
THINKING SKILLS

Paper 4 Applied Reasoning

9694/43

October/November 2015

1 hour 30 minutes

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

An answer booklet is provided inside this question paper. You should follow the instructions on the front cover of the answer booklet. If you need additional answer paper ask the invigilator for a continuation booklet.

Answer **all** the questions.

The number of marks is given in brackets [] at the end of each question.

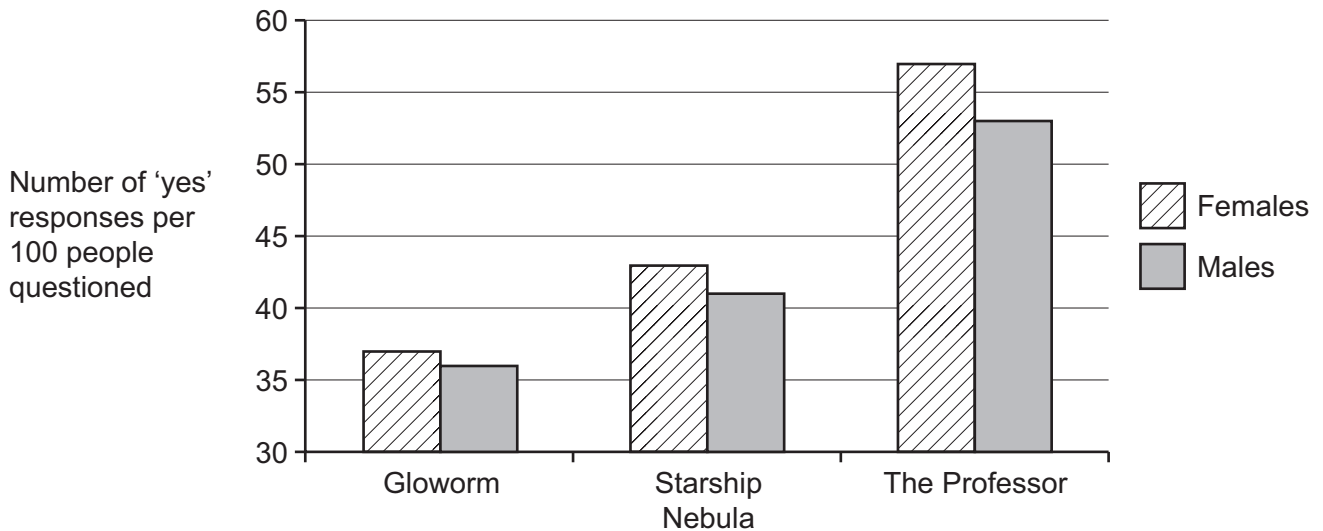
This document consists of **7** printed pages, **1** blank page and **1** insert.



- 1 Study the information and answer the question that follows.

Women watch more science fiction than men

The popular perception is that men like sci-fi and women like romantic comedy, but a recent study has shown that generalisations about gender preferences could be wrong. Students at three different UK universities were asked to fill in a questionnaire entitled “Are gender stereotypes real?”. One of the questions was, “Do you enjoy any of the following science-fiction TV shows?”. The results from those students who returned a questionnaire are shown in the graph below. Contrary to expectations, more women than men answered ‘yes’ with respect to three well known science fiction shows.



Make **five** criticisms of the data presented and/or the inference that “women watch more science fiction than men”. [5]

Questions 2, 3 and 4 refer to Documents 1 to 5.

- 2 Briefly analyse Oswin’s argument in Document 1: *Futile Frontier*, by identifying its main conclusion, intermediate conclusions and any counter-assertions. [6]
- 3 Give a critical evaluation of the strength of Oswin’s argument in Document 1: *Futile Frontier*, by identifying and explaining any flaws, implicit assumptions and other weaknesses. [9]
- 4 ‘We should explore space.’

Construct a reasoned argument to support **or** challenge this claim, commenting critically on some or all of Documents 1 to 5 and introducing ideas of your own. [30]

DOCUMENT 1

Futile Frontier

Space exploration is seen by some as the next step in human scientific evolution – the “final frontier”. Those that support it claim that Earth is no longer a mystery and, since mankind needs constant challenges, space becomes the obvious next step. But there is no reason to look beyond Earth for challenges. There is still much to discover about our planet. The deep oceans and Antarctica are still largely unexplored and new species are discovered in the rainforests every week. Even in basic lab research there is still a lot to do: diseases to cure, pollution to control, crops to improve – our increasing population needs to be fed!

Many people highlight glory and fame as sufficient reasons to explore space. However, there are more pressing problems that have to be solved down here, such as war and famine – problems that are often dirty, expensive and not very glamorous. These are the kind of jobs that we tend to avoid doing until it’s too late.

Artificial satellites are useful, productive and lucrative tools, but no visit to Mars is necessary for these benefits. The costs of the various space exploration programmes are staggering. The Apollo programme, a political stunt whose sole purpose was to upstage the Soviet Union, had no practical results and cost \$20 billion forty years ago; the development of the Saturn V rocket alone cost \$9.3 billion. The new International Space Station is intended as a base for future long-duration missions – missions which might never happen. Its budget has increased dramatically since its first design and is already at \$60 billion. The Voyager probe, a lump of scientific hardware fired off into deep space, cost a total of \$895 million. What benefits has it brought? Maybe some aliens have been entertained by Earth music. All of these projects amount to nothing more than an expensive folly.

The Hubble Space Telescope is another example. This flying telescope, that does nothing but gaze at stars, was sent up faulty! How, with all the advanced technology involved, could something like this happen? Millions of dollars had to be spent to repair it. Then there is SETI, the Search for Extra-Terrestrial Intelligence. The budget for this is about \$5 million per year and all it does is listen out for little green men! Hundreds of millions of dollars are being wasted by a few rich countries, while elsewhere millions live in poverty or die of starvation, disease and war. This money would be much better spent funding organisations that improve life on Earth, like the World Wide Fund for Nature or Oxfam.

The various space programmes represent a significant cost in human life. Ever since Gagarin stepped into his rocket, men and women have been dying for the sake of space exploration. When the space shuttle Columbia disintegrated over Texas in 2003 the cumulative death toll rose to at least 120. How many more will die, or come close to dying?

Space exploration serves no useful purpose. It should be curtailed. If we don’t stop spending money on dreams and start taking care of the planet, pretty soon we won’t have anywhere to live.

Oswin

DOCUMENT 2

Why We Explore

Human Space Exploration

Humanity's interest in the heavens has been universal and enduring. Humans are driven to explore the unknown, discover new worlds, push the boundaries of our scientific and technical limits, and then push further. The intangible desire to explore and challenge the boundaries of what we know and where we have been has provided benefits to our society for centuries. Human space exploration helps to address fundamental questions about our place in the Universe and the history of our solar system. Through addressing the challenges related to human space exploration we expand technology, create new industries, and help to foster a peaceful connection with other nations. Curiosity and exploration are vital to the human spirit, and accepting the challenge of going deeper into space will invite the citizens of the world today and the generations of tomorrow to join NASA on this exciting journey.

Why the International Space Station?

The first step in embarking on a long and challenging journey involves laying solid groundwork for a successful endeavour. The International Space Station serves as a laboratory for human health, biological and materials research, as a technology test-bed, and as a stepping stone for going further into the solar system. On the International Space Station we will learn new ways to ensure astronauts are safe, healthy and productive while exploring, and we will continue to expand our knowledge about how materials and biological systems behave outside of the influence of gravity. NASA will continue its unprecedented work with the commercial industry, and expand an entire industry as private companies develop and operate safe, reliable and affordable commercial systems to transport crew and cargo to and from the International Space Station and low Earth orbit.

Why Mars?

Mars has always been a source of inspiration for explorers and scientists. Robotic missions have found evidence of water, but whether life exists beyond Earth still remains a mystery. Scientific robotic missions have shown that Mars has characteristics and a history similar to those of Earth, but we know that there are striking differences that we have yet to begin to understand. Humans can build upon this knowledge, look for signs of life and investigate Mars's geological evolution, resulting in research and methods that could be applied here on Earth. A mission to our nearest planetary neighbour provides the best opportunity to demonstrate that humans can live for extended, even permanent, stays beyond low Earth orbit. The technology and space systems required to transport and sustain explorers will drive innovation and encourage creative ways to address challenges. As previous space endeavours have demonstrated, the resulting ingenuity and technologies will have long lasting benefits and applications. The challenge of travelling to Mars and learning how to live there will encourage nations around the world to work together to achieve such an ambitious undertaking. The International Space Station has shown that opportunities for collaboration will highlight our common interests and provide a global sense of community.

NASA

DOCUMENT 3

India launches Mars mission

Scientists from the Indian Space Research Organisation (ISRO) successfully launched their Mars Orbiter Mission on Tuesday, amid celebrations at mission control. As the launch vehicle soared spaceward scientists from ISRO could be heard shouting “Buriah!” – brilliant.

Indian scientists hailed the launch as a success and said they hoped it would herald a new era of low-cost space exploration. “I have no doubt the mission has been worthwhile and the credit for it goes to the scientists at the space department,” said Dr PM Bhargava.

The ‘Mangalyaan’ or Mars Orbiter was launched on an Indian Polar Satellite Launch Vehicle from the Satish Dhawan Space Centre, at Sriharikota, on the Andhra Pradesh coast, at 14:38 Indian time. The mission is a bid to reach the Red Planet in September 2014 and test the Martian atmosphere for hydrogen and methane gases. The mission will cost \$73 million, compared with the United States’ ‘Curiosity’ mission to Mars, which launched in 2011 at a cost of \$2.5 billion.

For India, the mission is about proving the value of its indigenous rocket and instrument technology, to inspire its own scientists and open a new frontier on infinitely cheaper space missions. Its officials believe a successful mission will establish its superiority over regional rivals China and Japan, whose recent Mars missions failed to achieve their goals.

Though the mission is cheap by developed countries’ standards, it has faced criticism in India, where commentators have questioned why the money has not been spent instead on improving poor sanitation. Tavleen Singh, a columnist for the *Indian Express*, said on Twitter: “Incredible India: we can go to Mars but cannot provide clean water to our people on Earth.” Some Indian space scientists have criticised the mission as a waste of resources for a developing country and argued that ISRO should focus on developing its next generation of satellite launchers to compete in the lucrative commercial sector. But officials at the Mangalyaan launch site said the mission will inspire a new generation of Indian space scientists and establish the country as a real power in space research.

“The primary goal is the technical demonstration. This will help us in future space exploration missions by advancing our existing technology in communications and Earth observation satellites. We hope it will also inspire younger minds”, ISRO spokesman Deviprasad Karnik told *The Telegraph*.

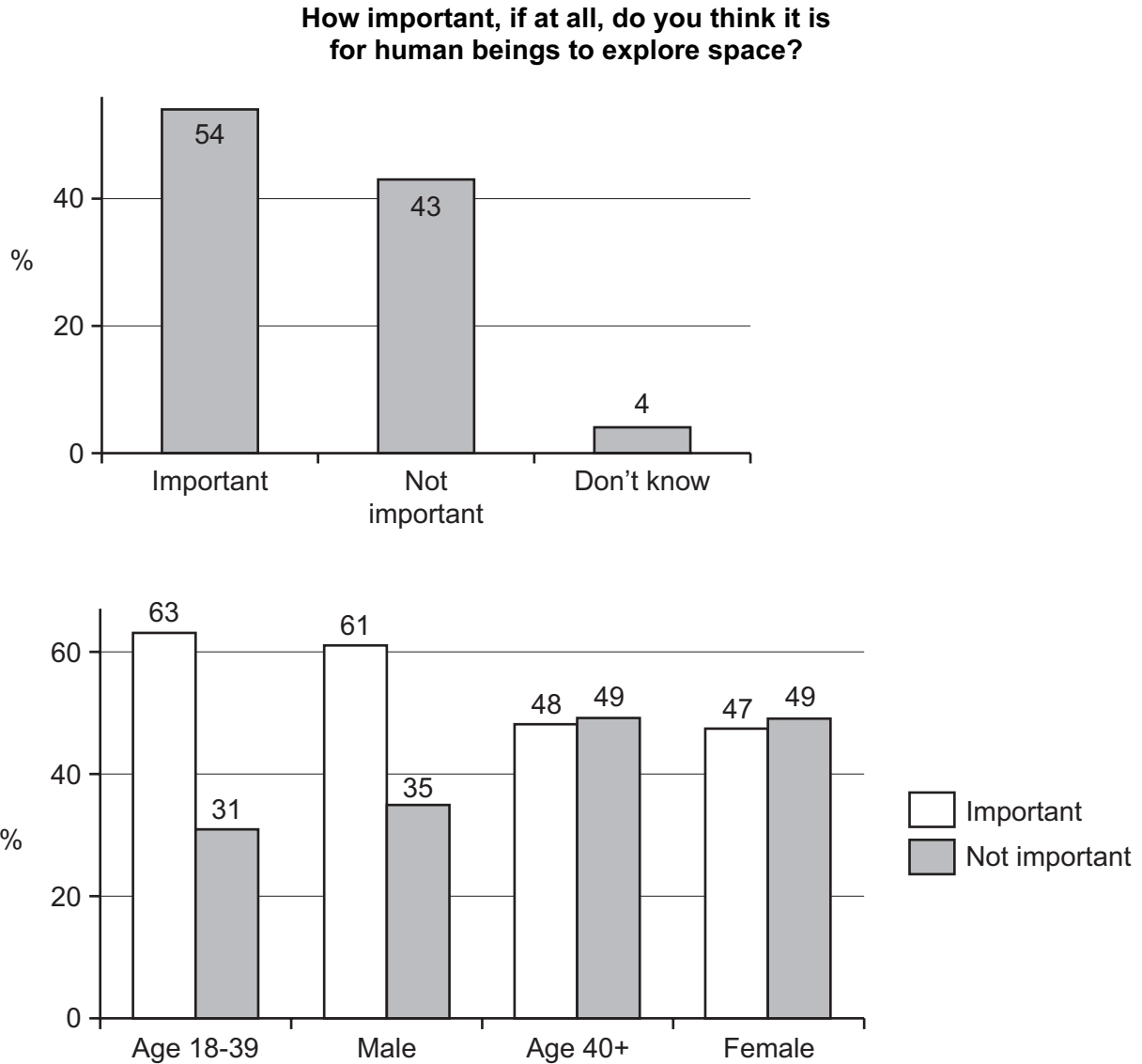
Dean Nelson

The Daily Telegraph, November 2013

DOCUMENT 4

Some Statistics about UK Public Opinion

Most British people still say human space exploration is important – but are unpersuaded by a manned trip to Mars.



However, the British public are less enthusiastic about NASA's planned manned mission to Mars. 63% say it is not important for a human being to set foot on Mars, while 33% say it is. The British have faith in America's ambition, though. 29% say the US space agency will be the first to send a human being to Mars, 18% think it will be China's and 8% believe it will be Russia's.

YouGov

UK-based research company, specializing in researching public opinion

DOCUMENT 5**National Space Agency Budgets**

The annual budgets listed are the official budgets for national space agencies available in the public domain. For European contributors to the European Space Agency (ESA), the national budgets shown are separate from their contributions to the ESA.

Budgets of different national or regional space agencies

Country/region	\$US million
USA	17 700
Russia	5 600
Europe	5 380
France	2 822
Japan	2 460
Germany	2 000
India	1 320
China	1 300
Italy	1 000
Iran	500
Canada	489
UK	414
Brazil	343
South Korea	300
Ukraine	250
Argentina	180
Belgium	170
Spain	135
Netherlands	110
Sweden	100
Pakistan	82
Switzerland	10
Mexico	8

Wikipedia

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