All of Atletico's other plays were one-offs that were never repeated, and the team won the league that season. One conclusion seems to be that teams with a less predictable style of play win more games. What's more, according to Dr Johann Muller, a sports scientist who has studied the Spanish research findings, the number of injuries a team suffers increases when they play in a style that prioritises

C

Since then, there has been a great deal of interest in the potential of Al. Professor of sports education Rebecca Graves believes that Al can provide coaches with invaluable insights. 'Tactics were once closely guarded secrets,' says Professor Graves, 'but now a coach with

access to Al can identify how a rival team is likely to play a match based on historic form. Once this was largely guesswork but now it can be achieved with some confidence.' The expense of Al technology means it will probably remain beyond the reach of all but elite teams, but among this group the implications are enormous. Professor Graves argues that Al allows preparations for a match to be tailored to individual players with much greater precision. She identifies fitness work, skills development, diet and numerous other factors that can be minutely customised, based on an individual's particular strengths and weaknesses.

D

Part of the appeal of Al lies in its versatility. Ice hockey coaches in Finland are using Al to analyse the success of different plays. An Indian company has employed wearable technology developed in other fields to analyse stride patterns. This analysis has allowed its technicians to develop sneakers in various styles aimed at both long- and short distance runners. Coaching practices in professional basketball, American football and tennis are also being transformed by Al. In addition, the technology has applications in highly technical sports such as car racing. Coaches involved in the National Association for Stock Car Auto Racing (NASCAR) believe that Al algorithms not only help drivers go faster but also enhance the safety of the sport because of their ability to monitor and predict potential problems.

E

Al doesn't get tired, has extraordinary powers of vision, particularly for objects moving at speed, and is capable of making complex calculations very quickly. For all these reasons Al is increasingly being used in the high-pressure world of judging gymnastics performances. Research has shown that, particularly over a whole day's worth of events, computers are just as reliable as human judges when it comes to giving gymnasts a score. However, computer scientist Henri Simeonson has been quick to warn about some potential difficulties. In particular, Simeonson is concerned that Al is vulnerable to hackers, who might be able to influence the outcome of a tournament.

F

It should not be forgotten, either, that many sports stars and sports teams are commercially dependent on their fans. If sufficient supporters do not buy tickets to games or pay to view a

recording, the teams might struggle to survive. But now teams and stars are making increasing use of chatbots and other 'virtual assistants' to provide fans with statistics, news and background information about their favourite players. Another innovation is seen in Minor League Baseball in the USA, which is promoting the sport and seeking new fans with the use of Al-enhanced journalism. In this way baseball is keeping supporters informed with all the up-tothe- minute developments in ways not possible with more traditional approaches. Analysts believe these sorts of initiatives are crucial to increasing a player or team's revenue stream. It's just one more way that sports stand to benefit from Al technologies, on and off the field.

Session 2 Questions

Multiple Choice Questions

Test 1

Have teenagers always existed?

A. Our ancestor, Homo erectus, may not have had culture or even language, but did they have teenagers? That question has been contested in the past few years, with some anthropologists claiming evidence of an adolescent phase in human fossil. This is not merely an academic debate. Humans today are the only animals on Earth to have a teenage phase, yet we have very little idea why. Establishing exactly when adolescence first evolved and finding out what sorts of changes in our bodies and lifestyles it was associated with could help us understand its purpose. Why do we, uniquely, have a growth spurt so late in life?

B. Until recently, the dominant explanation was that physical growth is delayed by our need to grow large brains and to learn all the behaviour patterns associated with humanity – speaking, social interaction and so on. While such behaviour is still developing, humans cannot easily fend for themselves, so it is best to stay small and look youthful. That way your parents and other members of the social group are motivated to continue looking after you. What's more, studies of mammals show a strong relationship between brain size and the rate of development, with larger-brained animals taking longer to reach adulthood. Humans are at the far end of this spectrum. If this theory is correct, and the development of large brains accounts for the teenage growth spurt, the origin of adolescence should have been with the evolution of our own species (Homo sapiens) and Neanderthals, starting almost 200,000 years ago. The trouble is, some of the fossil evidence seems to tell a different story.

C. The human fossil record is extremely sparse, and the number of fossilised children minuscule. Nevertheless, in the past few years, anthropologists have begun to look at what can be learned of the lives of our ancestors from these youngsters. One of the most studied is the famous Turkana boy, an almost complete skeleton of Homo erectus from 1.6 million years ago found in Kenya in 1984. Accurately assessing how old someone is from their skeleton is a tricky business. Even with a modern human, you can only make a rough estimate based on the developmental stage of teeth and bones and the skeleton's general size.

D. You need as many developmental markers as possible to get an estimate of age. The Turkana boy's teeth made him 10 or 11 years old. The features of his skeleton put him at 13, but he was as tall as a modern 15-year-old. Susan Anton of New York University points to research by Margaret Clegg who studied a collection of 18th- and 19th-century skeletons whose ages at death were known. When she tried to age the skeletons without checking the records, she found similar discrepancies to those of the Turkana boy. One 10-year-old boy, for example, had a dental age of 9, the skeleton of a 6-year-old but was tall enough to be 11. The Turkana kid still has a rounded skull, and needs more growth to reach the adult shape,' Anton adds. She thinks that Homo erectus had already developed modern human patterns of growth, with a late, if not quite so extreme, adolescent spurt. She believes Turkana boy was just about to enter it.

E. If Anton is right, that theory contradicts the orthodox idea linking late growth with the development of a large brain. Anthropologist Steven Leigh from the University of Illinois goes further. He believes the idea of adolescence as catch-up growth does not explain why the growth rate increases so dramatically. He says that many apes have growth spurts in particular body regions that are associated with reaching maturity, and this makes sense because by timing the short but crucial spells of maturation to coincide with the seasons when food is plentiful, they minimise the risk of being without adequate food supplies while growing. What makes humans unique is that the whole skeleton is involved. For Leigh, this is the key.

F. According to his theory, adolescence evolved as an integral part of efficient upright locomotion, as well as to accommodate more complex brains. Fossil evidence suggests that our ancestors first walked on two legs six million years ago. If proficient walking was important for survival, perhaps the teenage growth spurt has very ancient origins. While many anthropologists will consider Leigh's theory a step too far, he is not the only one with new ideas about the evolution of teenagers.

G. Another approach, which has produced a surprising result, relies on the minute analysis of tooth growth. Every nine days or so the growing teeth of both apes and humans acquire ridges on their enamel surface. These are like rings in a tree trunk: the number of them tells you how long the crown of a tooth took to form. Across mammals, the rate at which teeth develop is closely related to how fast the brain grows and the age you mature. Teeth are good indicators of life history because their growth is less related to the environment and nutrition than is the growth of the skeleton.

H. A more decisive piece of evidence came last year when researchers in France and Spain published their findings from a study of Neanderthal teeth. Neanderthals had much-festered tooth growth than Homo erectus who went before them, and hence, possibly, a shorter childhood. Lead researcher Fernando Ramirez-Rozzi thinks Neanderthals died young – about 25 years old — primarily because of the cold, harsh environment they had to endure in glacial Europe. They evolved to grow up quicker than their immediate ancestors. Neanderthals and Homo erectus probably had to reach adulthood fairly quickly, without delaying for an adolescent growth spurt. So it still looks as though we are the original teenagers.

Questions 27-30:

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

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

27. In the first paragraph, why does the writer say 'This is not merely an academic debate'?

A. Anthropologists' theories need to be backed up by practical research.

B. There have been some important misunderstandings among anthropologists.

C. The attitudes of anthropologists towards adolescence are changing.

D. The work of anthropologists could inform our understanding of modem adolescence.

28. What was Susan Anton's opinion of the Turkana boy?

A. He would have experienced an adolescent phase had he lived.

B. His skull showed he had already reached adulthood.

C. His skeleton and teeth could not be compared to those from a more modern age.

D. He must have grown much faster than others alive at the time.

29. What point does Steven Leigh make?

A. Different parts of the human skeleton develop at different speeds.

B. The growth period of many apes is confined to times when there is enough food.

C. Humans have different rates of development from each other depending on living conditions.

D. The growth phase in most apes lasts longer if more food is available.

30. What can we learn from a mammal's teeth?

A. A poor diet will cause them to grow more slowly.

B. They are a better indication of a lifestyle than a skeleton.

C. Their growing period is difficult to predict accurately.

D. Their speed of growth is directly related to the body's speed of development.

Test 2

Is there more to video games than people realize?

A. Many people who spend a lot of time playing video games insist that they have helped them in areas like confidence-building, presentation skills and debating. Yet this way of thinking about video games can be found almost nowhere within the mainstream media, which still tend to treat games as an odd mix of the slightly menacing and the alien. This lack of awareness has become increasingly inappropriate, as video games and the culture that surrounds them have become very big business indeed.

B. Recently, the British government released the Byron report into the effects of electronic media on children. Its conclusions set out a clear, rational basis for exploring the regulation of video games. The ensuing debate, however, has descended into the same old squabbling between partisan factions: the preachers of mental and moral decline, and the innovative game designers. In between are the gamers, busily buying and playing while nonsense is talked over their heads.

C. Susan Greenfield, a renowned neuroscientist, outlines her concerns in a new book. Every individual's mind is the product of a brain that has been personalized by the sum total of their experiences; with an increasing quantity of our experiences from very early childhood taking place 'on-screen' rather than in the world, there is potentially a profound shift in the way children's minds work. She suggests that the fast-paced, second-hand experiences created by video games and the Internet may inculcate a worldview that is less empathetic, more risk-taking and less contemplative than what we tend to think of as healthy.

D. Greenfield's prose is full of mixed metaphors and self-contradictions and is perhaps the worst enemy of her attempts to persuade. This is unfortunate, because however many technophiles may snort, she is articulating widely held fears that have a basis in fact. Unlike even their immediate antecedents, the latest electronic media are at once domestic and work-related, their mobility blurring the boundaries between these spaces, and video games are at their forefront. A generational divide has opened that is in many ways more profound than the equivalent shifts associated with radio or television, more alienating for those unfamiliar with new' technologies, more absorbing for those who are. So how do our lawmakers regulate something that is too fluid to be fully comprehended or controlled?

E. Adam Martin, a lead programmer for an online games developer, says: 'Computer games teach and people don't even notice they're being taught.' But isn't the kind of learning that goes on in games rather narrow? 'A large part of the addictiveness of games does come from the fact that as you play you are mastering a set of challenges. But humanity's larger understanding of the world comes primarily through communication and experimentation, through answering the question "What if?' Games excel at teaching this too.'

F. Steven Johnson's thesis is not that electronic games constitute a great, popular art, but that the mean level of mass culture has been demanding steadily more intellectual engagement from consumers. Games, he points out, generate satisfaction via the complexity of their virtual worlds, not by their robotic predictability. Testing the nature and limits of the laws of such imaginary worlds has more in common with scientific methods than with a pointless addiction, while the complexity of the problems children encounter within games exceeds that of anything they might find at school.

G. Greenfield argues that there are ways of thinking that playing video games simply cannot teach. She has a point. We should never forget, for instance, the unique ability of books to engage and expand the human imagination, and to give us the means of more fully expressing our situations in the world. Intriguingly, the video games industry is now growing in ways that have more in common with an old-fashioned world of companionable pastimes than with a cyber future of lonely, isolated obsessives. Games in which friends and relations gather round a console to compete at activities are growing in popularity. The agenda is increasingly being set by the concerns of mainstream consumers – what they consider acceptable for their children, what they want to play at parties and across generations.

H. These trends embody a familiar but important truth: games are human products and lie within our control. This doesn't mean we yet control or understand them fully, but it should remind us that there is nothing inevitable or incomprehensible about them. No matter how deeply it may be felt, instinctive fear is an inappropriate response to a technology of any kind. So far, the dire predictions many traditionalists have made about the 'death' of old-fashioned narratives and imaginative thought at the hands of video games cannot be upheld. Television and cinema may be suffering, economically, at the hands of interactive media. But literacy standards have failed to decline. Young people still enjoy sport, going out and listening to music And most research – including a recent $1.5m study funded by the US government suggests that even pre-teens are not in the habit of blurring game worlds and real worlds.

F. The sheer pace and scale of the changes we face, however, leave little room for complacency. Richard Battle, a British writer and game researcher, says Times change: accept it; embrace it.' Just as, today, we have no living memories of a time before radio, we will soon live in a world in which no one living experienced growing up without computers. It is for this reason that we must try to examine what we stand to lose and gain before it is too late.

Questions 33-37

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

Write the correct letter A-D in boxes on your answer sheet.

33. According to the writer, what view about video games does Susan Greenfield put forward in tier new book?

A. They are exposing a child to an adult view of the world too soon.

B. Children become easily frightened by some of the situations in them.

C. They are changing the way children's view of the world develops.

D. Children don't learn from them because they are too repetitive.

34. According to the writer, what problems are faced when regulating video games?

A. The widespread and ever-changing use of games makes it difficult for lawmakers to control them.

B. The appeal of the games to a younger generation isn't really understood by many lawmakers.

C. The lawmakers try to apply the same rules to the games as they did to radio and television.

D. Many lawmakers feel it is too late for the regulations to have much effect on the use of games.

35. What main point does Adam Martin make about video games?

A. People are learning how to avoid becoming addicted to them.

B. They enable people to learn without being aware of it happening.

C. They satisfy a need for people to compete with each other.

D. People learn a narrow range of skills but they are still useful.

36. Which of the following does Steven Johnson disagree with?

A. the opinion that video games offer educational benefits to the user

B. the attitude that video games are often labelled as predictable and undemanding

C. the idea that children's logic is tested more by video games than at school

D. the suggestion that video games can be compared to scientific procedures

37. Which of the following is the most suitable subtitle for Reading Passage 3?

A. A debate about the effects of video games on other forms of technology.

B. An examination of the opinions of young people about video games.

C. A discussion of whether attitudes towards video games are outdated.

D. An analysis of the principles behind the historical development of video games.

Test 3

The Deep Sea

A. At a time when most think of outer space as the final frontier, we must remember that a great deal of unfinished business remains here on earth. Robots crawl on the surface of Mars, and spacecraft exit our solar system, but most of our planet has still never been seen by human eyes. It seems ironic that we know more about impact craters on the far side of the moon than about the longest and largest mountain range on earth. It is incredible that human beings crossed a quarter of a million miles of space to visit our nearest celestial neighbour before penetrating just two miles deep into the earth own waters to explore the Midocean Ridge. And it would be hard to imagine a more significant part of our planet to investigate – a chain of volcanic mountains 42,000 miles long where most of the earth's solid surface was born, and where vast volcanoes continue to create new submarine landscapes.

B. The figure we so often see quoted 71% of the earth's surface – understates the oceans' importance. If you consider three-dimensional volumes instead, the land dwellers' share of the planet shrinks even more toward insignificance: less than 1% of the total. Most of dying oceans' enormous volume, lies deep below the familiar surface. The upper sunlit layer, by one estimate, contains only 2 or 3% of the total space available to life. The other 97% of the earth's biosphere lies deep beneath the water's surface, where sunlight never penetrates. Until recently, it was impossible to study the deep ocean directly. By the sixteenth century, diving bells allowed people to stay underwater for a short time: they could swim to the hell to breathe air trapped underneath it rather than return to the surface. Later, other devices, including pressurized or armoured suits, heavy' metal helmets, and compressed air supplied through hoses from dying surface, allowed at least one diver to reach 500 feet or so. It was 1930 when a biologist named William Beebe and his engineering colleague Otis Barton sealed themselves into a new kind of diving craft, an invention that finally allowed humans to penetrate beyond the shallow sunlit layer of the sea and the history of deep-sea exploration began. Science then was largely incidental – something that happened along the way. In terms of technical ingenuity and human bravery, this part of the story is every bit as amazing as the history of early aviation. Yet many of these individuals, and the deep-diving vehicles that they built and tested, arc not well known.

C. It was not until the 1970s that deep-diving manned submersibles were able to reach the Midocean Ridge and begin making major contributions to a wide range of scientific questions. A burst of discoveries followed in short order. Several of these profoundly changed the whole fields of science and their implications are still not fully understood. For example, biologists may now be seeing – in the strange communities of microbes and animals that live around deep volcanic vents – clues to the origin of life on earth. No one even knew that these communities existed before explorers began diving to the bottom in a submersible. Entering the deep, black abyss presents unique challenges for which humans must carefully prepare if they wish to survive. It is an unforgiving environment, both harsh and strangely beautiful, that few who have not experienced it firsthand can fully appreciate. Even the most powerful searchlights penetrate the only lens of feet. Suspended particles scatter tile light and water itself is for less transparent than air; it absorbs and scatters light. The ocean also swallows other types of electromagnetic radiation, including radio signals. That is why many deep-sea vehicles dangle from tethers. Inside those tethers, copper wires or fibre optic strands transmit signals that would dissipate and die if broadcast into open water.

D. Another challenge is that the temperature near the bottom in very deep water typically hovers just four degrees above freezing, and submersibles rarely have much insulation. Since water absorbs heat more quickly than air, the cold down below seems to penetrate a diving capsule far more quickly than it would penetrate, say, a control van up above, on the deck of the mother ship. And finally, the abyss clamps down with crushing pressure on anything that enters it. ‘This force is like air pressure on land, except that water is much heavier than air. At sea level on land, we don’t even notice 1 atmosphere of pressure, about 15 pounds per square inch, the weight of the earth’s blanket of air. In the deepest part of die ocean, nearly seven miles down, it’s about 1,200 atmospheres, 18,000 pounds per square inch. A square-inch column of lead would crush down on your body with equal force if it were 3,600 feet tall.

E. Fish that live in the deep don’t feel the pressure, because they are filled with water from their environment. It has already been compressed by abyssal pressure as much as water can be (which is not much). A diving craft, however, is a hollow chamber, rudely displacing the water around it. That chamber must withstand the full brunt of deep-sea pressure – thousands of pounds per square inch. If seawater with that much pressure behind it ever finds a way to break inside, it explodes through the hole with laserlike intensity. It was into such a terrifying environment that the first twentieth-century explorers ventured.

Questions 27-30:

Write the correct letter. **A, B, C** or **D**, in boxes 27-30 on your answer sheet.

27. In the first paragraph, the writer finds it surprising that …….

A. we send robots to Mars rattier than to the sea bed.

B. we choose to explore the least accessible side of the moon.

C. people reached the moon before they explored the deepest parts of the earth's oceans.

D. spaceships are sent beyond our solar system instead of exploring it.

28. The writer argues that saying 71 % of the earth's surface is the ocean is not accurate because of it …….

A. ignores the depth of the world's oceans.

B. is based on an estimated volume.

C. overlooks the significance of landscape features.

D. refers to the proportion of water in which life is possible.

29. How did the diving bell help divers?

A. It allowed each diver to carry a supply of air underwater.

B. It enabled piped air to reach deep below the surface.

C. It offered access to a reservoir of air below the surface.

D. It meant that they could dive as deep as 500 feet.

30. What point does the writer make about scientific discoveries between 1930 and 1970?

A. They were rarely the primary purpose of deep-sea exploration.

B. The people who conducted experiments were not professional scientists.

C. Many people refused to believe the discoveries that were made.

D. They involved the use of technologies from other disciplines.

Test 4

A) Matthew Walker dreads the question 'What do you do?' On an aeroplane it usually means that while everyone else watches movies, he will find himself giving a talk for the benefit of passengers and crew alike. To be specific. Walker is the director of the Center for Human Sleep Science at the University of California. No wonder people long for his advice. As the line between work and leisure grows more blurred, rare is the person who *doesn't* worry about their sleep. Indeed, it's Walker's conviction that we are in the midst of a 'catastrophic sleep-loss epidemic'. He has now written *Why* We *Sleep*, the idea being that once people know of the powerful links between sleep loss and poor health, they will try harder to get the recommended eight ours a night. Sleep deprivation constitutes anything less than seven. 'No one is doing anything about it but things have to change. But when did you ever see a national health service poster urging sleep on people? When did a doctor prescribe, not sleeping pills, but sleep itself? It needs to be prioritised:

B) Why are we so sleep-deprived in this century? In 1942, less than 8% of the population was trying to survive on six hours or less sleep a night; in 2017, almost one in two people is. Some reasons are obvious, but Walker believes, too, that in the developed world sleep is strongly associated with weakness. 'We want to seem busy, and one way we express that is by proclaiming how little sleep we're getting. When I give lectures, people wait behind until there is no one around and then tell me quietly:"! seem to be one of those people who need eight or nine hours' sleep." It's embarrassing to say it in public: C Walker has found clear evidence that without sleep, there is low energy and disease, and with sleep, there is vitality and health. More than 20 studies all report the same relationship: the shorter your sleep, the shorter your life. For example, adults aged 45 years or older who sleep less than six hours a night are 200% more likely to have a heart attack. As compared with those sleeping seven or eight.This is because even one night of sleep reduction will affect a person's heart and significantly increase their blood pressure as a result.

C) Walker also points out that when your sleep becomes short, you are susceptible to weight gain. Among the reasons for this are the fact that inadequate sleep increases levels of the hunger-signalling hormone, ghrelin. 'I'm not going to say that the obesity crisis is caused by the sleep-loss epidemic alone; says Walker. 'However, processed food and sedentary

lifestyles do not adequately explain its rise. It's now clear that sleep is that third ingredient.

D) Sleep also has a powerful effect on the immune system, which is why, when we have flu, our first instinct is to go to bed. If you are tired, you are more likely to get sick. The well-rested also respond better to the flu vaccine so this is something people should bear in mind before visiting their doctors. Walker's book also includes a long section on dreams. Here he details the various ways in which deep sleep - the part when we begin to dream helps us deal with our emotional experiences. He points to how important deep sleep is to young children. If they don't get enough, managing aggressive behaviour becomes harder and harder. Does Walker take his own advice when it comes to sleep? 'Yes. I give myself a nonnegotiable eight-hour sleep opportunity every night, and I keep very regular hours. I take my sleep incredibly seriously because I have seen the evidence.'

E) Sleep research shows that we sleep in 90-minute cycles, and it's only towards the end of each that we go into deep sleep. Each cycle comprises of NREM sleep (non-rapid eye movement sleep), followed by REM (rapid eye movement) sleep.' During NREM sleep ... your body settles into this lovely low state of energy,' Walker explains. 'REM sleep, on the other hand is ... an incredibly active brain state. Your heart and nervous system go through spurts of activity.' Because we need four or five of these cycles to stay healthy, it's important for people to break bad sleep habits. For example, they should not be regularly working late into the night as this affects cognitive functioning. Depending on sleeping pills is also not a good idea, as it can have a damaging effect on memory.

F) So what can individuals do to ensure they get the right amount of sleep? Firstly, we could think about getting ready for sleep in the same way we prepare for the end of a workout - say, on a spin bike.' People use alarms to wake up,' Walker says. 'So why don't we have a bedtime alarm to tell us we've got half an hour, that we should start cycling down?' Companies should think about rewarding sleep. Productivity will rise and motivation will be improved. We can also systematically measure our sleep by using personal tracking devices, Walker says, and points out that some far-sighted companies in the US already give employees time off if they get enough of it. While some researchers recommend banning

digital devices from the bedroom because of their effect on the sleep-inducing hormone melatonin, Walker believes that technology will eventually be an aid to sleep, as it helps us discover more about the **way we** function.

*Choose **TWO** letters, **A-E.***

Write the correct letters in boxes 23 and 24 on your answer sheet.

The list below mentions some things that individuals can do to ensure they get the right amount of sleep.

Which **TWO** of these things are recommended by Matthew Walker?

A taking a natural product that encourages sleep

B avoiding looking at brightly lit screens after dark

C negotiating later start times for work with employers

D keeping a regular record of hours spent sleeping

E reducing your activity level at a set time of day

*Choose **TWO** letters, **A-E.***

Write the correct letters in boxes 25 and 26 on your answer sheet.

Which **TWO** of the following statements are true of Matthew Walker?

A. He is sometimes reluctant to admit what his profession is.

B. He has based his new book on a series of lectures.

C. He has experienced significant improvements in his health.

D. He has carried out research into the meaning of dreams.

E. He always makes sure he gets enough sleep each night.

Test 5

Team Building

If you thought ancient monuments were built in honour of gods and kings, think again, says Laura Spinney

At Poverty Point in the US state of Louisiana, a remarkable monument overlooks the Mississippi river. Built around 3,500 years ago entirely from earth, it consists of six semi-circular ridges and five mounds. 'Mound A', as archaeologists refer to it, is the largest at 22 metres high. The earth mounds at Poverty Point are not just impressive, they are also intriguing. Ancient monuments have always been regarded as products of large, hierarchical societies, built as tributes to gods and kings. But the creators of the Poverty Point monument were hunter gatherers, who functioned in a more democratic way. They may have looked to elders for guidance, but these would not have exerted a commanding influence over their small groups. So who, or what,motivated building on such a grand scale?

Archaeologists have been excavating Poverty Point for more than a century. However, the truly remarkable nature of Mound A only emerged a few years ago. This was when a team led by Tristram Kidder of Washington University drilled into the mound. They saw for the first time that it consisted of neat layers of differently coloured earth. It rains a lot around Poverty Point, and we know that fluctuations in temperature and increased flooding eventually led to its abandonment. But Kidder could see no sign that the layers had combined, as you might expect if it had rained during construction. Kidder reached a startling conclusion: Mound A must have been built in one short period, perhaps in as little as 30 days, and probably no more than 90. Mound A contains nearly 240,000 cubic metres of earth; the equivalent of 32,000 truckloads. There were no trucks then, of course, nor any other heavy machinery, animals like mules to carry the earth, or wheelbarrows. Assuming it did take 90 days, Kidder's group calculated that around 3,000 basket-carrying individuals would have been needed to get the job done. Given that people probably travelled in family groups, as many as 9,000 people may have assembled at Poverty Point during construction. 'If that's true, it was an extraordinarily large gathering,' says Kidder. Why would they have chosen to do this? Another archaeologist, Carl Lipo, thinks he has the answer: the same reason that the people of Easter Island built their famous stone heads. When Lipa first when to Easter Island, the prevailing idea was that the enormous statues had been rolled into place using logs, and the resulting deforestation contributed to the human population's collapse. But Lipa and fellow archaeologist Terry Hunt showed the statues could

have been 'walked' upright into place by cooperating bands of people using ropes, with no need for trees. They argue further that by making statues, people's energy was directed into peaceful interactions and information-sharing. They ceased crafting statues, Lipo claims, precisely because daily existence became less of a challenge, and it was no longer so important that they work together.

An ancient temple known as Gobekli Tepe in south-east Turkey is another site where a giant team-building project might have taken place. Since excavations started, archaeologists have uncovered nine enclosures formed of massive stone pillars. Given the vast size of these pillars, a considerable workforce would have been needed to move them. But what archaeologists have also discovered is that every so often, the workers filled in the enclosures with broken rock and built new ones.

The apparent disposability of these monuments makes sense if the main aim was building a team rather than a lasting structure. Indeed, the many bones from animals such as gazelle found in the filled-in enclosures suggest people held feasts ton celebrate the end of a collaborative effort. A number of researchers share Lipo's view that the need to cooperate is what drove monument makers. But as you might expect when a major shift

in thinking is proposed, not everyone goes along with it. The sceptics include Tristram Kidder. For him, the interesting question is not 'Did cooperative building promote group survival' but 'What did the builders *think* they were doing?' All human behaviour comes down to a pursuit of food and self-preservation, he says. As for why people came to Poverty Point, he and his colleagues have suggested it was a pilgrimage site. If Lipo is right, have we in any way inherited our ancestors' tendency to work together for the sake of social harmony? Evolutionary biologist David Sloan Wilson thinks we have. Wilson cites the Burning Man festival, promoted as an experiment in community and art, which draws thousands of people to Nevada's Black Rock Desert each summer. Among the ten principles laid down by co-founder Larry Harvey are 'inclusion' and 'communal effort'. Another is 'leaving no trace', meaning that whatever festival-goers create they destroy before departing. In this way, the desert landscape is only temporarily disturbed. Wilson says there is evidence that such cooperative ventures matter more today than ever because we are dependent on a wider range of people than our ancestors were. Food, education, security: all are provided by people beyond our family group. Recently, as part of his Neighbourhood

Project in Binghamton, Wilson and his colleagues helped locals create their own parks. 'This brought people together and enabled them to cooperate in numerous other contexts,' he explains. This included helping with repairs after a series of floods in 20 l l. Social psychologist Susan Fiske of Princeton University also sees value in community projects.

Her research shows, for example, that they can help break down the ill-informed views that people hold towards others they have observed but do not usually interact with. So if modern projects really help build better communities, that will surely be a monumental achievement.

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

Write the correct letter in boxes 33-36 on your answer sheet.

33. The writer refers to trucks, mules and wheelbarrows in order to

A. highlight the technical ability of the Poverty Point inhabitants.

B. emphasise the number of workers required to build the mound.

C. question the logic of choosing Poverty Point as a place for construction.

D. challenge the idea that the mound could have been made so quickly.

34. Archaeologist Carl Lipo's research at Easter Island has led him to believe that

A. people had to cut down trees in order to transport larger statues.

B. remote communities faced greater environmental challenges than other societies.

C. islanders stopped making statues when their lives became easier.

D. methods of making the statues varied amongst different groups.

35. According to the writer, excavations at Gobekli Tepe suggest that

A. there was disagreement between groups over the temple's design.

B. human occupation drove certain animal populations into decline.

C. each of the enclosures that were built served a different purpose.

D. the builders had no intention of creating permanent structures.

36. In the sixth paragraph, what are we told about Tristram Kidder?

A. He feels the academic community should support Carl Lipo's theory.

B. He has changed his mind about the purpose of the Poverty Point monument.

C. He doubts that Carl Lipo has identified the key reason for monument making.

D. He believes that most people recognise the need to help each other to survive

Test 6

For the century before Johnson's Dictionary was published in 1775, there had been concern about the state of the English language. There was no standard way of speaking or writing and no agreement as to the best way of bringing some order to the chaos of English spelling. Dr Johnson provided the solution.

There had, of course, been dictionaries in the past, the first of these being a little book of some 120 pages, compiled by a certain Robert Cawdray, published in 1604 under the title A Table Alphabetical! ‘of hard usual English wordes'. Like the various dictionaries that came after it during the seventeenth century, Cawdray's tended to concentrate on 'scholarly' words; one function of the dictionary was to enable its student to convey an impression of fine learning.

Beyond the practical need to make order out of chaos, the rise of dictionaries is associated with the rise of the English middle class, who were anxious to define and circumscribe the various worlds to conquer - lexical as well as social and commercial. It is highly appropriate that Dr Samuel Johnson, the very model of an eighteenth-century literary man, as famous in his own time as in ours, should have published his dictionary at the very beginning of the heyday of the middle class.

Johnson was a poet and critic who raised common sense to the heights of genius. His approach to the problems that had worried writers throughout the late seventeenth and early eighteenth centuries was intensely practical. Up until his time, the task of producing a dictionary on such a large scale had seemed impossible without the establishment of an academy to make decisions about right and wrong usage Johnson decided he did not need an academy to settle arguments about language; he would write a dictionary himself; and he would do it single-handed. Johnson signed the contract for the Dictionary with the bookseller Robert Dosley at a breakfast held at the Golden Anchor Inn near Holbom Bar on 18 June 1764. He was to be paid £ 1.575 in instalments, and from this he took money to rent 17 Gough Square, in which he set up his 'dictionary workshop'.

James Boswell, his biographer described the garret where Johnson worked as ‘fitted up like a counting house' with a long desk running down the middle at which the copying clerks would

work standing up. Johnson himself was stationed on a rickety chair at an 'old crazy deal table' surrounded by a chaos of borrowed books. He was also helped by six assistants, two of whom died whilst the Dictionary was still in preparation.

The work was immense; filling about eighty large notebooks (and without a library to hand). Johnson wrote the definitions of over 40,000 words, and illustrated their many meanings with some I 14.000 quotations drawn from English writing on every subject, from the Elizabethans to his own time. He did not expect to achieve complete originality. Working to a deadline, he had to draw on the best of all previous dictionaries, and to make his work one of heroic synthesis. In fact it was very much more. Unlike his predecessors, Johnson treated English very practically, as a living language, with many different shades of meaning. He adopted his definitions on the principle of English common law - according to precedent. After its publication, his Dictionary was not seriously rivalled for over a century.

After many vicissitudes the Dictionary was finally published on 15 April 1775. It was instantly recognized as a landmark throughout Europe. ‘This very noble work.’ wrote the leading Italian lexicographer, ‘will be a perpetual monument of Fame to the Author, an Honour to his own Country in particular, and a general Benefit to the republic of Letters throughout Europe.' The fact that Johnson had taken on the Academies of Europe and matched them (everyone knew that forty French academics had taken forty years to produce the first French national dictionary) was cause for much English celebration.

Johnson had worked for nine years.‘with little assistance of the learned, and without any patronage of the great; not in the soft obscurities of retirement, or under the shelter of academic bowers, but amidst inconvenience and distraction, in sickness and in sorrow'. For all its faults and eccentricities his two-volume work is a masterpiece and a landmark, in his own words, 'setting the orthography, displaying the analogy, regulating the structures, and ascertaining the significations of English words’. It is the corner-stone of Standard English, an achievement which, in James Boswell’s words,‘conferred stability on the language of his country'.

The Dictionary, together with his other writing, made Johnson famous and so well esteemed that his friends were able to prevail upon King George III to offer him a pension. From then on, he was to become the Johnson of folklore.

Questions 1-3

*Choose **THREE** letters **A-H.***

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

***NB** Your answers may be given **in any order**.*

*Which **THREE** of the following statements are true of Johnson's Dictionary?*

A It avoided all scholarly words

B It was the only English dictionary in general use for 200 years.

C It was famous because of the large number of people involved.

D It focused mainly on language from contemporary texts.

E There was a time limit for its completion.

F It ignored work done by previous dictionary writers.

G It took into account subtleties of meaning.

H Its definitions were famous for their originality.

Session 3

Matching Features Questions

Test 1

The robots are coming - or are they?

What is the current state of play in Artificial Intelligence?

A. Can robots advance so far that they become the ultimate threat to our existence? Some scientists say no, and dismiss the very idea of Artificial Intelligence. The human brain, they argue, is the most complicated system ever created, and any machine designed to reproduce human thought is bound to fail. Physicist Roger Penrose of Oxford University and others believe that machines are physically incapable of human thought. Colin McGinn of Rutgers University backs this up when he says that Artificial Intelligence 'is like sheep trying to do complicated psychoanalysis. They just don't have the conceptual equipment they need in their limited brains.'

B. Artificial Intelligence, or AI, is different from most technologies in that scientists still understand very little about how intelligence works. Physicists have a good understanding of Newtonian mechanics and the quantum theory of atoms and molecules, whereas the basic laws of intelligence remain a mystery. But a sizeable number of mathematicians and computer scientists, who are specialists in the area, are optimistic about the possibilities. To them it is only a matter of time before a thinking machine walks out of the laboratory. Over the years, various problems have impeded all efforts to create robots. To attack these difficulties, researchers tried to use the 'top-down approach', using a computer in an attempt to program all the essential rules onto a single disc. By inserting this into a machine, it would then become self-aware and attain a human-like intelligence.

C. In the 1950s and 1960s great progress was made, but the shortcomings of these prototype robots soon became clear. They were huge and took hours to navigate across a room. Meanwhile, a fruit fly, with a brain containing only a fraction of the computing power, can effortlessly navigate in three dimensions. Our brains, like the fruit fly's, unconsciously recognise what we see by performing countless calculations. This unconscious awareness of patterns is exactly what computers are missing. The second problem is robots' lack of common

sense. Humans know that water is wet and that mothers are older than their daughters. But there is no mathematics that can express these truths. Children learn the intuitive laws of biology and physics by interacting with the real world. Robots know only what has been programmed into them.

D. Because of the limitations of the top-down approach to Artificial Intelligence, attempts have been made to use a 'bottom-up' approach instead - that is, to try to imitate evolution and the way a baby learns. Rodney Brooks was the director of MIT's Artificial Intelligence laboratory, famous for its lumbering 'top-down' walking robots. He changed the course of research when he explored the unorthodox idea of tiny 'insectoid' robots that learned to walk by bumping into things instead of computing mathematically the precise position of their feet. Today many of the descendants of Brooks' insectoid boots are on Mars gathering data for NASA (the National Aeronautics and Space Administration), running across the dusty landscape of the planet. For all their successes, in mimicking the behaviour of insects, however, robots using neural networks have performed miserably when their programmers have tried to duplicate in them the behaviour of higher organisms such as mammals. MIT's Marvin Minsky summarises the problems of AI: 'The history of AI is sort of funny because the first real accomplishment were beautiful things, like a machine that could do well in a maths course. But then we started to try to make machines that could answer questions about simple children's stories. There's no machine today that can do that.'

E. There are people who believe that eventually there will be a combination between the top-down and bottom-up, which may provide the key to Artificial Intelligence. As adults, we blend the two approaches. It has been suggested that our emotions represent the quality that most distinguishes us as human, that it is impossible for machines ever to have emotions. Computer expert Hans Moravec thinks that in the future robots will be programmed with emotions such as fear to protect themselves so that they can signal to humans when their batteries are running low, for example. Emotions are vital in decision-making. People who have suffered a certain kind of brain injury lose the ability to experience emotions and become unable to make decisions. Without emotions to guide them, they debate endlessly over their options. Moravec points out that as robots become more intelligent and are able to make choices, they could likewise become paralysed with indecision. To aid them, robots of the future might need to have emotions hardwired into their brains.

F. There is no universal consensus as to whether machines can be conscious, or even, in human terms, what consciousness means. Minsky suggests the thinking process in our brain is not localised but spread out, with different centres competing with one another at any given time.

Consciousness may then be viewed as a sequence of thoughts and images issuing from these different, smaller ‘minds’, each one competing for our attention. Robots might eventually attain a ‘silicon consciousness’. Robots, in fact, might one day embody an architecture for thinking and processing information that is different from ours - but also indistinguishable. If that happens, the question of whether they really ‘understand’ becomes largely irrelevant. A robot that has perfect mastery of syntax, for all practical purposes, understands what is being said.

Look at the following people (Questions 21-23) and the list of statements below.

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

Write the correct letter, A-E.

8. Colin McGinn **.....**

9. Marvin Minsky **.....**

10. Hans Moravec **.....**

A. Artificial Intelligence may require something equivalent to feelings in order to succeed.
B. Different kinds of people use different parts of the brain.
C. Tests involving fiction have defeated Artificial Intelligence so far.
D. People have intellectual capacities which do not exist in computers.
E. People have no reason to be frightened of robots.

Test 2

Is it time to halt the rising tide of plastic packaging?

A. Close up, plastic packaging can be a marvellous thing. Those who make a living from it call it a forgotten infrastructure that allows modem urban life to exist. Plastics have helped society defy natural limits such as the seasons, the rotting of food and the distance most of us live from where our food is produced. And yet we do not like it. Partly we do not like waste, but plastic waste, with its hydrocarbon roots and industrial manufacture, is especially galling. In 2008, the UK, for example, produced around two million tonnes of plastic waste, twice as much as in tire the early 1990s. The very qualities of plastic – its cheapness, its indestructible aura – make it a reproachful symbol of an unsustainable way of life.

B. The facts, however, do not justify our unease. All plastics are, at least theoretically, recyclable. Plastic packaging makes up just 6 to 7 per cent of the contents of British dustbins by weight and less than 3 per cent of landfills. Supermarkets and brands, which are under pressure to reduce the quantity of packaging of all types that they use, are finding good environmental reasons to turn to plastic: it is lighter, so requires less energy for transportation than glass, for example; it requires relatively little energy to produce, and it is often re-usable. An Austrian study found that if plastic packaging were removed from the tire supply chain, another packaging would have to increase fourfold to make up for it. So are we just wrong about plastic packaging?

C. Is it time to stop worrying and learn to love the disposable plastic wrapping around sandwiches? Certainly, there are bigger targets for environmental savings such as improving household insulation and energy emissions. Naturally, the tire plastics industry is keen to point them out. What's more, concern over plastic packaging has produced a squall of conflicting initiatives from retailers, manufacturers, and local authorities. It's a squall that dies down and then blows harder from one month to the next. 'It is being left to the individual conscience and supermarkets playing the market,' says Tim Lang, a professor specializing in food polio'. 'It's a mess.'

D. Dick Scarle of the Packaging Federation points out that societies without sophisticated packaging lose hall their food before it reaches consumers and that in the UK, waste in supply chains is about 3 per cent. In India, it is more titan 50 per cent. The difference comes later: the

British throw out 30 per cent of the food they buy – an environmental cost in terms of emissions equivalent to a fifth of the cars on their roads. Packagers agree that cardboard, metals, and glass all have their good points, but there's nothing quite like plastic. With more than 20 families of polymers to choose from and then sometimes blend, packaging designers and manufacturers have a limitless variety of qualities to play with.

E. But if there is one law of plastic that, in environmental terms at least, prevails over all others, it is this: a little goes a long way. This means, first, that plastic is relatively cheap to use – it represents just over one-third of the UK packaging market by value but it wraps more than half the total number of items bought. Second, it means that even though plastic encases about 53 per cent of products bought, it only makes up 20 per cent by weight of the packaging consumed. And in the packaging equation, weight is the main issue because the heavier something is, the more energy you expend moving it around. Because of this, righteous indignation against plastic can look foolish.

F. One store commissioned a study to find precise data on which had a less environmental impact: selling apples lose or ready-wrapped. Helene Roberts, head of packaging, explains that in fact, they found apples in fours on a tray covered by plastic film needed 27 per cent less packaging in transportation than those sold loose. Sieve Kelsey, a packaging designer, finds die debate frustrating. He argues that the hunger to do something quickly is diverting effort away from more complicated questions about how you truly alter supply chains. Rather than further reducing the weight of a plastic bottle, more thought should be given to how packaging can be recycled. Helene Roberts explains that their greatest packaging reduction came when the company switched to reusable plastic crates and stopped consuming 62,000 tonnes of cardboard boxes every year.

G. Plastic packaging is important, and it might provide a way of thinking about broader questions of sustainability. To target plastic on its own is to evade the complexity' of the issues. There seems to be a universal eagerness to condemn plastic. Is this due to an inability to make the general changes in society that are really required? 'Plastic as a lightweight food wrapper is now built-in as the logical thing,' Lang says. 'Does that make it an environmentally sound system of packaging? It only makes sense if you have a structure such as exists now. An environmentally-driven packaging system would look completely different' Dick Scarle put the challenge another way. "The amount of packaging used today is a reflection of modern life."

Look at the following statements (Questions 19-23) and the list of people below.

Match each statement to the correct person A-D.

Write the correct letter, A-D in boxes 19-23 on your answer sheet.

NB You may use **any letter more than once**.

19. A comparison of two approaches to packaging revealed an interesting result.

20. People are expected to do the right thing.

21. Most food roaches UK shops in good condition.

22. Complex issues are ignored in the search for speedy solutions.

23. It is merely because of the way societies operate that using plastic seems valid.

People:

A. Tim Lang

B. Dick Seatle

C. Helene Roberts

D. Steve Kelsey

Test 3

The Truth about Lying

A

An area of scientific study that caught the public imagination during the 1970s involved a gorilla called Koko. Animal psychologist Francine Patterson claimed to have taught Koko a simplified form of American Sign Language, and through signing, Koko could apparently communicate basic ideas such as 'food' and 'more', as well as concepts such as 'good' and 'sorry'. But Koko also used signs to blame other people for damage she had caused herself. While today there is some dispute about whether Koko truly understood the meaning of all the signs she made, Professor Karen Goodger believes she was certainly capable of dishonesty. 'People use words to lie, but for animals with higher brain functions, there's also a higher probability that they'll demonstrate manipulative behaviours. We see this not just in gorillas, but in other creatures with a large neocortex.'

B

Human societies may appear to disapprove of lying, but that doesn't mean we don't all do it. And it seems that the ability, or at least the desire to deceive, starts from an early age. In one study run by psychologist Kang Lee, children were individually brought into a laboratory and asked to face a wall. They were asked to guess what toy one of Lee's fellow researchers had placed on a table behind them - for example, a fluffy cat or dog. The researcher would then announce they had to leave the lab to take a phone call, reminding the child not to turn around. The research team were well aware that many children would be unable to resist peeking at the toy. Secret cameras showed that 30% of two-year-old children lied about not looking. This went up to 50% for three-year-olds and almost 80% of eight-year-olds. Interestingly, whereas the younger children simply named the toy and denied taking a peek, the older ones came up with some interesting reasons to explain how they had identified the toy correctly. Lee is reassured by this trend, seeing it as evidence in each case that the cognitive growth of a human child is progressing as it should. Parents, of course, may not be so pleased.

C

Adults, however, can hardly criticise children. According to Professor Richard Wiseman, it appears that adults typically tell two major lies per day, and that one third of adult conversations contain an element of dishonesty. Other research indicates that spouses lie in one out of every 10 interactions. This probably comes as no surprise to Tali Sharot at

University College London, who has run a series of experiments proving we become desensitised to lying over time. She has found that while we might initially experience a sense of shame about small lies, this feeling eventually wears off. The result, Sharot has found, is that we progress to more serious ones.

D

Other researchers, including Tim Levine at the University of Alabama, have analysed our motives for lying. By far the most common is our desire to cover up our own wrongdoing. Second to this are lies we tell to gain economic advantage - we might lie during an interview to increase the chances of getting a job. Interestingly, 'white lies', the kind we tell to avoid hurting people's feelings, account only for a small percentage of our untruths. But if we recognise our own tendency to lie, why don't we recognise it in others? Professor Goodger thinks it has something to do with our strong desire for certain information we hear to be true, even when we might suspect it isn't. This is because we might be 'comforted by others' lies or excited by the promise of a good outcome', Goodger says.

E

We might not expect ordinary people to be good at recognising lies, but what about people whose job it is to investigate the behaviour of others? Paul Ekman is a psychologist from the University of California.

As part of his research into deception, he has invited a range of experts to view videos of people telling lies and of others telling the truth. Among the experts have been judges, psychiatrists and people who operate polygraph machines for police investigations. None of these experts have shown they can detect dishonesty any better than people without their experience. Part of the problem is that so many myths still prevail about 'give-away signs' indicating that someone is lying.

F

A common claim, for example, is that liars won't look people in the eye during their explanations or while being questioned. Another is that they are likely to gesture as they tell their story, but so frequently that it seems unnatural - as if they are trying to convince others of their sincerity. However, many researchers have come to reject these ideas, suggesting a more effective approach is to listen to their narration style. A difficulty that liars face is having to remember exactly what they said, which is why they don't provide as many details as a person giving an honest account would. It is also typical of liars to mentally rehearse their story, and this is why one stage follows another in apparently chronological fashion. Honest stories, however, feature revisions and repetition. Recent research has also disproved

the widely believed notion that liars have a habit of fidgeting in their seats. Rather, it seems that they keep still, especially in the upper body, possibly hoping to give the impression of self-assurance. Liars also put some psychological distance between themselves and their lies. For that reason, they avoid the use of 'I' when narrating their stories. The reverse is true, however, when people write fake reviews of, say, a hotel or restaurant. In these instances, 'I' features again and again as they attempt to convince us that their experience was real.

Look at the following statements (Questions 19-22) and the list of researchers below.
Match each statement with the correct researcher, ***A, B or C.***
Write the correct letter, ***A, B or C,*** *in boxes 19-22 on your answer sheet. You may use any letter more than once.*

19. Guilt often diminishes as people become used to telling lies.
20. People's need to feel reassured and hopeful makes them susceptible to lies.
21. More intelligent species are more likely to be deceptive.
22. The increasing sophistication of lying is part of normal development

Summary Completion Questions

Test 1

What cookbooks really teach us

A. Shelves bend under the weight of cookery books. Even a medium-sized bookshop contains many more recipes than one person could hope to take in a lifetime. Although the recipes in one book are often similar to those in another, their presentation varies wildly, from an array of vegetarian cookbooks to instructions on cooking the food that historical figures might have eaten. The reason for this abundance is chat cookbooks promise to bring about a kind of domestic transformation for the user. The daily routine can be put on one side and they liberate the user, if only temporarily. To follow their instructions is to turn a task which has to be performed every day into an engaging, romantic process. Cookbooks also provide an opportunity to delve into distant cultures without having to turn up at an airport to get there.

B. The first Western cookbook appeared just over 1,600 years ago. *De re couquinara* (it means 'concerning cookery') is attributed to Roman gourmet named Apicius. It is probably a compilation of Roman and Greek recipes, some or all of them drawn from manuscripts that were later loss. The editor was sloppy, allowing several duplicated recipes to sneak in. Yet Apicius's book set the tone of cookery advice in Europe for more than a thousand years. As a cookbook, it is unsatisfactory with very basic instructions. Joseph Vehling, a chef who translated Apicius in the 1930s, suggested the author had been obscure on purpose, in ease his secrets leaked out.

C. But a more likely reason is that Apicius's recipes were written by and for professional cooks, who could follow their shorthand. This situation continued for hundreds of years. There was no order to cookbooks: a cake recipe might be followed by a mutton one. But then, they were not written for careful study. Before the 19* century few educated people cooked for themselves. The wealthiest employed literate chefs; others presumably read recipes to their servants. Such cooks would have been capable of creating dishes from the vaguest of instructions.

D. The invention of printing might have been expected to lead to greater clarity but at first, the reverse was true. As words acquired commercial value, plagiarism exploded. Recipes

were distorted through reproduction. A recipe for boiled capon in Vk Good Huswives Jewell, printed in 1596, advised the cook to add three or four dates. By 1653. when the recipe was given by a different author in A Book of Fruits & Flowers, the cook was told to see the dish aside for three or four days.

E. The dominant theme in 16th and 17th-century cookbooks was ordered. Books combined recipes and household advice, on the assumption that a well-made dish, a well-ordered larder and well-disciplined children were equally important. Cookbooks thus became a symbol of dependability in chaotic times. They hardly seem to have been affected by the English civil war or the revolutions in America and France.

F. In the 1850s, Isabella Becton published the Book of Household /Management. Like earlier cookery writers she plagiarized freely, lifting not just recipes bur philosophical observations from other books. If Becton's recipes were not wholly new. though, the way in which she presented them certainly was. She explains when the chief ingredients arc most likely to be in season, how long the dish will take to prepare and even how much it is likely to cost. Bee ton's recipes were well suited to her times. Two centuries earlier, an understanding of rural ways had been so widespread that one writer could advise cooks to heat water until it was a little hotter than milk comes from a cow. By the 1850s Britain was industrializing. The growing urban middle class needed details, and Becton provided them in the hill.

G. In France, cookbooks were fast becoming even more systematic. Compare with Britain, France had produced few books written for the ordinary householder by the end of the 19th century. The most celebrated French cookbooks were written by superstar chefs who had a clear sense of codifying a unified approach to sophisticated French cooking. The 5.000 recipes in Auguste Escoffier's Le Guide Culinaire (The Culinary Guide), published in 1902, might as well have been written in stone, given the book's reparation among French chefs, many of whom still consider it the definitive reference book.

H. What Escoffier did for French cooking. Fannie Farmer did for American home cooking. She not only synthesized American cuisine; she elevated it to the status of science. 'Progress in civilization has been accompanied by progress in cookery,' she breezily announced in The Boston Cooking-School Cook Book, before launching into a collection of recipes that sometimes resembles a book of chemistry experiments. She was occasionally over-fussy. She explained that currants should be picked between June 28th and July 3rd, but not when it is

raining. But in the main, her book is reassuringly authoritative. Its recipes arc short, with no unnecessary chat and no unnecessary spices.

I. In 1950, Mediterranean Food by Elizabeth David launched a revolution in cooking advice in Britain. In some ways, Mediterranean Food recalled even older cookbooks but the smells and noises that filled Davids books were not mere decoration for her recipes. They were the point of her books. When she began to write, many ingredients were not widely available or affordable. She understood this, acknowledging in a later edition of one of her books that 'even if people could not very often make the dishes here described, it was stimulating to think about them.' Davids books were not so much cooking manuals as guides to the kind of food people might well wish to eat.

Questions 14-16

Complete the summary below.

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

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

Why are there so many cookery books?

There are a great number more cookery books published than is really necessary and it is their **14**……. which makes them differ from each other. There are such large numbers because they offer people an escape from their **15**…… and some give the user the chance to inform themselves about other **16** ……

Test 2

The growth of intelligence

A. No one doubts that intelligence develops as children grow older. Yet the concept of intelligence has proved both quite difficult to define in unambiguous terms and unexpectedly controversial in some respects. Although at one level, there seem to be almost as many definitions of intelligence as people who have tried to define it, there is broad agreement on two key features. That is, intelligence involves the capacity not only to learn from experience but also to adapt to one's environment. However, we cannot leave the concept there. Before turning to what is known about the development of intelligence, it is necessary to consider whether we are considering the growth of one or many skills. That question has been tackled in rather different ways by psychometricians and by developmentalism.

B. The former group has examined the issue by determining how children's abilities on a wide range of tasks correlate or go together. Statistical techniques have been used to find out whether the pa Hems are best explained by one broad underlying capacity', general intelligence, or by a set of multiple, relatively separate, special skills in domains such as verbal and visuospatial ability'. While it cannot be claimed that everyone agrees on what the results mean, most people now accept that for practical purposes it is reasonable to suppose that both are involved. In brief, the evidence in favour of some kind of general intellectual capacity is that people who are superior (or inferior) on one type of task tend also to be superior (or inferior) on others. Moreover, general measures of intelligence tend to have considerable powers to predict a person's performance on a wide range of tasks requiring special skills. Nevertheless, it is plain that it is not at all uncommon for individuals to be very' good at some sorts of a task and yet quite poor at some others. Furthermore, the influences that affect verbal skills are not quite the same as those that affect other skills.

C. This approach to investigating intelligence is based on the nature of the task involved but studies of age-related changes show that this is not the only, or necessarily the most important, approach. For instance, some decades ago, Horn and Cattell argued for differentiation between what they termed 'fluid' and 'crystallized' intelligence. Fluid abilities are best assessed by tests that require mental manipulation of abstract symbols. Crystallized abilities, by contrast, reflect knowledge of the environment in which we live and past experience of similar tasks; they may

be assessed by tests of comprehension and information. It scents that fluid abilities peak in early adult life, whereas crystallized abilities increase up to advanced old age.

D. Developmental studies also show that the interconnection between different skills varies with age. Titus in the first year of a life interest in perceptual patterns is a major contributor to cognitive abilities, whereas verbal abilities are more important later on. These findings seemed to suggest a substantial lack of continuity between infancy and middle childhood. However, it is important to realize that the apparent discontinuity will vary according to which of the cognitive skills were assessed in infancy. It has been found that tests of coping with novelty do predict later intelligence. These findings reinforce the view that voting children's intellectual performance needs to be assessed from their interest in and curiosity about the environment, and the extent to which this is applied to new situations, as well as by standardized intelligence testing.

E. These psychometric approaches have focused on children's increase in cognitive skills as they grow older. Piaget brought about a revolution in the approach to cognitive development through his arguments (backed up by observations) that the focus should be on the thinking processes involved rather than on levels of cognitive achievement. These ideas of Piaget gave rise to an immense body of research and it would be true to say that subsequent thinking has been heavily dependent on his genius in opening up new ways of thinking about cognitive development. Nevertheless, most of his concepts have had to be so radically revised, or rejected, that his theory no longer provides an appropriate basis for thinking about cognitive development. To appreciate why that is so, we need to focus on some rather different elements of Piaget s theorizing.

F. The first element, which has stood the test of time, is his view that the child is an active agent of learning and of the importance of this activity in cognitive development. Numerous studies have shown how infants actively scan their environment; how they prefer patterned to non-patterned objects, how they choose novel over familiar stimuli, and how they explore their environment as if to see how it works. Children's questions and comments vividly illustrate the ways in which they are constantly constructing schemes of what they know and trying out their ideas of how to fit new knowledge into those schemes or deciding that the schemes need modification. Moreover, a variety' of studies have shown that active experiences have a greater effect on learning than comparable passive experiences. However, a second element concerns the notion that development proceeds through a series of separate stages that have to be gone

through step-by-step, in a set order, each of which is characterized by a particular cognitive structure. That has thinned out to be a rather misleading way of thinking about cognitive development, although it is not wholly wrong.

Questions 37-40

Complete the summary using the list of words, A-I below.

Write the correct letter, A-l, in boxes **37- 40** on your answer sheet.

Researchers investigating the development of intelligence have shown that **37**…… skills become more significant with age. One good predictor of **38**…… intelligence is the degree to which small children are **39**……. about their surroundings and how much interest they show on finding themselves in a **40**……. setting.

A. adult

B. practical

C. verbal

D. spatial

E. inquisitive

F. uncertain

G. academic

H. plentiful

I. unfamiliar

Test 3

The future of cities

Professor of Urban Planning Sarah Holmes looks at the challenges of *urban living*

The World Health Organisation has produced a report predicting that 9.8 billion of us will be living on this planet by 2050. Of that number, 72% will be living in urban areas - a higher proportion than ever before. Presented with this information, governments have a duty to consider how best to meet the needs of city residents, and not just for the short-term. Certain problems associated with urban living have been highlighted by research company Richmond-Carver in its latest global survey. At the top of the list of survey respondents' concerns is the fact that competition amongst tenants for rental properties has driven the median price up - so much so people need to hold down two or more jobs to meet all their expenses.

Another issue the survey highlighted is the difficulty commuters face. Overcrowding means that seats are often not available on long journeys, but more significant is that schedules are unreliable. Many studies have shown the effect that has on a country's productivity. Interestingly, certain problems seem more common in some cities than others: respondents from increasingly crowded European cities, including Manchester and Barcelona, commented on how their quality of life was affected by loud machinery, other people's music and car alarms. Something the survey failed to ask about was the value people placed on having access to nature in urban neighbourhoods. However, some countries are already moving forward. Singapore is a prime example; its rooftop gardens make the city a far more desirable place to live. It is the Singaporean government that is behind this push for sustainable living.

Perhaps some clearer government direction would benefit other cities. Take New York City, a place where I frequently meet up with other researchers in my field. Luckily for me, I am driven from the airport to the research centre, so do not need to navigate the freeways and constant congestion. Admittedly my experience of the urban lifestyle here is limited to the hotels I stay in, and the blocks within a threekilometre walk. But whenever I leave my room in search of an outlet providing fruit or anything with nutritional value, none can be found. It seems ridiculous that this should be the case. New York has made great advances in redeveloping its museums and arts centres, but authorities must recognise that people's basic needs must be met first.

Sometimes these basic needs are misunderstood. In some urban areas, new residential developments are provided with security features such as massive metal fences and multiple gates in the belief that these will make residents safer. There is little evidence such steps make a difference in this way, but we do know they make residents feel reluctant to go outside and walk around their neighbourhood. Instead they are more likely to remain inactive indoors. Grassy areas inside fenced developments are hardly used by householders or tenants either. All this adds up to a feeling of being cut off from others.

So where are planners and developers going wrong? Inviting a group of locals to attend a consultation event is the conventional method for discovering what a community might want. The issue here is that it often attracts the same few voices with the same few wishes. But the internet now makes it possible for others to contribute. A community website can be a place where local people propose ideas for making their neighbourhood a better place to live. Developers that pay attention to these ideas can get a clearer picture of the things residents actually want and reduce the risk of throwing away money on things they don't.

An example of a project that truly meets the needs of residents is Container City - a development in London's Docklands area. Constructed from metal containers once used to transport cargo on ships, it is a fivestorey architectural masterpiece. The containers have been turned into sunny work studios, and despite their limited size, some come with a bed, shower and kitchen unit. Smart planning and skilful construction mean they take up very little room. Furniture and fittings are made from recycled products. Other countries have their own versions of Container City - Amsterdam and Copenhagen have created container dormitories to house students - but the Docklands site shows how work and living areas can effectively be combined. The units are ideal for young entrepreneurs hoping to establish a business while keeping costs down.

Successful development is taking place in many urban areas around the world, and city planners have a duty to see for themselves the transforming effect this can have on residents' lives. There is no better way to do this than to visit these places in person. These might be neighbourhoods constructed for the first time, or developers might have transformed what was already there. In either case, the idea of cars determining urban planning, and indeed the whole concept of private car ownership, is now outdated and must be abandoned.0Instead, the layout of an area under development must make it easier for people to meet up in

pedestrianized zones and community spaces. At the heart of the0development should be a cultural area, providing venues for art, music and street theatre. Such activities bring communities together, and do far more for positive relations than a new mall or shopping precinct. For this reason, these kinds of performance spaces should be prioritised. Finally, planners and developers must be obliged to create, within the same neighbourhood, different types of homes for wealthy professionals, for families, for the elderly and for young people just starting out. This kind of mix is essential to ensure people can buy a home in an area convenient for work, and for a community to stay alive.

Complete the summary using the list of words, ***A-H,*** *below.*

Write the correct letter, ***A-H,*** *in boxes 27-31 on your answer sheet.*

Survey on problems facing city dwellers

The World Health Organisation has recently published data concerning **27** ..... in cities. This data should indicate to governments that they must think about ways to improve the lives of residents. According to a Richmond-Carver survey, the worst problem facing many city dwellers was **28** ..... The survey also indicated that in some cities, poor **29** ..... can impact dramatically on the economy. Another issue seems to be **30** ....., although this is more often mentioned by survey participants in European countries. Questions on people's views on the need for **31 .....** were unfortunately omitted from the survey, but countries like Singapore already seem to be making progress in this respect.

A noise pollution	**B** recycling facilities	**C** green areas
D employment opportunities	**E** population growth	**F** affordable housing
G antisocial behaviour	**H** public transport	

Test 4

Socially Responsible Businesses

Increasingly, businesses *are working* to *improve their communities, says analyst*

Pierre *Drucker*

Many economies today are witnessing the rise of socially responsible businesses, or SRBs. These are profit-making companies which have the additional goal of improving society in some **way.** Business commentators usually describe SRBs as a fundamentally 21 st-century phenomenon. However, this common generalisation overlooks the significant contribution of Muhammad Yunus, among a number of other entrepreneurs. Yun us established a highly successful bank in Bangladesh in the 1980s lending money to small village business projects that could not attract conventional loans.

There are also those such as CEO Dan Rathbourne who dismiss SRBs as a passing fad which have had little impact on the real world of business. This cynical **view** is disproved by the evidence: in the UK alone, there are an estimated 80,000 SRBs, turning over about £25 billion a year. What is more, research by the Quorate Group based on interviews with over 5,000respondents in twelve nations found that not only were consumers prepared to support SRBs but that employees preferred to work for them.

Ten years ago Christine Dubois used her experience in corporate finance to establish the Concern Consultancy, which coordinates advice and funding for **SRB** start-ups.As professional investors increasingly recognise the potential of SRBs, the number of niche firms such as Dubois's will almost inevitably multiply. Professor of business studies Joel Drew claims that this is partly a consequence of the digital revolution. In his persuasive analysis, digital networks have allowed consumers to identify socially responsible products and services in **ways** never possible before.

So what are some examples of SRBs? Many that have come to my attention recently are small-scale local companies, such as Renew, which searches demolition sites for old materials - wooden floorboards and other construction timber, for example. Rather than allow these resources to be wasted, the team at Renew have fashioned them into a range of tables, chairs and similar items that are sold at relatively low cost. Other SRBs have rather different

goals. The first Indulge cafe was established by owner Derek Jardine in an area with few local amenities. The idea for the cafe was to provide a meeting place for local residents - a community hub -not only by serving food and drink but also by running workshops, film evenings and art exhibitions. There are now six Indulge cafes around the country with more planned. Of course, large corporations may not be in a position to change their products or services quickly. But one international telecommunications corporation, for example, enables its employees to take part in the Green Scheme, whereby staff give short periods of their time unpaid to plant trees in conservation areas, and numerous other large companies have similar initiatives.

Another small SRB that caught my eye is Bright Sparks, where engineer Johann Jensen is investigating the use of things such as bamboo and soya beans to make coffee capsules and takeaway cups that will break down and decay naturally. In the longer term.Jensen hopes to work on other kinds of packaging for the food and hospitality industries. Meanwhile, Greater Good is now in its second decade of running a farm-to-table vegetable and fruit delivery box service to inner city residents. Recent years have seen a significant increase in demand for this type of direct service, bypassing traditional retailers.

The increase in the number of such SRBs is associated with the rise of' conscious consumers', who want to know exactly how the products they buy have been produced. What was the environmental impact? Were workers treated ethically? So the argument is sometimes put forward that SRBs are a response to new consumer values. But equally, many SRBs that I have studied were established by entrepreneurs who wanted to make a difference and have taken consumers along with them. In reality, both sides of the relationship have contributed to the fresh approach.

Consumers, of course, are not always members of the public. Recently I spoke to Lucinda Mitchell, procurement officer for my local council here in London, who told me that her organisation frequently purchases from SRBs because of shared values. Local, state and national authorities have huge purchasing power for both goods and services. And Mitchell's position is becoming commonplace internationally as these bodies are increasingly prepared to work with SRBs, provided they are competitive on price and quality.

In terms of goals, there are numerous types of social benefits that SRBs can hope to achieve. Many concern employment, whether creating opportunities in deprived areas, promoting gender equality in employment or providing jobs for disabled people. Others focus on fair and ethical treatment of employees and trading partners. Some SRBs add additional goals as they develop, which has worked well. Undoubtedly the most common goal, though, is environmental protection. While this is commendable and a reflection of deep concern in contemporary society, it would be good to see greater diversity as the SRB concept evolves.

As with any business, of course, there are issues to be faced. Some SRBs are set up with considerable energy and dedication, but with little knowledge or experience of business, and find it difficult to compete. Some find it a challenge to promote their values successfully and so never gain support from consumers or investors. Others lack an internal organisational structure, which leads to inefficiencies. However, few of these problems relate specifically to SRBs but are witnessed in many start-ups. Greater professionalism and business school education can solve all of these issues, ensuring the sector has a bright future.

Complete the summary using the list of words, **A-H,** below.

*Write the correct letter, **A-H,** in boxes 32-36 on your answer sheet.*

Examples of SRBs

Renew has made a successful business out of designing **32** ..... On the other hand, Indulge wishes to promote **33**. ..... and is expanding to new sites. Large corporations cannot always make quick changes but many make provision for **34** ..... , such as the Green Scheme.

On a smaller scale, Johann Jensen is experimenting with types of **35** ..... and is planning other ventures. In contrast, an example of a well-established business is Greater Good, which provides **36** ..... to a growing market.

- **A.** biodegradable materials
- **B.** recycled clothing
- **C.** fresh produce
- **D.** closer neighbourhoods
- **E.** secure accommodation
- **F.** affordable furniture
- **G.** permanent employment
- **H.** volunteer work

Test 5

The Truth about the Environment

For many environmentalists, the world seems to be getting worse. They have developed a hit-list of our main fears: that natural resources are running out; that the population is ever growing, leaving less and less to eat; that species are becoming extinct in vast numbers, and that the planet's air and water are becoming ever more polluted.

But a quick look at the facts shows a different picture. First, energy and other natural resources have become more abundant, not less so, since the book The Limits to Growth' was published in 1972 by a group of scientists. Second, more food is now produced per head of the world's population than at any time in history. Fewer people are starving. Third, although species are .indeed becoming extinct, only about 0.7% of them are expected to disappear in the next 50 years, not 25-50%, as has so often been predicted. And finally, most forms of environmental pollution either appear to have been exaggerated, or are transient - associated with the early phases of industrialisation and therefore best cured not by restricting economic growth, but by accelerating it. One form of pollution - the release of greenhouse gases that causes global warming - does appear to be a phenomenon that is going to extend well into our future, but its total impact is unlikely to pose a devastating problem. A bigger problem may well turn out to be an inappropriate response to it.

Yet opinion polls suggest that many people nurture the belief that environmental standards are declining and four factors seem to cause this disjunction between perception and reality.

One is the lopsidedness built into scientific research. Scientific funding goes mainly to areas with many problems. That may be wise policy, but it will also create an impression that many more potential problems exist than is the case.

Secondly, environmental groups need to be noticed by the mass media. They also need to keep the money rolling in. Understandably, perhaps, they sometimes overstate their arguments. In 1997, for example, the World Wide Fund for Nature issued a press release entitled: 'Two thirds of the world's forests lost forever'. The truth turns out to be nearer 20%.

Though these groups are run overwhelmingly by selfless folk, they nevertheless share many of the characteristics of other lobby groups. That would matter less if people applied the same

degree of scepticism to environmental lobbying as they do to lobby groups In other fields. A trade organisation arguing for, say, weaker pollution controls is instantly seen as self-interested. Yet a green organisation opposing such a weakening is seen as altruistic, even if an impartial view of the controls in question might suggest they are doing more harm than good.

A third source of confusion is the attitude of the media. People are clearly more curious about bad news than good. Newspapers and broadcasters are there to provide what the public wants. That, however, can lead to significant distortions of perception. An example was America's encounter with El Nino in 1997 and 1998. This climatic phenomenon was accused of wrecking tourism, causing allergies, melting the ski-slopes and causing 22 deaths. However, according to an article in the Bulletin of the American Meteorological Society, the damage it did was estimated at US$4 billion but the benefits amounted to some US$19 billion. These came from higher winter temperatures (which saved an estimated 850 lives, reduced heating costs and diminished spring floods caused by meltwaters).

The fourth factor is poor individual perception. People worry that the endless rise in the amount of stuff everyone throws away will cause the world to run out of places to dispose of waste. Yet, even if America's trash output continues to rise as it has done in the past, and even if the American population doubles by 2100, all the rubbish America produces through the entire 21st century will still take up only one-12.000th of the area of the entire United States.

So what of global warming? As we know, carbon dioxide emissions are causing the planet to warm. The best estimates are that the temperatures will rise by 2-3°C in this century, causing considerable problems, at a total cost of US$5,000 billion.

Despite the intuition that something drastic needs to be done about such a costly problem, economic analyses clearly show it will be far more expensive to cut carbon dioxide emissions radically than to pay the costs of adaptation to the increased temperatures. A model by one of the main authors of the United Nations Climate Change Panel shows how an expected temperature increase of 2.1 degrees in 2100 would only be diminished to an increase of 1.9 degrees. Or to put ft another way, the temperature increase that the planet would have experienced in 2094 would be postponed to 2100.

So this does not prevent global warming, but merely buys the world six years. Yet the cost of reducing carbon dioxide emissions, for the United States alone, will be higher than the cost of solving the world's single, most pressing health problem: providing universal access to clean drinking water and sanitation. Such measures would avoid 2 million deaths every year, and prevent half a billion people from becoming seriously ill.

It is crucial that we look at the facts if we want to make the best possible decisions for the future. It may be costly to be overly optimistic - but more costly still to be too pessimistic.

Questions 38-40

*Complete the summary with the list of words **A-I** below.*

Write the correct letter **A-I** in boxes **38-40** on your answer sheet.

GLOBAL WARMING

The writer admits that global warming is a **38** ……. Challenge, but says that it will not have a catastrophic impact on our future, if we deal with it in the **39** …….. way.

If we try to reduce the levels of greenhouse gases, he believes that it would only have a minimal impact on rising temperatures. He feels it would be better to spend money on the more **40** ……..health problem of providing the world's population with clean drinking water.

- **A.** Unrealistic
- **B.** Agreed
- **C.** Expensive
- **D.** Right
- **E.** Long-term
- **F.** Usual
- **G.** Surprising
- **H.** Personal
- **I.** urgent

Session 4 Questions

True / False / Not Given Questions

Test 1

Nature on display in American zoos

by Elizabeth Hanson

A. The first zoo in the United States opened in Philadelphia in 1874, followed by the Cincinnati Zoo the next year. By 1940 there were zoos in more than one hundred American cities. The Philadelphia Zoo was more thoroughly planned and better financed than most of the hundreds of zoos that would open later. But in its landscape and its mission – to both educate and entertain, it embodied ideas about how to build a zoo that stayed consistent for decades. The zoos came into existence in the late nineteenth century during the transition of the United States from a rural and agricultural nation to an industrial one.

B. The population more than doubled between 1860 and 1990. As more middle-class people lived in cities, they began seeking new relationships with the natural world as a place for recreation, self-improvement, and Spiritual renewal. Cities established systems of public parks, and nature tourism – already popular – became even more fashionable with the establishment of national parks. Nature was thought to be good for people of all ages and classes. Nature study was incorporated into the school curriculum, and natural history collecting became an increasingly popular pastime.

C. At the same time, the fields of study which were previously thought of as 'natural history' grew into separate areas such as taxonomy, experimental embryology and genetics, each with its own experts and structures. As laboratory research gained prestige in the zoology departments of American universities, the gap between professional and amateur scientific activities widened. Previously, natural history had been open to amateurs and was easily popularized, but research required access to microscopes and other equipment in laboratories, as well as advanced education.

D. The new zoos set themselves apart from travelling animal shows by stating their mission as the education and the advancement of science, in addition to recreation. Zoos presented zoology for the non-specialist, at a time when the intellectual distance between amateur naturalists and laboratory oriented zoologists was increasing. They attracted wide audiences and quickly became a feature of every growing and forward-thinking city. They were emblems of civic pride on a level of importance with art museums, natural history museums and botanical gardens.

E. Most American zoos were founded and operated as part of the public parks administration. They were dependent on municipal funds, and they charged no admission fee. They tended to assemble as many different mammal and bird species as possible, along with a few reptiles, exhibiting one or two specimens of each, and they competed with each other to become the first to display a rarity, like a rhinoceros. In the constant effort to attract the public to make return visits, certain types of display came in and out of fashion; for example, dozens of zoos built special Islands for their large populations of monkeys. In the 1930s, the Works Progress Administration funded millions of dollars of construction at dozens of zoos, for the most part, the collections of animals were organized by species in a combination of enclosures according to a fairly loose classification scheme.

F. Although many histories of individual zoos describe the 1940s through the 1960s as a period of stagnation, and in some cases there was neglect, new zoos continued to be set up all over the country. In the 1940s and 1950s, the first zoos designed specifically for children were built, some with the appeal of farm animals. An increasing number of zoos tried new ways of organizing their displays. In addition to the traditional approach of exhibiting like kinds together, zoo planners had a new approach of putting animals in groups according to their continent of origin and designing exhibits showing animals of particular habitats, for example, polar, desert, or forest. During the 1960s, a few zoos arranged some displays according to animal behaviour; the Bronx Zoo. for instance, opened its World of Darkness exhibit of nocturnal animals. Paradoxically, at the same time as zoo displays began incorporating ideas about the ecological relationships between animals, big cats and primates continued to be displayed in a bathroom like cages lined with tiles.

G. By the 1970s, a new wave of reform was stirring. Popular movements for environmentalism and animal welfare called attention to endangered species and to zoos that did not provide adequate care for their animals. More projects were undertaken by research

scientists and zoos began hiring full-time vets as they stepped up captive breeding programs. Many zoos that had been supported entirely by municipal budgets began recruiting private financial support and charging admission fees. In the prosperous 1980s and 1990s. zoos built realistic 'landscape immersion' exhibits, many of them around the theme of the tropical rainforest and increasingly, conservation moved to the forefront of zoo agendas.

H. Although zoos were popular and proliferating institutions in the United States at the turn of the twentieth century, historians have paid little attention to them. Perhaps zoos have been ignored because they were, and remain still multi-purpose institutions, and as such, they fall between the categories of analysis that historians often use. In addition, their stated goals of recreation, education, the advancement of science, and protection of endangered species have often conflicted. Zoos occupy a difficult middle ground between science and showmanship, high culture and low, remote forests and the cement cityscape, and wild animals and urban people.

Questions 1-7

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

In boxes 1-7 on your answer sheet, write

TRUE, if the statement agrees with the information

FALSE, if the statement contradicts the information

NOT GIVEN, if there is no information on this

1. The concepts on which the Philadelphia zoo was based soon became unfashionable.

2. The opening of zoos coincided with a trend for people to live in urban areas.

3. During the period when many zoos were opened, the study of natural history became more popular in universities than other scientific subjects.

4. Cities recognized that the new zoos were as significant an amenity as museums.

5. Between 1940 and 1960 some older zoos had to move to new sites in order to expand.

6. In the 1970's new ways of funding, zoos were developed.

7. There has been serious disagreement amongst historians about the role of the first zoos.

Test 2

Why do people collect things?

People from almost every culture love collecting things. They might collect stamps, books, cards, priceless paintings or worthless ticket stubs to old sports games. Their collection might hang on the walls of a mansion or be stored in a box under the bed. So what is it that drives people to collect? Psychologist Dr Maria Richter argues that the urge to collect is a basic human characteristic. According to her, in the very first years of life we form emotional connections with lifeless objects such as soft toys. And these positive relationships are the starting points for our fascination with collecting objects. in fact, the desire to collect may go back further still. Scientists suggest that for some ancient humans living hundreds of thousands of years ago, collecting may have had a serious purpose. Only by collecting sufficient food supplies to last through freezing winters or dry summers could our ancestors stay alive until the weather improved.

It turns out that even collecting for pleasure has a very long history. In 1925, the archaeologist Leonard Woolley was working at a site in the historic Babylonian City of Ur. Woolley had travelled to the region intending only to excavate the site of a palace. Instead, to his astonishment, he dug up artefacts which appeared to belong to a 2,500-year-old Museum. Among the objects was part of a statue and a piece of a local building. And accompanying some of the artefacts were descriptions like modern-day labels. These texts appeared in three languages and were carved into pieces of clay. It seems likely that this early private collection of objects was created by Princess Ennigaldi, the daughter of King Nabonidus. However, very little else is known about Princess Ennigaldior what her motivations were for setting up her collection.

This may have been one of the first large private collections, but it was not the last. indeed the fashion for establishing collections really got started in Europe around 2000 years later with the so-called 'cabinets of curiosities.' these were collections usually belonging to wealthy families, that were displayed in cabinets or small rooms. Cabinets of curiosities typically

included fine paintings and drawings, but equal importance was given to exhibits from the natural world such as animal specimens, shells and plants.

Some significant private collections of this sort date from the 15th century. One of the first belonged to the Medici family. The Medicis became a powerful political family in Italy and later a royal house, but banking was originally the source of all their wealth. The family started by collecting coins and valuable gems, then artworks and antiques from around Europe. in 1570 a secret 'studio' was built inside The Palazzo Medici to house their growing collection. This exhibition room had solid walls without windows to keep the valuable collection safe.

In the seventeenth century, another fabulous collection was created by a Danish physician named Ole Worm. His collection room contained numerous skeletons and specimens, as well as ancient texts and a laboratory. One of Ole worm's motivations was to point out what other researchers had made mistakes, such as the false claim that birds of paradise had no feet. He also owned a great auk, a species of bird that has now become extinct, and the illustration he produced of it has been of value to later scientists.

The passion for collecting was just as a strong in the 19th century. Lady Charlotte Guest spoke at least six languages and became well known for translating English books into Welsh. She also travelled widely throughout Europe acquiring old and rare pottery which she added to her collection at home in southern England. When Lady Charlotte died in 1895 this collection was given to the Victoria and Albert Museum in London. At around the same time in the north of England, a wealthy goldsmith named Joseph Mayer was building up an enormous collection of artefacts particularly those dug up from sites in his local area. His legacy, the Mayor Trust, continues to fund public lectures in accordance with his wishes.

In the 20th century the writer Beatrix Potter had a magnificent collection of books, insects, plants and other botanical specimens. Most of these were donated to London's Natural History Museum, but Beatrix held on to her cabinets of fossils, which she was particularly proud of. In the United States, President Franklin D. Roosevelt Began his stamp collection as a child and continue to add to it all his life. The stress associated with being president was easier to cope with, Roosevelt said, by taking time out to focus on his collection. By the end of his life, this had expanded to include model ships, coins and artworks.

Most of us will never own collection so large or valuable as this. However, examples given here suggest that collecting is a passion that has been shared by countless people over many centuries.

Questions 1-6

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

In boxes 1-6 on your answer sheet, write

TRUE *if the statement agrees with the information*

FALSE *if the statement contradicts the information*

NOT GIVEN *if there is no information on this*

1. Dr Maria Richter believes that people become interested in collecting in early childhood.

2. A form of collecting may have helped some ancient humans to survive.

3. Leonard Woolley expected to find the remains of a private collection at Ur.

4. Woolley found writing that identified some of the objects he discovered.

5. Princess Ennigaldi established her collection to show off her wealth.

6. Displaying artworks was the main purpose of Cabinets of Curiosities.

Test 3

The History of Modern American Dance

The birth of modern American dance occurred in the first years of the twentieth century. And, perhaps unusually for academics, dance historians hold remarkably similar views when it comes to identifying the individuals and influences that shaped the evolution of modern American dance. Starting in the early 1900s, we can see that dancers quite deliberately moved away from previous approaches. This included rejecting both the formal moves of ballet dancing and the entertainment of vaudeville dancing. As a result, dancers began the new century with a fresh start. One important figure at this time was Loie Fuller, who performed largely with her arms, perhaps because she had limited dance training. Fuller emphasised visual effects rather than storytelling, and pioneered the use of artificial lighting to create shadows while dancing.

Perhaps most influential in the early years was Isadora Duncan, who was well known in both America and Europe. Duncan refused to wear elaborate costumes, preferring to dance in plain dresses and bare feet. She is also notable for preferring music written by classical composers such as Chopin and Beethoven, rather than contemporary compositions. At a similar time, Ruth St Denis was bringing the influence of Eastern cultures to American dance, often performing solo. In 1915, St Denis opened a dance training academy with her husband with the intention of passing on her approach and style to the next generation of American dancers.

By the 1920s, the modern dance movement in America was well established. Audiences were enthusiastic and dancers were increasingly prepared to experiment with new ideas. Martha Graham was one of an important group who emerged in New York. Graham looked within herself to find her dance style, examining how her body moved as she breathed, but also observing the patterns made by her limbs when walking in order to find a new, naturalistic approach to dance. Doris Humphrey wanted her dance to reflect her personal experience of American life. She explored the concept of gravity, allowing her body to fall, only to recover at the last moment. Her book *The Art of Making Dances,* which detailed her approach to dance composition, was highly influential with later generations of dancers.

By the 1930s, modern dance was becoming an accepted, respectable art form. Universities such as Bennington College included modern dance in their performing arts programmes for the first time. In the 1940s, German-born dancer Hanya Holm embraced the changing times

by including modern dance in mainstream musicals on the Broadway stage. Among Holm's many other innovations was bringing her own humour to these performances - audiences adored it.

Modern American dance has seldom stood still. Each new generation of dancers either developed the techniques of their teachers or rejected them outright. So by the 1950s the techniques of traditional European ballet dancing were again influential. This was certainly true of Erick Hawkins, who also incorporated Native American and Asian styles. Similarly, Merce Cunningham emphasised the leg actions and flexibility of the spine associated with ballet moves. Paul Taylor preferred his dance to reflect the experiences and interactions of ordinary people going about their everyday lives. Taylor's career was the subject of a documentary that provided valuable insights into this period of dance.

The middle decades of the 20th century were certainly a dynamic time. Increasingly, the modern dance movement recognised and reflected the fact that America was a multi-racial, multi-cultural society. Katherine Dunham, an anthropology graduate, used movements from Pacific, African and Caribbean dance to create her unique style. Pearl Primus was another champion of African dance, which she passed on through her dance school in New York. After retirement she travelled widely to universities throughout America lecturing on ethnic dance, which became her main priority.

Modern dance since the 1980s has become a mix of multiple forms of dance, as well as art more generally. For example, Mark Morris's hugely popular work *The Hard Nut* includes sensational costumes and a stage design inspired by the comics he'd always enjoyed. Another innovator has been Ohad Naharin, who studied in New York and has worked internationally. Naharin's 'Gaga' style is characterised by highly flexible limbs and backbones, while in rehearsal his dancers have no mirrors, feeling their movements from within themselves, a break from traditional dance custom. In many ways it was a fitting end to a l 00-year period that had witnessed a transformation in dance. The emergence of modern American dance was very much a 20th-century phenomenon. The style drew on influences from home and abroad and in turn went on to influence global dance culture.

Questions 1-6

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

In boxes 1-6 on your answer sheet, write
***TRUE** if the statement agrees with the information*
***FALSE** if the statement contradicts the information*
***NOT GIVEN** if there is no information on this*

1. Dance historians agree about the development of modern American dance.
2. Dancers in the early 1900s tended to copy the styles of earlier dancers.
3. Loie Fuller preferred to dance alone on stage.
4. Isadora Duncan wore complicated clothing when dancing.
5. Some dancers criticised Isadora Duncan for her choice of music.
6. Ruth St Denis wished to educate others in her style of dancing.

Yes / No / Not Given Questions

Test 1

The growth of intelligence

A. No one doubts that intelligence develops as children grow older. Yet the concept of intelligence has proved both quite difficult to define in unambiguous terms and unexpectedly controversial in some respects. Although at one level, there seem to be almost as many definitions of intelligence as people who have tried to define it, there is broad agreement on two key features. That is, intelligence involves the capacity not only to learn from experience but also to adapt to one's environment. However, we cannot leave the concept there. Before turning to what is known about the development of intelligence, it is necessary to consider whether we are considering the growth of one or many skills. That question has been tackled in rather different ways by psychometricians and by developmentalism.

B. The former group has examined the issue by determining how children's abilities on a wide range of tasks correlate or go together. Statistical techniques have been used to find out whether the pa Hems are best explained by one broad underlying capacity', general intelligence, or by a set of multiple, relatively separate, special skills in domains such as verbal and visuospatial ability'. While it cannot be claimed that everyone agrees on what the results mean, most people now accept that for practical purposes it is reasonable to suppose that both are involved. In brief, the evidence in favour of some kind of general intellectual capacity is that people who are superior (or inferior) on one type of task tend also to be superior (or inferior) on others. Moreover, general measures of intelligence tend to have considerable powers to predict a person's performance on a wide range of tasks requiring special skills. Nevertheless, it is plain that it is not at all uncommon for individuals to be very' good at some sorts of a task and yet quite poor at some others. Furthermore, the influences that affect verbal skills are not quite the same as those that affect other skills.

C. This approach to investigating intelligence is based on the nature of the task involved but studies of age-related changes show that this is not the only, or necessarily the most important, approach. For instance, some decades ago, Horn and Cattell argued for differentiation between what they termed 'fluid' and 'crystallized' intelligence. Fluid abilities are best assessed by tests that require mental manipulation of abstract symbols. Crystallized

abilities, by contrast, reflect knowledge of the environment in which we live and past experience of similar tasks; they may be assessed by tests of comprehension and information. It scents that fluid abilities peak in early adult life, whereas crystallized abilities increase up to advanced old age.

D. Developmental studies also show that the interconnection between different skills varies with age. Titus in the first year of a life interest in perceptual patterns is a major contributor to cognitive abilities, whereas verbal abilities are more important later on. These findings seemed to suggest a substantial lack of continuity between infancy and middle childhood. However, it is important to realize that the apparent discontinuity will vary according to which of the cognitive skills were assessed in infancy. It has been found that tests of coping with novelty do predict later intelligence. These findings reinforce the view that voting children's intellectual performance needs to be assessed from their interest in and curiosity about the environment, and the extent to which this is applied to new situations, as well as by standardized intelligence testing.

E. These psychometric approaches have focused on children's increase in cognitive skills as they grow older. Piaget brought about a revolution in the approach to cognitive development through his arguments (backed up by observations) that the focus should be on the thinking processes involved rather than on levels of cognitive achievement. These ideas of Piaget gave rise to an immense body of research and it would be true to say that subsequent thinking has been heavily dependent on his genius in opening up new ways of thinking about cognitive development. Nevertheless, most of his concepts have had to be so radically revised, or rejected, that his theory no longer provides an appropriate basis for thinking about cognitive development. To appreciate why that is so, we need to focus on some rather different elements of Piaget s theorizing.

F. The first element, which has stood the test of time, is his view that the child is an active agent of learning and of the importance of this activity in cognitive development. Numerous studies have shown how infants actively scan their environment; how they prefer patterned to non-patterned objects, how they choose novel over familiar stimuli, and how they explore their environment as if to see how it works. Children's questions and comments vividly illustrate the ways in which they are constantly constructing schemes of what they know and trying out their ideas of how to fit new knowledge into those schemes or deciding that the schemes need modification. Moreover, a variety' of studies have shown that active

experiences have a greater effect on learning than comparable passive experiences. However, a second element concerns the notion that development proceeds through a series of separate stages that have to be gone through step-by-step, in a set order, each of which is characterized by a particular cognitive structure. That has thinned out to be a rather misleading way of thinking about cognitive development, although it is not wholly wrong.

Questions 31-36

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

In boxes 31-36 on your answer sheet, write

YES, if the statement agrees with the views of the writer

NO, if the statement contradicts the views of the writer

NOT GIVEN, if it is impossible to say what the writer thinks about this

31. A surprising number of academics have come to the same conclusion about what the term intelligence means.

32. A general test of intelligence is unlikely to indicate the level of performance in every type of task.

33. The elderly perform less well on comprehension tests than young adults.

34. We must take into account which skills are tested when comparing intelligence at different ages.

35. Piaget's work influenced theoretical studies more than practical research.

36. Piaget's emphasis on active learning has been discredited by later researchers.

Test 2

America's oldest art?

A. Set within treacherously steep cliffs, and hidden away valleys of northeast Brazil, is some of Southeast America's most significant and spectacular rock-art. Most of the art so far discovered from the ongoing excavations comes from the archaeologically – important National Park of the Serra da Capivara in the state of Piaui, and it is causing quite a controversy. The reason for the uproar? The art is being dated to around 25.CC0 or perhaps. According to some archaeologists, even 36,000 years ago. If correct, this is set to challenge the wide-field view that America was first colonized from the north, via the Bering Straits from eastern Siberia at around 10.000 BC. only moving down into Central and South America in the millennia thereafter.

B. Prior to the designation of 130,000 hectares as a National Park, the rock-art sites were difficult to get to and often dangerous to enter. In ancient times, this inaccessibility must have heightened the importance of the sites, and indeed of the people who painted on the rocks. Wild animals and human figures dominate the art and are incorporated into often-complex scenes involving hunting, supernatural beings, fighting and dancing. The artists depicted the animals that roamed the local ancient brushwood forest. The large mammals are usually hunted in groups and tend to be shown a running stance, as they trying to escape from hunting parties. Processions – lines of human and animal figures – also appear of great importance to these ancient artists. Might such lines represent family units or groups of warriors? On a number of panels, rows of stylized figures, some numbering up to 30 individual figures, were painted using the natural undulating contours of the rock surface, so evoking the contours of the seconding landscape. Other interesting, but very rare, occurrences are scenes that show small human figures holding on to and dancing around a tree, possibly involved in some form of a ritual dance.

C. Due to the favourable climatic conditions. the imagery on many panels is in a remarkable state of preservation. Despite this, however, there are serious conservation issues that affect their long term survival. The chemical and mineral quantities of the rock on which the imagery is panted are fragile and on several panels it is unstable. As well as the secretion of sodium carbonate on the rock surface, complete panel sections have, over the ancient and recent past, broken away from the main rock surface. These have then become buried and

sealed into sometimes-ancient floor deposits. Perversely, this form of natural erosion and subsequent deposition has assisted archaeologists in dating several major rock-art sites. Of course, dating the art is extremely difficult oven the non-existence of plant and animal remains that might be scientifically dated. However, there am a small number of sites in the Serra da Capivara that are giving up their secrets through good systematic excavation. Thus, at Toca do Roqi.omo da Pedra Furada. rock-art researcher Nide Guidon managed to obtain a number of dates. At different levels of excavation, she located fallen painted rock fragments, which she was able to dale to at least 36,000 years ago. Along with toe painted fragments, crude stone tools were found. Also discovered were a series of scientifically datable sites of fireplaces, or hearths, the earliest dated to 46,000 BC. arguably the oldest dates for human habitation in America.

D. However, these conclusions are not without controversy. Critics, mainly from North America, have suggested that the hearths may, in fact, be a natural phenomenon, the result of seasonal brushwood fires. Several North American researchers have gone further and suggested that the rock art from this site dates from no earlier than about 3,730 years ago, based on the results of limited radiocarbon dating. Adding further fool to the general debate is the fact that the artists in the area of the National Hark tended not to draw over old motifs (as often occurs with rock-art), which makes it hard to work out the relative chronology of the images or styles. However, the diversity of imagery and the narrative the paintings created from each of the many sites within the National Park suggests different artists were probably making their art at different times and potentially using each site over many thousands of years.

E. With fierce debates thus raging over to dating, where these artists originate from is also still very much open to speculation. The traditional view ignores the early dating evidence from the South American rock-art sites. In a revised scenario, some anthropologists are now suggesting that modern humans may' have migrated from Africa using the strong currents of the Atlantic Ocean some 63.000 years or more ago, while others suggest more improbable colonization coming from the Pacific Ocean. Yet, while the ether hypothesis is plausible, there is still no supporting archaeological evidence between the South American coastline and the interior. Rather, it seems possible that there were a number of waves of human colonization of the Americas occurring possibly over a 60,000-100,000 year period, probably using the Bering Straits as a land bridge to cross into the Americas.

F. Despite the compelling evidence from South America, it stands alone: the earliest secure human evidence yet found in die state of Oregon in North America only dates to 12,300 years BC. So this is a fierce debate that is likely to go on for many more years. However, the splendid rock art and its allied anthropology of northeast of Brazil, described here, is playing a huge and significant role in the discussion.

Questions 30-36

In boxes 30-36 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

30. Archaeologists have completed their survey of the rock-art in Piaui.

31. The location of the rock-art suggests that the artists had a significant role in their society.

32. The paintings of animals show they were regarded as sacred by the ancient humans.

33. Some damage to paintings is most likely due to changes in the weather of the region.

34. The fact that some paintings wore buried is useful to archaeologists.

35. The tools found near some paintings were probably used for hunting animals.

36. The North American researchers have confirmed Niede Guidons dating of the paintings.

Test 3

The Truth about the Environment

For many environmentalists, the world seems to be getting worse. They have developed a hit-list of our main fears: that natural resources are running out; that the population is ever growing, leaving less and less to eat; that species are becoming extinct in vast numbers, and that the planet's air and water are becoming ever more polluted.

But a quick look at the facts shows a different picture. First, energy and other natural resources have become more abundant, not less so, since the book The Limits to Growth' was published in 1972 by a group of scientists. Second, more food is now produced per head of the world's population than at any time in history. Fewer people are starving. Third, although species are .indeed becoming extinct, only about 0.7% of them are expected to disappear in the next 50 years, not 25-50%, as has so often been predicted. And finally, most forms of environmental pollution either appear to have been exaggerated, or are transient - associated with the early phases of industrialisation and therefore best cured not by restricting economic growth, but by accelerating it. One form of pollution - the release of greenhouse gases that causes global warming - does appear to be a phenomenon that is going to extend well into our future, but its total impact is unlikely to pose a devastating problem. A bigger problem may well turn out to be an inappropriate response to it.

Yet opinion polls suggest that many people nurture the belief that environmental standards are declining and four factors seem to cause this disjunction between perception and reality.

One is the lopsidedness built into scientific research. Scientific funding goes mainly to areas with many problems. That may be wise policy, but it will also create an impression that many more potential problems exist than is the case.

Secondly, environmental groups need to be noticed by the mass media. They also need to keep the money rolling in. Understandably, perhaps,they sometimes overstate their arguments. In 1997, for example, the World Wide Fund for Nature issued a press release entitled: 'Two thirds of the world's forests lost forever'. The truth turns out to be nearer 20%.

Though these groups are run overwhelmingly by selfless folk, they nevertheless share many of the characteristics of other lobby groups. That would matter less if people applied the same

degree of scepticism to environmental lobbying as they do to lobby groups In other fields. A trade organisation arguing for, say, weaker pollution controls is instantly seen as self-interested. Yet a green organisation opposing such a weakening is seen as altruistic, even if an impartial view of the controls in question might suggest they are doing more harm than good.

A third source of confusion is the attitude of the media. People are clearly more curious about bad news than good. Newspapers and broadcasters are there to provide what the public wants. That, however, can lead to significant distortions of perception. An example was America's encounter with El Nino in 1997 and 1998. This climatic phenomenon was accused of wrecking tourism, causing allergies, melting the ski-slopes and causing 22 deaths. However, according to an article in the Bulletin of the American Meteorological Society, the damage it did was estimated at US$4 billion but the benefits amounted to some US$19 billion. These came from higher winter temperatures (which saved an estimated 850 lives, reduced heating costs and diminished spring floods caused by meltwaters).

The fourth factor is poor individual perception. People worry that the endless rise in the amount of stuff everyone throws away will cause the world to run out of places to dispose of waste. Yet, even if America's trash output continues to rise as it has done in the past, and even if the American population doubles by 2100, all the rubbish America produces through the entire 21st century will still take up only one-12.000th of the area of the entire United States.

So what of global warming? As we know, carbon dioxide emissions are causing the planet to warm. The best estimates are that the temperatures will rise by 2-3°C in this century, causing considerable problems, at a total cost of US$5,000 billion.

Despite the intuition that something drastic needs to be done about such a costly problem, economic analyses clearly show it will be far more expensive to cut carbon dioxide emissions radically than to pay the costs of adaptation to the increased temperatures. A model by one of the main authors of the United Nations Climate Change Panel shows how an expected temperature increase of 2.1 degrees in 2100 would only be diminished to an increase of 1.9 degrees. Or to put ft another way, the temperature increase that the planet would have experienced in 2094 would be postponed to 2100.

So this does not prevent global warming, but merely buys the world six years. Yet the cost of reducing carbon dioxide emissions, for the United States alone, will be higher than the cost of solving the world's single, most pressing health problem: providing universal access to clean drinking water and sanitation. Such measures would avoid 2 million deaths every year, and prevent half a billion people from becoming seriously ill.

It is crucial that we look at the facts if we want to make the best possible decisions for the future. It may be costly to be overly optimistic - but more costly still to be too pessimistic.

Questions 1-6

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

*In boxes **1-6** on your answer sheet, write*

***YES** if the statement agrees with the writer's claims*

***NO** if the statement contradicts the writer's claims*

***NOT GIVEN** if it is impossible to say what the writer thinks about this*

27. Environmentalists take a pessimistic view of the world for a number of reasons.

28. Data on the Earth's natural resources has only been collected since 1972.
29. The number of starving people in the world has increased in recent years.
30. Extinct species are being replaced by new species.
31. Some pollution problems have been correctly linked to industrialisation.
32. It would be best to attempt to slow down economic growth.

Session 5 Questions

Matching Sentences Ending

Test 1

Endangered languages

'Nevermind whales, save the languages', says Peter Monaghan, graduate of the Australian National University.

Worried about the loss of rainforests and the ozone At linguistics meetings in the US, where the layer? Well, neither of those is doing any worse than endangered-language issue has of late been a large majority of the 6,000 to 7,000 languages that something of a flavour of the month, there is remain in use on Earth. One half of the survivors will growing evidence that not all approaches to the almost certainly be gone by 2050, while 40% more preservation of languages will be particularly will probably be well on their way out. In their place, helpful. Some linguists are boasting, for example, almost all humans will speak one of a handful of of more and more sophisticated means of capturing megalanguages – Mandarin, English, Spanish.

Linguists know what causes languages to disappear, but less often remarked is what happens on the way to disappearance: languages' vocabularies, grammars and expressive potential all diminish as one language is replaced by another. 'Say a community goes over from speaking a traditional Aboriginal language to speaking a creole*,' says Australian Nick Evans, a leading authority on Aboriginal languages, 'you leave behind a language where there's very fine vocabulary for the landscape. All that is gone in a creole. You've just got a few words like 'gum tree' or whatever. As speakers become less able to express the wealth of knowledge that has filled ancestors' lives with meaning over millennia, it's no wonder that communities tend to become demoralised.'

If the losses are so huge, why are relatively few linguists combating the situation? Australian linguists, at least, have achieved a great deal in terms of preserving traditional languages. Australian governments began in the 1970s to support an initiative that has resulted in good documentation of most of the 130 remaining Aboriginal languages. In England, another Australian, Peter Austin, has directed one of the world's most active efforts to limit language

loss, at the University of London. Austin heads a programme that has trained many documentary linguists in England as well as in language-loss hotspots such as West Africa and South America.

At linguistics meetings in the US, where the endangered-language issue has of late been something of a flavour of the month, there is growing evidence that not all approaches to the preservation of languages will be particularly helpful. Some linguists are boasting, for example, of more and more sophisticated means of capturing languages: digital recording and storage, and internet and mobile phone technologies. But these are encouraging the 'quick dash' style of recording trip: fly in, switch on digital recorder, fly home, download to hard drive, and store gathered material for future research. That's not quite what some endangered-language specialists have been seeking for more than 30 years. Most loud and untiring has been Michael Krauss, of the University of Alaska. He has often complained that linguists are playing with non-essentials while most of their raw data is disappearing.

Who is to blame? That prominent linguist Noam Chomsky, say Krauss and many others. Or, more precisely, they blame those linguists who have been obsessed with his approaches. Linguists who go out into communities to study, document and describe languages, argue that theoretical linguists, who draw conclusions about how languages work, have had so much influence that linguistics has largely ignored the continuing disappearance of languages. Chomsky, from his post at the Massachusetts Institute of Technology, has been the great man of theoretical linguistics for far longer than he has been known as a political commentator. His landmark work of 1957 argues that all languages exhibit certain universal grammatical features, encoded in the human mind. American linguists, in particular, have focused largely on theoretical concerns ever since, even while doubts have mounted about Chomsky's universals.

Austin and Co. are in no doubt that because languages are unique, even if they do tend to have common underlying features, creating dictionaries and grammars requires prolonged and dedicated work. This requires that documentary linguists observe not only languages' structural subtleties, but also related social, historical and political factors. Such work calls for persistent funding of field scientists who may sometimes have to venture into harsh and even hazardous places. Once there, they may face difficulties such as community suspicion. As Nick Evans says, a community who speak an endangered language may have reasons to

doubt or even oppose efforts to preserve it. They may have seen support and funding for such work come and go. They may have given up using the language with their children, believing they will benefit from speaking a more widely understood one.

Plenty of students continue to be drawn to the intellectual thrill of linguistics field work. That's all the more reason to clear away barriers, contend Evans, Austin and others. The highest barrier, they agree, is that the linguistics profession's emphasis on theory gradually wears down the enthusiasm of linguists who work in communities. Chomsky disagrees. He has recently begun to speak in support of language preservation. But his linguistic, as opposed to humanitarian, argument is, let's say, unsentimental: the loss of a language, he states, 'is much more of a tragedy for linguists whose interests are mostly theoretical, like me, than for linguists who focus on describing specific languages, since it means the permanent loss of the most relevant data for general theoretical work'. At the moment, few institutions award doctorates for such work, and that's the way it should be, he reasons. In linguistics, as in every other discipline, he believes that good descriptive work requires thorough theoretical understanding and should also contribute to building new theory. But that's precisely what documentation does, objects Evans. The process of immersion in a language, to extract, analyse and sum it up, deserves a PhD because it is 'the most demanding intellectual task a linguist can engage in'.

Questions 37-40

Complete each sentence with the correct ending A-G below. Write the correct letter A-G in boxes 37-40 on your answer sheet.

37) Linguists like Peter Austin believe that every language is unique

38) Nick Evans suggests a community may resist attempts to save its language

39) Many young researchers are interested in doing practical research

40) Chomsky supports work in descriptive linguistics

A. even though it is in danger of disappearing.

B. provided that it has a strong basis in theory.

C. although it may share certain universal characteristics.

D. because there is a practical advantage to it.

E. so long as the drawbacks are clearly understood.

F. in spite of the prevalence of theoretical linguistics.

G. until they realize what is involved.

Test 2

Jellyfish: a remarkable marine life form

When viewed in the wild, jellyfish are perhaps the most graceful and vividly coloured of all sea creatures. But few people have ever seen a jellyfish living in its natural habitat. Instead, they might see a dead and shapeless specimen lying on the beach, or perhaps receive a painful sting while swimming, so it is inevitable that jellyfish are often considered ugly and possibly dangerous. This misunderstanding can be partly traced back to the 20th century, when the use of massive nets and mechanical winches often damaged the delicate jellyfish that scientists managed to recover. As a result, disappointingly little research was carried out into jellyfish, as marine biologists took the easy option and focused on physically stronger species such as fish, crabs and shrimp. Fortunately, however, new techniques are now being developed. For example, scientists have discovered that sound bounces harmlessly off jellyfish, so in the Arctic and Norway researchers are using sonar to monitor jellyfish beneath the ocean's surface. This, together with aeroplane surveys, satellite imagery and underwater cameras, has provided a wealth of new information in recent years.

scientists now believe that in shallow water alone there are at least 38 million tonnes of jellyfish and that these creatures inhabit every type of marine habitat, including deep water. Furthermore, jellyfish were once regarded as relatively solitary, but this is another area where the science has evolved. Dr Karen Hansen was the first to suggest that jellyfish are in fact the center of entire ecosystems, as shrimp, lobster and fish shelter and feed among their tentacles. This proposition has subsequently been conclusively proven by independent studies. DNA sequencing and isotope analysis have provided further insights, including the identification of numerous additional species of jellyfish unknown to science only a few years ago.

This brings us to the issue of climate change. Research studies around the world have recorded a massive growth in jellyfish populations in recent years and some scientists have linked this to climate change. However, while this may be credible, it cannot be established with certainty as other factors might be involved. Related to this was the longstanding academic belief that jellyfish had no predators and therefore there was no natural process to limit their numbers. However, observations made by Paul Dewar and his team showed that this was incorrect. As a result, the scientific community now recognises that species including sharks, tuna, swordfish and some salmon all prey on jellyfish.

It is a still widely assumed that jellyfish are among the simplest life forms, as they have no brain or central nervous system. While this is true, we now know they process senses that allow them to see, feel and interact with their environment in subtle ways. What is more, analysis of the so-called 'upside-down' jellyfish shows that they shut down their bodies and rest in much the same way that humans do at night, something once widely believed to be impossible for jellyfish. Furthermore, far from 'floating' in the water as they are still sometimes thought to do, analysis has shown jellyfish to be the most economical swimmers in the animal Kingdom.in short, scientific progress in recent years has shown many of our established beliefs about jellyfish were inaccurate.

Jellyfish, though, are not harmless. Their sting can cause a serious allergic reaction in some people and large outbreaks of them - known as 'blooms' - can damage tourist businesses, break fishing nets, overwhelm fish farms and block industrial cooling pipes. On the other hand, jellyfish are a source of medical collagen used in surgery and wound dressings. In addition, a particular protein taken from jellyfish has been used in over 30,000 scientific studies of serious diseases such as Alzheimer's. Thus, our relationship with jellyfish is complex as there are a range of conflicting factors to consider.

Jellyfish have existed more or less unchanged for at least 500 million years. Scientists recognize that over the planet's history there have been three major extinction events connected with changing environmental conditions. Together, these destroyed 99% of all life, but jellyfish lived through all three. Research in the Mediterranean Sea has now shown, remarkably, that in old age and on the point of death, certain jellyfish are able to revert to an earlier physical state, leading to the assertion that they are immortal. While this may not technically be true, it is certainly an extraordinary discovery. What is more, the oceans today contain 30% more poisonous acid than they did 1 00 years ago, causing problems for numerous species, but not jellyfish, which may even thrive in more acidic waters. Jellyfish throughout their long history have shown themselves to be remarkably resilient.

Studies of jellyfish in the class known as scyphozoan have shown a lifecycle of three distinct phases. First, thousands of babies known as planulae are released. Then, after a few days the planulae develop into polyps - stationary lifeforms that feed off floating particles. Finally, these are transformed into something that looks like a stack of pancakes, each of which is a tiny jellyfish. It is now understood that all species of jellyfish go through similarly distinct

stages of life. This is further evidence of just how sophisticated and unusual these lifeforms are.

Questions 37-40

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

Write the correct letter, ***A-F,*** *in boxes 37-40 on your answer sheet.*

37. Researchers working in Norway and the Arctic have shown that

38. The use of DNA sequencing and isotope analysis has proved that

39. Research into 'upside-down jellyfish' showed that

40. Following research in the Mediterranean Sea, it has been claimed that

A it was wrong to assume that jellyfish do not sleep
B certain species of jellyfish have changed their usual diet.
C jellyfish can be observed and tracked in ways that do not injure them.
D one particular type of jellyfish may be able to live forever.
E there are more types of jellyfish than previously realised.
F some jellyfish are more dangerous to humans than once thought.

Test 3

Review: The hidden life of trees by Peter Wohlleben

That so many copies of Peter Wohlleben's book The Hidden Life of Trees have been sold is no surprise. Life in the urban jungle can be overwhelming, and many of us long to escape by seeking more natural environments. We hope an encounter with nature might make us feel more 'alive'. Would we use this same term to describe nature itself, though? Forests and the trees that form them are commonly perceived as objects lacking awareness, like rocks or stones. But here, Wohlleben would beg to differ. From his observations, he has concluded that they are conscious in a way we do not fully understand.

In recent decades, a number of writers have investigated our planet's flora. The Cabaret of Plants by Richard Mabey and What a Plant Knows by Daniel Chamovitz, for example, have done much to reformulate our views about the green world. Central to many of these books is a serious message about sustainability, and The Hidden Life of Trees is no exception. What sets it apart is its approach to description: at the start Wohlleben announces that 'When you know that trees ... have memories and that tree parents live together with their children, then you can no longer just chop them down.' Not everyone will be comfortable with this kind of anthropomorphism.

Nevertheless, Wohlleben's experience of working in a beech forest in the Eitel mountains of Germany may put him in a better position than many to write a book about trees. In the introduction, he explains that he started out as a state-employed forester, taking care of trees purely for industrial reasons. The straighter they were, the more high-quality logs could be sawn. But after a while he began to appreciate trees for more than just their commercial worth. He gives some of the credit for this realization to the tourists that would come to the forest, who were more enchanted by bent, crooked trees, which did not conform to the straight ideal.

An anecdote that stands out is Wohlleben's encounter with 'the gnarled remains of an enormous tree stump' in the Eitel forest. More than anything else, it was this encounter that prompted him to look further into the hidden behaviour of trees. To his surprise, after scraping at the outside layer of bark covering the stump, he discovered a green layer underneath. This was chlorophyll, the pigment normally produced by living trees. Wohlleben

realised that the only way the stump could still be alive was if the surrounding beeches were providing it with a sugar solution through their own roots.

Wohlleben is not the first person to claim that trees are cooperative. In the 1990s, Dr Suzanne Simard realised that fir and birch trees were supplying each other with carbon. Simard's findings made complete sense to Wohlleben, who believes that this kind of nutrient exchange between neighbours is typical of a healthy forest. Wohlleben also had the opportunity to deepen his understanding of tree biology when researchers from Aachen University set up investigative programmes in his beech forest. Discussions with them reinforced his beliefs about the way trees thrived, and Wohlleben eventually found himself strongly opposed to some traditional forestry practices. He finally succeeded in persuading local villagers that the forest should be allowed to return to a natural state: this involved banning the use of machinery for logging, and giving up on pesticides for a start. Since then, Wohlleben has been noting how his beech forest has developed, and his observations formed the foundation for the book. Humour and a straightforward narrative make it instantly appealing to readers without a science background -elements that have successfully been translated into over a dozen languages. Those that do have scientific training, however, will be more demanding. Critics of Wohlleben point out that proper academic studies need to be done to prove all his claims are factually accurate. This seems a fair point. What the book will certainly do is transform nature lovers' experiences of a forest walk. Once you know what is happening below ground, you can't help but marvel at the complex life of trees. Will it transform the way we produce timber for the manufacturing industry? As large corporations tend to focus on immediate profits, they are hardly likely to adopt the longer-term practices that Wohlleben recommends.

One of these is allowing trees to grow nearer to each other. This is the opposite of what happens in many state-owned forests, where foresters deliberately space out trees so they can get more sunlight and grow faster. But Wohlleben claims this spacing prevents vital root interaction, and so lowers resistance to drought. Older, established trees, he explains, draw up moisture through their deep roots and provide this to juvenile trees growing below them. Without this assistance, they could die. The relationship between fungi and trees is also given attention. For instance, when pines require more nitrogen, the fungi growing at their base release a poison into the soil. This poison kills many minute organisms, which release nitrogen as they die, and this is absorbed by the trees' roots. In return, the fungi receive photosynthesised sugar from the pines. Then Wohlleben explores the way trees employ scent,

giving the example of acacia trees in sub-Saharan Africa. When giraffes begin feeding on an acacia's leaves, the tree emits ethylene gas as a warning to neighbouring acacias. These then pump tannins into their leaves - substances toxic to giraffes. More controversial is Wohlleben's suggestion that trees feel pain. Although scientific research has now established that if branches are broken off or the trunk is hit with an axe, a tree will emit electrical signals from the site of the wound, the application of the concept of 'pain' might be an instance where readers are unconvinced.

Questions 37-40

Complete each sentence with the correct ending, ***A-G,*** *below.*

Write the correct letter, ***A-G,*** *in boxes 37-40 on your answer sheet.*

37 The distance between trees in state-owned forests

38 The fungi growing at the base of trees

39 The scent sometimes given off by trees

40 The electrical signals sent out by trees

A may prevent harm occurring to the same tree species.
B can be the result of different forms of damage.
C might help the spread of trees in a new location.
D could be a sign that trees have reached maturity.
E may affect how vulnerable young trees are during dry periods.
F can play a part in providing essential nutrients.
G might encourage disease in trees growing nearby

Test 4

Tue Influence of the Crime Writer

Agatha Christie

Crime fiction books, in which detectives hunt for the perpetrators of crimes, have been popular with readers for many decades - so popular, in fact, that at a recent London Book Fair sales of the genre overtook general fiction for the first time ever, a development that had been widely anticipated. Commercial success, of course, does not impress everyone and there are those who believe crime fiction should not be held in such high regard. Prominent in this group is Sebastian Franklin, who has argued that most crime fiction books better resemble crossword puzzles than literature. His view is shared by other literary critics. However, increasingly this is a minority opinion as crime fiction becomes recognised around the world as a rich and dynamic literary genre in its own right.

Crime writing really came to prominence in the 1920s and 30s with the books of the British author Agatha Christie, and to a slightly lesser extent the American James M. Cain. Agatha Christie was a prolific writer, publishing more than 60 detective novels over a 50-year period, beginning in 1920. However, the majority of the general public have never picked up one of her books and are more familiar with Christie from the numerous adaptations of her work for films. The colourful locations around the world where Christie set many of her stories were not fictional depictions, but were informed by her extensive travels, on the Orient Express train, to Cairo and the River Nile, and elsewhere. Her memoir, *Come, Tell Me How You Live*, published in 1946, is a non-fiction account of these real-life travels, so is unique among Christie's publications. Success brought Christie considerable wealth and international fame, though she never lost her appetite for work, continuing writing and publishing until shortly before her death in 1976.

Without doubt there are certain elements that tend to be repeated in Christie's books. The stories generally revolve around a well-off if not aristocratic circle of people, whose privileged lives are thrown into chaos by an unexplained crime. What's more, the location is often a confined space of some sort: a train, an island, a boat, an isolated house or a village. This is quite different, for example, to the world of the fictional detective Sherlock Holmes, who often has as his hunting ground the entire city of London. But the influence of Christie's sheltered, secluded locations has been immense, for they have been used in countless television series ever since.

The writer Michael Utley argues that Christie's characters lack depth and are not convincing people we can believe in. This is a not infrequent complaint, but it is quite untrue. Christie was a perceptive observer of human nature and psychology and she put the traits of people she knew into many of her fictional characters. Part of the reason her appeal has been so widespread is that she wrote about human relationships in a way so many of us can relate to. Her very first book, *The Mysterious Affair at Styles,* features the amateur detective Hercule Poirot. Poirot and Miss Marple are Christie's two best known and most frequently imitated characters precisely because they are so well drawn and believable. Further evidence of Christie's ability at characterisation was provided by a recent survey. The survey asked readers to identify the villain revealed in the final pages of Christie's sixteenth book, *Murder on the Orient Express.* Most readers could not recall, because for them the really important aspect of the book had been the interplay between the characters, not the outcome. The truth is that Christie's characters were one of her greatest achievements as a writer.

The books are also action-packed, no less so than today's most popular thrillers. Christie mastered the art of the page-turner: events unfold so quickly and unpredictably chat we keep reading to find out what happens next. The most significant consequence is chat it is so simple to overlook viral clues. It is worth reading a Christie book a second time just to notice how carefully she hides crucial information about the criminal's identity. It was there all along, but we just fail to see it because she has created such tension and so many exciting distractions.

Attempts to retell Christie's stories in contemporary times have largely been unsuccessful; they work best in their original early twentieth-century settings and cannot accommodate mobile phones, computers and DNA analysis. But that does not mean her influence has come to an end. Indeed, a new generation of global crime writers is emerging in nations as diverse as Brazil, Singapore, South Korea, India and Nigeria, to name but five. And though each new writer adds something of their own, they all employ conventions first established by Christie. If we take just one of her books, *The Murder of Roger Ackroyd,* we find near perfect examples of conventions that are still used today: eight plotting, clever sub-plots, unexpected twists, perceptive characterisation. Perhaps this is why Christie herself is believed to have ranked *The Murder of Roger Ackroyd* above all her other work. Certainly, the digital revolution has transformed crime fighting. But a survey of contemporary crime writing shows that Agatha Christie's legacy is more important now than at any time previously, at the very point when crime writing has become the most popular of all book genres.

Questions 37-40

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

Write the correct letter, ***A-F,*** *in boxes 37-40 on your answer sheet.*

37. Christie's book *Come, Tell Me How You Live,*

38. Christie's first book, *The Mysterious Affair at Styles*

39. Christie's sixteenth book, *Murder on the Orient Express*

40. *The Murder of Roger Ackroyd*, published in 1926,

A is an example of a book disliked by many critics.

B has sold more copies than her other books.

C has illustrated the fact that readers cannot remember the ending.

D was Christie's own favourite from among her books for good reasons.

E is different from all of her other books.

F introduced one of her most famous and most often copied characters.

Test 5

America's oldest art?

A. Set within treacherously steep cliffs, and hidden away valleys of northeast Brazil, is some of Southeast America's most significant and spectacular rock-art. Most of the art so far discovered from the ongoing excavations comes from the archaeologically – important National Park of the Serra da Capivara in the state of Piaui, and it is causing quite a controversy. The reason for the uproar? The art is being dated to around 25.CC0 or perhaps. According to some archaeologists, even 36,000 years ago. If correct, this is set to challenge the wide-field view that America was first colonized from the north, via the Bering Straits from eastern Siberia at around 10.000 BC. only moving down into Central and South America in the millennia thereafter.

B. Prior to the designation of 130,000 hectares as a National Park, the rock-art sites were difficult to get to and often dangerous to enter. In ancient times, this inaccessibility must have heightened the importance of the sites, and indeed of the people who painted on the rocks. Wild animals and human figures dominate the art and are incorporated into often-complex scenes involving hunting, supernatural beings, fighting and dancing. The artists depicted the animals that roamed the local ancient brushwood forest. The large mammals are usually hunted in groups and tend to be shown a running stance, as they trying to escape from hunting parties. Processions – lines of human and animal figures – also appear of great importance to these ancient artists. Might such lines represent family units or groups of warriors? On a number of panels, rows of stylized figures, some numbering up to 30 individual figures, were painted using the natural undulating contours of the rock surface, so evoking the contours of the seconding landscape. Other interesting, but very rare, occurrences are scenes that show small human figures holding on to and dancing around a tree, possibly involved in some form of a ritual dance.

C. Due to the favourable climatic conditions. the imagery on many panels is in a remarkable state of preservation. Despite this, however, there are serious conservation issues that affect their long term survival. The chemical and mineral quantities of the rock on which the imagery is panted are fragile and on several panels it is unstable. As well as the secretion of sodium carbonate on the rock surface, complete panel sections have, over the ancient and recent past, broken away from the main rock surface. These have then become buried and

sealed into sometimes-ancient floor deposits. Perversely, this form of natural erosion and subsequent deposition has assisted archaeologists in dating several major rock-art sites. Of course, dating the art is extremely difficult oven the non-existence of plant and animal remains that might be scientifically dated. However, there am a small number of sites in the Serra da Capivara that are giving up their secrets through good systematic excavation. Thus, at Toca do Roqi.omo da Pedra Furada. rock-art researcher Nide Guidon managed to obtain a number of dates. At different levels of excavation, she located fallen painted rock fragments, which she was able to dale to at least 36,000 years ago. Along with toe painted fragments, crude stone tools were found. Also discovered were a series of scientifically datable sites of fireplaces, or hearths, the earliest dated to 46,000 BC. arguably the oldest dates for human habitation in America.

D. However, these conclusions are not without controversy. Critics, mainly from North America, have suggested that the hearths may, in fact, be a natural phenomenon, the result of seasonal brushwood fires. Several North American researchers have gone further and suggested that the rock art from this site dates from no earlier than about 3,730 years ago, based on the results of limited radiocarbon dating. Adding further fool to the general debate is the fact that the artists in the area of the National Hark tended not to draw over old motifs (as often occurs with rock-art), which makes it hard to work out the relative chronology of the images or styles. However, the diversity of imagery and the narrative the paintings created from each of the many sites within the National Park suggests different artists were probably making their art at different times and potentially using each site over many thousands of years.

E. With fierce debates thus raging over to dating, where these artists originate from is also still very much open to speculation. The traditional view ignores the early dating evidence from the South American rock-art sites. In a revised scenario, some anthropologists are now suggesting that modern humans may’ have migrated from Africa using the strong currents of the Atlantic Ocean some 63.000 years or more ago, while others suggest more improbable colonization coming from the Pacific Ocean. Yet, while the ether hypothesis is plausible, there is still no supporting archaeological evidence between the South American coastline and the interior. Rather, it seems possible that there were a number of waves of human colonization of the Americas occurring possibly over a 60,000-100,000 year period, probably using the Bering Straits as a land bridge to cross into the Americas.

F. Despite the compelling evidence from South America, it stands alone: the earliest secure human evidence yet found in die state of Oregon in North America only dates to 12,300 years BC. So this is a fierce debate that is likely to go on for many more years. However, the splendid rock art and its allied anthropology of northeast of Brazil, described here, is playing a huge and significant role in the discussion.

Questions 37-40

Complete each sentence with the correct ending. A-F below.

Write the correct letter A-F on your answer sheet.

37. Materials derived from plants or animals ……

38. The discussions about the ancient hearths …….

39. Theories about where the first South Americans originated from ……..

40. The finds of archaeologists in Oregon …….

A. giving rise to a great deal of debate among anthropologists.
B. does not support the earliest dates suggested for the arrival of people in America.
C. are absent from rock-art sites In the Serra da Capivara.
D. have not been accepted by academics outside America.
E. centre on whether or not they are actually man-made.
F. reflect the advances in scientific dating methods.

Sentence Completion Questions

Test 1

Is there a psychologist in the building?

— CHRISTIAN JARRETT reports on psychology's place in new architectural development. —

A. The space around us affects us profoundly – rebuilding of one south London school as a striking emotionally, behaviorally, cognitively. In Britain, that example of how building design can affect human space is changing at a pace not seen for a generation. But is anyone listening? 'This is a hugely recognised country's psychology research that is not only relevant but improved schools. At the moment we're talking to ourselves,' says Chris Spencer, professor of environmental psychology at the University of Sheffield. Spencer recalls a recent talk he gave in which he called on fellow researchers to make a greater effort to communicate their findings to architects and planners. 'I was amazed at the response of many of the senior researchers, who would say: "I'm doing my research for pure science, the industry can take it or leave it". But there are models of how to apply environmental psychology to real problems if you know where to look Professor Frances Kuo is an example.

B. Kuo's website provides pictures and plain English " The collaborative project currently summaries of the research conducted by her Human stands as a one-off experiment. " Among these is trainee architects will now go away with some a study using police records that found inner-city surrounded by more vegetation suffered 52 per cent fewer crimes than apartment blocks with little or no greenery. Frances Kuo and her co-researcher William Sullivan believe that greenery reduces crime – so long as visibility is preserved – because it reduces aggression, brings local residents together outdoors, and the conspicuous presence of people deters criminals.

C. 'Environmental psychologists are increasingly in demand,' says David Uzzell, professor of environmental psychology. 'We're asked to contribute to the planning, design and management of many different environments, ranging from neighbourhoods, offices, schools, health, transport, traffic and leisure environments for the purpose of improving quality of life and creating a better people-environment fit.' Uzzell points to the rebuilding of one south

London school as a striking example of how building design can affect human behaviour positively. Before its redesign, it was ranked as the worst school in the area – now it is recognised as one of the country's twenty most improved schools.

D. Uzzell has been involved in a pioneering project between M.Sc students in England and Scotland. Architecture students in Scotland acted as designers while environmental psychology students in England acted as consultants, as together they worked on a community project in a run-down area of Glasgow. The psychology students encouraged the architecture students to think about who their client group was, to consider issues of crowding and social cohesion, and they introduced them to psychological methodologies, for example, observation and interviewing local residents about their needs.' The collaborative project currently stands as a one-off experiment. 'Hopefully, these trainee architects will now go away with some understanding of the psychological issues involved in the design and will take into account people's needs,' says Uzzell.

E. Hilary Barker, a recent graduate in psychology, now works for a design consultancy. She's part of a four-person research team that contributes to the overall work of the company in helping clients use their office space more productively. Her team all have backgrounds in psychology or social science, but the rest of the firm consists mainly of architects and interior designers. 'What I do is pretty rare, to be honest,' Barker says. 'I feel very privileged to be able to use my degree in such a way.' Barker explains that the team carries out observational studies on behalf of companies, to identify exactly how occupants are using their building. The companies are often surprised by the findings, for example, that staff use meeting rooms for quiet, individual work.

F. One area where the findings from the environment- behaviour research have certainly influenced building is in hospital design. The government has a checklist of criteria that must be met in the design of new hospitals, and these are derived largely from the work of the behavioural scientist Professor Roger Ulrich,' Chris Spencer says. Ulrich's work has shown, for example, how the view from a patient's window can affect their recovery. Even a hospital's layout can impact on people's health, according to Dr John Zeisel. 'If people get lost in hospitals, they get stressed, which lowers their immune system and means their medication works less well. You might think that way-finding around the hospital is the responsibility of the person who puts all the signs up, but the truth is that the basic layout of a building is what helps people find their way around,' he says.

G. Zeisel also points to the need for a better balance between private and shared rooms in hospitals. ‘Falls are reduced and fewer medication errors occur’ in private rooms, he says. There’s also research showing how important it is that patients have access to the outdoors and that gardens in hospitals are a major contributor to well-being. However, more generally, Zeisel shares Chris Spencer’s concerns that the lessons from environmental psychology research are not getting through. ’There is certainly a gap between what we in social science knowledge and the world of designers and architects,’ says Zeisel. He believes that most industries, from sports to film- making, have now recognised the importance of an evidence-based approach and that the building trade needs to formulate itself more in that vein and to recognise that there is relevant research out there. ‘It would be outrageous, silly, to go ahead with huge building projects without learning the lessons from the new towns established between 30 and 40 years ago,’ he warns.

Questions 25-26

Complete the sentences below.

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

Write your answers in boxes 25 and 26 on your answer sheet.

25. The students from England suggested that the Scottish students should identify their …… .

26. John Zeisel believes that if the …….. of a building is clear, patient outcomes will improve.

Test 2

Wooden Buildings

Using wood as a construction material for large buildings is an ancient practice. The 67-metre-high Sakyamuni Pagoda in China was constructed in 1056, while Japan's Horyu-ji Temple is even older, dating from the 7th or 8th century. That these magni-Acent structures have survived for over a thousand years is evidence of wood's strength and durability as a building material. Still today, 80% of houses in the USA are built of wood. In Australia the proportion is slightly smaller since stone is also a popular choice, particularly in the southern states, while in New Zealand the -Agure is more like 85%. Certainly, there are problems associated with wooden constructions: wood can rot when exposed to water and is said to be a fire risk. However, with modern technology these issues can be eliminated, which has led to a dramatic renewal of interest in wood as a building material in recent years.

Today, architects and engineers recognise the potential of wood not only for private homes but also for larger multi-storey offices and apartment blocks. In 2015, a 52.8-metre wooden tower block was constructed in Norway, then a world record for an apartment block, but this was soon surpassed by a 53-metre student dormitory at the University of British Columbia in Canada. Then came the 84-metre HoHo building in Vienna, home to a hotel, offices and apartments. Although the HoHo building has a concrete core, most of the structure as well as the -Aoors are built of wood. Many of these advances have been made possible by research at the Technical Institute in Graz, Austria, where new engineering systems based on wood construction have been pioneered.

A good example of these techniques is found at the Wood Innovation and Design Centre at the University of Northern British Columbia, Canada. The flrst stage in the construction of the building saw large planks of Douglas -Ar being fastened to one another with glue, which these days can be stronger than nails or screws. This produced large heavy sheets of wooden material; these became the basic structural components for the building. These sheets then had to be precision cut to create the thousands of columns and beams necessary - the team employed lasers for this purpose. Once the cutting work was complete, all the wooden components were taken to the site for assembly. The building was constructed one storey at a time, layer upon layer, not unlike the system used to make a large cake. Once the eighth and final storey was completed, the building reached a height of 30 metres and became a notable

landmark in its neighbourhood. And, of course, one of the great advantages of wood comes at the end of a building's life, in around 1 00 years' time. When the Wood Innovation and Design Centre eventually has to be demolished, it will be possible for its principal building material to be recycled, which is not usually practical with steel or concrete.

Other significant wooden buildings are to be found in locations around the world. Perhaps not surprisingly, given that the Hory0-ji Temple may be the oldest large wooden building in the world, Japanese engineers are at the forefront of this process. One thing that has been learned from maintaining the Horyu-ji Temple over many centuries is that it is often simpler to make major repairs to wooden structures than to those made of concrete and steel. Until quite recently, regulations in Japan have made the construction of very large wooden structures difficult. However, in recognition of new technologies, these are being relaxed by the government, with the result that ever more ambitious projects are being announced. Perhaps the most radical example is the proposed Sumitomo Tower, a skyscraper of 70 storeys to be built largely of wood in central Tokyo; its completion date is 2041.

Because wood is more flexible than steel, it has great potential in countries prone to earthquakes, such as Japan and New Zealand. Engineers in New Zealand believe that wood construction can significantly improve building safety in the event of a natural disaster, as has been demonstrated at the new Wynn Williams House. The wood has been left exposed inside the house to showcase how this type of construction provides attractive interiors as well. Another advantage of wood is that it is so light, particularly when compared to steel and concrete. In Australia, the benefits of light weight have been taken advantage of in the city of Melbourne, where a large wooden library has been constructed directly beside water, on land so soft that a heavier building would have been impossible. Furthermore, wood is advantageous even in extreme climates. In Finland, where winter temperatures can fall to -30°C, wood provides all the load-bearing structures for the Puukuokka Block, but also guarantees excellent heat insulation as well. As wood construction technologies continue to develop, it seems probable that architects and engineers will dream up ever more uses for this practical, flexible and beautiful building material.

Questions 9-13

Complete the notes below.

Write **NO MORE THAN TWO WORDS** for each answer.

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

Other Significant Wooden Buildings

Japan

• Experience with the Horyu-ji Temple proves that **9**. ..... are easier with wood.

• New technologies and new **10** ..... make large buildings such as the Sumitomo Tower possible.

Other countries

• Wynn Williams House in New Zealand is earthquake-proof and is an example of how wooden buildings can have **11** ..... .

• Wood is so light that a new library in Australia was built right next to **12** ..... .

• Finland's Puukuokka Block illustrates that wood provides good **13**..... in addition to structural strength.

Test 3

The Science of Human Laughter

A

Human beings love to laugh. It's such an obvious fact that it's easy to overlook. Laughter, like music and language, is a fundamental human trait. Common sense tells us that laughter is associated with happiness. However, there is also a body of scientific evidence proving that laughter is good for us. Studies show that laughter strengthens relationships in both personal and professional life. It has also been established that laughter improves cardiovascular function, boosts the immune system and releases beneficial hormones into t□e bloodstream. However, according to psychologist Dr Peter Shrimpton, humans might all laugh, but they often don't remember doing it. 'All the studies show that we laugh more frequently than we realise,' says Dr Shrimpton. 'Perhaps because it is such a basic part of human nature, we tend not to notice when we are laughing.'

B

Infants typically give their first laugh around three to four months of age, long before they can talk. But according to biologists, this isn't because they find something amusing; it is rather a form of non-verbal communication. They laugh to form a closer connection to the people they are with, and adults are little different. 'There is a widespread belief outside the scientific community that we laugh because something is humorous,' says sociologist Jocelyn Barnes. 'While this is true, just as commonly the real purpose of laughter is to promote bonding with other individuals or groups.' This may be partly because it i□ almost impossible to imitate laughter; even tramed actors struggle to mimic a laugh convincingly. So if someone is laughing, the chances are they are being genuine. There's even a difference between a real and a fake smile. In the 19th century, the French neurologist Guillaume Duchenne found that a genuine smile activates the zygomaticus major and orbicularis muscles, and this in turn causes lines to develop called 'crow's feet' at the outside corners of the eyes. No crow's feet appear if the smile is put on.

C

There is certainly nothing new about joking and laughter. Attempts to be humorous have been found from ancient Egypt, dating from 2600 BC. And a long and detailed joke book called *The Laughter Lover*, which was written in ancient Rome, still exists today. While of considerable historical value, it may not be all that amusing any more. A professor of

classics, Heinrich Ahrends, has studied many such ancient sources and concluded that tastes in jokes have evolved markedly with the passing of the centuries and that the jokes of our forebears would not get much of a laugh today - and vice versa, no doubt. Nonetheless, studies show that almost everyone can find amusement in some form or other. There is a rare neurological disorder named aphonogelia that prevents some people from laughing out loud. However, they may still be amused or entertained, but just express it in different ways.

D

Much more common is contagious laughter: laughter that spreads uncontrollably between people, sometimes referred to as 'getting the giggles'. Many people will have experienced this themselves, particularly as children, though it also occurs in adults. On one infamous occasion, a group of BBC cricket commentators got the giggles while broadcasting live on radio. And in January 1962 in Tanzania contagious laughter spread through a group of students. Ninety-five pupils were affected and one girl laughed continuously for 16 days. Eventually the situation became so bad that the authorities at the school felt obliged to close it temporarily. In general, however, it is possible for most people to suppress laughter in circumstances where it would be inappropriate. Scientists believe this is possible because in the brain's cerebral cortex there appears to be a laughter switch over which humans have some conscious control.

E

What is becoming clear to scientists is that laughter is highly complex. It appears, for example, that laughter has the power to override other emotions, at least temporarily. Neurologist Nikki Sokolov is studying the network of brain circuits and neurotransmitters that regulate laughter and other emotions. She hopes her work may provide further insights to explain the processes involved when laughter occurs simultaneously with other, seemingly contradictory emotions, such as crying, for example. Another aspect of humour's complexity is that it is so subjective. What makes one person laugh will be met with stony silence by another. Writer David Mackenzie recognised this from the reactions his own jokes received. Intrigued,Mackenzie conducted an international online survey to establish exactly what makes people laugh and what doesn't, and was surprised by the diverse and often contradictory variety of topics and scenarios that were listed in each category.Understanding humour is still as much an art as a science, according to theatre critic Jake Gottlieb.'Stand-up comedians are a remarkable type,' says Gottlieb. 'Making jokes for a living is a serious business. You need to be a psychologist and social commentator, be empathetic, self-aware, observant, stubborn and have great timing. Not many of us are so multi-talented.' Perhaps

not, but we can still enjoy the instinctive humour of our family and friends, and perhaps sometimes buy a ticket for a show.

Questions 23-26

Complete the sentences below.

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

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

23. The French neurologist Guillaume Duchenne showed that if a smile is fake, the skin around a person's ..... does not change shape.

24. A ..... that was produced in ancient Rome contains early examples of attempts to be funny.

25. In January 1962, an outbreak of mass laughter caused problems in a ……..... in Tanzania.

26. Neurologist Nikki Sokolov is investigating why ..... is possible even when a person finds something funny.

Test 4

Artificial intelligence in sport

A

The first sports game was televised in the USA more than fifty years ago. Over the following decades television provided sports coaches with a wealth of information to analyse. By viewing recordings, they could study the number of passes received, tackles avoided, distances covered, speeds achieved and a host of other factors relating to the performance of their teams or athletes. Most of this data, though,consisted of bare statistics without any meaningful context. However, the use of artificial intelligence (Al) is now enabling an alternative approach to coaching. Al means the development of computer systems that can perform tasks usually associated with human intelligence, such as decision making. Increasingly, computers are being trained to understand the rules and objectives of sports so they can coach more directly. Al can analyse not only a player's actions, but also relate those actions to the wider context, including the directives of the coach and the actions of other players. Sports scientists believe that Al is revolutionising sports coaching by analysing patterns of behaviour in ways simply not possible before.

B

There may be limitless ways in which Al technology can be developed, but certain practical applications are already apparent. Recently, a research experiment was conducted into the Spanish football league using an Al algorithm to analyse the passing strategies of 20 teams. The research revealed that two teams, Barcelona and Real Madrid, had more than 150 recurring passing patterns. However, the algorithm detected just 31 passing patterns used by Atletico Madrid. All of Atletico's other plays were one-offs that were never repeated, and the team won the league that season. One conclusion seems to be that teams with a less predictable style of play win more games. What's more, according to Dr Johann Muller, a sports scientist who has studied the Spanish research findings, the number of injuries a team suffers increases when they play in a style prioritises offence.

C

Since then, there has been a great deal of interest in the potential of Al. Professor of sports education Rebecca Graves believes that Al can provide coaches with invaluable insights. 'Tactics were once closely guarded secrets,' says Professor Graves, 'but now a coach with

access to Al can identify how a rival team is likely to play a match based on historic form. Once this was largely guesswork but now it can be achieved with some confidence.' The expense of Al technology means it will probably remain beyond the reach of all but elite teams, but among this group the implications are enormous. Professor Graves argues that Al allows preparations for a match to be tailored to individual players with much greater precision. She identifies fitness work, skills development, diet and numerous other factors that can be minutely customised, based on an individual's particular strengths and weaknesses.

D

Part of the appeal of Al lies in its versatility. Ice hockey coaches in Finland are using Al to analyse the success of different plays. An Indian company has employed wearable technology developed in other fields to analyse stride patterns. This analysis has allowed its technicians to develop sneakers in various styles aimed at both long- and shortdistance runners. Coaching practices in professional basketball, American football and tennis are also being transformed by Al. In addition, the technology has applications in highly technical sports such as car racing. Coaches involved in the National Association for Stock Car Auto Racing (NASCAR) believe that Al algorithms not only help drivers go faster but also enhance the safety of the sport because of their ability to monitor and predict potential problems.

E

Al doesn't get tired, has extraordinary powers of vision, particularly for objects moving at speed, and is capable of making complex calculations very quickly. For all these reasons Al is increasingly being used in the high-pressure world of judging gymnastics performances. Research has shown that, particularly over a whole day's worth of events, computers are just as reliable as human judges when it comes to giving gymnasts a score. However, computer scientist Henri Simeonson has been quick to warn about some potential difficulties. In particular, Simeonson is concerned that Al is vulnerable to hackers, who might be able to influence the outcome of a tournament.

F

It should not be forgotten, either, that many sports stars and sports teams are commercially dependent on their fans. If sufficient supporters do not buy tickets to games or pay to view a recording, the teams might struggle to survive. But now teams and stars are making

increasing use of chatbots and other 'virtual assistants' to provide fans with statistics, news and background information about their favourite players. Another innovation is seen in Minor League Baseball in the USA, which is promoting the sport and seeking new fans with the use of Al-enhanced journalism. In this way baseball is keeping supporters informed with all the up-to-the-minute developments in ways not possible with more traditional approaches. Analysts believe these sorts of initiatives are crucial to increasing a player or team's revenue stream. It's just one more way that sports stand to benefit from Al

Questions 22-26

Complete the sentences below.

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

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

22. Analysis of Al data by Dr Johann Muller suggests that teams which play defensively have fewer .....

23. An Indian company has designed new ..... using Al technology.

24. The use of Al in NASCAR is believed to improve ..... as well as driver performance.

25. Henri Simeonson says that ..... might be able to disrupt Al and make competitions unfair.

26. In Minor League Baseball, a type of ..... powered by Al is giving the sport greater publicity.

Test 5

Earth's lakes are under threat

Lake Poop used to be Bolivia's second largest lake. Situated in the Altiplano Mountains at an altitude of around 3,700m, the lake in winter would cover an area of some 2,700 square kilometres as it was fed by swollen rivers. With very little rainfall during summer, this reduced to around 1,000, still a remarkable size. This was the patter n in previous centuries, but in December 2015, satellites confirmed the reports of local people that the lake had gone. While scientists had suspected that Poop6 would eventually run dry, they didn't expect that this would occur for at least another thousand years. The local mining industr y had already contributed to the pollution of the lake, but scientists believe global warming, drought and ir rigation projects are all responsible for its disappearance. Today the consequences of Lake Poop6's disappearance are dramatic; many people who lived in the villages around it have left, since there are no more fish to be caught. Environmentalists also point to the fact that the lake had been the stopover point for thousands of birds as they migrated to other regions. Their numbers will certainly fall now the lake has gone.

Lake Poop is not the only vast area of water to have disappeared. The Aral Sea in Central Asia was once the world's fourth largest lake but then it began to shrink in the 1960s. As a shallow lake, it depended on rivers to keep its level up. But then water from these rivers was diverted for irrigation purposes. Rice is a crop that needs huge quantities of water to survive in desert areas. Fields planted with cotton also require a regular supply. Now the water level is so low that fishing has stopped altogether. And it is not just the immediate area that is affected. Because the floor of the lake is now exposed, the salt that lies there is often carried by the wind across a radius of 300 kilometres. This impacts on agriculture as it damages growing plants and is absorbed by the soil.

For some lakes, the biggest threat is from climate change. On average, the surface water of the world's lakes has gone up in temperature by 0.34°C every ten years since 1985. Lake Tanganyika in East Africa is a lake where this trend has been observed, although it is by no means the most extreme example. This would be Lake Fracksjon in Sweden, where an increase of l .35°C per decade has been observed - a figure which is estimated to rise. For Lake Tanganyika, however, the consequences have been severe. Warming has disrupted its ecosystem, and fish numbers have dropped sharply. In turn, this decline in fish stocks has

impacted on families living in villages and towns around the lake, since they have no other source of protein. Furthermore, around 100,000 people depend on the fisheries established around Lake Tanganyika. These companies provide them with regular employment, without which communities will not survive.

In Iran, Lake Urmia's waters have also been affected by unusually hot summers, but dams and irrigation projects have also played a part. In the past, people admired its beautiful green blue colour. However, the water now has a red tint. The reason for this is that bacteria quickly multiply in the warm waters of a shallow lake. Now local communities are understandably concerned about the future. One of their concerns is that Lake Urmia is no longer seen as a place where people can bathe to improve their health. As a result, in the last decade, there has been a downturn in tourism in the area, an industry many people depended on.

In some cases, it can be a challenge for scientists to predict outcomes for a lake or to recognise the factors that threaten it. Take, for example, Lake Waiau in Hawaii, a lake that was used in healing rituals by native Hawaiians. It is a fairly small lake, approximately 100m across, with some variation as the water level rises and falls. However, in early 2010, the lake began to decrease in size. By September 2013, it could only be described as a pond. The cause of the lake's decline has not yet been established, but drought is among the suspects. Then there is Scott Lake in central Florida. In June 2006 a massive sinkhole opened up beneath the lake - acting like a plug hole in a bath. It only took two weeks for the water to drain away. Local residents called meetings to decide what action to take, but in the end, nature took care of the problem. Clay, sand and other fine material plugged the hole and the lake started to fill with water again. Nevertheless, as geologists point out, sinkholes can occur with some frequency in Florida, so there is a chance that Scott Lake will drain away again.

Questions 1-8

Complete the notes below.

Choose **ONE WORD AND/ OR A NUMBER** from the passage for each answer.

Disappearing and Damaged Lakes

• Lake Poop

It covered about **1** _____ square kilometres in the dry season.

It can no longer support people, fish or visiting **2** _____

• The Aral Sea

It has shrunk because water is used for crops such as **3** _____ and rice.

4 _____ from the bottom of the lake affects an area of 300 kilometres.

• Lake Tanganyika

Families need to eat fish for its ***5*** _____

Fisheries give **6** _____ to over l 00,000 people.

• Lake Urmia

The colour has changed because ***7*** _____ are increasing.

Session 6 Questions

Matching Paragraph Information Questions

Test 1

Can we prevent the poles from melting?

A growing number of scientists ore looking to increasingly ambitious technological fixes to halt the tide of global warming. ***Mark Rowe*** *reports.*

A. Such is our dependence on fossil fuels, and such is the volume of carbon dioxide we have already released into the atmosphere, that most climate scientists agree that significant global warming is now inevitable – the best we can hope to do is keep it at a reasonable level, and even that is going to be an uphill task. At present, the only serious option on the table for doing this is cutting back on our carbon emissions, but while a few countries are making major strides in this regard, the majority are having great difficulty even stemming the rate of increase, let alone reversing it. Consequently, an increasing number of scientists are beginning to explore the alternatives. They all fall under the banner of geoengineering – generally defined as the intentional large-scale manipulation of the environment.

B. Geoengineering has been shown to work, at least on a small, localized scale, for decades. May Day parades in Moscow have taken place under clear blue skies, aircraft having deposited dry ice, silver iodide and cement powder to disperse clouds. Many of the schemes now suggested to do the opposite, and reduce the amount of sunlight reaching the planet. One scheme focuses on achieving a general cooling of the Earth and involves the concept of releasing aerosol sprays into the stratosphere above the Arctic to create clouds of sulphur dioxide, which would, in turn, lead to global dimming. The idea is modelled on historical volcanic explosions, such as that of Mount Pinatubo in the Philippines in 1991, which led to a short term cooling of global temperatures by 0.5“C. The aerosols could be delivered by artillery, highflying aircraft or balloons.

C. Instead of concentrating on global cooling, other schemes look specifically at reversing the melting at the poles. One idea is to bolster an ice cap by spraying it with water. Using pumps to carry water from below the sea ice, the spray would come out as snow or ice

particles, producing thicker sea ice with a higher albedo (the ratio of sunlight reflected from a surface) to reflect summer radiation. Scientists have also scrutinized whether it is possible to block ice fjords in Greenland with cables which have been reinforced, preventing icebergs from moving into the sea. Veli Albert Kallio, a Finnish scientist, says that such an idea is impractical because the force of the ice would ultimately snap the cables and rapidly release a large quantity of ice into the sea. However, Kallio believes that the sort of cables used in suspension bridges could potentially be used to divert, rather than halt, the southward movement of ice from Spitsbergen. 'It would stop the ice moving south, and local currents would see them float northwards,' he says.

D. A number of geoengineering ideas are currently being examined in the Russian Arctic. These include planting millions of birch trees: the thinking, according to Kallio, is that their white bark would increase the amount of reflected sunlight. The loss of their leaves in winter would also enable the snow to reflect radiation. In contrast, the native evergreen pines tend to shade the snow and absorb radiation. Using ice-breaking vessels to deliberately break up and scatter coastal sea ice in both Arctic and Antarctic waters in their respective autumns, and diverting Russian rivers to increase cold-water (low to ice-forming areas, could also be used to slow down warming, Kallio says. 'You would need the wind to blow the right way, but in the right conditions, by letting ice float free and head north, you would enhance ice growth.'

E. But will such ideas ever be implemented? The major counter-arguments to geoengineering schemes are, first, that they are a 'cop-out' that allow us to continue living the way we do, rather than reducing carbon emissions; and, second, even if they do work, would the side-effects outweigh the advantages? Then there's the daunting prospect of upkeep and repair of any scheme as well as the consequences of a technical failure. 'I think all of us agree that if we were to end geoengineering on a given day, then the planet would return to its pre-engineered condition very rapidly, and probably within 10 to 20 years,' says Dr. Phil Rasch, chief scientist for climate change at the US-based Pacific Northwest National Laboratory. 'That's certainly something to worry about. I would consider geoengineering as a strategy to employ only while we manage the conversion to a non-fossil- fuel economy.' 'The risk with geoengineering projects is that you can "overshoot",' says Dr. Dan Lunt, from the University of Bristol. 'You may bring global temperatures back to pre-industrial levels, but the risk is that the poles will still be warmer than they should be and the tropics will be cooler than before industrialization.'

F. The main reason why geoengineering is countenanced by the mainstream scientific community is that most researchers have little faith in the ability of politicians to agree – and then bring in – the necessary carbon cuts. Even leading conservation organisations believe the subject is worth exploring. As Dr. Mortin Sommerkorn, a climate change advisor says. 'But human-induced climate change has brought humanity to a position where it is important not to exclude thinking thoroughly about this topic and its possibilities despite the potential drawbacks. If, over the coming years, the science tells us about an ever-increased climate sensitivity of the planet – and this isn't unrealistic – they may be best served by not having to start our thinking from scratch.'

Questions 14-18

Reading Passage 2 has six paragraphs A-F. Which paragraph contains the following information?

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

NB You may use **any letter more than once.**

14. the existence of geoengineering projects distracting from the real task of changing the way we live

15. circumstances in which geoengineering has demonstrated success

16. maintenance problems associated with geoengineering projects

17. support for geoengineering being due to a lack of confidence in governments

18. more success in fighting climate change in some parts of the world than others

Test 2

The Pursuit Of Happiness

A. In late 1990, psychologist Martin Seligman of the University of Pennsylvania urged colleagues to observe optimal moods with the same kind of focus with which they had for so long studied illnesses: we would never learn about the full range of human functions unless we knew as much about mental wellness as we do about mental illness. A new generation of psychologists built up a respectable body of research on positive character traits and happiness-boosting practices. At the same time, developments in neuroscience provided new clues to what makes us happy and what that looks like In the brain. Self-appointed experts took advantage of the trend with guarantees to eliminate worry, stress, dejection and even boredom. This happiness movement has provoked a great deal of opposition among psychologists who observe that the preoccupation with happiness has come at the cost of sadness, an important feeling that people have tried to banish from their emotional repertoire. Allan Horwitz of Rutgers laments that young people who are naturally weepy after breakups are often urged to medicate themselves instead of working through their sadness. Wake Forest University's Eric Wilson fumes that the obsession with happiness amounts to a 'craven disregard" for the melancholic perspective that has given rise to the greatest works of art. "The happy man," he writes, 'is a hollow man.'

B. After all, people are remarkably adaptable. Following a variable period of adjustment, we bounce back to our previous level of happiness, no matter what happens to us. (There are some scientifically proven exceptions, notably suffering the unexpected loss of a job or a partner. The events tend to permanently knock people back a step.) Our adaptability works in two directions. Because we are so adaptable, points out Professor Sonja J.yubomirsky of the University of California, we quickly get used to many of the accomplishments we strive for in life, such as landing the big job or getting married. Soon after we reach a milestone, we start to feel that something is missing. We begin coveting another worldly possession or eyeing a social advancement. But such an approach keeps us tethered to a treadmill where happiness is always just out of reach, one toy or one step away. It's possible to get off the treadmill entirely by focusing on activities that are dynamic, surprising, and attention-absorbing. and thus less likely to bore us than, say, acquiring shiny new toys.

C. Moreover, happiness is not a reward tor escaping pain. Russ Harris, the author of The Happiness Trap, calls popular conceptions of happiness dangerous because they set people up for a 'struggle against reality'. They don't acknowledge that real life is full of disappointments, loss, and inconveniences. "If you're going to live a rich and meaningful life." Harris says, "you're going to feel a full range of emotions." Action toward goals other than happiness makes people happy. It is not crossing the most rewarding finish line, it is anticipating achieving the goal. University of Wisconsin neuroscientist Richard Davidson has found that working hard toward a goal, and making progress to the point of expecting a goal to be realized, activates not only positive feelings but also suppresses negative emotions such as fear and depression.

D. We are constantly making decisions, ranging from what clothes to put on to whom we should marry, not to mention all those flavours of ice cream. We base many of our decisions on whether we think a particular preference will increase our well-being. Intuitively, we seem convinced that the more choices we have, the better off we will ultimately be. But our world of unlimited opportunity imprisons us more than it makes us happy. In what Swarthmore psychologist Barrs-Schwartz calls "the paradox of choice." lacing many possibilities leaves us stressed out – and less satisfied with whatever we do decide. Having too many choices keeps us wondering about all the opportunities missed.

E. Besides, not everyone can put on a happy face. Rirlxira Held, a professor of psychology at Bowdoin College, rails against "the tyranny of the positive attitude". 'Looking on the bright side isn't possible for some people and is even counterproductive," she insists. 'When you put pressure on people to cope in a way that doesn't fit them, it not only doesn't work, it makes them feel like a failure on top of already feeling bad." The one-size-fits-all approach to managing emotional life is misguided, agrees Professor Julie Norem, author of The Positive Power of Negative Thinking. In her research, she has shown that the defensive pessimism that anxious people feel can be harnessed to help them get things done, which in turn makes them happier. A naturally pessimistic architect, for example, can set low expectations for an upcoming presentation and review all of the bad outcomes that she's imagining so that she can prepare carefully and increase her chances of success.

F. By contrast, an individual who is not living according to their values, will not be happy, no matter how much they achieve. Some people, however, are not sure what their values are. In that case, Harris has a great question: 'Imagine I could wave a magic wand to ensure that you

would have the approval and admiration of everyone on the planet, forever. What, in that case, would you choose to do with your life?" Once this has been answered honestly, you can start taking steps toward your ideal vision of yourself. The actual answer is unimportant, as long as you're living consciously. The state of happiness is not really a state at all. It's an ongoing personal experiment.

Questions 14-19

Reading Passage 2 has six paragraphs A-F.

Which paragraph mentions the following?

Write the correct letter A-F in boxes 14-19 on your answer sheet.

NB You may use **any letter more than once.**

14. the need for individuals to understand what really matters to them

15. tension resulting from a wide variety of alternatives

16. the hope of success as a means of overcoming unhappy feelings

17. people who call themselves specialists

18. human beings' capacity for coping with change

19. doing things which are interesting in themselves

Test 3

Biofuels: are they the fuels of the future?

Many plants can be turned into biofuels - but which ones should we use and what methods are best?

A

On paper, biofuels seem the ideal replacement for oil, coal and gas, the fossil fuels we depend upon, and which drive global warming and disrupt weather patterns by releasing carbon dioxide into the atmosphere. But the past decade has seen the biofuel industry face tough questions over whether it can truly claim to be 'green'. One of the biggest criticisms of biofuel crops - at least those that produce the fuel ethanol - has been their impact on food markets and on traditional land use. Direct impacts - for example, cutting down forests to make way for a biofuel crop – are usually obvious, says Professor Bill Laurance director of the Centre for Tropical Environmental and Sustainability Science at James Cook University. But, in his experience, indirect impacts can be no less devastating for the environment and are far more of a challenge to anticipate.

B

Let's take Brazil, for example. When farmers in the US opted out of soy in favour of corn as a biofuel crop, soy prices soared, suddenly making it an attractive crop for Brazilian farmers. In turn, this increased demand for freshly deforested cropland 1n Brazil. Similar situations are occurring all over the world. But while deforestation can certainly lead to economic benefits for farmers, it also puts biodiversity at risk. Then, once a biofuel crop has been planted on deforested land, farmers need to ensure that it grows as well as it can. That means applying large quantities of fertilizer, and while this helps the plants to shoot up, there is also the possibility it will lead to the contamination of local rivers.

C

Not all biofuels have been grown on land, but the once-popular idea of generating them from microscopic algae grown in ponds or tanks has largely been forgotten. Professor Rachel Burton leader of the ARC Centre of Excellence for Plant Cell Walls at the University of Adelaide, thinks that there is a smarter way forward for biofuels and it starts with selecting the right crop for land not usually used for agriculture. Burton and others are looking to tough plants that grow on land too dry or salty for conventional crops. Australia, for example, could

turn to crops such as agave, hemp or the native saltbush and wild-growing sorghum for the biofuels of the future, she says.

D Researchers must also consider economic factors, however. While plant oils can be extracted and turned into biodiesel for vehicles and machinery, currently the process is very expensive - much more so than the process for fossil fuels. Dr Allan Green is innovation leader for bio-based products at CSIRO Agriculture and Food. His solution is to make plants oilier by genetically altering them so that they produce oil in their leaves, not just in their fruit or seeds. With more oil being produced on a particular section of land by the same number of plants, it would become cheaper to harvest and extract the oil. The technology, which has so far only been tested in tobacco, shows that oil production can be boosted to a third or more of a tobacco leaf's weight. If used in a different crop - one that already produces oil in its seeds or fruit – the hope is that oil output could be doubled, though that idea is yet to be put to the test.

E

A technology which is becoming increasingly popular in the biofuel industry is hydrothermal liquefaction. This is a process which uses heat and pressure to break apart molecules in whole plants and remove oxygen, so that the raw material is turned into 'bio-crude oil'. Then, just as we need to refine the crude oil made from fossil fuels, the plant-based oil is also refined. After this, it can then be turned into different kinds of fuel. One advantage of the hydrothermal liquefaction process is that many kinds of plant can be used. And if this process could run on energy from solar panels or wind farms, it would be much more environmentally sustainable.

F

New processing technologies are giving biofuel producers hope that, in future, they won't be limited to plants designed to be biofuel-only crops. Perhaps they will be able to choose species that deliver added benefits or sources of income. Hemp crops, for instance, could be used for their oil, but also for their fibre. Some car manufacturers have already used it as a soundproofing material in their vehicles, and others may do the same. And according to Kirsten Heimann, associate professor at the College of Science and Engineering at James Cook University, it might be possible, say, for algae not just to act as a biofuel, but to decontaminate water. Burton believes this kind of multi-purpose use for biofuel crops is the way forward. 'It's much more sophisticated thinking, ‘she says. 'Biofuels maybe don't need to be as cheap as we think they do, because you can make money out of the other things.'

Eventually, the biofuel industry could well develop into a very diverse one, with no one crop or process dominating the market, according to Green. 'The amount of fuel we need to move away from petroleum is massive, so there's plenty of space for all technologies,' he says.

Questions 14-19

Reading Passage 2 has six paragraphs, A-F.

Which paragraph contains the following information?

14. a theory about oil production which must still be proved

15. an overview of the stages in a particular biofuel manufacturing method

16. examples of the uses that biofuel crops might have apart from providing energy

17. an explanation of the way that fossil fuel use harms the environment

18. reference to a particular biofuel production method being abandoned

19. a comparison between the production costs for biofuels and for other kinds of fuel

Test 4

Nature or Nurture

A

A few years ago, in one of the most fascinating and disturbing experiments in behavioural psychology, Stanley Milgram of Yale University tested 40 subjects from all walks of life for their willingness to obey instructions given by a ‘leader’ in a situation in which the subjects might feel a personal distaste for the actions they were called upon to perform. Specifically, Milgram told each volunteer 'teacher-subject' that the experiment was in the noble cause of education, and was designed to test whether or not punishing pupils for their mistakes would have a positive effect on the pupils' ability to learn.

B

Milgram’s experimental set-up involved placing the teacher-subject before a panel of thirty switches with labels ranging from '15 volts of electricity (slight shock)' to ‘450 volts (danger - severe shock)' in steps of 15 volts each. The teacher-subject was told that whenever the pupil gave the wrong answer to a question, a shock was to be administered, beginning at the lowest level and increasing in severity with each successive wrong answer. The supposed 'pupil' was in reality an actor hired by Milgram to simulate receiving the shocks by emitting a spectrum of groans, screams and writhings together with an assortment of statements and expletives denouncing both the experiment and the experimenter. Milgram told the teacher-subject to ignore the reactions of the pupil, and to administer whatever level of shock was called for as per the rule governing the experimental situation of the moment.

C

As the experiment unfolded, the pupil would deliberately give the wrong answers to questions posed by the teacher, thereby bringing on various electrical punishments, even up to the danger level of 300 volts and beyond. Many of the teacher-subjects balked at administering the higher levels of punishment, and turned to Milgram with questioning locks and/or complaints about continuing the experiment. In these situations, Milgram calmly explained that the teacher-subject was to ignore the pupil's cries for mercy and carry on with the experiment. If the subject was still reluctant to proceed, Milgram said that it was

important for the sake of the experiment that the procedure be followed through to the end. His final argument was, ‘You have no other choice. You must go on.' What Milgram was trying to discover was the number of teacher-subjects who would be willing to administer the highest levels of shock, even in the face of strong persona! and moral revulsion against the rules and conditions of the experiment.

D

Prior to carrying out the experiment, Milgram explained his idea to a group of 39 psychiatrists and asked them to predict the average percentage of people in an ordinary population who would be willing to administer the highest shock level of 450 volts. The overwhelming consensus was that virtually all the teacher-subjects would refuse to obey the experimenter. The psychiatrists felt that 'most subjects would not go beyond 150 volts' and they further anticipated that only four per cent would go up to 300 volts. Furthermore, they thought that only a lunatic fringe of about one in 1.000 would give the highest shock of 450 volts.

E

What were the actual results? Well, over 60 per cent of the teacher-subjects continued to obey Milgram up to the 450-volt limit! In repetitions of the experiment in other countries, the percentage of obedient teacher-subjects was even higher, reaching 85 per cent in one country How can we possibly account for this vast discrepancy between what calm, rational, knowledgeable people predict in the comfort of their study and what pressured, flustered, but cooperative teachers’ actually do in the laboratory of real life?

F

One’s first inclination might be to argue that there must be some sort of built-in animal aggression instinct that was activated by the experiment, and that Milgram’s teacher- subjects were just following a genetic need to discharge this pent-up primal urge onto the pupil by administering the electrical shock. A modern hard-core sociobiologist might even go so far as to claim that this aggressive instinct evolved as an advantageous trait, having been of survival value to our ancestors in their struggle against the hardships of life on the plains and in the caves, ultimately finding its way into our genetic make-up as a remnant of our ancient animal ways.

G

An alternative to this notion ot genetic programming is to see the teacher-subjects' actions as a result of the social environment under which the experiment was carried out. As Milgram himself pointed out. Most subjects in the experiment see their behaviour in a larger context that is benevolent and useful to society - the pursuit of scientific truth. The psychological laboratory has a strong claim to legitimacy and evokes trust and confidence in those who perform there. An action such as shocking a victim, which in isolation appears evil, acquires a completely different meaning when placed in this setting'.

H

Thus, in this explanation the subject merges his unique personality and personal and moral code with that of larger institutional structures, surrendering individual properties like loyalty, self-sacrifice and discipline to the service of malevolent systems of authority.

I

Here we have two radically different explanations for why so many teacher-subjects were willing to forgo their sense of personal responsibility for the sake of an institutional authority figure. The problem for biologists, psychologists and anthropologists is to sort out which of these two polar explanations is more plausible. This, in essence, is the problem of modem sociobiology - to discover the degree to which hard-wired genetic programming dictates, or at least strongly biases, the interaction of animals and humans with their environment, that is, their behaviour. Put another way sociobiology is concerned with elucidating the biological basis of all behaviour.

Questions 14-19

Reading Passage 2 has nine paragraphs, A-I.

Which Paragraph contains the following information?

*Write the correct letter **A-I** in boxes 14-19 on your answer sheet.*

14. a biological explanation Milgram gave the teacher-subjects behavior

15. the explanation Milgram gave the teacher-subjects for the experiment

16. the identity of the pupils

17. the expected statistical outcome

18. the general aim of sociobiological study

19. the way Milgram persuaded the teacher-subjects to continue

Short Answer Questions

Test 1

Communicating In Colour

A. There are more than 160 known species of chameleons. The main distribution is in Africa and Madagascar, and other tropical regions, although some species are also found in parts of southern Europe and Asia. There are introduced populations in Hawaii and probably in California and Florida too.

B. New species are still discovered quite frequently. Dr. Andrew Marshall, a conservationist from York University, was surveying monkeys in Tanzania. Accidently, he stumbled across a twig snake in the Magombera forest, which, frightened, coughed up a chameleon and fled. Though a colleague persuaded him not to touch it because of the venom's risk, Marshall suspected it might be a new species and took a photograph to send to colleagues, who confirmed his suspicions. Kinyongia Magombera, literally "the chameleon from Magombera," is the result, and the fact it was not easy to identify is precisely what made it unique. The most remarkable features of chameleons are their ability to change colour and ability rivalled only by cuttlefish and octopi in the animal kingdom. Because of this, colour is not the best thing for telling chameleons apart, and different species are usually identified based on the patterning and shape of the head, and the arrangement of scales. In this case, it was the bulge of scales on the chameleon's nose.

C. Chameleons can use colour for both communication and camouflage by switching from bright, showy colours to the exact colour of a twig within seconds. They show an extraordinary range of colours, from nearly black to bright blues, oranges, pinks, and greens, even several at once. A popular misconception is that chameleons can match whatever background they are placed on, whether a chequered red and yellow shirt or a Smartie box. But each species has a characteristic set of cells containing pigment distributed over their bodies in a specific pattern, which determines the range of colours and patterns they can show. To the great disappointment of many children, placing a chameleon on a Smartie box generally results in a stressed, confused, dark grey or mottled chameleon.

D. Chameleons are visual animals with excellent eyesight, and they communicate with colour. When two male dwarf chameleons encounter each other, each shows its brightest colours. They puff out their throats and present themselves side-on with their bodies flattened to appear as large as possible and show off their colours. This enables them to assess each other from a distance. If one is clearly superior, the other quickly changes to submissive colouration, usually a dull combination of greys or browns. If the opponents are closely matched and both maintain their bright colours, the contest can escalate to physical fighting and jaw-locking, each trying to push each other along the branch in a contest of strength. Eventually, the loser will signal his defeat with submissive colouration.

E. Females also have aggressive displays used to repel male attempts at courtship. When courting a female, males display the same bright colours that they use during contests. Most of the time, females are unreceptive and aggressively reject males by displaying a contrasting light and dark colour pattern, with their mouths open and moving their bodies rapidly from side to side. If the male continues to court a female, she often chases and bites him until he retreats. The range of colour-change during female displays, although impressive, is not as great as that shown by males.

F. Many people assume that colour change evolved to enable chameleons to match a greater variety of backgrounds in their environment. If this was the case, then chameleons' ability to change colours should be associated with the range of background colours in the chameleon's habitat, but there is no evidence for such a pattern. For example, forest habitats might have a greater range of brown and green background colours than grasslands, so forest-dwelling species might be expected to have higher colour change powers. Instead, the males whose display colours are the most eye-catching, show the greatest colour change. Their displays are composed of colours that contrast highly with each other and the background vegetation. This suggests that the species that evolved the most impressive capacities for colour change did so to enable them to intimidate rivals or attract mates rather than to facilitate camouflage.

G. How do we know that chameleon display colours are eye-catching to another chameleon – or, for that matter, to a predatory bird? Getting a view from the perspective of chameleons or their bird predators requires information on the chameleon's or bird's visual system and how their brains might process visual information. This is because the perceived colours of an object depend on the brain's wiring as on the physical properties of the object itself. Luckily,

recent scientific advances have made it possible to obtain such measurements in the field, and information on visual systems of a variety of animals is becoming increasingly available.

H. The spectacular diversity of colours and ornaments in nature has inspired biologists for centuries. But if we want to understand the function and evolution of animal colour patterns, we need to know how they are perceived by the animals themselves – or their predators. After all, camouflage and conspicuousness are in the eye of the beholder.

Questions 1-4

Answer the questions below.

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

Write your answers in boxes 1-4 on your answer sheet.

1. What kind of climate do most chameleons live in? …….

2. Which animal caught a chameleon from an undiscovered species? ……..

3. What was the new species named after? ……

4. Which part of the body is unique to the species Kinyongia Magombera?

Test 2

The History of Modern American Dance

The birth of modern American dance occurred in the first years of the twentieth century. And, perhaps unusually for academics, dance historians hold remarkably similar views when it comes to identifying the individuals and influences that shaped the evolution of modern American dance. Starting in the early 1900s, we can see that dancers quite deliberately moved away from previous approaches. This included rejecting both the formal moves of ballet dancing and the entertainment of vaudeville dancing. As a result, dancers began the new century with a fresh start. One important figure at this time was Loie Fuller, who performed largely with her arms, perhaps because she had limited dance training. Fuller emphasised visual effects rather than storytelling, and pioneered the use of artificial lighting to create shadows while dancing.

Perhaps most influential in the early years was Isadora Duncan, who was well known in both America and Europe. Duncan refused to wear elaborate costumes, preferring to dance in plain dresses and bare feet. She is also notable for preferring music written by classical composers such as Chopin and Beethoven, rather than contemporary compositions. At a similar time, Ruth St Denis was bringing the influence of Eastern cultures to American dance, often performing solo. In 1915, St Denis opened a dance training academy with her husband with the intention of passing on her approach and style to the next generation of American dancers.

By the 1920s, the modern dance movement in America was well established. Audiences were enthusiastic and dancers were increasingly prepared to experiment with new ideas. Martha Graham was one of an important group who emerged in New York. Graham looked within herself to find her dance style, examining how her body moved as she breathed, but also observing the patterns made by her limbs when walking in order to find a new, naturalistic approach to dance. Doris Humphrey wanted her dance to reflect her personal experience of American life. She explored the concept of gravity, allowing her body to fall, only to recover at the last moment. Her book *The Art of Making Dances*, which detailed her approach to dance composition, was highly influential with later generations of dancers.

By the 1930s, modern dance was becoming an accepted, respectable art form. Universities such as Bennington College included modern dance in their performing arts programmes for the first time. In the 1940s, German-born dancer Hanya Holm embraced the changing times by including modern dance in mainstream musicals on the Broadway stage. Among Holm's many other innovations was bringing her own humour to these performances - audiences adored it.

Modern American dance has seldom stood still. Each new generation of dancers either developed the techniques of their teachers or rejected them outright. So by the 1950s the techniques of traditional European ballet dancing were again influential. This was certainly true of Erick Hawkins, who also incorporated Native American and Asian styles. Similarly, Merce Cunningham emphasised the le actions and flexibility of the spine associated with ballet moves. Paul Taylor preferred his dance to reflect the experiences and interactions of ordinary people going about their everyday lives. Taylor's career was the subject of a documentary that provided valuable insights into this period of dance.

The middle decades of the 20th century were certainly a dynamic time. Increasingly, the modern dance movement recognised and reflected the fact that America was a multi-racial, multi-cultural society. Katherine Dunham, an anthropology graduate, used movements from Pacific, African and Caribbean dance to create her unique style. Pearl Primus was another champion of African dance, which she passed on through her dance school in New York. After retirement she travelled widely to universities throughout America lecturing on ethnic dance, which became her main priority.

Modern dance since the 1980s has become a mix of multiple forms of dance, as well as art more generally. For example, Mark Morris's hugely popular work *The Hard Nut* includes sensational costumes and a stage design inspired by the comics he'd always enjoyed. Another innovator has been Ohad Naharin, who studied in New York and has worked internationally. Naharin's 'Gaga' style is characterised by highly flexible limbs and backbones, while in rehearsal his dancers have no mirrors, feeling their movements from within themselves, a break from traditional dance custom. In many ways it was a fitting end to a l 00-year period that had witnessed a transformation in dance. The emergence of modern American dance was very much a 20th-century phenomenon. The style drew on influences from home and abroad and in turn went on to influence global dance culture.

Questions 11-13

Answer the questions below.

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

11. When Pearl Primus gave up dancing, what did she focus on doing?

12. What was an important influence for Mark Morris's *The Hard Nut?*

13. Dancers working with Ohad Naharin practise without using what?

Session 7

Table Completion Questions

Test 1

Our Vanishing Night

” Most city skies have become virtually empty of stars “

A. If humans were truly at home under the light of the moon and stars, it would make no difference to us whether we were out and about at night or during the day, the midnight world as visible to us as it is to the vast number of nocturnal species on this planet. Instead, we are diurnal creatures, meaning our eyes are adapted to living in the sun’s light. This is a basic evolutionary fact, even though most of us don’t think of ourselves as diurnal beings any more than as primates or mammals or Earthlings. Yet it’s the only way to explain what we’ve done to the night: we’ve engineered it to meet our needs by filling it with light.

B. This kind of engineering is no different from damming a river. Its benefits come with consequences – called light pollution – whose effects scientists are only now beginning to study. Light pollution is largely the result of bad lighting design, which allows artificial light to shine outward and upward into the sky, where it is not wanted, instead of focusing it downward, where it is. Wherever human light spills into the natural world, some aspect of life – migration, reproduction, feeding – is affected. For most of human history, the phrase “light pollution” would have made no sense. Imagine walking toward London on a moonlit night around 1800, when it was one of Earth’s most populous cities. Nearly a million people lived there, making do, as they always had, with candles and lanterns. There would be no gaslights in the streets or squares for another seven years.

C. Now, most of humanity lives under reflected, refracted light from overlit cities and suburbs, from light-flooded roads and factories. Nearly all of night-time Europe is a bright patch of light, as is most of the United States and much of Japan. In the South Atlantic, the glow from a single fishing fleet – squid fishermen luring their prey with metal halide lamps – can be seen from space, burning brighter on occasions than Buenos Aires. In most cities, the sky looks as though it has been emptied of stars, and taking their place is a constant orange glow. We’ve become so used to this that the glory of an unlit night – dark enough for the

planet Venus to throw shadows on Earth – is wholly beyond our experience, beyond memory almost. And yet above the city's pale ceiling lies the rest of the universe, utterly undiminished by the light we waste.

D. We've lit up the night as if it were an unoccupied country when nothing could be further from the truth. Among mammals alone, the number of nocturnal species is astonishing. Light is a powerful biological force, and on many species, it acts as a magnet. The effect is so powerful that scientists speak of songbirds and seabirds being 'captured' by searchlights on land or by the light from gas flares on marine oil platforms, circling and circling in the thousands until they drop. Migrating at night, birds are apt to collide with brightly lit buildings; immature birds suffer in much higher numbers than adults.

E. Insects, of course, cluster around streetlights, and feeding on those insects is a crucial means of survival for many bat species. In some Swiss valleys, the European lesser horseshoe bat began to vanish after streetlights were installed, perhaps because those valleys were suddenly filled with fight-feeding pipistrelle bats. Other nocturnal mammals, like desert rodents and badgers, are more cautious about searching for food under the permanent full moon of fight pollution because they've become easier targets for the predators who are hunting them.

F. Some birds – blackbirds and nightingales, among others-sing at unnatural hours in the presence of artificial light. Scientists have determined that long artificial days — and artificially short nights — induce early breeding in a wide range of birds. And because a longer day allows for longer feeding, it can also affect migration schedules. The problem, of course, is that migration, like most other aspects of bird behaviour, is a precisely timed biological behaviour. Leaving prematurely may mean reaching a destination too soon for nesting conditions to be right.

G. Nesting sea turtles, which seek out dark beaches, find fewer and fewer of them to bury their eggs on. When the baby sea turtles emerge from the eggs, they gravitate toward the brighter, more reflective sea horizon but find themselves confused by artificial lighting behind the beach. In Florida alone, hatching losses number in the hundreds of thousands every year. Frogs and toads living on the side of major highways suffer nocturnal fight levels that are as much as a million times brighter than normal, disturbing nearly every aspect of their behaviour, including their night-time breeding choruses.

H. It was once thought that light pollution only affected astronomers, who need to see the night sky in all its glorious clarity. And, in fact, some of the earliest civic efforts to control light pollution were made half a century ago to protect the view from Lowell Observatory in Flagstaff, Arizona. In 2001 Flagstaff was declared the first International Dark Sky City. By now the effort to control light pollution has spread around the globe. More and more dues and even entire countries have committed themselves to reduce unwanted glare.

Questions 8-13:

Complete the table below.

Choose **NO MORE THAN THREE WORDS** from the passage for each answer. Write your answers in boxes **8-13** on your answer sheet.

CREATURE	**EFFECTS OF LIGHT**
Songbirds and seabirds they bump into **9**…….	The worst-affected birds are those which are seabirds **8**…….. which stand out at night
Desert rodents and badgers	They are more at risk from **10**……
Migrating birds not suitable on arrival.	Early migration may mean the **11**……. are
Sea turtles	They suffer from a decreasing number of **12**……..
Frogs and toads	If they are near **13**…….. their routines will be upset.

Test 2

Can animals count?

A. Prime among basic numerical faculties is the ability to distinguish between a larger and a smaller number, says psychologist Elizabeth Brannon. Humans can do this with ease – providing the ratio is big enough – but do other animals share this ability? In one experiment, rhesus monkeys and university students examined two sets of geometrical objects that appeared briefly on a computer monitor. They had to decide which set contained more objects. Both groups performed successfully but, importantly, Brannon's team found that monkeys, like humans. make more errors when two sets of objects are close in number. The students' performance ends up looking just like a monkey's. It's practically identical.' she says.

B. Humans and monkeys are mammals, in the animal family known as primates. These are not the only animals whose numerical capacities rely on ratio, however. The same seems to apply to some amphibians. Psychologist Claudia Uller's team tempted salamanders with two sets of fruit flies held in clear tubes. In a series of trials, the researchers noted which tube the salamanders scampered towards, reasoning that if they could recognize the number, they would head for the larger number. The salamanders successfully discriminated between tubes containing 8 and 16 flies respectively, but not between 3 and 4. 4 and 6, or 8 and 12. So it seems that for the salamanders to discriminate between two numbers, the larger must be at least twice as big as the smaller. However, they could differentiate between 2 and 3 flies just as well as between 1 and 2 flies, suggesting they recognize small numbers differently from larger numbers.

C. Further support for this theory comes from studies of mosquitofish, which instinctively join the biggest shoal* they can. A team at the University of Padova found that while mosquito fish can tell the difference between a group containing 3 shoal-mates and a group containing 4, they did not snow a preference between groups of 4 and 5. The team also found that mosquitofish can discriminate between numbers up to 16, but only if the ratio between the fish in each shoal was greater than 2:1. This indicates that the fish, like salamanders, possess both the approximate and precise number systems found in more intelligent animals such as infant humans and other primates.

D. While these findings are highly suggestive, some critics argue that the animals might be relying on other factors to complete the tasks, without considering the number itself. 'Any study that's claiming an animal is capable of representing number should also be controlling for other factors,' says Brannon. Experiments have confirmed that primates can indeed perform numerical feats without extra clues, but what about the more primitive animals? To consider this possibility, the mosquitofish tests were repeated, this time using varying geometrical shapes in place of fish. The team arranged these shapes so that they had the same overall surface area and luminance even though they contained a different number of objects. Across hundreds of trials on 14 different fish, the team found they consistently discriminated 2 objects from 3. The team is now testing whether mosquito fish can also distinguish 3 geometric objects from 4.

E. Even more primitive organisms may share this ability. Entomologist Jurgen Tautz sent a group of bees down a corridor, at the end of which lay two chambers – one which contained sugar water, which they like, while the other was empty. To test the bees' numeracy, the team marked each chamber with a different number of geometrical shapes – between 2 and 6. The bees quickly learned to match the number of shapes with the correct chamber. Like the salamanders and fish, there was a limit to the bees' mathematical prowess – they could differentiate up to 4 shapes, but failed with 5 or 6 shapes.

F. These studies still do not show whether animals learn to count through training, or whether they are born with the skills already intact. If the latter is true, it would suggest there was a strong evolutionary advantage to a mathematical mind. Proof that this may be the case has emerged from an experiment testing the mathematical ability of three- and four-day-old chicks. Like mosquitofish, chicks prefer to be around as many of their siblings as possible, so they will always head towards a larger number of their kin. It chicks spend their first few days surrounded by certain objects, they become attached to these objects as if they were family. Researchers placed each chick in the middle of a platform and showed it two groups of balls of paper. Next, they hid the two piles behind screens, changed the quantities and revealed them to the chick. This forced the chick to perform simple computations to decide which side now contained the biggest number of its "brothers". Without any prior coaching, the chicks scuttled to the larger quantity at a rate well above chance. They were doing some very simple arithmetic, claim the researchers.

G. Why these skills evolved is not hard to imagine since it would help almost any animal forage for food. Animals on the prowl for sustenance must constantly decide which tree has the most fruit, or which patch of flowers will contain the most nectar. They are also other, less obvious, advantages of numeracy. In one compelling example, researchers in America found that female coots appear to calculate how many eggs they have laid – and add any in the nest laid by an intruder – before making any decisions about adding to them. Exactly how ancient these skills are is difficult to determine, however. Only' by studying the numerical abilities of more and more creatures using standardized procedures can we hope to understand the basic preconditions for the evolution of number.

Questions 1-7

Complete the table below.

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

Subjects	Experiment	Results
rhesus monkeys and humans	looked at two sets of geometrical on a computer screen	performance of two groups is almost **1** …….
chicks	chose between two sets of **2** …… which are altered	chicks can do calculations in order to choose a larger group
coots	behaviour of **3** …….. birds was observed	the bird seems to have the ability to count eggs
salamanders	offered clear tubes containing different quantities of **4** …….	salamanders distinguish between numbers over four if the bigger number is at least two times larger
5 …….	shown real shoals and later artificial ones of geometrical shapes; these are used to check the influence of total **6** …… and brightness	subjects know the difference between two and three and possibly three and four, but not between four and five
bees	had to learn where **7** ……. was stored	could soon choose the correct place

Test 3

New Zealand's early crafts and traditions

The first groups of people to discover New Zealand came from Polynesia. Exactly when these explorers arrived has often been a matter of debate, but today the general understanding is that it was during the l 3'h century that their canoes eventually landed on New Zealand's shores. In some ways the new country must have seemed like an ideal place to settle: the land was fertile, and thick forests provided firewood, shelter and building materials. Still, life would have been challenging for the different Polynesian tribes, who had to adapt to a new environment. The tribes only began to refer to themselves as *Maori,* meaning 'ordinary people', when Europeans in search of new opportunities began arriving in the 18th century. To the Maori, of course, the European settlers and sailors were not 'ordinary', but very strange.

It was not only a knowledge of canoe-building and navigation that the Polynesians brought to New Zealand. They were also skilled craftsmen. There is archaeological evidence that the tools they produced were of high quality and would have enabled tribes to plant and harvest crops. Craftsmen were also occupied with making weapons such as knives and axes, which were used for both construction and fighting. Interestingly, some crafts that had once been popular in Polynesian islands were no longer done in New Zealand, although researchers are unsure why. Pottery is an example of this, despite the fact that the clay needed to make pots and bowls could easily be found in the new country.

The Maori word *whakairo* can be translated as 'decorative work' – this can refer to bone, wood and greenstone carving. Although Maori carvers were influenced by their Polynesian heritage, they developed their own style, including the curved patterns and spirals inspired by New Zealand plants. The same term can also apply to weaving; the crafting of, for example, woven baskets and mats all required knowledge and skill. Carving greenstone, or *pounamu* as it is called in Maori, was a long process, requiring great patience . Further, because of this mineral's rarity, any greenstone object, such as a piece of jewellery or cutting blade, was a prized possession. For that reason, it was the few people of high status rather than low-ranking members of a tribe who would possess such objects.

As New Zealand had no native mammals except for bats, dolphins and whales, Maori largely had to depend on plants to provide material for their clothing, including their cloaks. Weavers experimented with the inner bark of the *houhere,* the lacebark tree, but found it unsuitable. Bur the dried-out leaves and fibres of the flax plant provided a solution. Once a cloak had been

woven from flax, it could be decorated. Borders might be dyed black or red, for example. In the case of superior ones made for chiefs or the more important members of a tribe, feathers from kiwi, pigeons or other native birds might be attached. All *flax* cloaks were rectangular in shape, so had no sleeves, and neither was a hood a feature of this garment. Short cloaks were fastened around a person's neck, and came only to the waist. Pins made of bone, wood or greenstone allowed longer cloaks to be secured at the shoulder; these were a type that were often used for ceremonial occasions. Of course, the construction of the cloaks was influenced by the plant material available to Maori weavers. This meant that cloaks were loose-fitting, and while they protected wearers from New Zealand's strong sunshine, they were not useful during the winter months. A cloak made from fur or wool could provide insulation from the cold, but not so a cloak made of *flax.*

The warriors of a tribe required a different kind of cloak to help protect them. To create these special cloaks, the tough fibres of the mountain cabbage tree were used instead. It is not clear to researchers what the entire process involved, but they believe the fibres were left to soak in water over a period of time in order to soften them and make them easier to weave together. Later, once the whole cloak had been constructed, it would be dyed black. To do this, Maori weavers covered it in a special kind of mud they had collected from riverbeds. This was rich in iron due to New Zealand's volcanic landscape. The particular advantage of these cloaks was that the tough cabbage tree fibres they were woven from could reduce the impact of spear tips during a fight with enemy tribes. It is fortunate that some cloaks from the 1800s still survive and can provide us with further insight into the materials and construction techniques that Maori craftsmen used.

Questions 7-13

Complete the table below.

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

Write your answers in boxes 7-13 on your answer sheet.

Maori cloaks		
	flax cloaks	
methods of construction	Maori made flax cloaks by - weaving leaves and fibres - sometimes adding **7** .... to the better cloaks	Weavers had to use **11** ..... to make cabbage tree fibres less stiff
appearance	Flax cloaks were - rectangular in shape - designed without a **8** ..... . - tied at either the wearer's neck or their **9**	Mud containing **12 .....** was used to make the cloaks look black
good **bad points**	Flax cloaks offered no **10** ..... during winter	**13 ..... .** could not easily go through the cloak's tough fibres

Diagram Labelling Questions

Test 1

Walking with dinosaurs

Peter L. Falkingham and his colleagues at Manchester University are developing techniques which look set to revolutionize our understanding of how dinosaurs and other extinct animals behaved.

The media image of palaeontologists who study prehistoric life is often of field workers camped in the desert in the hot sun, carefully picking away at the rock surrounding a large dinosaur bone. But Peter Falkingham has done little of that for a while now. Instead, he devotes himself to his computer. Not because he has become inundated with paperwork, but because he is a new kind of palaeontologist: a computational palaeontologist.

What few people may consider is that uncovering a skeleton, or discovering a new species, is where the research begins, not where it ends. What we really want to understand is how the extinct animals and plants behaved in their natural habitats. Drs Bill Sellers and Phil Manning from the University of Manchester use a 'genetic algorithm' – a kind of computer code that can change itself and 'evolve' – to explore how extinct animals like dinosaurs, and our own early ancestors, walked and stalked.

The fossilized bones of a complete dinosaur skeleton can tell scientists a lot about the animal, but they do not make up the complete picture and the computer can try to fill the gap. The computer model is given a digitized skeleton, and the locations of known muscles. The model then randomly activates the muscles. This, perhaps unsurprisingly, results almost without fail in the animal falling on its face. So the computer alters the activation pattern and tries again … usually to similar effect. The modeled dinosaurs quickly 'evolve'. If there is any improvement, the computer discards the old pattern and adopts the new one as the base for alteration. Eventually, the muscle activation pattern evolves a stable way of moving, the best possible solution is reached, and the dinosaur can walk, run, chase or graze. Assuming natural selection evolves the best possible solution too, the modeled animal should be moving in a manner similar to its now-extinct counterpart. And indeed, using the same method for living animals (humans, emu and ostriches) similar top speeds were achieved on the computer as in reality. By comparing their cyberspace results with real measurements of living species, the

Manchester team of palaeontologists can be confident in the results computed showing how extinct prehistoric animals such as dinosaurs moved.

The Manchester University team have used the computer simulations to produce a model of a giant meat-eating dinosaur. lt is called an acrocanthosaurus which literally means ‘high spined lizard’ because of the spines which run along its backbone. It is not really known why they are there but scientists have speculated they could have supported a hump that stored fat and water reserves. There are also those who believe that the spines acted as a support for a sail. Of these, one half think it was used as a display and could be flushed with blood and the other half think it was used as a temperature-regulating device. It may have been a mixture of the two. The skull seems out of proportion with its thick, heavy body because it is so narrow and the jaws are delicate and fine. The feet are also worthy of note as they look surprisingly small in contrast to the animal as a whole. It has a deep broad tail and powerful leg muscles to aid locomotion. It walked on its back legs and its front legs were much shorter with powerful claws.

Falkingham himself is investigating fossilized tracks, or footprints, using computer simulations to help analyze how extinct animals moved. Modern-day trackers who study the habitats of wild animals can tell you what animal made a track, whether that animal was walking or running, sometimes even the sex of the animal. But a fossil track poses a more considerable challenge to interpret in the same way. A crucial consideration is knowing what the environment including the mud, or sediment, upon which the animal walked was like millions of years ago when the track was made. Experiments can answer these questions but the number of variables is staggering. To physically recreate each scenario with a box of mud is extremely time-consuming and difficult to repeat accurately. This is where computer simulation comes in.

Falkingham uses computational techniques to model a volume of mud and control the moisture content, consistency, and other conditions to simulate the mud of prehistoric times. A footprint is then made in the digital mud by a virtual foot. This footprint can be chopped up and viewed from any angle and stress values can be extracted and calculated from inside it. By running hundreds of these simulations simultaneously on supercomputers, Falkingham can start to understand what types of footprint would be expected if an animal moved in a certain way over a given kind of ground. Looking at the variation in the virtual tracks,

researchers can make sense of fossil tracks with greater confidence.

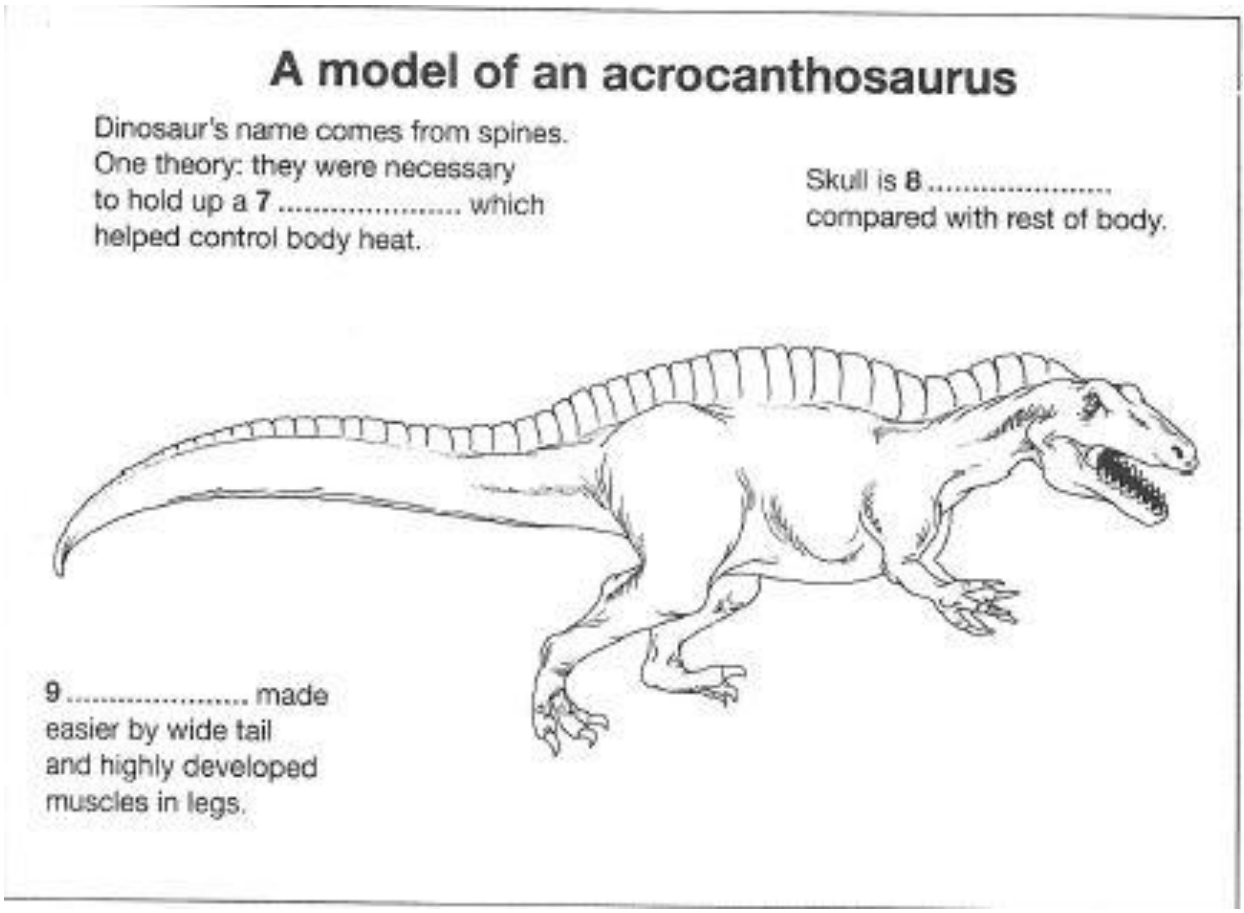
The application of computational techniques in palaeontology is becoming more prevalent every year. As computer power continues to increase, the range of problems that can be tackled and questions that can be answered will only expand.

Questions 7-9

Label the diagram below.

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

Write your answers in boxes 7-9 on your answer sheet.



Test 2

Seed vault guards resources for the future

Fiona Harvey paid a visit to a building whose contents are very precious.

About 1,000 km from the North Pole, Svalbard is one of the most remote places on earth. For this reason, it is the site of a vault that will safeguard a priceless component of our common heritage – the seeds of our staple crops. Here, seeds from the world's most vital food crops will be locked away for hundreds or even thousands of years. If something goes wrong in the world, the vault will provide the means to restore farming. We, or our descendants, will not have to retread thousands of years of agriculture from scratch.

Deep in the vault at the end of a long tunnel, are three storage vaults which are lined with insulated panels to help maintain the cold temperatures. Electronic transmitters linked to a satellite system monitor temperature, etc. and pass the information back to the appropriate authorities at Longycarbyen and the Nordic Gene Bank which provide the technical information for managing the seed vaults. The seeds are placed in scaled boxes and stored on shelves in the vaults. The minimal moisture level and low temperature ensure low metabolic activity. The remote location, as well as the rugged structure, provide unparalleled security for the world's agricultural heritage.

The three vaults are buried deep in the hillside. To reach them, it is necessary to proceed down a long and surprisingly large corridor. At 93.3 metres in length, it connects the 26-metre long entrance building to the three vaults, each of which extends a further 27 metres into the mountain. Towards the end of this tunnel, after about 80 metres, there are several small rooms on the right-hand side. One is a transformer room to which only the power company officials have access – this houses the equipment needed to transform the incoming electrical current down to 220 volts. A second is an electrical room housing controls for the compressor and other equipment. I he oilier room is an office which can be heated to provide comfortable working conditions for those who will make an inventory of the samples in and out of the vault.

Anyone seeking access to the seeds has to pass through four locked doors: the heavy steel entrance doors, a second door approximately 90 metres down the tunnel and finally the two keyed doors separated by an airlock, from which it is possible to proceed directly into the seed vaults. Keys are coded to allow access to different levels of the facility. A work of art will make

the vault visible for miles with reflective sheets of steel and mirrors which form an installation acting as a beacon. It reflects polar light in the summer months, while in the winter, a network of 200 fibre-optic cables will give the piece a muted greenish-turquoise and white light. Cary Fowler, the mastermind behind the vault, stands inside the echoing cavern. For him, this is the culmination of nearly 30 years of work. 'It's an insurance policy,' he explains, 'a very cheap insurance policy when you consider what we're insuring – the earth's biological diversity.'

Seeds are being brought here from all over the world, from seed banks created by governments, universities and private institutions. Soon, there will be seed varieties from at least 100 crops in the Svalbard vault – extending to examples of all of the 1.5 million known crop seed varieties in the world. If any more are unearthed, either in the wild or found in obscure collections, they can be added, too – the vault has room for at least 4.5 million samples. Inside the entrance area, it is more than 10°C below freezing, but in the chambers where the seeds are kept, refrigerators push down the temperature even further, to -18°C. At this temperature, which will be kept constant to stop the seeds germinating or rotting, the wheat seeds will remain viable for an estimated 1,700 years.

Svalbard's Arctic conditions will keep the seeds cold. In order to maintain the temperature at a constant -10° C to -20°C, the cold Arctic air will be drawn into the vault during the winter, automatically and without human intervention. The surrounding rock will maintain the temperature requirements during the extremely cold season and, during warmer periods, refrigeration equipment will engage. Looking out across the snow-covered mountains of Svalbard, it is hard not to feel respect for the 2,300 or so people who live here, mainly in Longyearbyen, a village a few miles away. There are three months without light in winter.

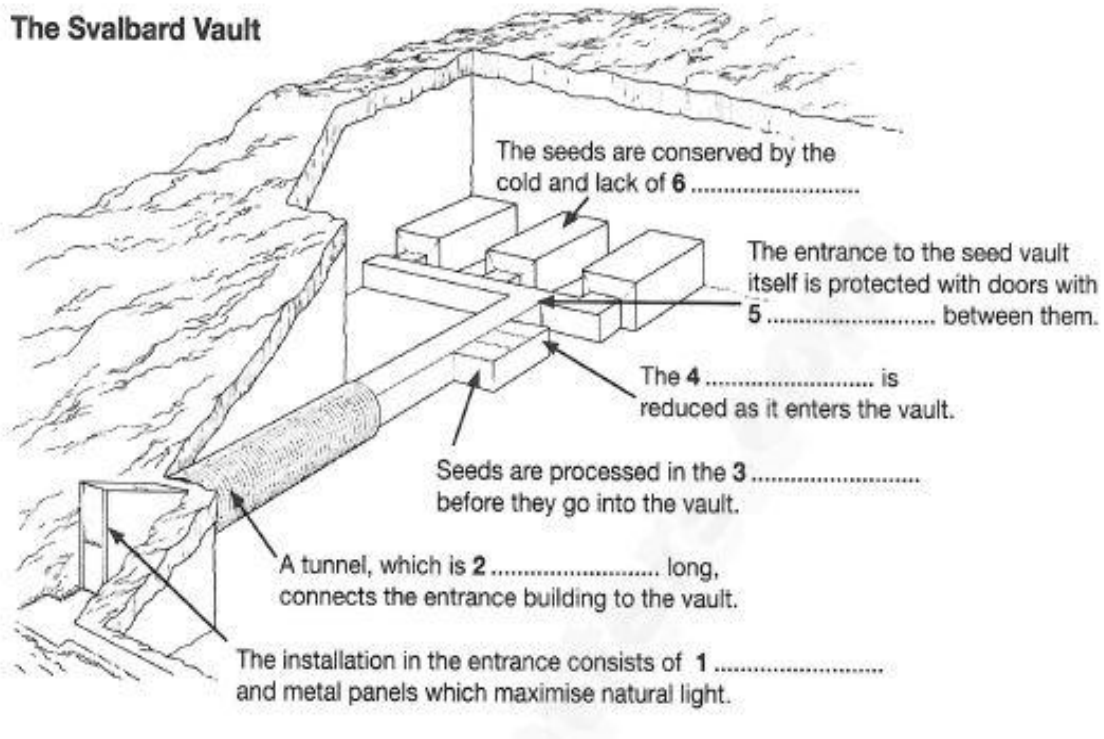
Svalbard is intended 3s the seed bank of last resort. Each sample is made up of a few hundred seeds, sealed inside a watertight package which will never be tampered with while it is in the vault. The packages of seeds remain the property of the collections they have come from. Svalbard will disburse samples 'only if all the other seeds in other collections around the world are gone,' explains Fowler. If seeds do have to be given out, those who receive them are expected to germinate them and generate new samples, to be returned to the vault.

Questions 1-6

Label the diagram below.

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

Write your answers in boxes 1-6 on your answer sheet.



Test 3

The Romans Reveal their Secrets

As Katherine Sheen rested on the banks of Hensham river on 3 August 2005, her gaze fell upon a small, dirt-covered object amongst a tangle of tree roots. Cleaning away the soil, she realised it was a leather pouch. It fell apart as Katherine opened it, and the items inside fell to the ground. Although her university degree had merely touched on the Roman occupation of ancient Britain, providing a very general overview of everyday activities, once she'd rubbed off some of the dirt, Katherine immediately identified the coins in her hand as coming from that era. Despite their discoloration, Katherine had no doubt they were historically significant. As soon as she got home, she informed the police of her find.

That might have been the end of the story - except for the fact that the farmer who owned the adjacent field then mentioned the lines of large stones his plough kept running into. By mid-August, with the farmer's permission, a team of archaeologists, led by Professor Kevin Durrand, were camped out in the field. Durrand had previously worked on other projects where pieces of ancient pottery and the discovery of an old sword had led archaeologists to unearth sizeable Roman settlements. He was keen to start excavations at Hensham, and had got funding for a three-month dig. What his team eventually discovered, three weeks into excavations, were the remains of the outer walls of a Roman villa. As many Romans in Britain simply lived in wooden houses with thatched roofs, the family that occupied the villa must have been very wealthy. As the team continued their work, they looked for evidence that might indicate whether the villa had been attacked and purposely demolished, or fallen into such a poor state that it eventually collapsed. Looking at the way a set of slate roof tiles had fallen to the ground, they decided on the latter. What caused the noble Roman family and their servants to abandon the villa remains open to speculation. Another find was six blue beads, crafted from glass, which the archaeologists speculated were part of a necklace. Durrand has previously found gold bracelets on other sites, but for him the beads are no less significant. 'Every find contributes to the story,' he says.

On the outer western wall, the archaeologists uncovered a number of foundation stones. On one is carved what the archaeologists made out to be a Latin inscription. But as the stone itself has endured centuries of erosion, the team has yet to work out what it says. Another find was a section of traditional Roman mosaic. Although incomplete, enough pieces remain to show a

geometrical pattern and stylised fish. From this, Durrand assumes that a bath house would have been a feature of the villa. While his team have so far not found any hard proof of this, Durrand is confident it will turn out to be the case.

Something that the team are particularly excited about is evidence of a heating system, which would have served the Roman family and their visitors well in winter months. Although much of the system has long since crumbled at Hensham, Durrand and his team believe it would have been based on a typical Roman hypocaust; they have created a model for visitors to see. The furnace that produced the hot air needed to be kept burning all the time, a task that would have fallen to the villa's slaves. As large branches would have taken too long to produce the heat required, it is more likely that twigs would have been gathered from surrounding woodland instead. Another fuel source used in some Roman hypocausts was charcoal, but evidence for this at Hensham has not presented itself. The underfloor space was made by setting the floor on top of piles of square stones, known as pilae, these stones stood approximately two feet high. The gap this created meant that the hot air coming out of the furnace was not trapped and restricted. Instead its distribution around the pilae and under the floor was free flowing. Floor tiles were not placed directly onto the pilae but separated by a layer of concrete, or at least a primitive version of it. This would have made the whole structure more solid, and helped reduce the risk of fire spreading to upper levels. The walls of the rooms above the heating system were made of bricks, but the key point here is that they were hollow, in order to allow heat to rise around the rooms and provide insulation. Some have been recovered from the Hensham villa and are now undergoing preservation treatment.

Another feature of the heating system that archaeologists have identified at Hensham was its clay pipes. These were cleverly built into the wall so as not to take up space. The principal reason for including the pipes was to let out air through a vent in the roof once it had cooled down. What the Romans may not have realised, however, was that gas produced by the burning fuel was expelled in this way too. In high doses, it could have been lethal if it had leaked into the upper levels. Inside the rooms in the villa, a layer of plaster would have been applied to the walls and painted in rich colours. Sadly, none of the original plaster at Hensham still exists. However, some of the tiles that the family would have walked on have survived. They would certainly have felt warm underfoot and helped generate an indoor climate that the family could relax in. In its day, the Hensham hypocaust would have been a remarkable piece of engineering.

Questions 8-13

Label the diagram below.

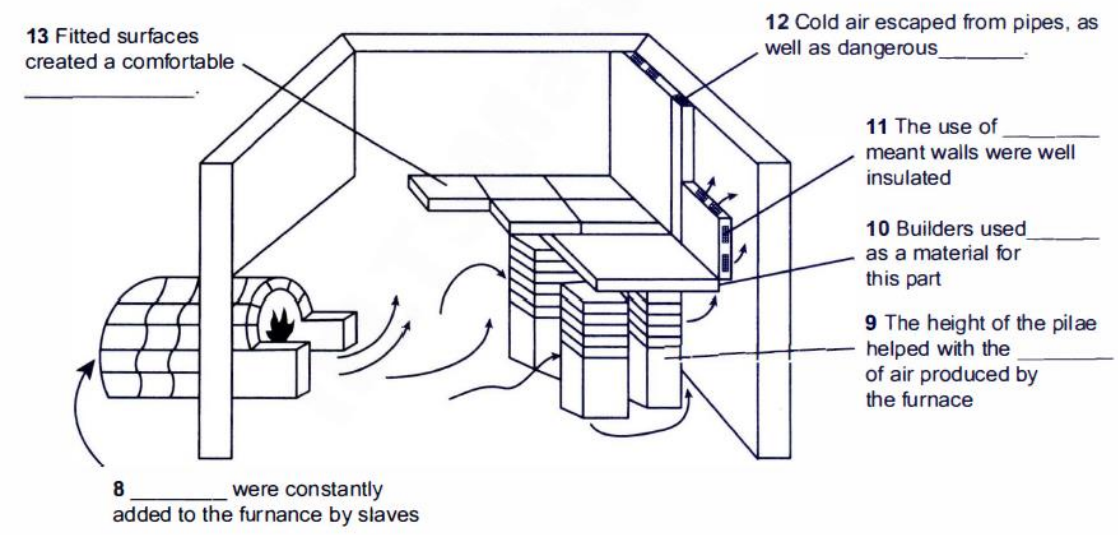
*Choose **NO MORE THAN TWO WORDS** from the passage for each answer.*

*Write your answers in boxes **8-13** on your answer sheet.*

A model of the heating system used at Hensham villa

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

A model of the heating system used at Hensham villa



Test 4

What's so Funny?

John McCrone reviews recent research on humour

The joke comes over the headphones: ' Which side of a dog has the most hair? The left.' No, not funny. Try again. ' Which side of a dog has the most hair? The outside.' Hah! The punchline is silly yet fitting, tempting a smile, even a laugh. Laughter has always struck people as deeply mysterious, perhaps pointless. The writer Arthur Koestler dubbed it the luxury reflex: 'unique in that it serves no apparent biological purpose'.

Theories about humour have an ancient pedigree. Plato expressed the idea that humour is simply a delighted feeling of superiority over others. Kant and Freud felt that joke-telling relies on building up a psychic tension which is safely punctured by the ludicrousness of the punchline. But most modern humour theorists have settled on some version of Aristotle's belief that jokes are based on a reaction to or resolution of incongruity, when the punchline is either a nonsense or, though appearing silly, has a clever second meaning.

Graeme Ritchie, a computational linguist in Edinburgh, studies the linguistic structure of jokes in order to understand not only humour but language understanding and reasoning in machines. He says that while there is no single format for jokes, many revolve around a sudden and surprising conceptual shift. A comedian will present a situation followed by an unexpected interpretation that is also apt.

So even if a punchline sounds silly, the listener can see there is a clever semantic fit and that sudden mental 'Aha!' is the buzz that makes us laugh. Viewed from this angle, humour is just a form of creative insight, a sudden leap to a new perspective.

However, there is another type of laughter, the laughter of social appeasement and it is important to understand this too. Play is a crucial part of development in most young mammals. Rats produce ultrasonic squeaks to prevent their scuffles turning nasty. Chimpanzees have a 'play-face' - a gaping expression accompanied by a panting 'ah, ah' noise. In humans, these signals have mutated into smiles and laughs. Researchers believe social situations, rather than cognitive events such as jokes, trigger these instinctual markers

of play or appeasement. People laugh on fairground rides or when tickled to flag a play situation, whether they feel amused or not.

Both social and cognitive types of laughter tap into the same expressive machinery in our brains, the emotion and motor circuits that produce smiles and excited vocalisations. However, if cognitive laughter is the product of more general thought processes, it should result from more expansive brain activity.

Psychologist Vinod Goel investigated humour using the new technique of 'single event' functional magnetic resonance imaging (fMRl). An MRI scanner uses magnetic fields and radio waves to track the changes in oxygenated blood that accompany mental activity. Until recently, MRI scanners needed several minutes of activity and so could not be used to track rapid thought processes such as comprehending a joke. New developments now allow half-second 'snapshots' of all sorts of reasoning and problem-solving activities.

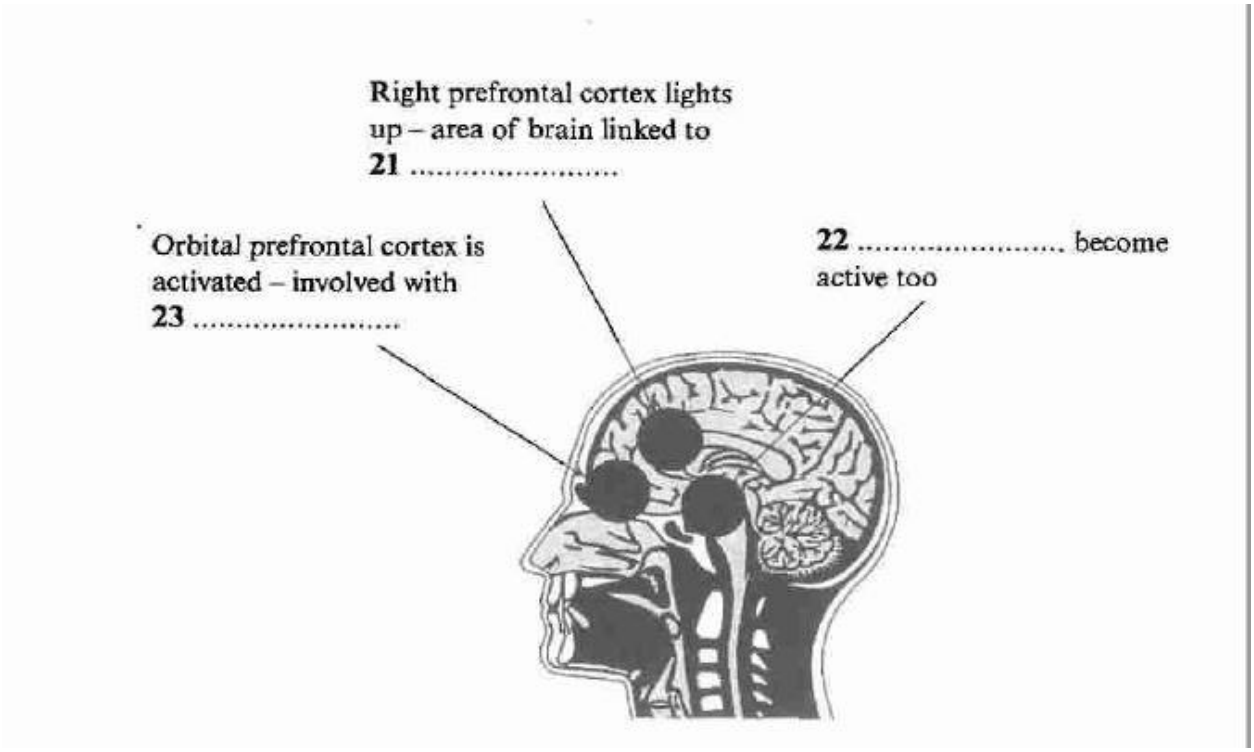
Although Goel felt being inside a brain scanner was hardly the ideal place for appreciating a joke, he found evidence that understanding a joke involves a widespread mental shift. His scans showed that at the beginning of a joke the listener'$ prefrontal cortex lit up, particularly the right prefrontal believed to be critical for problem solving. But there was also activity in the temporal lobes at the side of the head (consistent with attempts to rouse stored knowledge) and in many other brain areas. Then when the punchline arrived, a new area sprang to life -the orbital prefrontal cortex. This patch of brain tucked behind the orbits of the eyes is associated with evaluating information.

Making a rapid emotional assessment of the events of the moment is an extremely demanding job for the brain, animal or human. Energy and arousal levels may need, to be retuned in the blink of an eye. These abrupt changes will produce either positive or negative feelings. The orbital cortex, the region that becomes active in Goel's experiment, seems the best candidate for the site that feeds such feelings into higher-level thought processes, with its close connections to the brain's sub-cortical arousal apparatus and centres of metabolic control.

All warm-blooded animals make constant tiny adjustments in arousal in response to external events, but humans, who have developed a much more complicated internal life as a result of language, respond emotionally not only to their surroundings, but to their own thoughts. Whenever a sought-for answer snaps into place, there is a shudder of pleased recognition. Creative discovery being pleasurable, humans have learned to find ways of milking this

natural response. The fact that jokes tap into our general evaluative machinery explains why the line between funny and disgusting, or funny and frightening, can be so fine. Whether a joke gives pleasure or pain depends on a person's outlook.

Humour may be a luxury, but the mechanism behind it is no evolutionary accident. As Peter Derks, a psychologist at William and Mary College in Virginia, says: 'I like to think of humour as the distorted mirror of the mind. It's creative, perceptual, analytical and lingual. If we can figure out how the mind processes humour, then we'll have a pretty good handle on how it works in general.



Flow Chart Completion Questions

Test 1

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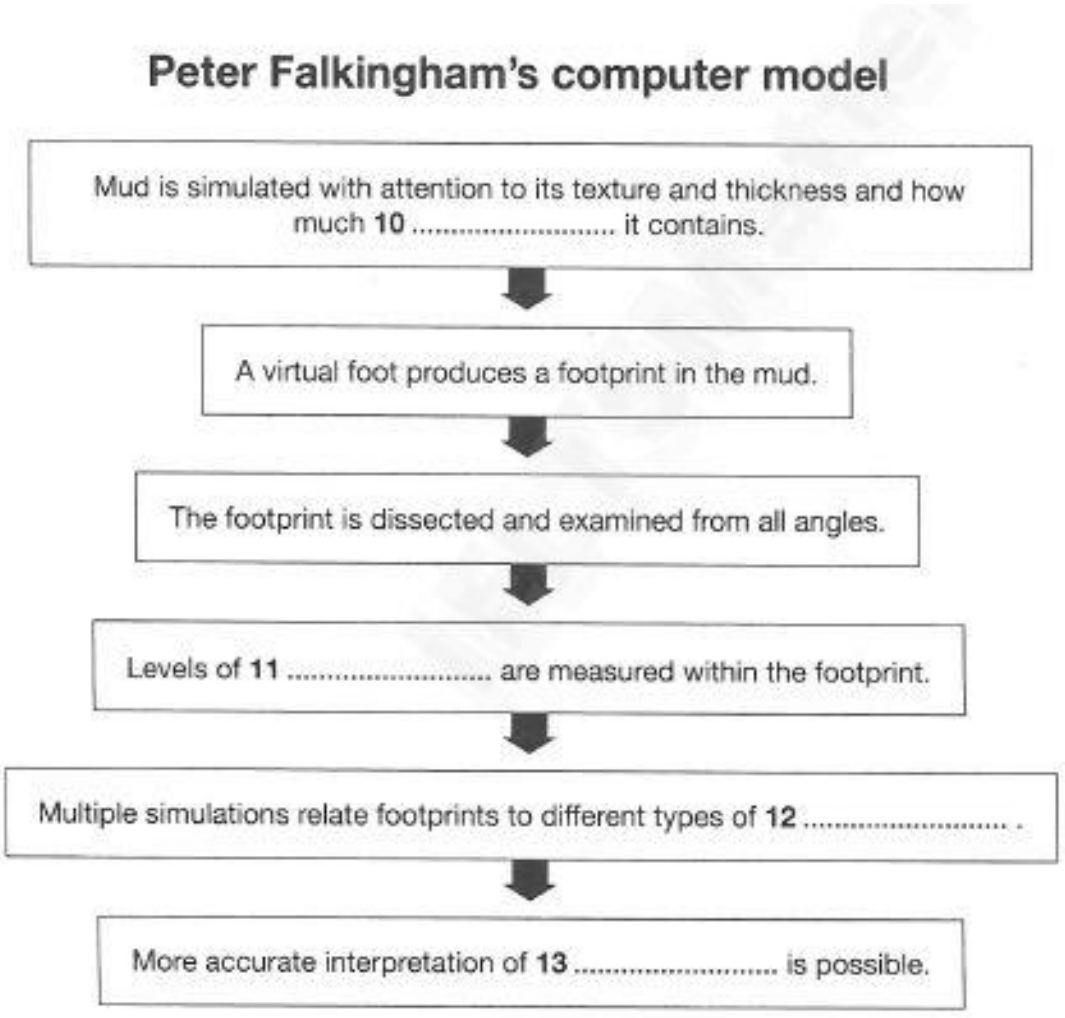
Question 10-13

Complete the flow-chart below

Write **NO MORE THAN TWO WORDS** for each answer



Test 2

Wooden Buildings

Using wood as a construction material for large buildings is an ancient practice. The 67-metre-high Sakyamuni Pagoda in China was constructed in 1056, while Japan's Horyu-ji Temple is even older, dating from the 7th or 8th century. That these magni-Acent structures have survived for over a thousand years is evidence of wood's strength and durability as a building material. Still today, 80% of houses in the USA are built of wood. In Australia the proportion is slightly smaller since stone is also a popular choice, particularly in the southern states, while in New Zealand the -Agure is more like 85%. Certainly, there are problems associated with wooden constructions: wood can rot when exposed to water and is said to be a flre risk. However, with modern technology these issues can be eliminated, which has led to a dramatic renewal of interest in wood as a building material in recent years.

Today, architects and engineers recognise the potential of wood not only for private homes but also for larger multi-storey offices and apartment blocks. In 2015, a 52.8-metre wooden tower block was constructed in Norway, then a world record for an apartment block, but this was soon surpassed by a 53-metre student dormitory at the University of British Columbia in Canada. Then came the 84-metre HoHo building in Vienna, home to a hotel, offices and apartments. Although the HoHo building has a concrete core, most of the structure as well as the -Aoors are built of wood. Many of these advances have been made possible by research at the Technical Institute in Graz, Austria, where new engineering sysems based on wood construction have been pioneered.

A good example of these techniques is found at the Wood Innovation and Design Centre at the University of Northern British Columbia, Canada. The flrst stage in the construction of the building saw large planks of Douglas -Ar being fastened to one another with glue, which these days can be stronger than nails or screws. This produced large heavy sheets of wooden material; these became the basic structural components for the building. These sheets then had to be precision cut to create the thousands of columns and beams necessary - the team employed lasers for this purpose. Once the cutting work was complete, all the wooden components were taken to the site for assembly. The building was constructed one storey at a time, layer upon layer, not unlike the system used to make a large cake. Once the eighth and flnal storey was completed, the building reached a height of 30 metres and became a notable landmark in its neighbourhood. And, of course, one of the great advantages of wood comes at the end of a building's life, in around 1 00 years' time. When the Wood Innovation and

Design Centre eventually has to be demolished, it will be possible for its principal building material to be recycled, which is not usually practical with steel or concrete.

Other signi-Acant wooden buildings are to be found in locations around the world. Perhaps not surprisingly, given that the Hory0-ji Temple may be the oldest large wooden building in the world, Japanese engineers are at the forefront of this process. One thing that has been learned from maintaining the Horyu-ji Temple over many centuries is that it is often simpler to make major repairs to wooden structures than to those made of concrete and steel. Until quite recently, regulations in Japan have made the construction of very large wooden structures difficult. However, in recognition of new technologies, these are being relaxed by the government, with the result that ever more ambitious projects are being announced. Perhaps the most radical example is the proposed Sumitomo Tower, a skyscraper of 70 storeys to be built largely of wood in central Tokyo; its completion date is 2041.

Because wood is more flexible than steel, it has great potential in countries prone to earthquakes, such as Japan and New Zealand. Engineers in New Zealand believe that wood construction can significantly improve building safety in the event of a natural disaster, as has been demonstrated at the new Wynn Williams House. The wood has been left exposed inside the house to showcase how this type of construction provides attractive interiors as well.

Another advantage of wood is that it is so light, particularly when compared to steel and concrete. In Australia, the benefits of light weight have been taken advantage of in the city of Melbourne, where a large wooden library has been constructed directly beside water, on land so soft that a heavier building would have been impossible. Furthermore, wood is advantageous even in extreme climates. In Finland, where winter temperatures can fall to 30°C, wood provides all the load-bearing structures for the Puukuokka Block, but also guarantees excellent heat insulation as well.As wood construction technologies continue to develop, it seems probable that architects and engineers will dream up ever more uses for this practical. flexible and beautiful building material.

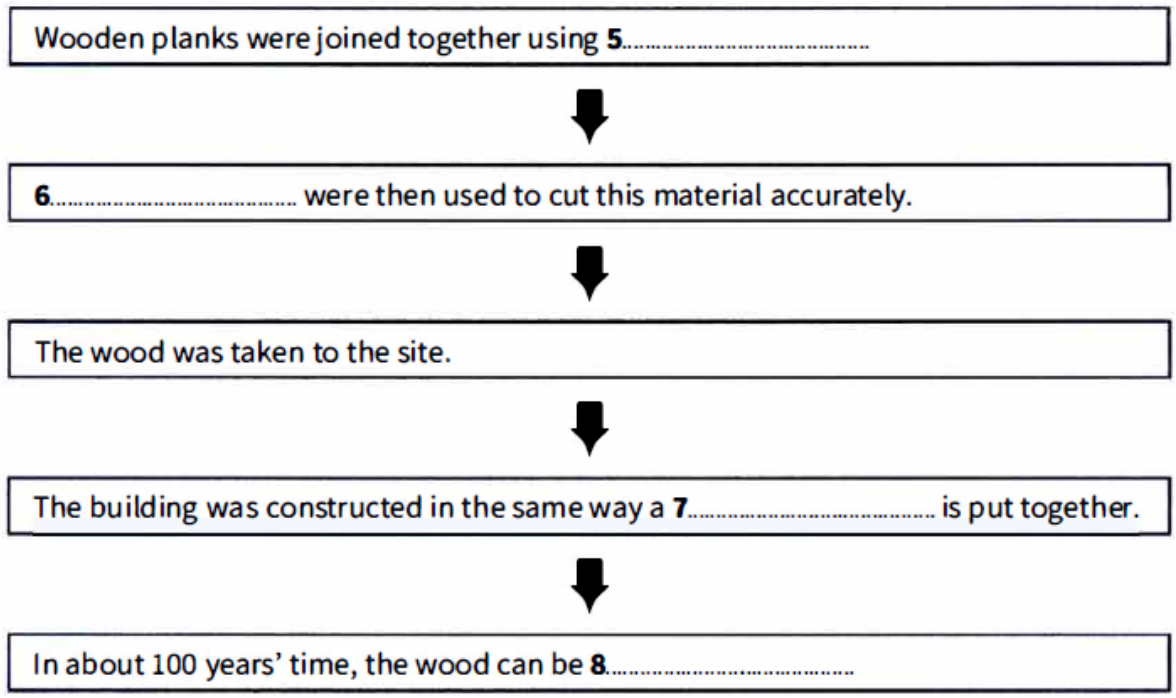
Questions 5-8

Complete the flow-chart below.

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

Write your answers in boxes 5-8 on your answer sheet.

Building the Wood Innovation and Design Centre



Test 3

BAKELITE - The birth of modem plastics

In 1907, Leo Hendrick Baekeland, a Belgian scientist working in New York, discovered and patented a revolutionary new synthetic material. His invention, which he named 'Bakelite', was of enormous technological importance, and effectively launched the modern plastics industry.

The term 'plastic' comes from the Greek plassein, meaning 'to mould' Some plastics are derived from natural sources, some are semi-synthetic (the result of chemical action on a natural substance), and some are entirely synthetic, that is, chemically engineered from the constituents of coal or oil. Some are 'thermoplastic', which means that, like candlewax, they melt when heated and can then be reshaped. Others are 'thermosetting': like eggs, they cannot revert to their original viscous state, and their shape is thus fixed for ever Bakelite had the distinction of being the first totally synthetic thermosetting plastic.

The history of today's plastics begins with the discovery of a series of semi-synthetic thermoplastic materials in the mid-nineteenth century. The impetus behind the development of these early plastics was generated by a number of factors - immense technological progress in the domain of chemistry, coupled with wider cultural changes, and the pragmatic need to find acceptable substitutes for dwindling supplies of 'luxury' materials such as tortoiseshell and ivory.

Baekeland's interest in plastics began in 1885 when, as a young chemistry student in Belgium, he embarked on research into phenolic resins, the group of sticky substances produced when phenol (carbolic acid) combines with an aldehyde (a volatile fluid similar to alcohol). He soon abandoned the subject, however, only returning to it some years later. 8y 1905 he was a wealthy New Yorker, having recently made his fortune with the invention of a new photographic paper. While Baekeland had been busily amassing dollars, some advances had been made in the development of plastics. The years 1899 and 1900 had seen the patenting of the first semi-synthetic thermosetting material that could be manufactured on an industrial scale. In purely scientific terms, Baekeland's major contribution to the field is not so much the actual discovery of the material to which he gave his name, but rather the method by which a reaction between phenol and formaldehyde could be controlled, thus

making possible its preparation on a commercial basis. On 13 July 1907, Baekeland took out his famous patent describing this preparation, the essential features of which are still in use today.

The original patent outlined a three-stage process, in which phenol and formaldehyde (from wood or coal) were initially combined under vacuum inside a large egg-shaped kettle. The result was a resin known as Novalak, which became soluble and malleable when heated. The resin was allowed to cool in shallow trays until it hardened, and then broken up and ground into powder. Other substances were then introduced: including fillers, such as woodflour, asbestos or cotton, which increase strength and moisture resistance, catalysts (substances to speed up the reaction between two chemicals without joining to either) and hexa, a compound of ammonia and formaldehyde which supplied the additional formaldehyde necessary to form a thermosetting resin. This resin was then left to cool and harden, and ground up a second time. The resulting granular powder was raw Bakelite, ready to be made into a vast range of manufactured objects. In the last stage, the heated Bakelite was poured into a hollow mould of the required shape and subjected to extreme heat and pressure, thereby 'setting' its form for life.

The design of Bakelite objects, everything from earrings to television sets, was governed to a large extent by the technicalrequirements of the moulding process. The object could not be designed so that it was locked into the mould and therefore difficult to extract. A common general rule was that objects should taper towards the deepest part of the mould, and if necessary the product was moulded in separate pieces. Moulds had to be carefully designed so that the molten Bakelite would flow evenly and completely into the mould. Sharp corners proved impractical and were thus avoided, giving rise to the smooth, 'streamlined' style popular in the 1930s. The thickness of the walls of the mould was also crucial’ thick walls took longer to cool and harden, a factor which had to be considered by the designer in order to make the most efficient use of machines.

Baekeland's invention, although treated with disdain in its early years, went on to enjoy an unparalleled popularity which lasted throughout the first half of the twentieth century. It became the wonder product of the new world of industrial expansion - 'the material of a thousand uses'. Being both non-porous and heat-resistant, Bakelite kitchen goods were promoted as being germ-free and sterilisable. Electrical manufacturers seized on its insulating properties, and consumers everywhere relished its dazzling array of shades, delighted that

they were now, at last, no longer restricted to the wood tones and drab browns of the preplastic era. It then fell from favour again during the 1950s, and was despised and destroyed in vast quantities. Recently, however, it has been experiencing something of a renaissance, with renewed demand for original Bakelite objects in the collectors' marketplace, and museums, societies and dedicated individuals once again appreciating the style and originality of this innovative material.

Questions 4-8

Complete the flow-chart.

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

*Write your answers in boxes **4-8** on your answer sheet.*