

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

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General Certificate of Secondary Education
June 2005



**ENVIRONMENTAL SCIENCE
HIGHER TIER
Written Paper**

3441/H

H

Monday 20 June 2005 9.00 am to 11.00 am

In addition to this paper you will require:
a ruler.
You may use a calculator.

For Examiner's Use			
Number	Mark	Number	Mark
1		6	
2		7	
3		8	
4		9	
5		10	
Total (Column 1)	→		
Total (Column 2)	→		
TOTAL			
Examiner's Initials			

Time allowed: 2 hours

Instructions

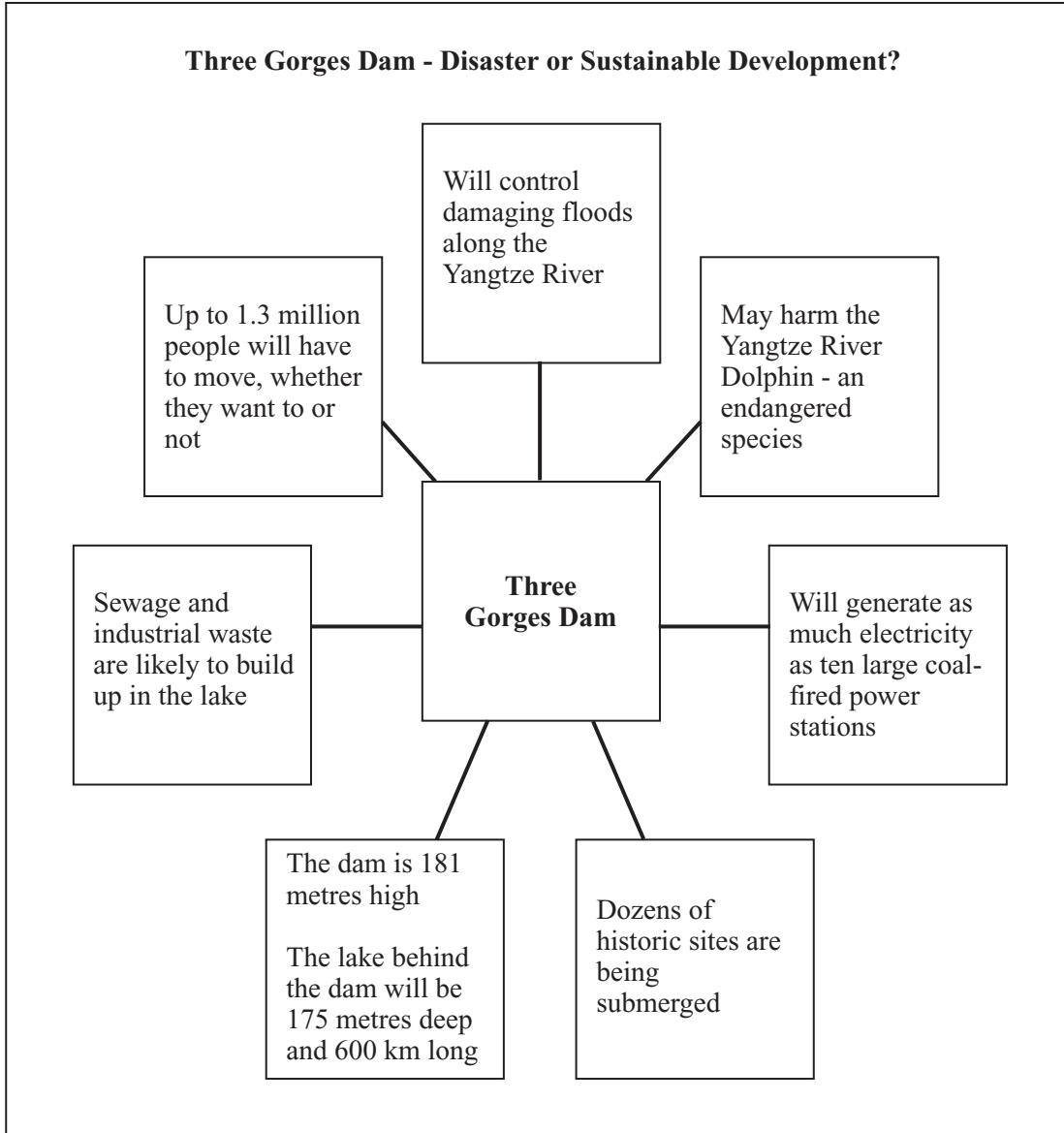
- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want marked.

Information

- The maximum mark for this paper is 120.
- Mark allocations are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.

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

1 (a) The diagram gives details about the Three Gorges Dam in China.



(i) Using information from the diagram state **three** reasons why some people might think that the Three Gorges Dam will be a disaster.

- 1
-
- 2
-
- 3
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(3 marks)

(ii) The diagram states that the dam will be used to control floods and generate electricity. Suggest **two** other ways in which the new lake could be used.

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

(b) (i) What is meant by the phrase *sustainable development*?

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(2 marks)

(ii) Explain **one** possible reason why some people think that the Three Gorges Dam is an example of sustainable development.

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(2 marks)

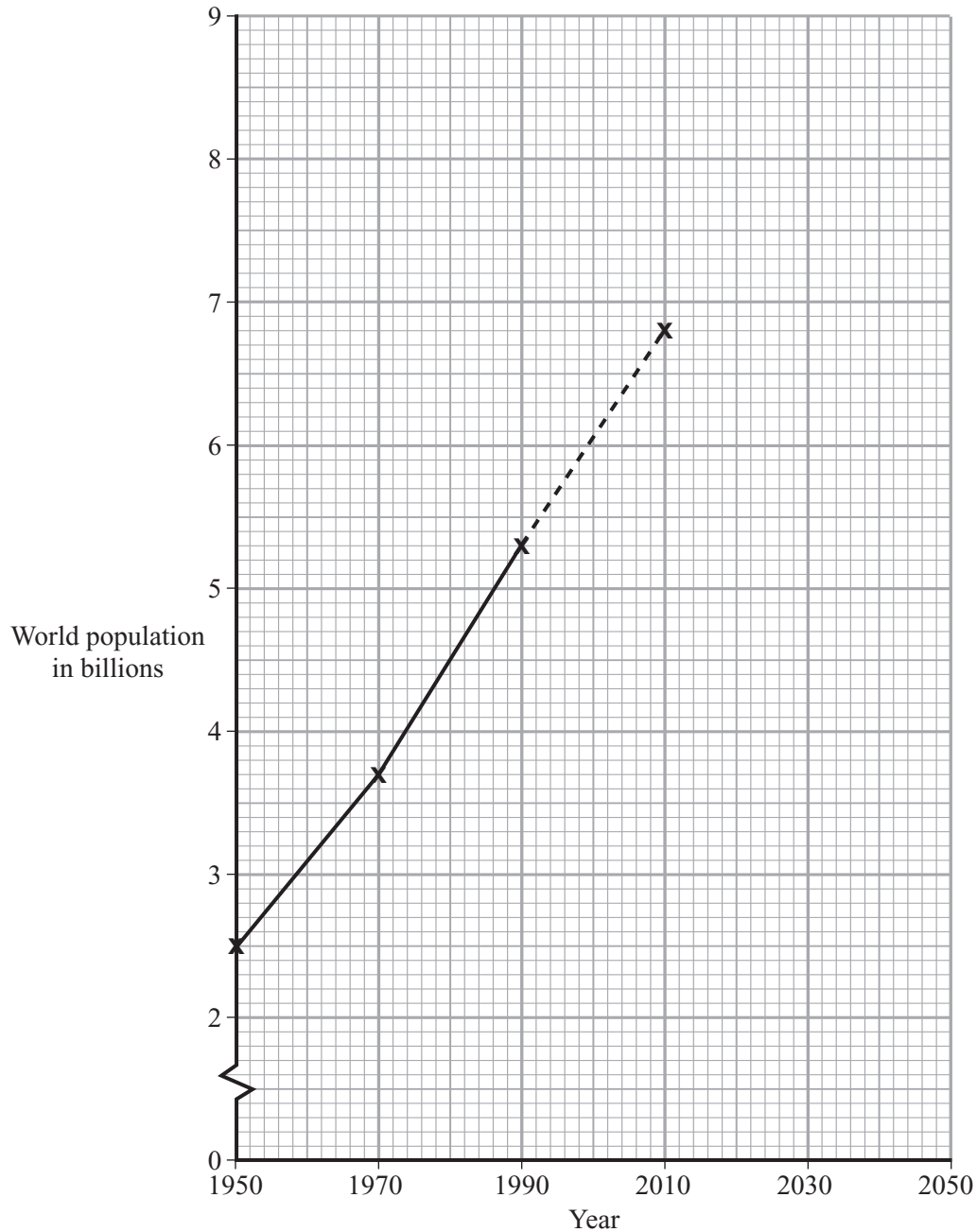
(iii) Explain **one** possible reason why some people think that the Three Gorges Dam is **not** an example of sustainable development.

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(2 marks)

2 (a) The table gives figures for the total population of the world between 1950 and 2050.

Year	1950	1970	1990	2010	2030	2050
Total population in billions	2.5	3.7	5.3	6.8	8.1	8.9

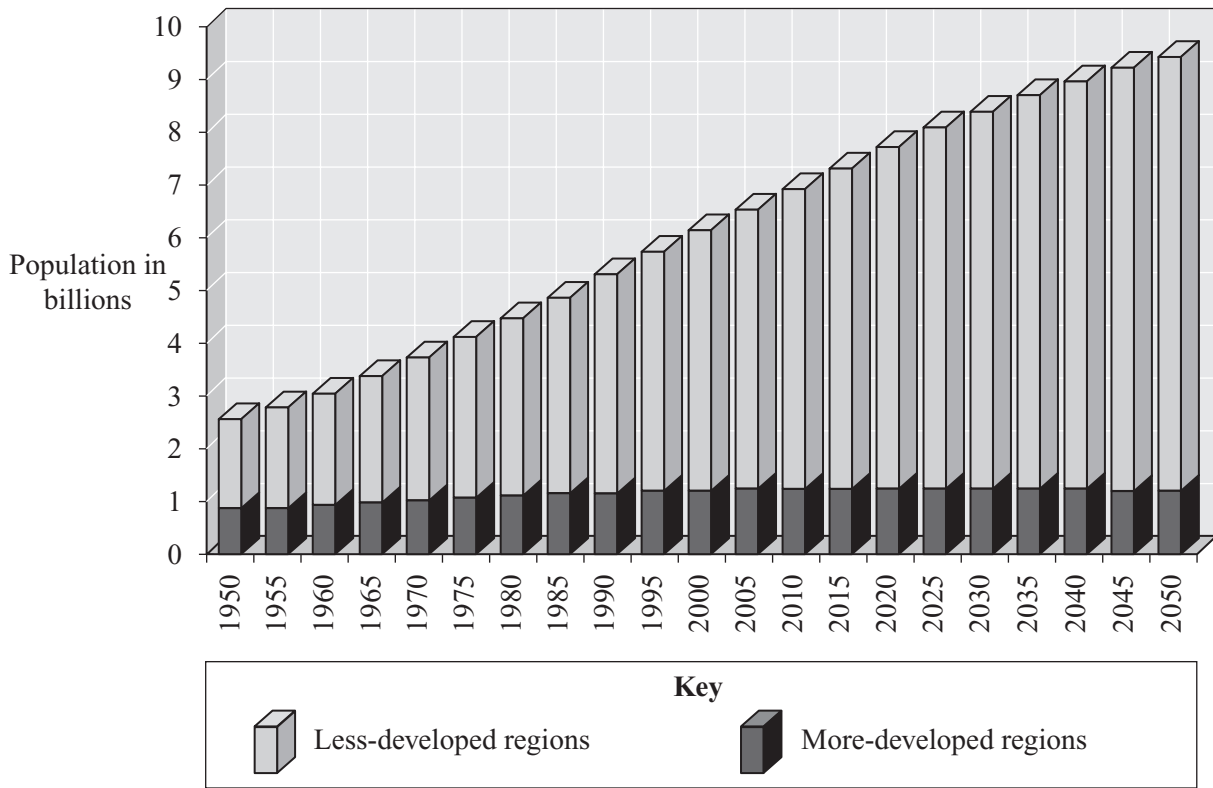


- (i) Use figures from the table to complete the graph. (2 marks)
- (ii) Use the graph to estimate the year in which the total population of the world reached six billion people.

.....

(1 mark)

(b) The chart shows information about population growth in less economically developed regions and in more economically developed regions of the world. It appeared on a web site about world population.



Source: United Nations

(i) State **two** trends shown by the chart.

1

.....

2

.....

(2 marks)

(ii) People using this chart might have problems getting precise information from it. Suggest **two** problems which they might have.

1

.....

2

.....

(2 marks)

QUESTION 2 CONTINUES ON THE NEXT PAGE

Turn over ►

- (c) Ethiopia is an economically less-developed country where the population is growing quickly and where many people are often short of food and fuel.

The use of wood and animal manure as fuel adds to the problem of food shortage in Ethiopia.

Explain **one** reason why using **each** of these resources as fuel can add to the problem of food shortage in Ethiopia.

(i) Wood

.....

.....

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(2 marks)

(ii) Animal manure (faeces).....

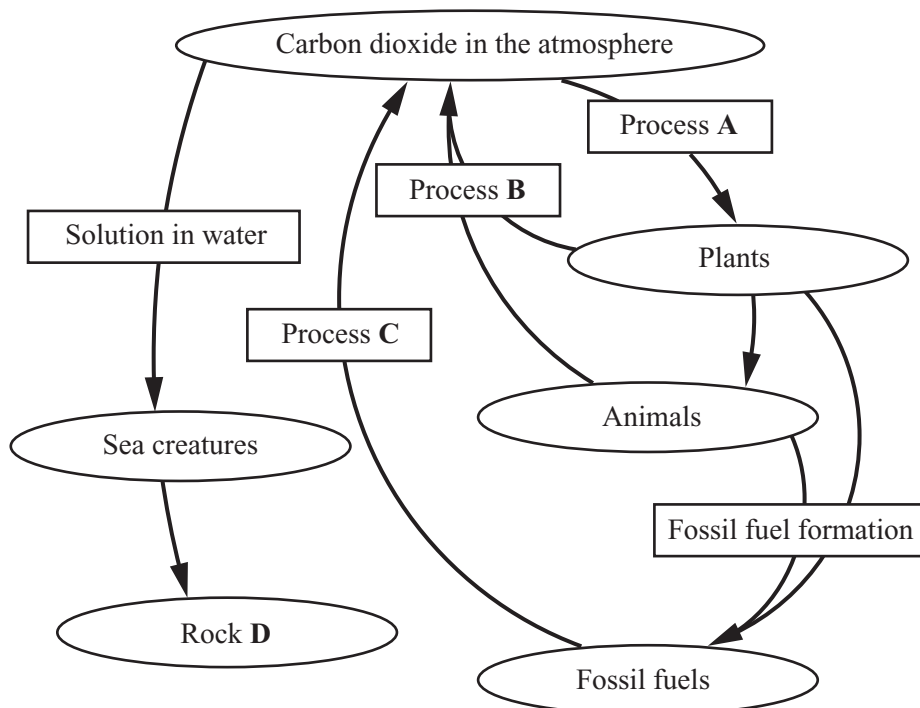
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(2 marks)

3 The diagram shows some of the processes involved in the carbon cycle.



(a) (i) Name processes **A**, **B** and **C**.

A.....

B.....

C.....

(3 marks)

(ii) Name rock **D**.....

(1 mark)

(b) (i) Name a combination of **two** processes which could allow carbon dioxide to be taken out of the atmosphere and returned to it within a few days.

..... and

(1 mark)

(ii) Name a combination of **two** processes which could lead to carbon being taken out of circulation for millions of years.

..... and

(1 mark)

(iii) Describe how animals obtain the carbon which they need.

.....

.....

.....

.....

(2 marks)

8

TURN OVER FOR THE NEXT QUESTION

Turn over ►

- 4 (a) The diagrams below show two samples of soil with different textures, one with a large proportion of clay and the other with a large proportion of sand.

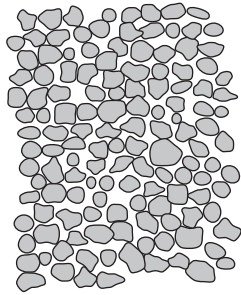


Diagram A

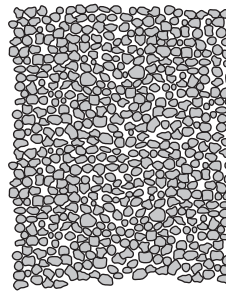


Diagram B

- (i) State which diagram shows the sandy soil and give **one** reason for your choice.

Diagram

Reason for choice.....

.....
(1 mark)

- (ii) Which **one** of the following statements gives the most accurate description of the nutrient content of sandy and clay soils? Tick the correct box.

Sandy soils usually contain more nutrients than clay soils.

There is no difference in the nutrient content of sandy and clay soils.

Clay soils usually contain more nutrients than sandy soils. (1 mark)

- (iii) Soils often need to be cultivated by ploughing or digging. Explain why sandy soils are easier to cultivate than clay soils.

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

- (b) Some students were planning to compare the nitrate content of clay and sandy soils. They had been told to use an accurate test kit to measure the nitrate content of their samples.

The extract shows the students' first plan for this investigation and their teacher's comments.

Method

- We will collect a sample of sandy soil from a garden and a sample of clay soil from a field on a farm.
- We will use the nitrate test kit from school to measure the nitrate content in each sample.

Teacher's comments

Positive comment

- The test kit will give you accurate measurements.

Negative comments

- You need to include more details about your sampling method.
- There are at least two reasons why your plan will not provide you with reliable results.

- (i) State and give a reason for **one** extra detail which the students should provide about their method of obtaining the soil samples.

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(2 marks)

- (ii) State and explain **two** reasons why the students' plan will not provide reliable results.

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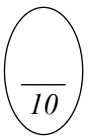
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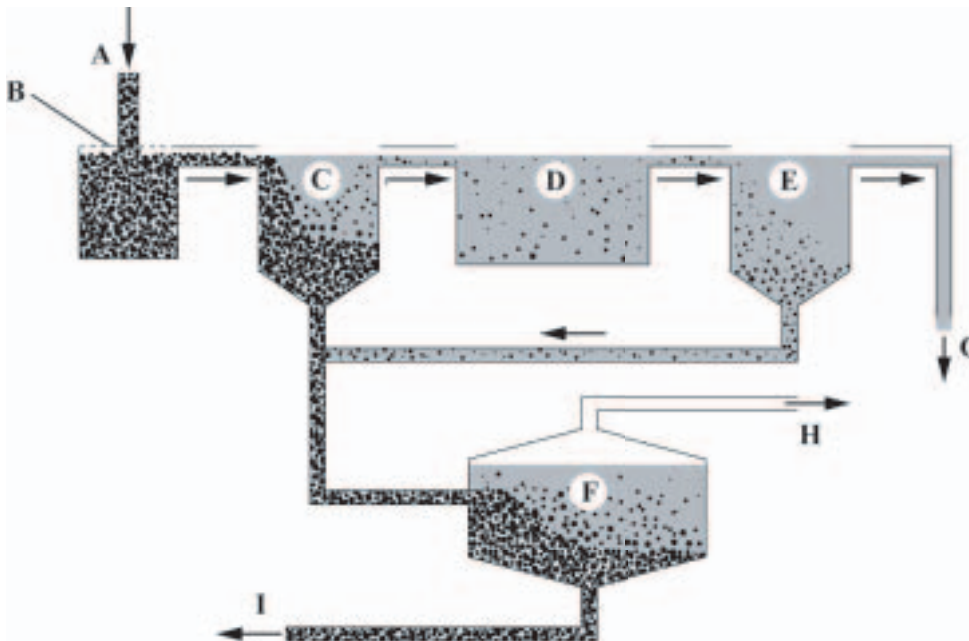
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(4 marks)



Turn over ►

- 5 (a) The diagram shows the processes involved in the treatment of sewage. Untreated sewage enters the treatment works at point **A** and treated sewage is discharged into a river at **G**.



- (i) When the sewage arrives at the treatment works it passes through a moving grid (**B** on the diagram) which removes large objects. Name this process.

..... (1 mark)

- (ii) Tanks **C** and **E** are settlement (or sedimentation) tanks. Describe what happens in these tanks.

.....

 (3 marks)

- (iii) Biological processing of the sewage takes place in tanks **D** and **F**. Explain what is meant by *biological processing*.

.....

 (3 marks)

(iv) Conditions in tank **D** are aerobic, but in tank **F** they are anaerobic. State the difference between aerobic and anaerobic conditions.

.....

..... (1 mark)

(v) The gas produced in tank **F** can be used to produce heat for the sewage works. Name this gas.

..... (1 mark)

(b) Untreated sewage sometimes enters lakes and rivers. Even if the sewage does not contain any toxic substances it can kill fish and other water life. Explain how this can happen.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

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(5 marks)

14

TURN OVER FOR THE NEXT QUESTION

Turn over ►

6 The extract gives information about the use of Bt maize, which is a genetically modified crop.

Ordinary maize	Bt maize - a genetically modified crop
	
<ul style="list-style-type: none"> • Ordinary maize plants can be attacked by the Corn Borer insect. • This insect can reduce yields by up to 20%. • Ordinary maize crops may have to be sprayed with pesticides up to six times. 	<p>Bt maize has been genetically modified so that it produces the Bt protein which kills the Corn Borer insect.</p> <p>Bt maize may only need to be sprayed once.</p> <p>Organic farmers are allowed to use sprays containing the bacteria which naturally produce the Bt protein as a way of controlling pests.</p>

(a) Explain the meaning of each of the following terms which are used in the extract.

(i) *Pesticides*.....

 (2 marks)

(ii) *Genetically modified crop*.....

 (2 marks)

(iii) *Organic farmers*

.....

.....

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(2 marks)

(b) (i) Explain **two** possible advantages of growing Bt maize rather than ordinary maize.

1

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(4 marks)

(ii) Explain **two** reasons why some people are against the growing of genetically modified crops.

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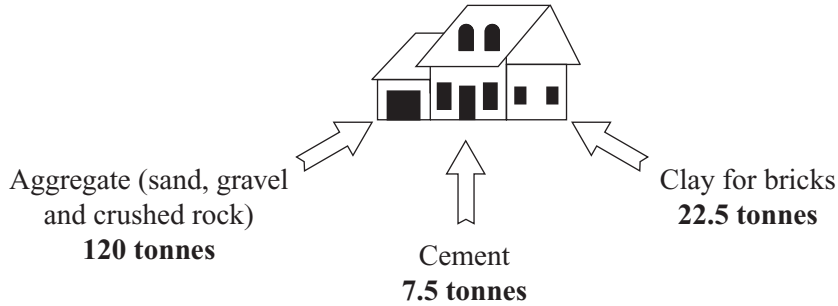
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(4 marks)

7 (a) In April 2002 the UK government introduced the Aggregates Levy. This is a tax of £1.60 per tonne which has to be paid on aggregates (sand, gravel and crushed rock) used in the UK. The tax does not apply to other mineral resources such as clay for bricks or the raw materials for cement, or to recycled aggregate produced by crushing rubble from demolished buildings.

(i) Calculate the amount of Aggregates Levy which would have to be paid on the materials used to build this house.



£ (1 mark)

(ii) The Aggregates Levy is intended to encourage companies to re-use and recycle building materials. Explain **two** reasons why many people think that this will help the environment.

1

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2

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(4 marks)

(b) Some of the money from the Aggregates Levy will be used to help to pay for schemes which will allow local communities to make good use of areas affected by the extraction of sand and gravel or crushed rock.

(i) Suggest **two** different ways in which sites affected by the extraction of these resources could be developed for use by local people.

1.....

2.....

(2 marks)

(ii) Choose one of the uses you have suggested in part (i) and state and explain **three** things which would need to be done to allow a mineral extraction site to be used in this way.

Chosen use

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(6 marks)

TURN OVER FOR THE NEXT QUESTION

Turn over ►

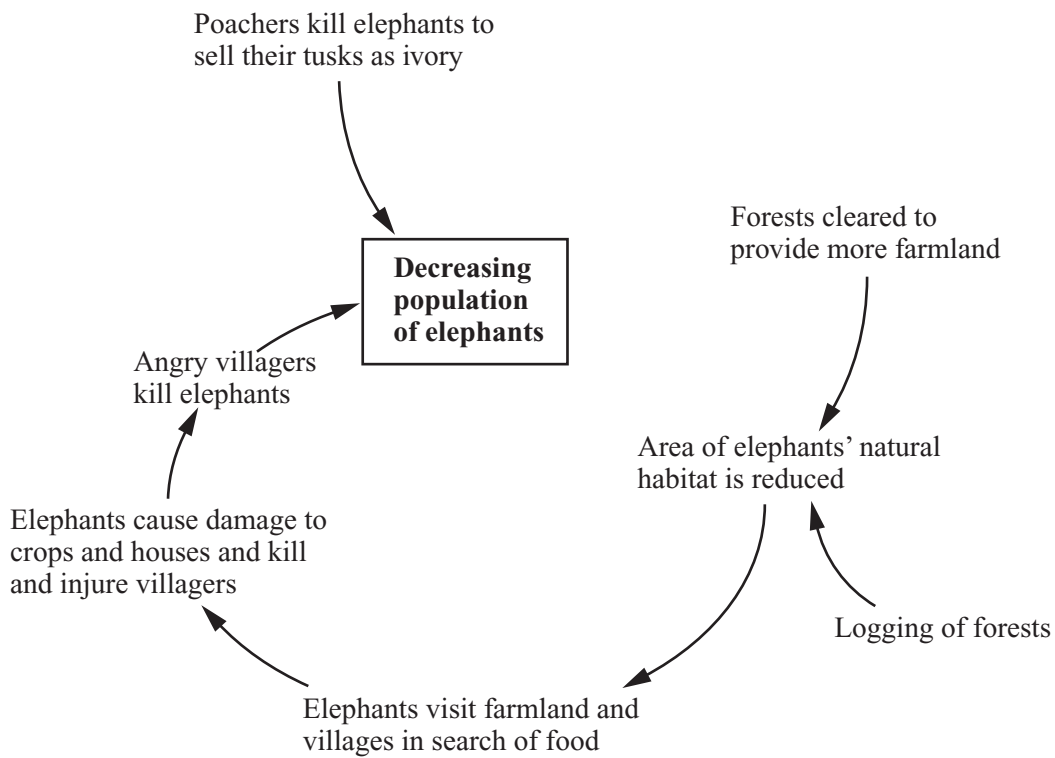
8 (a) The table shows estimates of the population of elephants in Sri Lanka, a country in Asia.

Year	Estimated number of elephants in Sri Lanka
1815	30 000
1900	12 000
2003	2 800

Use data from the table to calculate the percentage decrease in the number of elephants between 1815 and 2003.

..... (1 mark)

(b) The diagram shows some of the reasons for the decrease in the number of elephants in Sri Lanka.



(i) The human population of Sri Lanka is increasing quickly. Use information from the diagram to help you explain why this is likely to help cause the decrease in the population of elephants.

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(2 marks)

(ii) Wildlife conservationists have suggested surrounding villages and fields with electrified fences which elephants will not cross. Use information from the diagram to help you explain how this might help to conserve the elephant population.

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(2 marks)

(c) (i) Elephant ivory from Sri Lanka is sometimes sold in other countries. Name the international agreement by which most countries co-operate to stop this kind of buying and selling of rare organisms or products obtained from them.

.....

(1 mark)

(ii) Some conservationists think that if the number of elephants increases again licences should be sold to allow a small number to be shot each year and for their tusks to be sold as ivory. Explain **one** argument in favour and **one** argument against this point of view.

In favour

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.....
.....

Against

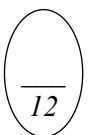
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(4 marks)

(iii) Describe **one** way in which zoos could help the conservation of elephants and other endangered species.

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(2 marks)



Turn over ►

- 9 **Diagram A** shows a cross section of a tidal barrage. This type of barrage has been designed to generate electricity only when the tide is ebbing (as water flows from the estuary towards the sea).

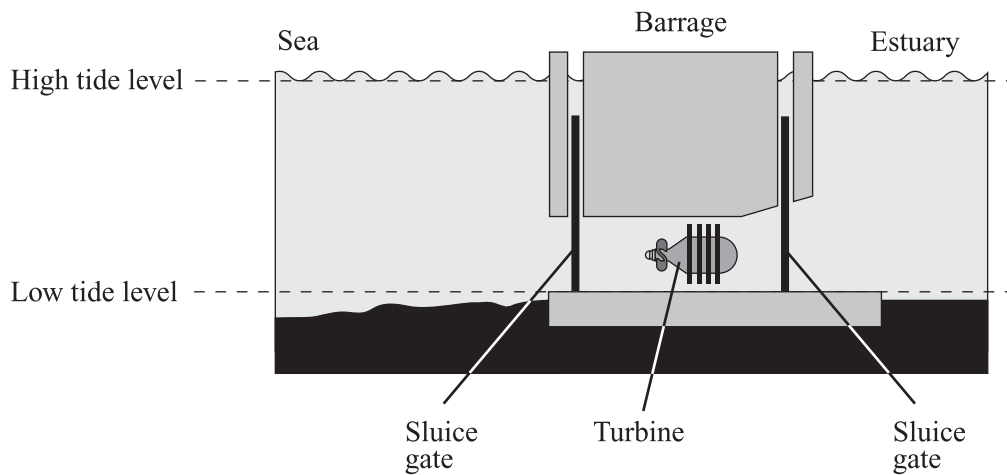


Diagram A

- (a) What is the original source of energy for a tidal power station?

.....
(1 mark)

- (b) **Diagram A** (above) shows the situation at high tide when no electricity is being generated. Sketch the water levels and the position of the sluice gates on **Diagram B** (below) to show the situation when electricity begins to be generated.

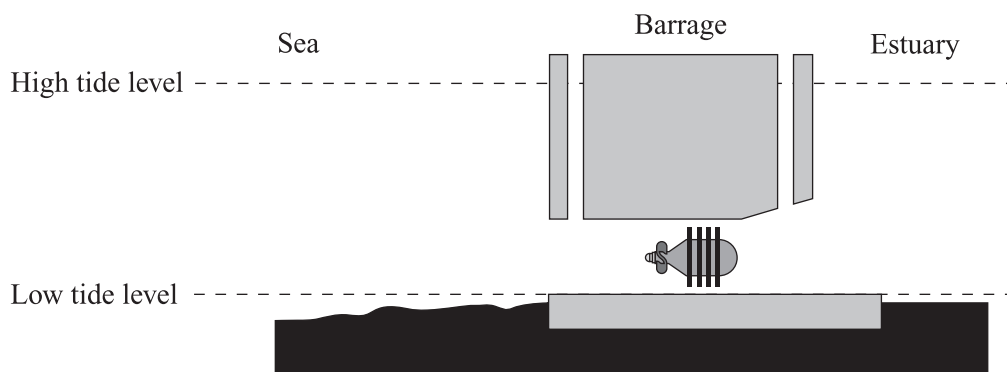


Diagram B

(3 marks)

- (c) Tidal barrage schemes need to be located in places where there is a large tidal range. State the meaning of the term *tidal range*.

.....

.....

(1 mark)

- (d) The table shows some renewable energy resources classified according to whether they are variable and/or reliable in the amount of energy they can produce.

	Variable	Reliable
Solar power	Yes	No
Wind power	Yes	No
Tidal power		

- (i) Complete the table by writing Yes or No in the correct columns for tidal power.

(1 mark)

- (ii) Explain the choices you have made in Part (i).

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(2 marks)

QUESTION 9 CONTINUES ON THE NEXT PAGE

Turn over ►

- (e) The article gives details of tidal current turbines, which could be used instead of a barrage to generate electricity using movements of water caused by the tides.

Tidal current turbines - an alternative to tidal barrages?



◀ An artist's impression of a group of tidal current turbines. The turbines are like underwater wind turbines. They are turned by currents in the sea rather than the wind. They can be built well away from the shore rather than across an estuary.

▼ A photograph of Rance tidal barrage in northern France.



Source: © MCT Ltd (2003)

Source: www.edf.fr

Explain **two** reasons why environmental campaigners might prefer the use of tidal current turbines rather than tidal barrages.

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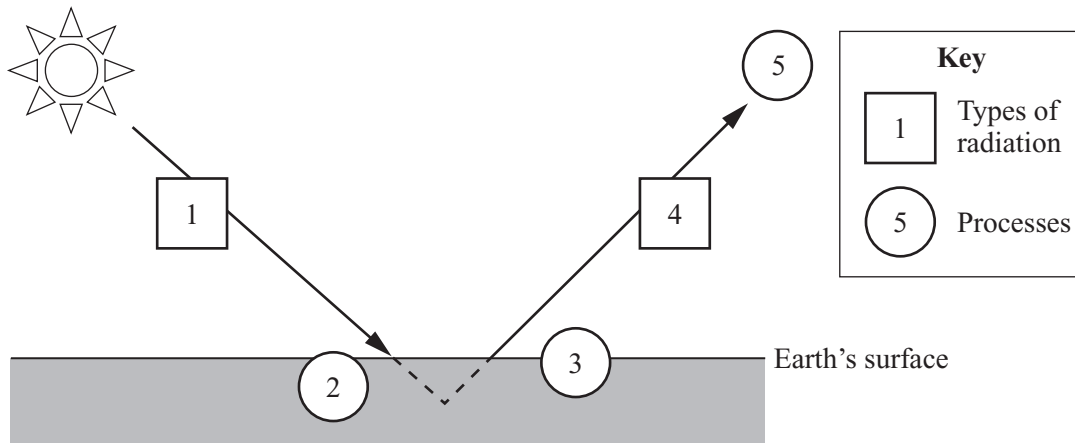
(4 marks)

NO QUESTIONS APPEAR ON THIS PAGE

TURN OVER FOR THE NEXT QUESTION

Turn over ►

10 (a) The diagram shows how the greenhouse effect works.



(i) Complete the key below to show **two** types of radiation (long or short wavelength) and **two** processes involved in the greenhouse effect.

1

2

3

4

5 Radiation absorbed by greenhouse gases. (4 marks)

(ii) Some scientists believe that increased emissions of greenhouse gases are already causing changes to the Earth's climate but others say that this is not true. Explain why there is so much disagreement about this issue.

.....

(2 marks)

THERE ARE NO QUESTIONS PRINTED ON THIS PAGE

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