General Certificate of Education
Advanced Subsidiary Examination
June 2015

General Studies (Specification A) GENA2

Unit 2 AS Science and Society

Friday 22 May 2015 1.30 pm to 3.00 pm

For this paper you must have:
- a Source Booklet for Section A (enclosed)
- an objective test answer sheet for Section A
- an AQA 8-page answer book for Section B.

You may use a calculator.

Time allowed
- 1 hour 30 minutes

Instructions
- Use black ink or black ball-point pen.
- Write the information required on the front of your answer book for Section B. The **Paper Reference** is GENA2.
- You must answer:
  – all questions in **Section A** (Questions 1.1 to 1.30) using the answer sheet provided
  – and **one pair** of questions from **Section B** in your separate answer book.
- Do all rough work in your answer book. Cross through any work you do not want to be marked.
- Hand in **both** your answer sheet **and** your answer book separately at the end of the examination.

Information
- The maximum mark for this paper is 65.
- This paper consists of two sections.
  Section A contains 30 objective test questions based on material in the Source Booklet. There is 1 mark for each question.
  Section B contains three alternative pairs of questions. Marks are shown after each question and the total for each pair is 35.
- In **Section B**, questions should be answered in continuous prose. You will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist language where appropriate.

Section A

Answer **Questions 1.1** to **1.30**

There is **1 mark** for each question.

Read the passage entitled **Space exploration** – **is it worth all the taxes we spend on it?**, which is printed in the separate Source Booklet, and answer **Questions 1.1** to **1.30** by choosing the answer represented by the letter **A**, **B**, **C** or **D** that you think best. Mark your responses on your objective test answer sheet.

1.1 The main argument in paragraph 1 is

A solving problems caused by street crime should be a priority.
B we are wasting the Earth's natural resources.
C we should use extra-terrestrial resources to help eradicate poverty.
D space exploration should be supported by public finance.

1.2 The introductory paragraph

A serves as a neutral introduction to the issues around space exploration.
B implies a bias towards the argument against space exploration.
C has a clear bias towards the argument in favour of space exploration.
D includes emotive language in an effort to engage the reader from the start.

1.3 According to paragraph 2, western civilisation

A has wasted materials and energy resources from the rest of the world.
B must be satisfied with a lower standard of living in a relatively short time.
C needs to embrace recycling policies more effectively at home.
D has imported resources from abroad as domestic supplies dwindle.

1.4 Paragraphs 2 and 3 imply that exploiting the Sun as a plentiful energy source to generate power is likely to lead to

A the end of the generation of power by conventional means.
B much smaller energy bills for most households.
C even greater dependence on energy in the future.
D the solution of the problems regarding global warming.

1.5 In the passage, fertility rate (paragraph 4) describes the number of

A live births per 100 women of all ages per year.
B live births per 100 women of reproductive age per year.
C children a woman gives birth to during her lifetime.
D children fathered by a male during his lifetime.

1.6 CERN (paragraph 5) includes the Large Hadron Collider. Its main purpose was for research into

A nuclear fusion.
B nuclear fission.
C space exploration.
D fundamental particles.

1.7 Launch payloads are small (paragraph 5) because

A their weight increases as they go further from the Earth.
B it takes a lot of energy to escape from Earth's gravity.
C the rocket is so large in comparison.
D the metals used are very expensive.

1.8 According to paragraph 5

A giving money to projects on Earth would produce a better return on investment.
B CERN produced the first major technological development across the world.
C military research has not produced any real benefits for society.
D we should only invest in projects that will produce spin-off technologies.

1.9 Which of the following statements, derived from paragraph 7, are fact rather than opinion?

1 NASA's primary purpose was to protect jobs.
2 NASA was reluctant to take risks in space exploration.

Answer

A if **both** are facts.
B if **1** alone is a fact.
C if **2** alone is a fact.
D if **neither** is a fact.

1.10 Which one of the following is implied in paragraph 7?

A More private investment is needed to create a flourishing space industry.
B The law prevents entrepreneurs from financing space research.
C The money spent on space exploration should be used for cancer research.
D Space exploration has resulted in lower tax revenues for the US economy.

1.11 In 1961, President Kennedy announced that the US would put a man on the Moon. A key motivation for this was that

A the US could then expect to exploit the resources there.
B the scientific research involved would produce significant spin-offs.
C at the time, the USSR was ahead of the US in the space race.
D the US could then co-operate with the USSR on equal terms.

1.12 **Figure 1** shows that

A more money is spent on people than defence and space research combined.
B spending on NASA was poor value for money.
C ten times as much is spent on space research than cancer research.
D defence is about 30% of the budget.

1.13 In 2010, NASA was allocated $19 billion. If that money had been given to the National Cancer Institute (**Figure 1**), their funds would have increased by approximately

A 200%
B 300%
C 400%
D 500%

1.14 'terrestrial human population' (paragraph 9) describes

A the total population on Earth.
B all the people who live at sea level.
C the potential increase in mankind if we also live in space.
D the projected maximum population for the Earth.

1.15 Among the challenges for space exploration (paragraph 10) are

1 a wide range of forces.
2 a wide range of pressures.
3 a wide range of temperatures.
4 the performance of many different materials.

Answer

A if **1** and **3** only are correct.
B if **2** and **3** only are correct
C if **1**, **2** and **4** only are correct.
D if **all** are correct.

1.16 Which of the following factors has the greatest effect on the size of payloads for space exploration (paragraph 12)?

A fuel for lift-off
B land for launch sites
C metal for rockets
D water for manufacture of equipment

1.17 The space available for payload in the space shuttle, which flew from 1981 to 2011, had a length of 18 m and a diameter 4.6 m. Assuming this to be a cylinder, the total volume available for the payload was then approximately

A 260 m^3
B 300 m^3
C 460 m^3
D 1200 m^3

1.18 Which of the following best illustrates how space exploration need not be limited to investigating data from our own solar system?

A the Hubble space telescope
B the Moon landings
C the Apollo programme
D the Cassini–Huygens space probe to Saturn

1.19 From the information given in **Figure 3**, the number of arcseconds in 1 degree is

A 1/3600
B 1/60
C 60
D 3600

1.20 How many times greater is the resolving power of the Hubble space telescope compared with the Mount Palomar telescope (**Figure 3**)?

A 5
B 20
C 50
D 200

1.21 ‘sustainable energy’ (paragraph 15) means energy that is

A recyclable.
B regenerative.
C renewable.
D reusable.

1.22 Nuclear fusion produces

A heavier atoms.
B lighter atoms.
C heavier molecules.
D lighter molecules.

1.23 All the resources on Earth

A are found elsewhere in the solar system.
B cause environmental damage during use.
C would last longer if the population was controlled.
D are sustainable if managed carefully.

1.24 The argument against space exploration claims

A technological research is always too expensive to be cost effective.
B technological research into other areas could produce just as many spin-offs.
C technological advances are developed better by private industry.
D technological development relies too heavily on the whim of politicians.

1.25 According to the passage there will be no worries about energy shortages in the future if we

A expand our nuclear fusion programme.
B expand our nuclear fission programme.
C manage to convert the Sun’s energy efficiently.
D find fuel on the Moon and transport it to Earth.

Assertion / Reason questions

For **Questions 1.26** to **1.30** you are given an assertion followed by a reason. Consider the assertion and decide whether, on its own, it is a true statement. If it is, consider the reason and decide if it is a true statement. If, and only if, you decide that both the assertion and the reason are true, consider whether the reason is a valid or true explanation of the assertion. Choose your answer (**A** to **D**) as follows and indicate your choice on the answer sheet.

	Assertion	Reason	Argument
A	True	True	Reason is **a correct** explanation of assertion
B	True	True	Reason is **not a correct** explanation of assertion
C	True	False	Not applicable
D	False	–	Not applicable

	ASSERTION		REASON
1.26	Only a tiny fraction of the Sun's energy reaches the Earth's atmosphere	because	the Sun's energy is radiated in all directions.
1.27	Traces of iodine in water are harmful	because	iodine can kill bacteria.
1.28	Telescopes in space produce clearer images than ground-based ones	because	the atmosphere interferes with light from space.
1.29	Launch payloads are relatively small	because	there are already many satellites in space
1.30	The arguments in favour assert that space exploration is likely to improve our lives	because	space research has been largely funded by government.

END OF SECTION A

Turn over for Section B

Section B

Answer **one pair** of questions only, either **02** and **03**
or **04** and **05**
or **06** and **07**

For **each pair** of questions, read the stimulus extract provided and answer the questions with reference to the extract and your own knowledge.

You will be marked on your ability to use good English, to organise information clearly and to use specialist vocabulary where appropriate.

Either

Questions 02 and 03

Girls and physics

Alice, an enthusiastic A-Level student, said: "Physics is not all just theory. You need to see how it's applied practically as well. It's involved in everything we do."

But for the past two decades, female students have accounted for only one-fifth of those taking physics at A-level. It is the fourth most popular subject for boys, yet slips to 19th in the rankings for girls. According to a recent study, 49% of state co-educational schools in England did not have any girls studying physics at A-level in 2011. By contrast, girls were almost two and a half times more likely to take the subject at A-level if they were at a single-sex school.

The numbers continue to decrease at university. Around 17% of applicants for undergraduate physics are girls, but only 7.9% of these undergraduates stay on to become senior lecturers and 4% professors. Why is this happening? Is there some endemic sexism within the world of physics? Or do women simply not find it appealing?

Source: adapted from Elizabeth Day, 'Why don't more girls study physics?'
The Observer, 30 December 2012

0 2 Examine **two** different ways in which the practical application of physics has shaped the way we live in society today.

[17 marks]

0 3 Consider reasons why girls are less likely to study physics and why women are under-represented in the science and engineering professions.

[18 marks]

or

Questions 04 and 05

Alternative medicine

You can't get crystal healing on the NHS. The Department of Health doesn't fund faith healing. And most doctors believe magnets are best stuck on fridges, not patients. But it's estimated that the health service spends around £25 million on acupuncture.

The NHS body which approves medicines and treatments, the National Institute for Health and Care Excellence (NICE), says that doctors can prescribe acupuncture for lower back pain and chronic tension headaches. And there are plenty of anecdotes from patients who swear it works.

Of all the branches of complementary and alternative medicine, acupuncture has without doubt the most credibility among doctors and health officials. Not everyone is convinced, however.

In the past few years, scientific rationalists have turned their attentions to the ancient Chinese therapy and found it wanting. They say there is no proven mechanism to explain how needles could ease pain or treat disease. There is also no evidence that it works for most of the conditions that acupuncturists treat. While there is research showing it may be mildly effective, the effect is weak. In trials, some patients benefit and others don't. And when acupuncture is tested on thousands of patients, the average benefit is too small for a person to notice.

Source: adapted from David Derbyshire, 'Why acupuncture is giving sceptics the needle' The Observer, 26 July 2013

0 4 Explain how you would use scientific methods to test the effectiveness of medical treatments.

[17 marks]

0 5 Discuss whether the NHS should or should not offer patients complementary and alternative medical treatments which are unsupported by scientific evidence.

[18 marks]

Turn over for Questions 06 and 07

or

Questions 06 and 07

Fracking

Britain must press on with fracking to reduce the country's reliance on energy imports, the chairman of the Government's climate change advisory board has said.

Lord Deben dismissed claims from Britain's green lobby that hydraulic fracturing – known as 'fracking' – could cause considerable damage. Greenpeace claims that widespread use of fracking could result in the contamination of water supplies due to the gas and toxic chemicals needed during the process.

Fracking, the process of pumping water, sand and chemicals into the ground at high pressure to extract gas trapped in shale rock, will give Britain better energy security, he said. However, this shale gas will not bring down the price of energy bills because the natural resource is difficult to reach in places, he added.

The Treasury has published draft legislation introducing tax breaks for shale gas companies in a bid to entice international gas companies to drill in Britain.

Source: adapted from Amy Willis, 'Britain must press on with fracking, says Lord Deben' The Telegraph, 10 December 2013

0 6 Explain how the extraction of natural gas by the process of fracking is different from conventional methods of gas extraction.

[17 marks]

0 7 Discuss the environmental, economic and social issues that should be considered when making decisions about permitting fracking in the UK.

[18 marks]

END OF QUESTIONS

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