Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
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8	
9	
10	
TOTAL	

General Certificate of Secondary Education
Higher Tier
June 2013

Environmental Science 44401H

Unit 1 Topics in Environmental Science

Thursday 16 May 2013 9.00 am to 11.00 am

For this paper you must have:
- a ruler.

You may use a calculator.

Time allowed
- 2 hours

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 120.
- You are expected to use a calculator where appropriate.
- In some questions you will be assessed on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

Advice
- In all calculations, show clearly how you work out your answer.

Answer **all** questions in the spaces provided.

1 There is evidence that an increase in atmospheric greenhouse gases has led to global warming.

1 (a) The table shows one greenhouse gas and the reason for its increase.

Complete the table by identifying **two** more greenhouse gases, and suggest a reason why each gas has increased.

Greenhouse gas	Reason for increase
Carbon dioxide	Combustion of fossil fuels

(4 marks)

1 (b) Not all the carbon dioxide produced remains in the atmosphere.

Suggest **two** ways in which carbon dioxide is removed from the atmosphere.

1 .....

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2 .....

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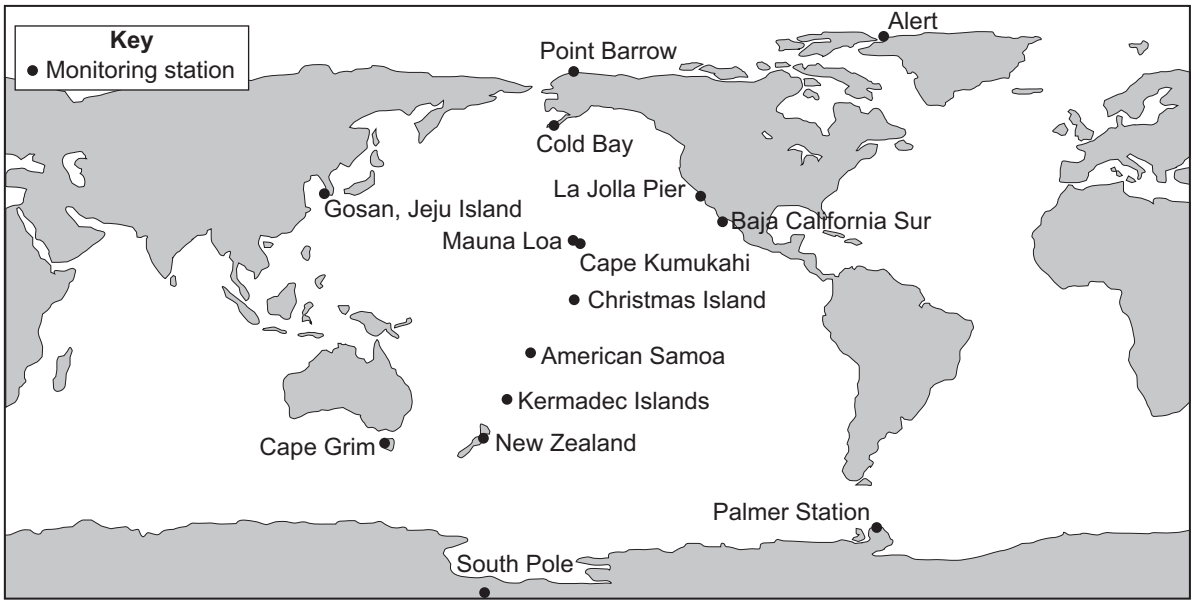
(2 marks)

1 (c) The map shows the locations of stations that monitor atmospheric gases.



Suggest a reason why many of the monitoring stations are on islands in the middle of the Pacific Ocean.

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(1 mark)

1 (d) Action needs to be taken to slow down the increase in greenhouse gases.

Give an example of how **each** of the following may be used to reduce greenhouse gas emissions.

Legislation .....

.....

Scientific developments .....

.....

Personal action .....

.....

(3 marks)

Question 1 continues on the next page

1 (e) Suggest **four** ways in which global warming might lead to food shortages in the future.

1 .....

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2 .....

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3 .....

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4 .....

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(4 marks)

1 (f) Give **one** reason why increased carbon dioxide levels might result in **increased** crop production.

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(1 mark)

1 (g) Name **one** international protocol which aimed to cut global carbon dioxide emissions.

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(1 mark)

16

Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

2 The world's biggest rubbish dump is a mass of plastic located in the middle of the Pacific Ocean.

Image cannot be reproduced here due to third-party copyright constraints.

- Of the 100 billion kg of plastic that people use each year, about 10 % ends up in the ocean.
- Plastic bags, bottle caps, plastic bottles and Styrofoam make up the majority of the waste.
- 30 % of this ends up at the surface sucked into gyres – places where currents meet, forming a whirlpool-like system.
- Of the five gyres worldwide the North Pacific is the biggest, covering an area estimated to be one and a half times the size of the USA.
- Accurate estimates are difficult, as much of the plastic floats just below the surface, and is therefore invisible to satellites.
- It has been estimated that over a million seabirds and 100 000 sea mammals and turtles are killed each year.
- The sun breaks the plastic down into smaller and smaller pieces but can never break it down completely.
- When small enough, the particles are ingested by the plankton eaters.
- Plastics in the water absorb toxic chemicals such as pesticides and insecticides which can enter the food chain when ingested by marine creatures.

2 (a) Approximately what mass of plastic finds its way to the ocean each year?

…… kg
(1 mark)

2 (b) Why does plastic collect in these huge areas in the middle of the ocean?

.....

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(1 mark)

2 (c) Suggest **two** ways in which this plastic might have ended up in the ocean.

1 .....

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2 .....

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(2 marks)

2 (d) Suggest how plastic might lead to the death of sea creatures.

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(2 marks)

2 (e) Most plastic is non-biodegradable.

What does *non-biodegradable* mean?

.....

.....
(1 mark)

2 (f) Explain why small amounts of plastics ingested by plankton might cause problems for organisms further up the food chain.

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(2 marks)

Turn over ▶

2 (g) Suggest **two** ways to reduce pollution from plastic waste.

1 .....

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2 .....

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(2 marks)

11

Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

3 Conservation is an active process aimed at improving the environment.

Source: Getty Images

3 (a) Describe **three** ways in which woodland could be managed to improve the habitat for native wildlife.

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(3 marks)

3 (b) Explain what is meant by *coppicing*.

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(2 marks)

3 (c) Describe how to carry out a quadrat survey to find the diversity of plant species on the woodland floor.

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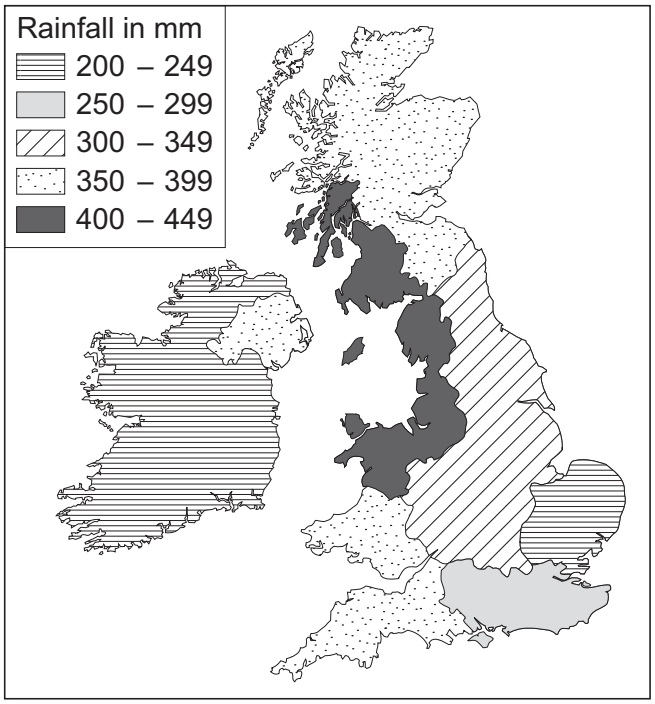
(4 marks)

9

Turn over for the next question

4 The map shows average summer rainfall figures for areas of the UK.



4 (a) Use the map and your own knowledge to suggest **three** reasons why the east and south of England have the greatest problems with water shortages.

1 .....

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2 .....

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3 .....

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(3 marks)

4 (b) Personal water consumption has been increasing by 1 % per year since 1930.

Suggest **three** reasons for this increase.

1 .....

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2 .....

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3 .....

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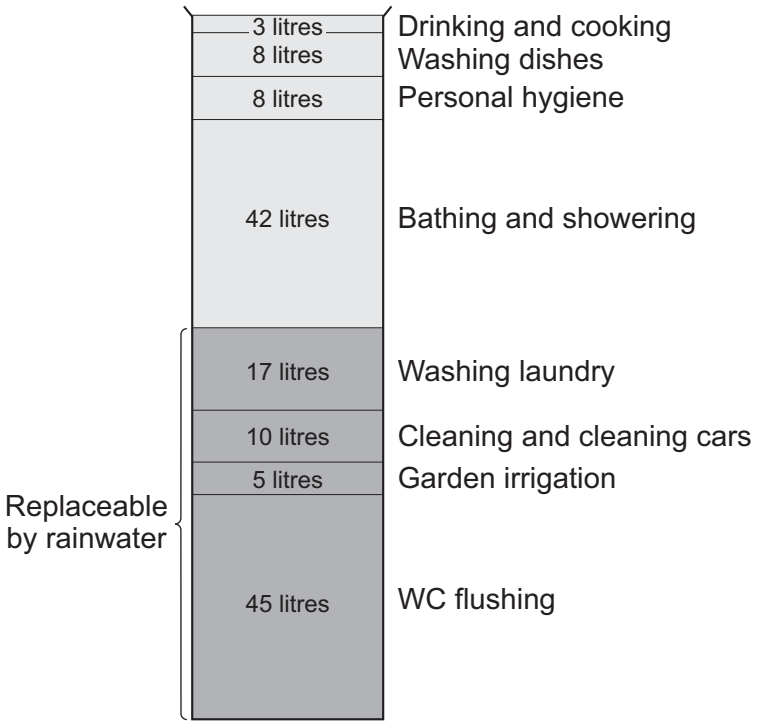
(3 marks)

4 (c) The diagram shows the amounts of water typically used by a person in the home in one day.



What percentage of this water use is potentially replaceable by using rainwater?

..... %

(2 marks)

Turn over ▶

4 (d) In East Anglia the average annual rainfall is 0.55 m.

A house in East Anglia has a flat roof with an area of 120 m^2.
If 75 % of the rain falling on the roof is collected, what volume of rainwater would be collected in one year?

Show your working.

..... m^3
(2 marks)

4 (e) Suggest **three other** ways in which a family might reduce its water consumption.

1 .....

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2 .....

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3 .....

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(3 marks)

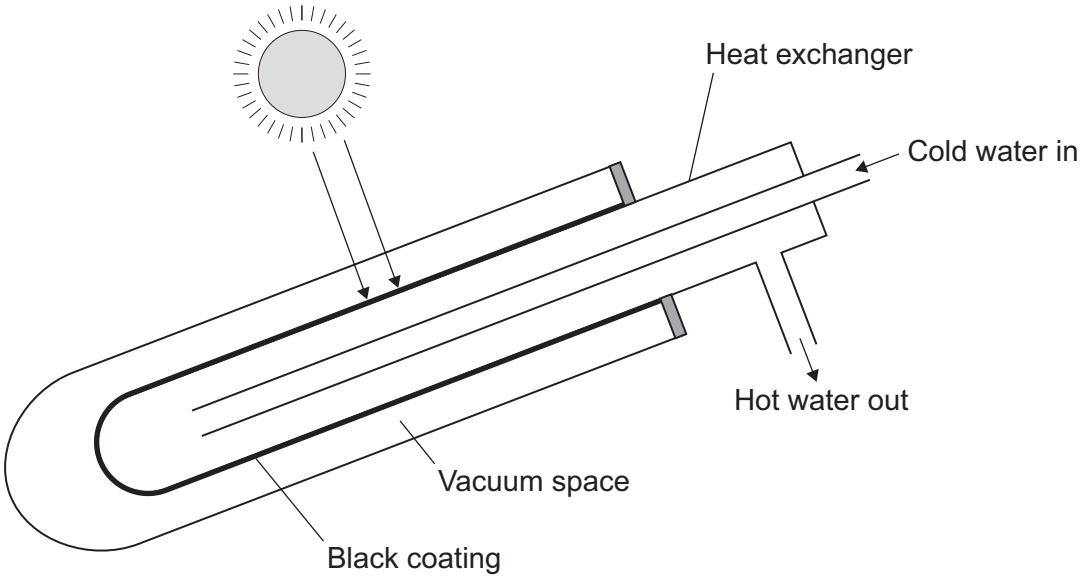
13

Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

5 The UK receives an average of 1 kW/m^2 of solar radiation.

5 (a) The diagram shows one system for heating water using solar energy.



Suggest why the following features make this system more efficient.

1 The heat exchanger is painted black.

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2 The heat exchanger is contained in a vacuum.

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3 The solar collector is able to change its vertical angle.

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4 The solar collector is able to change its horizontal angle.

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(4 marks)

5 (b) Using the terms *predictability*, *reliability* and *energy density*, discuss the contribution that solar energy could make to the UK energy supply.

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(3 marks)

5 (c) Suggest how schools might save money by making use of solar energy.

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(4 marks)

5 (d) Some people are opposed to the widespread installation of solar systems for homes on environmental grounds.

Suggest **two** reasons why.

1 .....

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2 .....

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(2 marks)

Turn over ▶

5 (e) Suggest **three** ways in which the UK Government could encourage households to invest in alternative energy systems for their homes.

1 .....

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2 .....

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3 .....

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(3 marks)

16

6 **Hugh's Big Fish Fight**

Celebrity chef Hugh Fearnley-Whittingstall is championing the campaign to save our dwindling fish stocks.

Source: © Mark Johnson

6 (a) He claims that half the fish caught in the North Sea are thrown back dead.

Give **three** reasons why so many fish are thrown back after being caught.

1 .....

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2 .....

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3 .....

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(3 marks)

Question 6 continues on the next page

6 (b) Suggest ways in which supermarkets, restaurants and consumers might help to make fishing more sustainable.

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(3 marks)

6 (c) How does the Common Fisheries Policy support sustainable fishing?

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(4 marks)

6 (d) Describe **three** ways in which fishing nets can be harmful to sustainable fishing.

1 .....

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2 .....

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3 .....

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(3 marks)

6 (e) Suggest **one** reason why the EU began monitoring fish imported from the Pacific area of Fukushima, Japan in 2011.

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(1 mark)

6 (f) What do you understand by the term *maximum sustainable yield* when applied to fishing?

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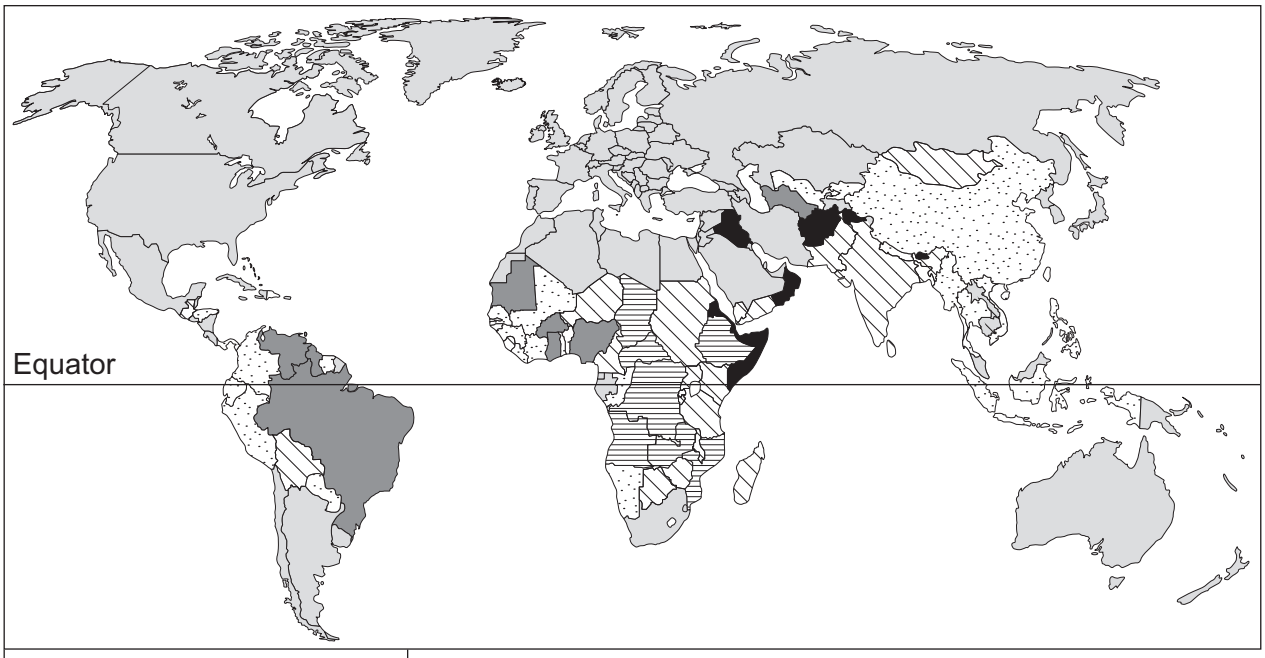
(1 mark)

15

Turn over for the next question

7 Hunger kills more people than AIDS, malaria and tuberculosis combined.
(UN World Food Organisation)

The map shows the world distribution of undernourished people.



Key	
Category	**Undernourished**
	Less than 5 %
	5 – 9 %
	10 – 19 %
	20 – 34 %
	More than 34 %
	Incomplete data

7 (a) Suggest **three** causes of world hunger.

1 .....

2 .....

3 .....

(3 marks)

7 (b) (i) What does the map suggest about the geographical pattern of hunger?

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(1 mark)

7 (b) (ii) Suggest **two** reasons for the pattern that you have described in your answer to **7(b)(i)**.

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(2 marks)

7 (c) How might the advances in GM (genetically modified) crop development benefit countries with many hungry people?

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(3 marks)

7 (d) Suggest **two** reasons why GM crops might **not** be the answer for many of the countries with hungry people.

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(2 marks)

11

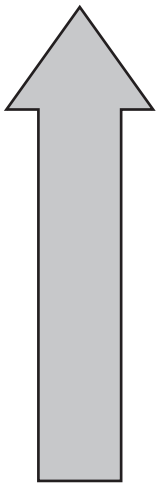
Turn over for the next question

8 One method of comparing energy sources is by their energy densities.

8 (a) Rank the following sources in terms of their energy densities.

coal **uranium-235** **tidal** **solar**

Highest density



Lowest density

(2 marks)

8 (b) All of the following fuels are capable of powering a motor car.
The table shows their energy densities by mass and by volume.

	Energy density by mass MJ/kg	Energy density by volume MJ/l
Hydrogen	33 300	530
Petrol	12 700	8 760
Ethanol (alcohol)	5 600	4 420

Compare the energy densities of these fuels in terms of their practical value as fuels for cars.

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(5 marks)

8 (c) Ignoring their energy densities, suggest **one** advantage that **each** of these fuels has over petrol as a fuel for cars.

Hydrogen .....

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Ethanol .....

.....

(2 marks)

9

9 Since 1960 average world crop yields have doubled to try to meet the increased demand for food. The increase in yield has been achieved as a result of changes in agricultural practices.

9 (a) Explain why many scientists consider that this increased yield has been at the expense of wildlife.

In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

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(6 marks)

9 (b) (i) What is selective breeding?

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(2 marks)

9 (b) (ii) What is genetic modification (GM)?

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(2 marks)

9 (c) Describe how intensive food production may cause algal blooms in reservoirs.

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(4 marks)

14

Turn over for the next question

10 Local authorities collect waste.

10 (a) The table shows how local authorities dealt with the waste they collected in 2009 and 2010.

	January 2009 – December 2009		January 2010 – December 2010		Percentage change between periods
Local authority collected waste	000 tonnes	%	000 tonnes	%	%
Recycled, composted or reused	10 275	38.7		39.7	0.14
Not recycled, composted, or reused	16 266	61.3	15 628	60.3	

10 (a) (i) What mass of waste was recycled in 2010?

Write your answer in the table. *(1 mark)*

10 (a) (ii) What is the percentage change in the waste **not** recycled between 2009 and 2010?

Write your answer in the table. *(1 mark)*

10 (b) In 2011 about 40 % of household waste was recycled, compared with 11% in 2001.
(defra Dec 2011)

Suggest how this increase in recycling has been achieved.

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(4 marks)

6

END OF QUESTIONS