

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
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6	
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8	
9	
10	
TOTAL	



General Certificate of Secondary Education  
Higher Tier  
June 2012

# Environmental Science

# 44401H

## Unit 1 Topics in Environmental Science

Monday 28 May 2012 1.30 pm to 3.30 pm

**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.



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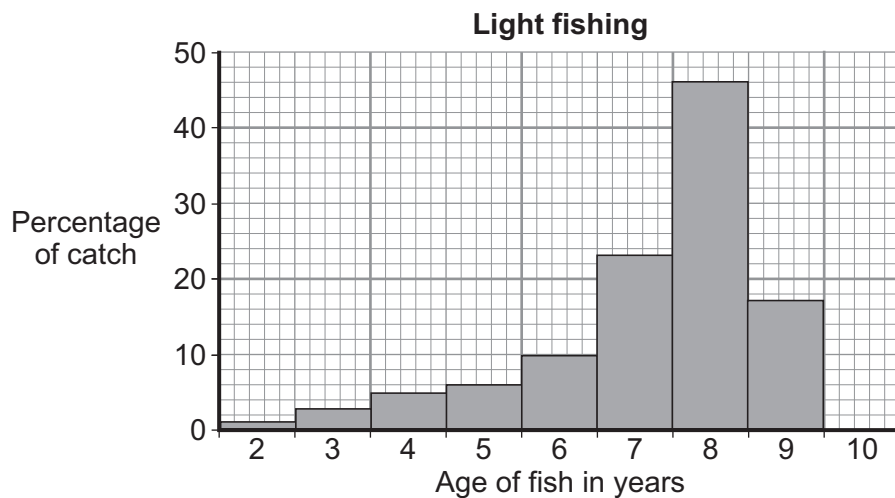
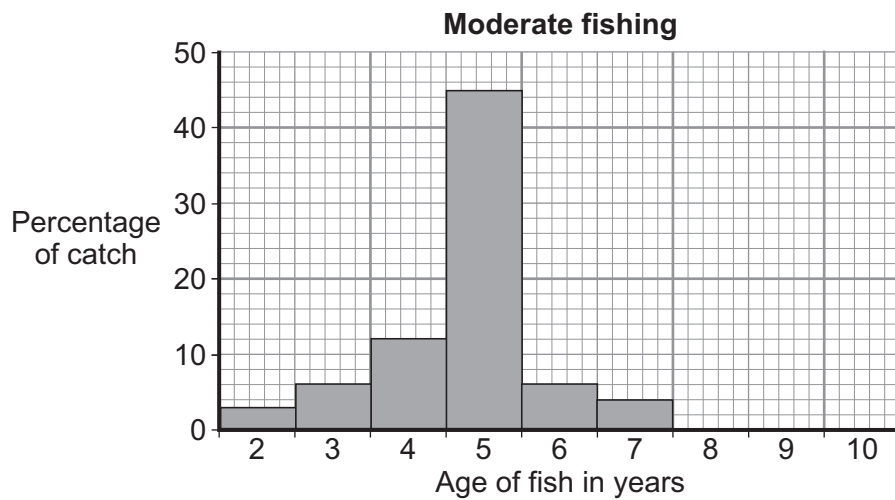
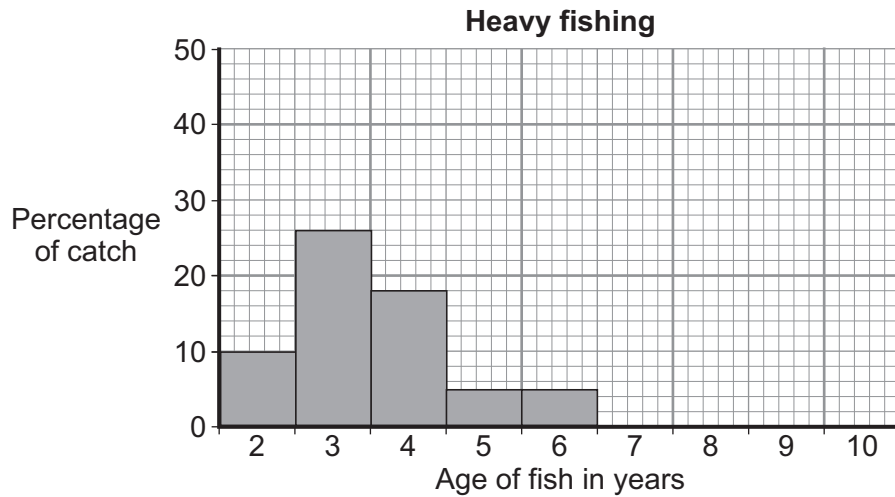
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# 44401H

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

- 1 The graphs show the effect of different levels of fishing on the structure of the fish populations.



Source: *Environmental Science*,  
Biozone International © 2008



1 (a) Describe and explain how different levels of fishing impact on the sustainability of the fishing.

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.....  
.....

(2 marks)

1 (b) Suggest **two** reasons why fish farming might be damaging stocks of wild fish.

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(2 marks)

1 (c) State how **each** of the following helps to make fishing more sustainable.

Quotas

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.....

Nets with larger mesh size

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Zoning of fishing grounds

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Line fishing

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(4 marks)

1 (d) Name **one** international fishing agreement.

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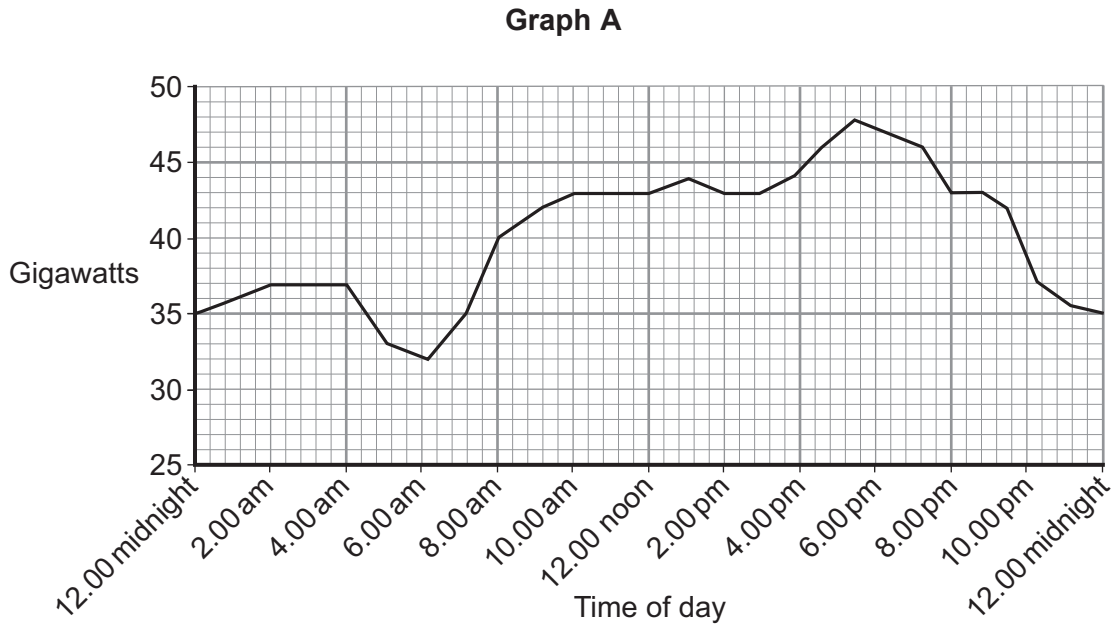
(1 mark)

9

Turn over ►



2 **Graph A** shows changes in demand for electricity that occur during a typical winter's day.



2 (a) (i) Identify and explain **two** changes in demand for energy over the 24 hours, as shown in **Graph A**.

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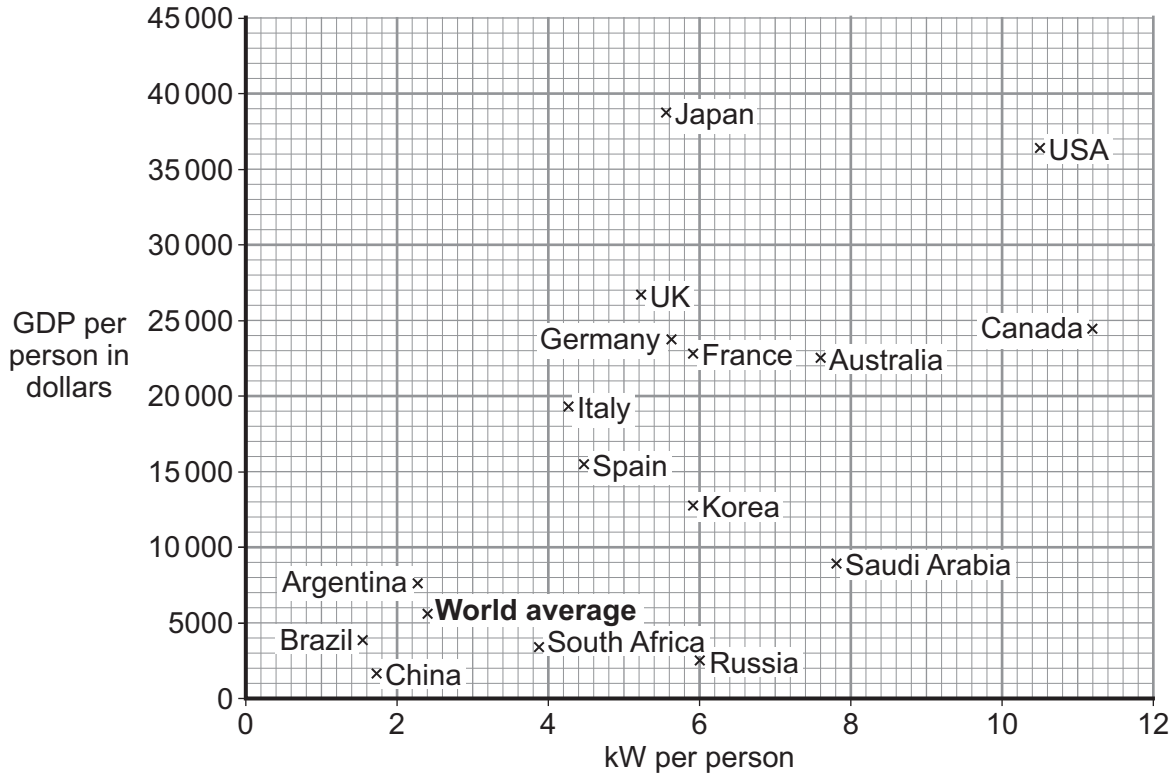
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(4 marks)





2 (b) The chart shows the relationship between energy consumption and gross domestic product (GDP) (the value of goods produced by a country).



Source: adapted from International Energy Agency, 2008 Key World Energy Statistics, Frank van Mierlo

2 (b) (i) What relationship between energy consumption and GDP is shown by the chart?

.....  
 .....  
 (1 mark)

2 (b) (ii) Suggest **two** reasons for the relationship that you have described in 2(b)(i).

1 .....  
 .....  
 2 .....  
 .....  
 (2 marks)



3 Drinking water supplies are obtained from rivers, reservoirs and aquifers.

3 (a) For **each** water source shown in **Table 1**, suggest an advantage **and** a disadvantage of it as a source of drinking water supply.

**Table 1**

Water source	Advantage	Disadvantage
Rivers		
Reservoirs		
Aquifers		

(6 marks)

3 (b) **Table 2** shows some characteristics of three rocks, **A**, **B** and **C**.

**Table 2**

	Rock A	Rock B	Rock C
Porosity %	0.75	55	45
Permeability cm/s	0.01	1	10

Which rock would make the best aquifer?

Draw a ring around your answer.

**Rock A**

**Rock B**

**Rock C**

(1 mark)

3 (c) Which **one** of the following rock types would make a suitable aquifer rock?

Draw a ring around your answer.

**basalt**

**granite**

**sandstone**

**slate**

(1 mark)

Turn over ►



**3 (d)** Suggest **three** things that planners should consider when looking for a site for a new reservoir.

1 .....

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2 .....

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3 .....

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(3 marks)

**3 (e)** Reservoirs are frequently used for a range of activities.



Source: Getty images

This multiple use can sometimes lead to conflict between users.

**3 (e) (i)** Give **one** example of how different users might come into conflict.

.....

.....

(1 mark)





3 (e) (ii) Suggest **two** ways in which managers of the reservoir might avoid conflict between different users.

1 .....

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2 .....

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(2 marks)

3 (f) Environmentalists are recommending that more homes should consider using 'grey' water.

Explain what is meant by the term *grey* water.

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(1 mark)

3 (g) The following processes are used in the production of drinking water.

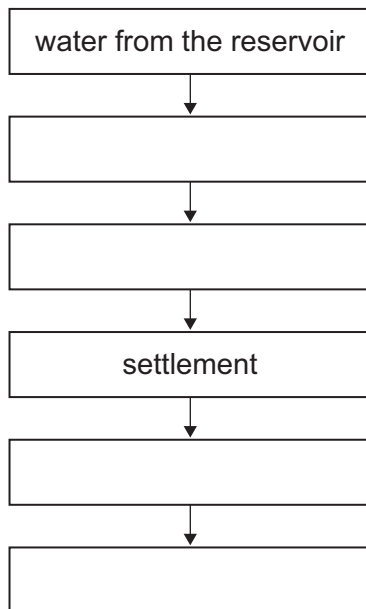
Put them in their correct order in the flow chart. One has been done for you.

**clarification**

**disinfection**

**filtration**

**screening**



(3 marks)

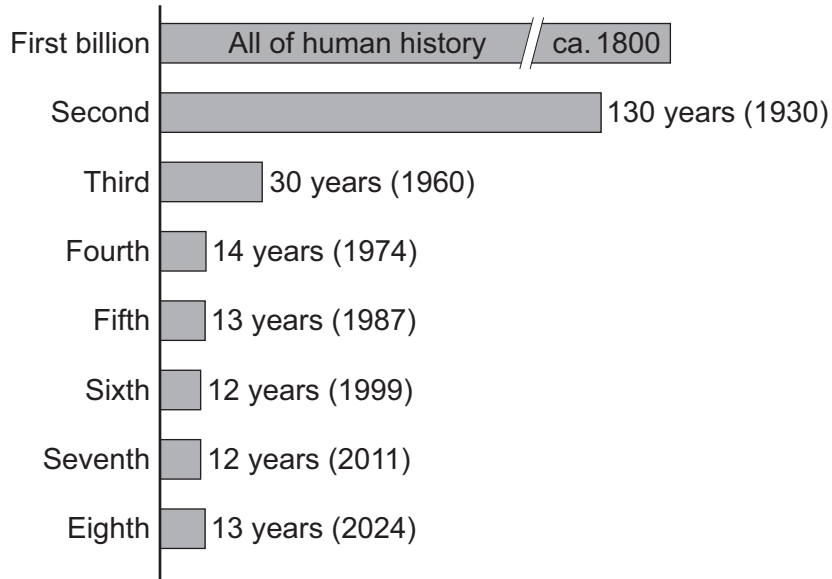
18

Turn over for the next question

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4 (a) The population of the world had reached 1 billion by 1800. The chart shows the estimated time to reach each further billion from 1800 to 2024.



Source: Population Reference Bureau estimates and projections; and UN Population Division, *World Population Prospects: The 2008 Revision* (2009)

4 (a) (i) Why did the population of the world take so long to reach its first billion?

.....  
.....  
(1 mark)

4 (a) (ii) What is the predicted population increase from the end of 1974 to 2024?

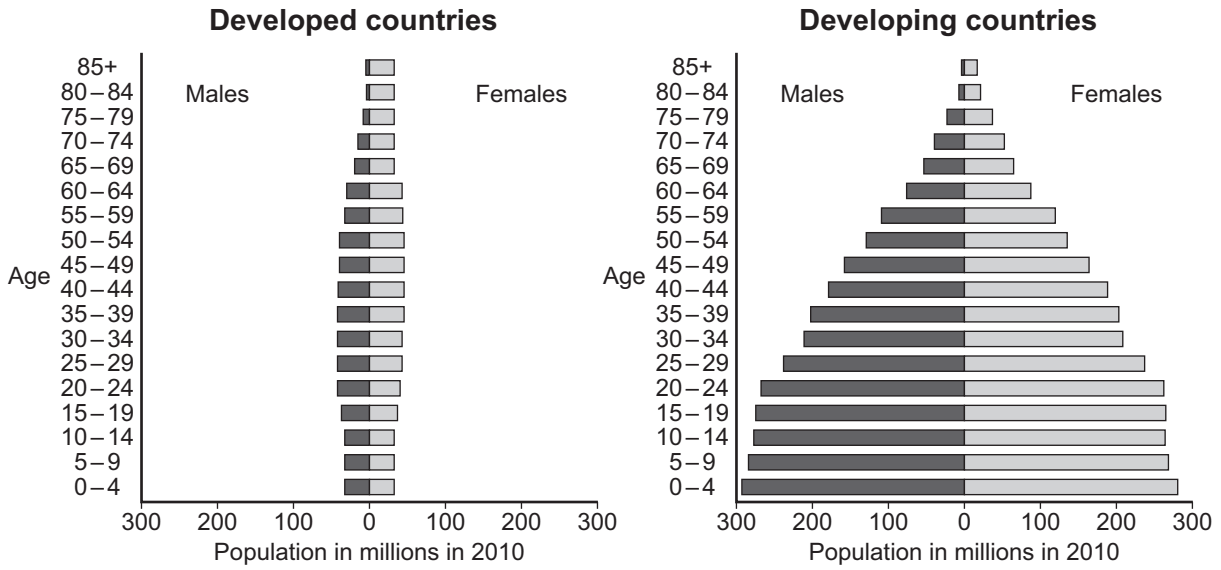
.....  
(1 mark)

4 (a) (iii) Suggest **three** consequences of a rapid increase in the numbers of people in the world.

1 .....  
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2 .....  
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3 .....  
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(3 marks)



4 (b) A population pyramid shows the age structure of countries. Population pyramids for developed and developing countries are shown below.



Source: UN Population Division, *World Population Prospects: The 2008 Revision* (2009)

Give **two** reasons why the population structures as shown in the pyramids may cause problems for both developed and developing countries.

4 (b) (i) Developed countries

1 .....

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2 .....

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(2 marks)

4 (b) (ii) Developing countries

1 .....

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2 .....

.....

(2 marks)

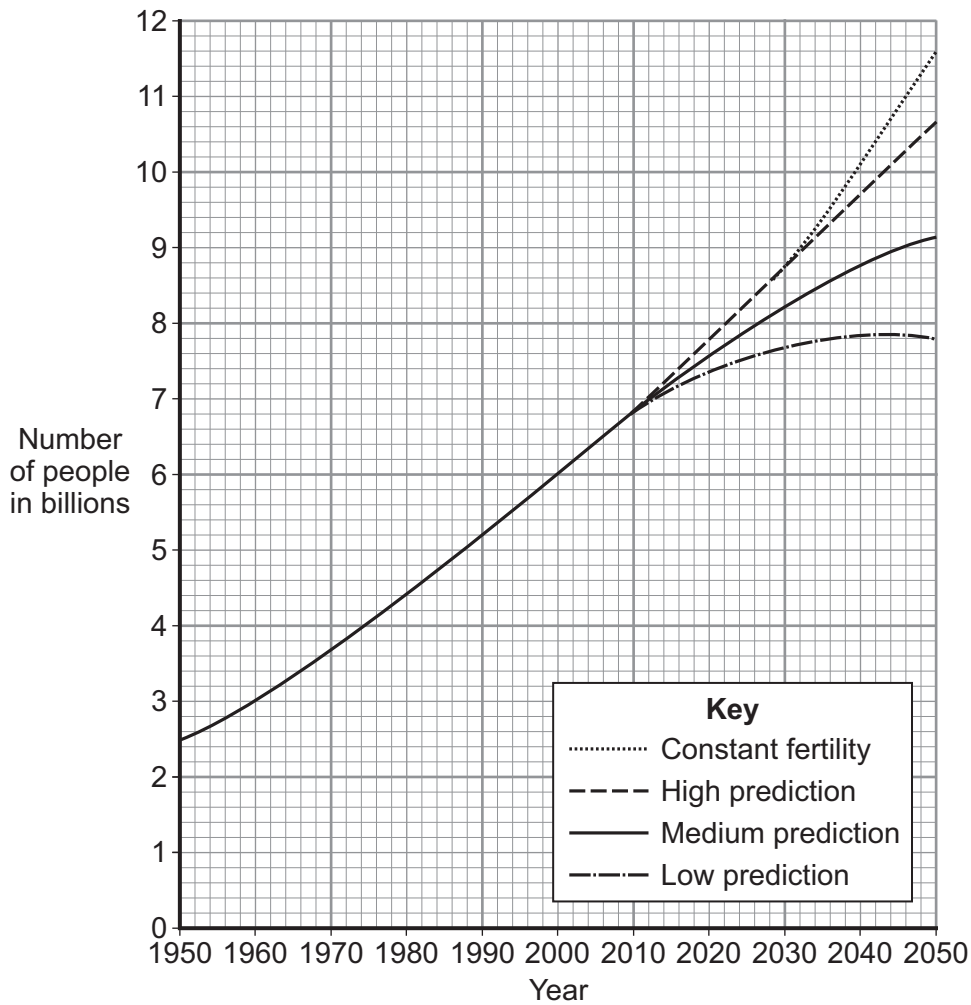
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4 (c) Governments and organisations such as the United Nations have to make predictions about population growth to help with future planning.

The graph shows United Nations predictions for world population growth until 2050.



Source: United Nations Department of Economic and Social Affairs/Population Division *World Population to 2300*

4 (c) (i) Suggest what is meant by the term *constant fertility*.

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(1 mark)

4 (c) (ii) The graph gives a range of possible population growth rates. Suggest why making accurate predictions of world population growth is so difficult.

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(2 marks)



**Turn over for the next question**

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ANSWER IN THE SPACES PROVIDED**

**Turn over ►**



5 An Environmental Science textbook published in 1982 included **Table 1**, predicting when fossil fuels would run out.

**Table 1**

Energy source	Depletion date (years from 1982)
Crude oil	25–35
Natural gas	25–35
Coal	700–1400

An internet search in 2011 produced the predicted depletion dates shown in **Table 2**.

**Table 2**

Energy source	Depletion date (years from 2011)
Crude oil	40–55
Natural gas	50–65
Coal	155–200

5 (a) Suggest reasons why oil and gas have not depleted as predicted in 1982.

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(3 marks)

5 (b) Give **one** reason why the predicted depletion date for coal was shorter in 2011 than it was in 1982.

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(1 mark)



**5 (c)** Outline the problems caused by the continued use of fossil fuels as an energy source.

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(4 marks)

**5 (d)** Fossil fuels have several advantages compared to many of the alternative energy resources available.

State **two** advantages of fossil fuels.

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(2 marks)

<b>10</b>

**Turn over for the next question**

**Turn over ►**



**6** The consequences of climate change are greater than just global warming.

**6 (a)** Suggest **two** other ways that the weather patterns might change in the UK apart from an increase in average temperature.

1 .....

2 .....

(2 marks)

**6 (b)** It is predicted that climatic zones may shift northwards at a rate of 40 to 80 km per decade in the UK.  
Suggest how this might affect crop production in the UK.

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(3 marks)

**6 (c)** Explain how **each** of the following is being used in an attempt to reduce the level of atmospheric carbon dioxide.

Carbon taxes

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Carbon off-setting

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Carbon capture (sequestration)

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(3 marks)





**6 (d)** The 1997 Kyoto protocol failed in its aim to produce a large decrease in carbon production worldwide.

Suggest **two** reasons for this.

1 .....

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2 .....

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(2 marks)

**6 (e)** The Montreal Protocols have been successful in reducing the use of CFCs.

Suggest **two** ways that this success might help to reduce climate change.

1 .....

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2 .....

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(2 marks)

12

**Turn over for the next question**

**Turn over ►**



7 In April 2010, the *Deepwater Horizon* oil rig exploded in the Gulf of Mexico. Millions of barrels of oil escaped into the water.



Source: Getty images

The area was already suffering major environmental problems due to overfishing, loss of wetland habitats and oxygen depletion at the mouth of the Mississippi River.

7 (a) Explain how the oil spill might increase the environmental problems, due to **each** of the following.

Overfishing

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Loss of wetland habitats

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Oxygen depletion

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(6 marks)



**7 (b)** The oil spill can make species more vulnerable to population decline.

Explain how **each** of the following affects the vulnerability of a species.

Population size

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Sex ratios

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Position in the food chain

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Tolerance range

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(4 marks)

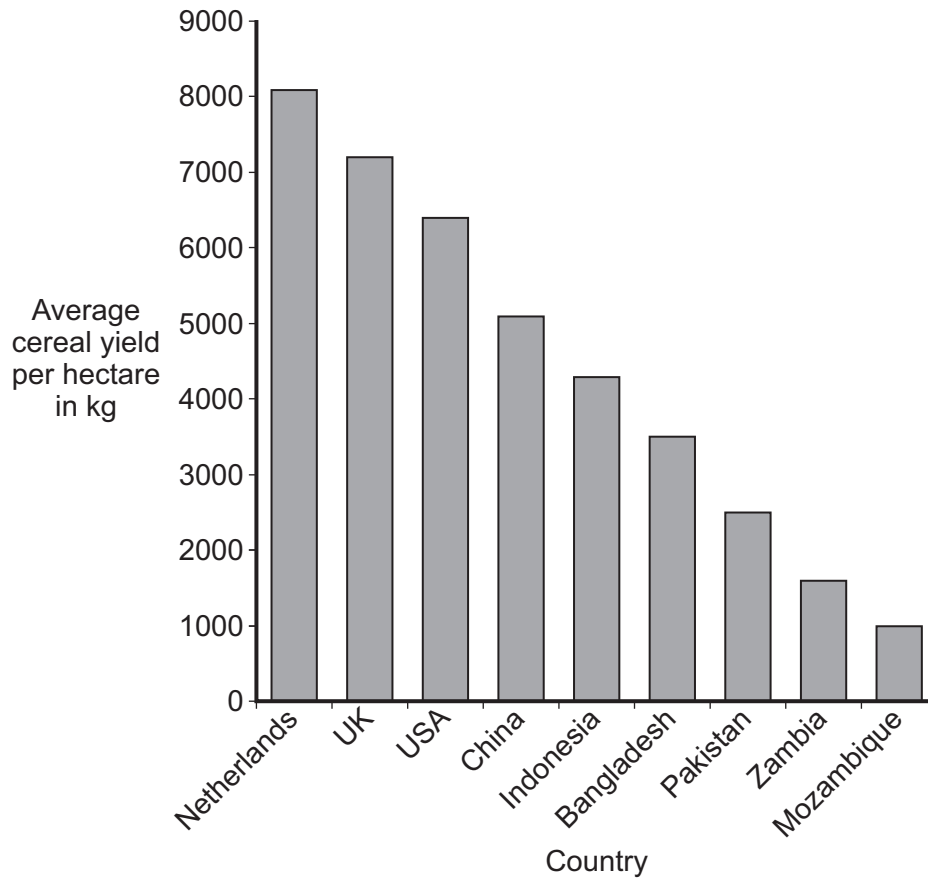
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10

**Turn over for the next question**

**Turn over ►**



8 The graph shows the average cereal yields per hectare for a selection of countries.



8 (a) (i) What do the data suggest about the relationship between the level of development of a country and average cereal yield?

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(1 mark)

8 (a) (ii) Suggest **three** reasons for the difference in the average cereal yields of the UK and Mozambique.

1 .....

2 .....

3 .....

(3 marks)



**8 (b)** Genetically modified (GM) food may help to reduce food shortages.

Suggest how genetic modification may be used to increase agricultural output.

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(4 marks)

**8 (c)** The need to increase yields has sometimes led farmers to use agricultural practices which may harm the environment.

The table shows some agricultural practices and an environmental concern linked to that practice.

Complete the gaps in the table. The first has been done for you.

Agricultural practice	Environmental concern
Use of heavy machinery	Damage to soil structure by compaction
	Eutrophication of streams and rivers
Use of pesticides	
	Increased soil erosion and loss of wildlife habitats
Large numbers of animals housed indoors	

(4 marks)

Turn over ►



**8 (d)** Explain how the Common Agricultural Policy (CAP) helped UK farmers to increase food production.

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(2 marks)

<hr/>
14



**9** A man who tried to smuggle a rhino horn out of Manchester airport has been jailed for 12 months.



Source: Getty images

The horn, believed to be worth about £120 000, was from a rhino called Simba who died at Colchester Zoo in 2009. UK Border Agency (UKBA) officials seized the horn at the airport after it was smuggled out of the Essex zoo's crematorium. They believed that the horn was to be sold in the lucrative Chinese market.

The man was prosecuted under CITES regulations.

**9 (a)** Explain how CITES is used to protect endangered species such as the rhino.

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(2 marks)

**Question 9 continues on the next page**

**Turn over ►**



**9 (b) (i)** The zoo was part of a programme to help to protect the rhino species.

Describe the ways in which zoos can help to protect wild populations of endangered species.

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*(4 marks)*

**9 (b) (ii)** Suggest problems that might occur with zoo-based programmes to conserve wild populations.

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*(3 marks)*

**9 (b) (iii)** Describe strategies that might be used to protect the rhino in its natural habitat.

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*(4 marks)*





**9 (b) (iv)** The rhino is listed in the Red Data Book.

What is the *Red Data Book*?

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.....

(1 mark)

<b>14</b>

**Turn over for the next question**

**Turn over ►**



**10** Wildlife conservationists help to protect species by maintaining habitats.

Conservation is an active process which may involve interfering with the natural succession of an ecosystem.

**10 (a) (i)** For a type of habitat that you have studied, explain how conservationists might manage the succession to protect the habitat.

Type of habitat studied .....

Management .....

.....

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(2 marks)

**10 (a) (ii)** Describe **two** consequences for the habitat named in **10(a)(i)** if the succession is not managed.

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(2 marks)

**10 (b)** When monitoring the habitat, conservationists would need to sample and keep records of the changing populations of plants and animals.

Conservationists might use both quadrats and transects to sample populations.



Source: M.J. Wedgwood



**10 (b) (i)** Describe the difference between the method of sampling using a quadrat and that of using a transect.

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(2 marks)

**10 (b) (ii)** Suggest an appropriate situation for using **each** of the sampling techniques.

Quadrat .....

Transect .....

(2 marks)

**10 (c)** Conservationists may also need to sample abiotic factors in the habitat. One abiotic factor is pH.

Describe a method to test pH reliably.

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(2 marks)

<b>10</b>

**END OF QUESTIONS**



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