READING PASSAGE 1

You should spend about 20 minutes on Questions 1-14.

LIFE ON MARS?

Terraforming may sound like something out of science fiction, but some believe it is possible to turn that fiction into fact.

As plans are slowly being drawn up for the first manned mission to Mars, many space travel sceptics are asking one vital question: why go there? Mars is a barren, desolate planet, and with its thin atmosphere and bitterly cold climate, it would appear to be completely unsuitable for human life. Above all, it is a very distant place, and getting there would be an enormous challenge. However, the planet might just hold the key to long-term human survival. With the Earth's population currently at more than seven billion and climbing, we may eventually be forced to look elsewhere in the solar system for somewhere to live. It is just possible that, contrary to photographic evidence, Mars may be more promising than it appears.

Today, Mars is a viciously cold, dry place. However, it does have some things in common with our own planet. For example, it has a daily rotation rate of 24 hours 37 minutes, compared with 23 hours 56 minutes on Earth. It also has an axial tilt of 24 degrees, which is just half a degree more than Earth's, and a gravitational pull one third of Earth's. Furthermore, it holds many of the elements that are required to support life, including carbon and oxygen (in the form of carbon dioxide), nitrogen, and frozen water at its polar ice caps. In fact, if you were to travel back in time several billions years, you would notice some remarkable parallels between the atmosphere on Earth then and Mars today. Back then, Earth was also a lifeless planet; until photosynthetic bacteria developed and began to produce enough oxygen to allow for the development of animal and plant life, our atmosphere also consisted entirely of carbon dioxide and nitrogen.

It comes as no surprise to learn, therefore, that some scientists believe the same process which turned Earth's atmosphere from mostly carbon dioxide into breathable air could be repeated on Mars, but by using technology rather than by letting nature and evolution take its natural course. Terraforming, as this process is known, would initially create a greenhouse effect that would heat the planet, which in turn would create other conditions necessary to provide a suitable living environment for plants and animals. However, it would be a highly challenging undertaking, and the process of terraforming the entire planet into an Earth-like habitat could still take many thousands of years.

Three terraforming methods have been suggested, with the first already under development, albeit for a different purpose. At present, the American space agency NASA is working on a system that will use large mirrors to capture the sun's radiation. This radiation will be used to propel spacecraft through space, removing the need for heavy and expensive rocket fuel. With a few changes, it might be possible to use similar mirrors to reflect the sun's radiation and heat the surface of Mars. Aimed at the planet from a distance of two hundred thousand miles, these enormous mirrors would raise the surface temperature by a few degrees. If they were concentrated on the polar ice caps, they would provide enough heat to melt the polar ice caps and release the carbon dioxide that is believed to be trapped there. Gradually, as the temperature rose, greenhouse gases would be released, and this

would create a form of Martian global warming, the first stage in making the planet sustainable for life.

The second method would be to set up greenhouse gas 'factories' in order to raise the temperature of the planet. It is generally accepted that greenhouse gases produced by heavy industry are raising the Earth's temperature. Therefore, by building hundreds of greenhouse-gas emitting factories on Mars, a similar effect could be achieved. Carbon dioxide, methane and other greenhouse gases would be pumped into the Martian atmosphere. The same factories would then produce oxygen by mimicking the natural process of plant photosynthesis: they would inhale the carbon dioxide they produce, and then emit oxygen. The process could be accelerated by 'sowing' the planet's surface with photosynthetic bacteria, which would increase the rate at which oxygen is produced. Eventually, there would be enough oxygen on the planet for humans to breathe using only special apparatus similar to that used by mountain climbers.

The third, and by far the most extreme, method has been proposed by space scientists Robert Zubrin and Christopher McKay. They believe that it would be possible to produce greenhouse gases and water by firing large, ammonia-bearing asteroids at the planet. Each asteroid would weigh about ten billion tons, and would be powered by huge rocket engines which would move it towards Mars at over 10,000 miles per hour. At this speed, it would take each asteroid about ten years to reach its destination. The energy produced by one asteroid slamming into Mars' surface, say Zubrin and McKay, would raise the temperature of the planet by three degrees Celsius and melt about one thousand billion tons of ice at the polar caps. They believe it would take many of these asteroids, and at least fifty years, in order to create a temperate climate and enough water to cover a quarter of the planet's surface.

Terraforming Mars, if it is ever attempted, will be neither cheap nor easy. And it certainly won't be quick: although optimists like Zubrin and McKay say it could be achieved in five or six decades, the reality is that terraforming is more likely to take hundreds or even thousands of years. Furthermore, it will stretch human ingenuity to its limits, and will require levels of will and commitment that have rarely been seen before. The challenge of developing a habitable environment and bringing life to the cold, dry world of Mars is fraught with challenges, but it might just be one that saves the human race.

Questions 1-5

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

In boxes 14-19 on your answer sheet, write

TRUE	if the statement is true
FALSE	if the statement is false
NOT GIVEN	if the information is not given in the passage

1 Pictures of Mars suggest it might make a good place for people to settle.....

2 Modern Mars and ancient Earth looked remarkably similar. .....

3 One method of terraforming could involve adapting technology that is already under development. .....

4 Greenhouse gas factories would provide enough oxygen for people to breathe without special equipment. .....

5 Terraforming Mars would be an extreme test of human skill and intelligence.

.....

Question 6-9

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

6 Which one of these factors suggests that Mars might be a good place for people to settle?

A It is not too far from Earth.

B It has no other life forms living there.

C It has a cool, dry climate.

D It has some similarities with Earth.

7 The first step in terraforming Mars would be to

A make the planet warmer.

B create a breathable atmosphere.

C find a suitable source of water.

D create a habitat for living organisms.

8 Special factories on Mars could be used to

A control the level of greenhouse gases.

B absorb excess levels of carbon dioxide.

C produce oxygen in a manner similar to plants.

D help grow essential bacteria.

9 What is the writer's main purpose in the passage?

A To explain why we need to terraform Mars.

B To illustrate the three processes required to terraform a planet like Mars.

C To consider how and why Mars might be terraformed.

D To demonstrate how straightforward it would be to terraform a planet.

Question 10-13

Complete the summary using a word **A-I** from the box.

One method of terraforming Mars would be to **10** ..... asteroids at the planet. Rockets attached to an enormous asteroid would propel it towards Mars, taking ten years to **11** ..... the enormous distances required. The asteroid would **12** ..... the planet with incredible force and **13** ..... enough energy to increase the planet's temperature. The result would be a temperate climate and lots of water from melting ice caps.

A cover	B create	C hit	D increase
E land	F drive	G power	H rise
I shoot			

READING PASSAGE 2

You should spend about 20 minutes on Questions **14-26**.

SAVING THE BITTERN

A The bittern, A British waterbird, does not have a good record as far as survival is concerned. By 1886, habitat destruction and other pressures had pushed it close to extinction. Fortunately, it recovered a few decades later, and in 1950 the numbers of nature male bitterns rose to a peak of about 70. By the 1980s, however, it was clear that the bird was in trouble again. The bittern needs extensive wet reedbeds to survive, and long periods of drainage, pollution and lack of management had destroyed most of its habitat. By 1997, it again faced imminent extinction. To prevent this, the British government set up a plan for the bittern, aiming to establish a population of 50 males by 2010. However, this target was reached six years early, a rate of recovery faster than anyone had dared hope for. We at the Royal Society for the Protection of Birds (RSPB) now claim the bittern as one of Britain's greatest wildlife success stories, since figures reveal that the number of these rare birds has increased fivefold in just seven years.

B Bitterns have feathers that help them to conceal themselves and a shy nature; they usually remain hidden within the cover of reedbed vegetation. Our first challenge was to develop standard methods to monitor their numbers. The booming call of the male bittern is its most distinctive of feature during the breeding season, and we developed a method to count them using the sound patterns unique to each individual. This not only allowed us to be much more certain of the number of booming males in the UK, but also enabled us to estimate local survival of males from one year to the next.

C Our first direct understanding of what breeding bitterns require in their ideal habitat came from comparisons of reedbed sits that had lost their male birds with those that retained them. This research showed that bitterns had been retained in reedbeds where the natural process of drying out had been slowed through management. Based on this work, broad recommendations on how to manage and rehabilitate reedbeds for bitterns were made, and funding was provided through a European Union (EU) wildlife fund to manage 13 sites within the core breeding range.

D To refine these recommendations and provide fine-scale, quantitative habitat EXAMS

prescriptions on the bitterns' preferred feeding habitat, we started radio-tracking male bitterns on the RSPB's Minsmere and Leighton Moss reserves. This showed clear preferences for feeding in the wetter reedbed areas, particularly within reedbed next to larger open pools. The average home range sizes of the male bitterns we followed (about 20 hectares) provided a good indication of the area of reedbed necessary when managing or creating habitat indication of the area of reedbed necessary when managing or creating habitat for this species. Female bitterns undertake all the incubation and care of the young, so it was important to understand their requirements as well. Over the course of your research, we located 87 bittern nests and found that female bitterns preferred to nest in areas of continuous vegetation, well into the reedbed, but where was still present during the driest part of the breeding season.

E The success of the habitat prescriptions developed from this research has been spectacular. For instance, at minsmere, male bittern numbers gradually increased from one to ten following reedbed lowering, a management technique designed to halt the drying out process. After a low point of 11 mature males in 1997, bittern numbers in Britain responded to all the habitat management work and started to increase for the first time since 1950.

F The final phase of research involved understanding the diet, survival and dispersal of bittern chicks. To do this we fitted small radio tags to young bittern chicks in the nest, to determine their fate through to fledging, when they begin to fly, and beyond. Many chicks did not survive to this stage, and starvation was found to be the most likely reason for their demise. The fish prey fed to chicks was mainly those species penetrating into the reed edge. So, an important element of recent studies has been development of recommendations on habitat and water conditions to promote native fish populations. Once independent, radio-tagged young bitterns were found to seek out new sites during their first winter, a proportion of these would remain on new sites to breed if the conditions were suitable. A second EU-funded project aims to provide these suitable sites in new areas. A network of 19 sites developed through this partnership project will secure a more sustainable UK bittern population with successful breeding outside of the core area, less vulnerable to chance events and sea level rise.

G By 2004, the number of booming male bitterns in the UK had increased to 55. Almost all of the increase occurred on those sites undertaking management based on advice derived

from our research. What rescuing the bittern, the work has helped a range of other spectacular wetland species such as otters. Although science has been at the core of the bittern story, success has only been achieved through the trust, hard work and dedication of all the managers, owners and wardens of sites that have implemented, in some cases very drastic, management to secure the future of this wetland species in the UK.

Questions 14-20

Reading Passage 2 has seven paragraphs, **A-G**.

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

Write the correct number, **i-ix**, in boxes **15-21** on your answer sheet.

List of headings

i. Fluctuations in bittern numbers over time
ii. Research findings on habitat needs of adult bitterns
iii. Predators in the natural world
iv. The importance in the natural world
v. Initial habitat investigation and decisions
vi. The need for co-operation to ensure nature preservation
vii. Impressive results of initial intervention
viii. determining how many bitterns there are
ix. Education as the key to preserving wildlife

14. Paragraph A .....
15. Paragraph B .....
16. Paragraph C .....
17. Paragraph D .....
18. Paragraph E .....
19. Paragraph F .....
20. Paragraph G .....

Questions 21-26

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

21 When was the bittern population largest? .....

22 What word is used in the passage to describe the bittern's character?.....

23 What is probably the main cause of death of bittern chicks? .....

24 What food supply do bittern chicks depend on? .....

25 What other creature mentioned in the passage have also benefited from improvement made to the bittern's habitat? .....

Questions 26

Complete the summary below.

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

26 What is the main theme of Reading Passage 2?

A. how one species may be helped at the expense of another?
B. disagreement among environmentalists on methods to protect species from extinction
C. fighting the destruction of wetland reedbeds
D. how research and good management can save an endangered species

READING PASSAGE 3

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

The communication of Science

Science plays an increasingly significant role in people's lives, making the communication by journalists in the popular media of scientific developments more important than ever. Yet such communication Is fraught with challenges that can easily distort discussions and lead to unnecessary confusion.

Some problems stem from the esoteric nature of current research and are the associated difficulty of coming up with sufficiently faithful terminology. Abstraction and complexity are not signs that a given scientific direction is wrong, but are instead a tribute to the success of human ingenuity in meeting the challenges that nature presents. They can, however, make communication more difficult.

But many of the biggest challenges for scientific reporting arise because in areas of evolving research, scientists tend to be specialists, and often only party realise the significance of any particular advance or development. Since that partial understanding applies to most of the scientific developments that directly affect people's lives, such as cancer research and diet studies, learning how to overcome it is critical to stimulating a more informed scientific debate among the broader public.

Ambiguous word choices are the source of some misunderstandings Scientists often employ common terminology, to which they then assign a specific meaning that is impossible to fathom without a precise definition. Take Einstein's famous theory of relativity. The term 'relativity' here is intrinsically misleading. Many interpret the theory to mean that everything is relative and there are no absolutes, Yet although the measurements any observer makes depend on his coordinates and reference frame, according to Einstein's theory, the physical phenomena he measures, in fact, have an invariant description that transcends that observer's particular coordinates. The physical phenomena are not relative. Even Einstein admitted that the term relativity was probably misleading.

But not all communication problems stem solely from poor word choices. Some are inherent in the intrinsically complex nature of much of modern science. Science sometimes transcends this limitation: remarkably, chemists were able to detail the precise chemical processes involved in the destruction of the ozone layer, making the evidence that chlorofluorocarbon gases (Freon, for example) were destroying the ozone layer successfully conveyed to the public.

How journalists report scientific developments on vital issues of the day that are less well understood, or in which the connection is less direct, is a more complicated question. Global warming patterns are a case in point. Even if we understand some effects of carbon dioxide in the atmosphere, it is difficult to predict the precise chain of events that a marked increase in carbon dioxide will cause. The distillation of results presented to the public in such cases should reflect at least some of the subtleties of the most current developments. Balanced reporting, of course, usually helps public understanding. Journalists should seek to offer balance by providing opposing or competitive on any controversial issue, But almost all newly discovered results will have some supporters and some opponents, and only time and more evidence will sort out the true story. However, a real problem in the global warming debate was that the story was reported in the press in a way that suggested some scientists

believed it was a legitimate issue and some didn't, even long after the bulk of the scientific community had recognized the seriousness of the problem.

A better understanding by the general public of the mathematical significance of results would help to clarify many scientific discussions. Statistical analysis can show whether particular results are significant or could occur simply by chance. A few because no one yet knows the big years ago, the Harvard University faculty was tortured by empty debates over the relative intrinsic differences in the scientific abilities of men and women. One of the more amusing aspects of the discussion was that those who believed in the differences and those who didn't used the same evidence in their opposing arguments. about gender-specific scientific ability. How could that be? The answer is that the data did show gender differences, but no statistically significant differences in inherent scientific ability based on gender.

There are steps we can take to improve public understanding of scientific developments. The first would be to inculcate greater understanding and acceptance of indirect scientific evidence not directly observable by human scientists. The information from an unmanned space mission is no less legitimate than the information from one in which people are on board. Secondly, we might need different standards for evaluating science with urgent policy implications as opposed to research with a purely theoretical value. Third. it would be better if scientists were more prepared to discuss the mathematical significance of their results, and if the public didn't treat maths as quite so scary: statistics, which tell us the uncertainty in a measurement, give us the tools to evaluate new developments fully.

But fourth, and most important, people have to recognise that science can be complex. If we accept only straightforward stories, the description will necessarily be distorted. When advances are subtle or complicated, scientists should be willing to go the extra distance to give proper explanations, and the public should be more patient about the truth. Even so, some difficulties are unavoidable.

Most developments reflect work in progress, so the story is complex because no one yet know the big picture. Although the more involved story might not have the same immediate appeal, the truth in the end will always be far more interesting.

Questions 27-30

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

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

27 Why does the writer say we particularly need to pay attention to the communication of science?

A Scientific developments are affecting everyone more and more.

B There is too little discussion of scientific research nowadays.

C There are now so many scientific research projects.

D Scientists need wider public support.

28 In the second paragraph, the writer says it may be difficult to choose the appropriate terminology to describe scientific developments because

A research findings can be interpreted very differently.

B the nature of modern science is inherently complicated.

C scientists are the only people who can understand their research.

D the public is so critical of the findings of scientists.

29 The writer refers to the term relativity as an example of

A Einsteins deliberate deception of the public.

B a scientific word used to describe a physical phenomenon.

C the use of a generally used word to describe a scientific concept.

D the absolute nature of scientific theories.

30 What example does the writer cite as a successful scientific explanation of a complicated issue?

A the results of diet studies

B the developments in cancer research

C the explanation of the theory of relativity MS

D the destruction of the ozone layer

Questions 31-34

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

In boxes 31-34 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 Reporting of different viewpoints on global warming tends to lead to a fuller appreciation of the issues. .....

32 The media s attempt to present both sides of the global warming issue went on fo too long. .....

33 Explaining the mathematical significance of experimental results would confuse the public. .....

34 In the Harvard debate, it would have been better to pay more attention to the discoveries made by male and female scientists. .....

Questions 35-40

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

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

Several possible changes could reduce **35** ..... in the reporting of science. The public needs to recognise that scientific evidence does not need to be **36**..... by people to be valid. The way theoretical research is judged may be different from the way research with practical **37**..... is. Scientists should be more **38**..... about the mathematical significance of their findings and the public should learn to be more comfortable with numerical **39**..... Most importantly, scientists, journalists and the public must accept that science and science reporting is necessarily **40**..... .

A complicated	B observable	C data
D proposals	E immediate	F misunderstandings
G open	H distorted	I implications
J miscalculations		

Good luck!