



General Certificate of Education
Advanced Subsidiary Examination
June 2009

General Studies (Specification A)

GENA2

Unit 2 AS Science and Society

Specimen paper for examinations in June 2010 onwards
This question paper uses the new numbering system and new AQA answer book

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 **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 **and one pair** of questions from Section B in your separate 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 the Source Material in the separate Source Booklet. There is 1 mark for each question.
Section B contains three alternative pairs of questions. Marks are shown after each question and total 35.

Section A

There is 1 mark for each question.

Read the passage entitled **Ethanol – The Long Haul** which is printed in the separate Source Booklet, and answer **Questions 1.1 to 1.30** by choosing the answer represented by the letters **A, B, C** or **D** that you think best.

1.1 The Energy Bill passed by the United States Congress in 2005, calling for an increase in ethanol production (paragraph 2), was passed in order to

- A** use up the surplus corn crop.
- B** encourage the growth of sugar-cane.
- C** reduce the level of carbon emissions.
- D** reduce the quantity of imported fuel.

1.2 Which of these statements about greenhouse gases are true?

- 1** They cause global warming.
- 2** They produce acid rain.
- 3** They cause climate changes.

Answer

- A** if **1** and **2** only are true.
- B** if **1** and **3** only are true.
- C** if **2** and **3** only are true.
- D** if all are true.

1.3 Carbohydrates are compounds of carbon, hydrogen and

- A** lead.
- B** oxygen.
- C** nitrogen.
- D** sulfur.

1.4 The production of ethanol as a viable industrial process in the USA will only make economic sense (paragraph 4) when

- A** a method is perfected to derive the fuel from the corn itself.
- B** more sugar-cane is grown in the United States.
- C** the price of imported fuel drops significantly.
- D** a viable method is established to derive fuel from cellulose.

1.5 Sugar can be converted into ethanol as shown in the following equation.



What mass of ethanol (in g) could be obtained from 180 g sugar?

[C = 12 H = 1 O = 16]

- A 46
- B 70
- C 92
- D 360

1.6 What is the lowest percentage of petrol that can be used in European bio-fuel without causing damage to a normal engine (paragraph 5)?

- A 80%
- B 85%
- C 90%
- D 95%

1.7 Which of the following sets of figures, concerning the manufacture of ethanol vehicles in Brazil, could be represented by the chart in **Figure 1** for the years 1985 and 1995?

	1985		1995	
	Ethanol vehicles	Conventional vehicles	Ethanol vehicles	Conventional vehicles
A	575 000	190 000	27 000	1 259 000
B	278 000	667 000	804 000	857 000
C	765 000	190 000	1 286 000	1 259 000
D	278 000	667 000	1 286 000	1 259 000

1.8 Which of the following statements most accurately describes the proportion of alcohol powered vehicles produced in Brazil over the 25 years from 1980 to 2005 (**Figure 1**)?

- A increased to 100%, dropped to zero and then increased again
- B increased to over 50%, dropped to almost zero and the increased again
- C increased slightly, increased to over 50%, and then decreased again
- D increased steadily until 2000 and then decreased again

-
- 1.9** A car's average petrol consumption is 45 miles per gallon when using standard unleaded petrol. If this car were converted to run on ethanol which of the following is the best estimate of its petrol consumption (in miles per gallon) when using the new fuel (paragraph 8)?
- A** 15
 - B** 30
 - C** 45
 - D** 60
- 1.10** Natural gas is mainly
- A** butane.
 - B** ethane.
 - C** methane.
 - D** propane.
- 1.11** Each of the following is a true statement about the manufacture of ethanol (paragraph 9) **except**
- A** a lot of energy is required for heating.
 - B** the fermentation process gives off carbon dioxide.
 - C** producing a gallon of ethanol requires 80 000 Btu of energy.
 - D** coal is sometimes used as an energy source for its production.
- 1.12** The calculation of the 'net energy balance' (paragraph 10) is important in deciding the value of any fuel. This term can be defined as
- A** the energy given off during combustion plus the energy required for production.
 - B** the energy required to produce a fuel divided by the energy obtained by combustion.
 - C** the energy required to produce a fuel minus the energy obtained by combustion.
 - D** the energy given off during combustion minus the energy required to produce the fuel.
- 1.13** Approximately how much energy is required to produce 100 000 Btu of energy as ethanol fuel from corn (paragraph 10)?
- A** 10 000 Btu
 - B** 90 000 Btu
 - C** 110 000 Btu
 - D** 370 000 Btu
- 1.14** It is better to produce ethanol from cellulose than from corn (paragraph 12) because
- A** stillage is produced which can be made into animal feed.
 - B** lignin is left behind which can be burned to generate steam for electricity.
 - C** the bioreactors are more efficient in converting cellulose into ethanol.
 - D** the lignin left behind can be converted into animal feed.

1.15 Which one of the following is a useful by-product of **both** methods of making ethanol (paragraph 12)?

- A electricity
- B lignin
- C steam
- D stillage

1.16 With reference to **Figure 2**, which of the following best describes the number of separate labelled processes involved in the production of ethanol from corn and cellulose?

	Preliminary stages for corn	Preliminary stages for cellulose	Common stages to complete the process
A	4	2	3
B	4	5	5
C	3	1	2
D	3	2	3

1.17 If all the corn crop produced in the USA were converted to ethanol this would meet

- A about half the demand now met by gasoline.
- B most of the energy demand in the USA.
- C less than one tenth of the USA's demand for energy.
- D less than 1% of the USA's demand for energy.

1.18 Which of the following is/are facts rather than opinions?

- 1 Some enzymes are more difficult to use on an industrial scale than yeast.
- 2 A commercially viable process will be in operation in five years.

Answer

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

1.19 The main problem in the breaking down of cellulose is the removal of sugars from the lignin. This can be done (paragraph 14) by the use of

- A enzymes from bacteria.
- B industrial yeast.
- C steaming.
- D grinding and mashing.

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- 1.20** Which of the following is the best estimate of how much the production of biodiesel had risen in the EU from 2002 to 2003 (**Figure 3**)?
- A** 35%
 - B** 75%
 - C** 135%
 - D** 175%
- 1.21** Which of the following would be the best reason for a country such as the United Kingdom to develop the production of ethanol to use as a fuel?
- A** The cost of fuel would be cheaper for motorists.
 - B** There would be reduced carbon emissions.
 - C** There is cheap labour available for farming.
 - D** The country would be less dependent on imported fuel.
- 1.22** The best current source of ethanol is
- A** corn stalks.
 - B** grass.
 - C** sugar-cane.
 - D** trees.
- 1.23** The use of fuel containing ethanol is increasing because those in favour of it argue that it
- A** produces more energy than gasoline.
 - B** does not contribute to global warming.
 - C** is renewable as corn can be grown every year.
 - D** occurs naturally and is more abundant than petroleum.
- 1.24** The energy yield in producing ethanol from Brazilian sugar-cane is considerably greater than from North American corn because
- A** wages are markedly lower in Brazil.
 - B** fuel costs to refine the raw material are lower in Brazil.
 - C** corn stalks contain significantly less sugar than sugar-cane.
 - D** sugar-cane is refined where it is grown rather than in factories.
- 1.25** Most of the energy lost by burning fuels is due to the production of
- A** carbon dioxide.
 - B** heat.
 - C** light.
 - D** water vapour.

1.26 Each of the following supports the case that ethanol fuel is not entirely clean and renewable **except**

- A** following distillation, the stillage can be processed into animal feed.
- B** carbon dioxide is produced in the manufacture of ethanol.
- C** carbon dioxide is produced when ethanol fuel is burned.
- D** the manufacture of ethanol requires a significant amount of energy.

1.27 Which of the following is/are facts rather than opinions?

- 1** Brazil's development of ethanol was linked to its climate.
- 2** Brazil's development of ethanol was linked to its concerns about climate change.

Answer

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

Assertion / Reason questions

For **Questions 1.28 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

- | | | | |
|-------------|---|---------|---|
| 1.28 | Ethanol is produced in large quantities in Brazil | because | the climate is particularly suitable for growing sugar-cane. |
| 1.29 | Ethanol produces less energy than the same quantity of gasoline when it is burned | because | ethanol requires substantial amounts of energy to produce it. |
| 1.30 | Ethanol derived from corn is a solution to global warming | because | it does not produce carbon dioxide when used as a car fuel. |

END OF SECTION A

Turn over for Section B

Turn over ►

Section B

Answer **one pair** of questions **only**, either **2 and 3**
or **4 and 5**
or **6 and 7**

Wherever possible **use your own words** to show you understand the arguments.

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

EITHER

The government has announced plans for ten new 'eco-towns'. Ministers want five of them built by 2016, with the other half completed by 2020. The new environmentally-friendly towns – low-energy, carbon-neutral developments built from recycled materials – will be the first new towns since the 1960s.

The housing minister, Caroline Flint, said the new towns would help to tackle climate change, as well as providing affordable new housing. "We need to think about sustainable homes in sustainable communities."

But there are concerns among environmental campaigners that most of the proposed eco-towns will increase car pollution because they will not be big or diverse enough to sustain viable public transport. The government is stressing that any new towns proposed will have to go through the normal planning process and that local people and other interested bodies will have the right to challenge the plans.

Source: Adapted from 'Eco-towns short list is revealed',
http://news.bbc.co.uk/1/hi/uk_politics/7327717.stm, 3 April 2008

0 2 Explain what methods can be used to make new and existing housing more environmentally sustainable. (17 marks)

AND

0 3 Discuss the environmental, political and economic problems that are likely to arise in building new towns and altering existing properties in order to increase the number of 'sustainable homes'. (18 marks)

OR

Once upon a time, sprinters just took their chances with gym shoes on a cinder track and swimmers made do with a good old-fashioned pair of trunks.

These days, though, no self-respecting gold medallist is complete without a technological back-up team pushing the boundaries of athletic endeavour with nutrition plans, new materials, new equipment and much more.

But do such scientific aids help raise the standards of competitions, lifting sport to a new level? Or are they just elaborate gimmicks? Is it all just a corporate conspiracy on the part of the leisure industry, as they look for new ways to get us to shell out at the sports shop?

Source: Adapted from 'Technology gone mad?', BBC Sport,
http://news.bbc.co.uk/sport1/hi/olympics2000/sports_talk/935307.stm

0 4

Explain the ways in which developments in science and technology have contributed to improving sporting achievement. *(17 marks)*

AND

0 5

Consider the extent to which sporting activity and achievement can be beneficial for individuals and for society as a whole. *(18 marks)*

Turn over for the next question

Turn over ►

OR

Millions of passers-by are being encouraged to join the life-saving NHS Organ Donor Register in a high-profile outdoor advertising campaign featuring eye-catching images of hearts.

Kate Baldwin, Campaigns and Publications Officer at UK Transplant, said: "Every person joining the register is sending a message of real hope to the 9,000 people who currently need an organ transplant to save or transform their life." Currently 1,000 people die every year because they do not get the transplant they need.

While the heart symbolises kindness and giving, the underlying message focuses on the need for all types of organ transplant which rely mainly on the generosity of an anonymous stranger to offer the gift of life. As well as the heart, people can agree to donate their kidneys, liver, lungs, pancreas and tissue for transplantation.

Source: Adapted from news release, UK Transplant, 3 April 2008
http://www.uktransplant.org.uk/ukt/newsroom/news_releases/article.jsp?releaseld=209

0	6
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 Explain the scientific principles involved in transplanting human organs. (17 marks)

AND

0	7
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 Discuss economic, medical and ethical issues involved in deciding who receives transplants and other scarce health care resources in the NHS. (18 marks)

END OF QUESTIONS

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