



General Certificate of Education
Advanced Subsidiary Examination
January 2011

General Studies (Specification A)

GENA2

Unit 2 AS Science and Society

Monday 17 January 2011 9.00 am to 10.30 am

For this paper you must have:

- a Source Booklet for Section A (enclosed)
- an objective test answer sheet for Section A
- an 8-page answer book for Section B.

You may use a calculator.

Time allowed

- 1 hour 30 minutes

Instructions

- Use black ball-point pen only.
- Write the information required on the front of your answer book. The **Examining Body** for this paper is AQA. The **Paper Reference** is GENA2.
- Answer Section A (Questions 1.1 to 1.30) using the answer sheet provided.
- Answer **one pair** of questions from Section B, in your answer book.
- Do all rough work in your answer book.
- 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.

Section A

There is 1 mark for each question.

Read the source entitled **If people start having trouble, it won't show up until it is a really big effect** which is provided in the 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.

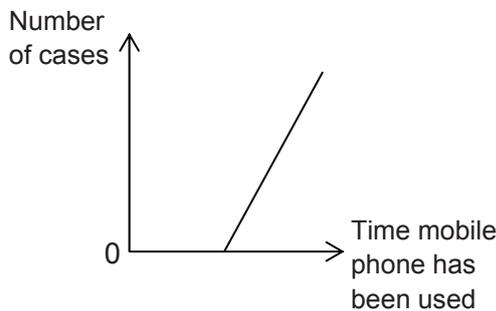
- 1.1** The radiation emitted by mobile phones is best described as
- A** nuclear.
 - B** infrared.
 - C** ultraviolet.
 - D** radio waves.
- 1.2** Each of the following pairs have been accepted by the scientific community as being linked **except**
- A** smoking and lung cancer.
 - B** the MMR vaccination and autism.
 - C** obesity and diabetes.
 - D** alcohol consumption and liver disease.
- 1.3** **Table 1** shows that
- A** 10% of the population bought a mobile phone in the first year they were produced.
 - B** by 2001 more than three-quarters of the population must have had a mobile phone.
 - C** in recent years some UK phone subscriptions must have been taken out by people now living abroad.
 - D** the number of mobile phone subscriptions in the UK rose continually from 1995 to 2006.
- 1.4** The population of the UK was 59 million in 2000. The number of mobile phone subscriptions (**Table 1**) at that time was approximately
- A** 1.27 million.
 - B** 6.8 million.
 - C** 40 million.
 - D** 68 million.
- 1.5** Which of the following can be deduced from the data in **Table 1**?
- A** By 2006 everyone in the UK owned at least one mobile phone.
 - B** By 2006 some people in the UK owned more than one mobile phone.
 - C** From 1999 to 2000 the number of mobile phone subscriptions in the UK rose by 27%.
 - D** Between 2000 and 2006 there was a substantial increase in the number of children in the UK who owned a mobile phone.

1.6 No adverse effects have so far been found for people using a mobile phone for up to ten years. It is therefore reasonable to conclude that

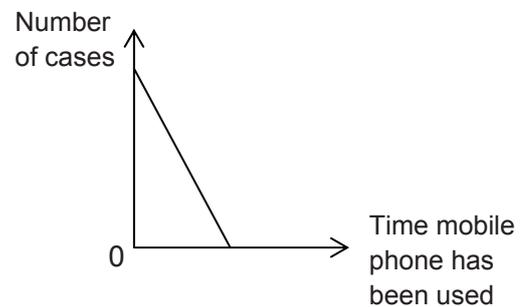
- A** it is safe to use mobile phones.
- B** if people stopped using phones after ten years they would be safe.
- C** if people used phones less they would be safe to use them for more than ten years.
- D** there are no short-term effects for those who use mobile phones.

1.7 From the information in the source, which graph shows a possible profile of the number of cancer cases if there is a link between the use of mobile phones and cancer?

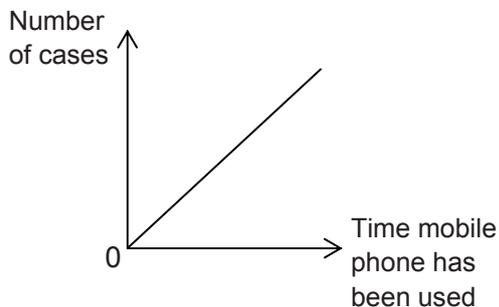
A



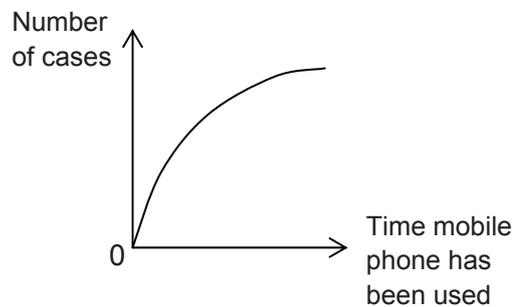
B



C



D



1.8 Professor Challis is likely to have referred to the atomic bomb, Nagasaki and Hiroshima (paragraph 5) because

- A** using emotive language helps to make his point.
- B** thousands more atomic bombs were produced in later decades.
- C** tens of thousands of people were killed when each bomb landed.
- D** many more died from the bombs' effects some time after they were dropped.

1.9 Once a conclusion is reached on the safety of phones for adults additional research will need to be carried out to find out the effects on children because

- A** not all children can afford a mobile phone.
- B** children might react differently to radiation.
- C** the number of children using mobile phones has increased significantly.
- D** children cannot have used phones for as long as adults.

Turn over ►

1.10 In paragraph 8 Professor Challis asserts that we know each of the following **except**

- A bright sunlight is more of a future health risk for children than for adults.
- B pollution has a greater effect on children than adults.
- C more children than adults react to ionising radiation.
- D children's reactions to gamma rays are different from those of adults.

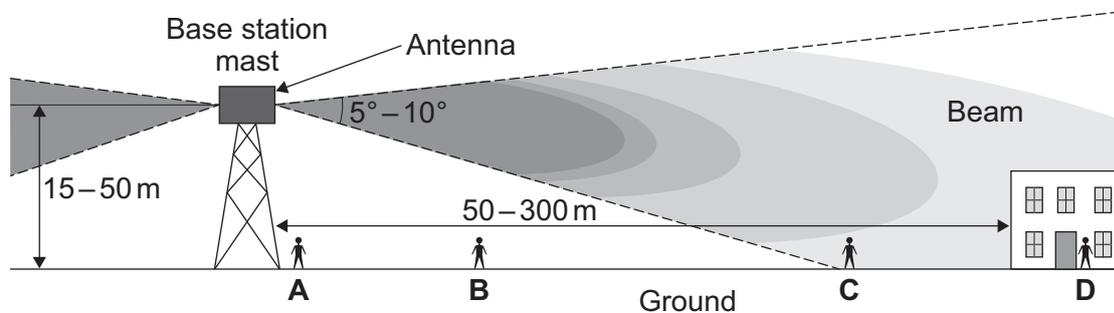
1.11 Radio communications use a large range of frequencies (**Figure 2**). 300 GHz is how many times greater than 30 kHz?

- A 10
- B 10^6
- C 10^7
- D 10^8

1.12 Television transmitters do not pose a risk to public health

- A because TV signals are comparatively weak.
- B if they are not erected in built-up areas.
- C except in a lightning storm.
- D unless the National Grid experiences a power surge.

1.13 The diagram shows the area around a base station where mobile phone signals can be detected.



The strongest signal from the transmitter will be detected by the person standing at

- A position A.
- B position B.
- C position C.
- D position D.

1.14 The human body tries to maintain itself at a constant temperature. Organisms with this property are described as being

- A thermodynamic.
- B thermostatic.
- C cold-blooded.
- D warm-blooded.

- 1.15 A 'thermoregulatory' response (paragraph 13) could best be described as
- A an external heating effect on the body
 - B an effort by the body to maintain the best temperature.
 - C a reaction by the body to raise the temperature.
 - D an external cooling effect on the body.
- 1.16 Achieving 'complete coverage across any region' (paragraph 14)
- A is impossible while many people still use landline phones.
 - B is essential for any developed country.
 - C will not occur unless the cells are regular hexagons.
 - D contributes towards equal access for all mobile phone users.
- 1.17 Radio signals from the base station cannot travel effectively more than 35 kilometres (paragraph 15). This is because the signals
- A take too long to travel.
 - B have spread too widely.
 - C are then too weak.
 - D suffer from interference.
- 1.18 Radio waves travel at a speed of $3 \times 10^8 \text{ ms}^{-1}$. The minimum time taken by a radio signal to travel 35 km between a transmitter and a receiver is approximately
- A $1.2 \times 10^{-7} \text{ s}$
 - B $8.6 \times 10^{-5} \text{ s}$
 - C $1.2 \times 10^{-4} \text{ s}$
 - D $8.6 \times 10^{-3} \text{ s}$
- 1.19 Why are the cells for base stations much larger in rural areas than in urban areas?
- A The total rural area of the UK is larger than the total urban area.
 - B Phone calls made as people travel across the country will be passed between fewer base stations.
 - C Those living in rural areas exert more political influence than those in urban areas.
 - D A higher concentration of mobile phone users in cities requires a higher density of base stations.
- 1.20 Wi-fi (paragraph 18) is used whenever
- A anyone listens to an MP3 player.
 - B anyone listens to the radio.
 - C a computer sends information via radio waves.
 - D a computer is connected to the Internet.

- 1.21** Some scientists feel that children may be more susceptible than adults to potentially harmful effects of radio waves from cell phones. Their reasons include each of the following **except**
- A** children generally send more text messages than adults.
 - B** pre-teen children have a smaller head and brain size, thinner skull bones, skin and ears.
 - C** children's brains and nerves are still developing and are likely to be more sensitive to exposure.
 - D** children are known to be more susceptible than adults to ionising radiation.
- 1.22** If the use of mobile phones continues to increase, network operators could ensure that the network capacity is sufficient by increasing the
- A** height of the base station masts.
 - B** number of transmitters on each mast.
 - C** power of the radio signals.
 - D** frequency of the radio waves.
- 1.23** Which of the following will have the greatest effect to reduce your exposure to mobile phone radiation?
- A** using a 'hands-free' device
 - B** increasing the volume and holding the phone slightly away from your head
 - C** holding the phone against alternate ears
 - D** purchasing a phone which has a stronger signal where you use it most
- 1.24** Listening to a radio by holding it to your ear does not raise concerns about radiation because
- A** broadcast radio frequencies are smaller than mobile phone frequencies.
 - B** radio waves are only being received and not transmitted.
 - C** the radio waves are being picked up by the aerial.
 - D** the concerns about hearing damage from loud volumes are so much greater.
- 1.25** If mobile phones are eventually found to be harmful to the user's health, which of the following actions would be necessary?
- 1** increased NHS provision over the long term
 - 2** publicity campaigns introduced to highlight the risks
 - 3** fining all responsible organisations

Answer

- A** if **1** alone would be necessary.
- B** if **2** alone would be necessary.
- C** if **1** and **2** only would be necessary.
- D** if all would be necessary.

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 | When using a mobile phone some radio waves will be absorbed by the head of the user | because | the majority of waves are sent in the direction of the head. |
| 1.27 | Network operators cannot always erect masts where they would like | because | smaller cells are required where there will be greatest demand. |
| 1.28 | Using a mobile phone can raise the temperature of your head | because | radio waves are a form of energy. |
| 1.29 | Results from the government's mobile phone safety research (paragraph 1) are likely to be biased | because | the government considers politics to be more important than science. |
| 1.30 | Professor Challis switches his phone off while travelling by train | because | he believes mobile phone use may have a harmful effect on young people. |

END OF SECTION A

Turn over for Section B

Turn over ►

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

Space exploration

James Lovelock, a leading environmentalist, said: "I strongly support space travel. The more we know about Mars, for example, the better we can understand our own planet. The more personally adventurous sort of travel offers great inspiration to humans. And, were it not for space travel, we'd have no mobile phones, no internet, no weather forecasts of the kind we have now and so on."

Dr Steve Howard, chief executive of the Climate Group, said: "I don't think space travel is an 'either/or'. Sometimes we feel that we will have to stop other things if we go to the Moon or Mars, but man has always been an explorer. At a time of global recession we have to budget and plan carefully and it needs to be a collaborative venture."

But John Sauven, executive director of Greenpeace UK, is sceptical. He said: "Our argument is that Earth hasn't been properly explored and understood yet. I'm not against space exploration, but it mustn't be a trophy-collecting exercise for countries."

Source: adapted from DAVID RANDALL, VICTORIA RICHARDS and ANDREW JOHNSON, '2010: A new space odyssey beckons', *The Independent on Sunday*, 19 July 2009

0 2

Explain how scientific research and space exploration have contributed to our knowledge of the universe and the solar system. (17 marks)

0 3

'Space exploration has been a waste of money and scientific effort.'

Consider the view that the world's scientific, technological and financial resources would be better spent on dealing with such issues as global poverty and climate change rather than further space exploration. (18 marks)

OR

Questions 04 and 05

Travel and the environment

As we travel to work and go about our daily business, we experience something of the twin economic and environmental challenges confronting our transport system in the UK. We need a transport system that can support the movement of people and goods in a growing economy, whilst ensuring that the impact it has on both the local and global environment is within acceptable limits.

Congestion threatens economic growth in key places such as urban areas and inter-urban corridors. Debate about how to tackle climate change has risen to unprecedented prominence during the past year, reflecting predictions of the likely effects. The Department for Transport has a range of initiatives, including the promotion of travel planning, which are aimed at reducing the impact of transport on the environment.

Source: adapted from Foreword, *The Essential Guide to Travel Planning*,
Department for Transport, October 2007

- 0 4** Explain how actions by individual motorists can reduce the impact of their journeys on the environment. (17 marks)
- 0 5** Consider possible actions that both vehicle manufacturers and governments could take to attempt to reduce the overall impact of transport on the environment and discuss the problems they may face in doing so. (18 marks)

Turn over for the next question

Turn over ►

OR

Questions 06 and 07**Sex and relationship education**

Teaching about contraception will become part of new compulsory sex education lessons from September 2011. A government review of Personal, Social, Health and Economic education, which includes lessons about sex and relationships, ruled that sex education should be a compulsory subject in both primary and secondary schools.

Children's Secretary Ed Balls said: "It is clear that if children are going to get a well-rounded education which prepares them for life in the 21st century, PSHE has a key role to play." However, he stressed: "Parents bring up children, not government. Schools, however, can play a vital role in teaching essential skills for learning and life."

Leaders of the Catholic Education Service said what was taught "ought to be in line with the wishes of parents and should uphold the ethos of the particular school".

The director of Brook, the sex and contraception advisory service, said: "All young people need to know about their legal rights – you can be gay, you can use contraception and you can have access to abortion services."

Source: adapted from RICHARD GARNER, 'Schools must teach pupils about babies, AIDS and sex', *The Independent*, 28 April 2009

0 6 Explain which scientific and social elements should be included in an effective programme of sex and relationship education for young people. *(17 marks)*

0 7 "Parents bring up children, not government. Schools, however, can play a vital role in teaching essential skills for learning and life."

To what extent do you think it is the case that schools and government are taking over the responsibilities of parents in raising their children? *(18 marks)*

END OF QUESTIONS

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