

Surname						Other Names					
Centre Number						Candidate Number					
Candidate Signature											

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General Certificate of Education  
 June 2003  
 Advanced Subsidiary Examination



**ENVIRONMENTAL SCIENCE**  
**Unit 1 Energy, Atmosphere and Hydrosphere**

**ESC1**

Wednesday 4 June 2003 Afternoon Session

**No additional materials are required.**  
 You may use a calculator.

Time allowed: 1 hour

**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. All working must be shown.
- Do all rough work in this book. Cross through any work you do not want marked.

**Information**

- The maximum mark for this paper is 60.
- Mark allocations are shown in brackets.
- You will be assessed on your ability to use an appropriate form and style of writing, to organise relevant information clearly and coherently, and to use specialist vocabulary, where appropriate.
- The degree of legibility of your handwriting and the level of accuracy of your spelling, punctuation and grammar will also be taken into account.

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

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

1 (a) How does the solar radiation that reaches the Earth's atmosphere differ from:

(i) the solar radiation reaching the Earth's surface;

.....  
(1 mark)

(ii) the electromagnetic radiation emitted from the Earth's surface?

.....  
(1 mark)

(b) What is meant by the albedo of a surface?

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(1 mark)

(c) (i) Outline the concept of the Gaia hypothesis.

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(1 mark)

(ii) Outline how increased cloud cover may be used to illustrate the Gaia hypothesis.

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(2 marks)

2 A range of different types of radioactive wastes is produced by the nuclear industry.

(a) Complete the table below by adding the appropriate source or disposal technique.

Level and form of radioactive waste	Source within the nuclear power industry	Disposal/storage method
High level waste		
Intermediate level waste		Sealed in cement in stainless steel drums
Low level liquid waste	Cooling ponds	Filtered, then discharged to river or sea
Low level solid waste		Sealed in steel containers in a concrete lined trench

(4 marks)

(b) Compare radioactive waste and solid coal waste (spoil) in terms of:

(i) the quantities produced;

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.....

(1 mark)

(ii) the length of time for which it is a problem.

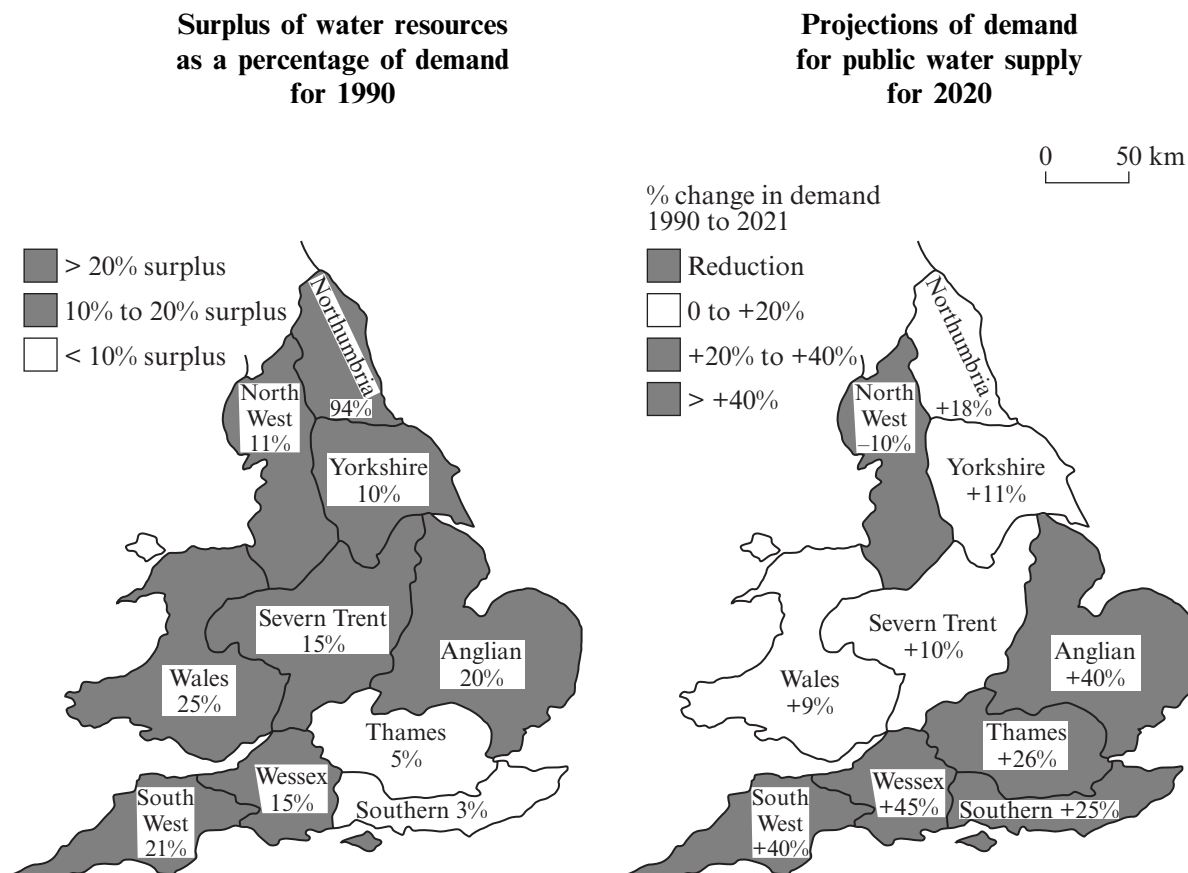
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(1 mark)

6

Turn over ►

3 The maps of England and Wales show the surplus of water in different regions in 1990 and projections of the change in demand for water in 2020.



(a) Suggest **one** reason to account for **each** of the following:

(i) the relatively small surpluses of water in south east England;

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

(ii) the projected reduction in demand for water in north west England;

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

(iii) the large projected increase in demand for water in south west England.

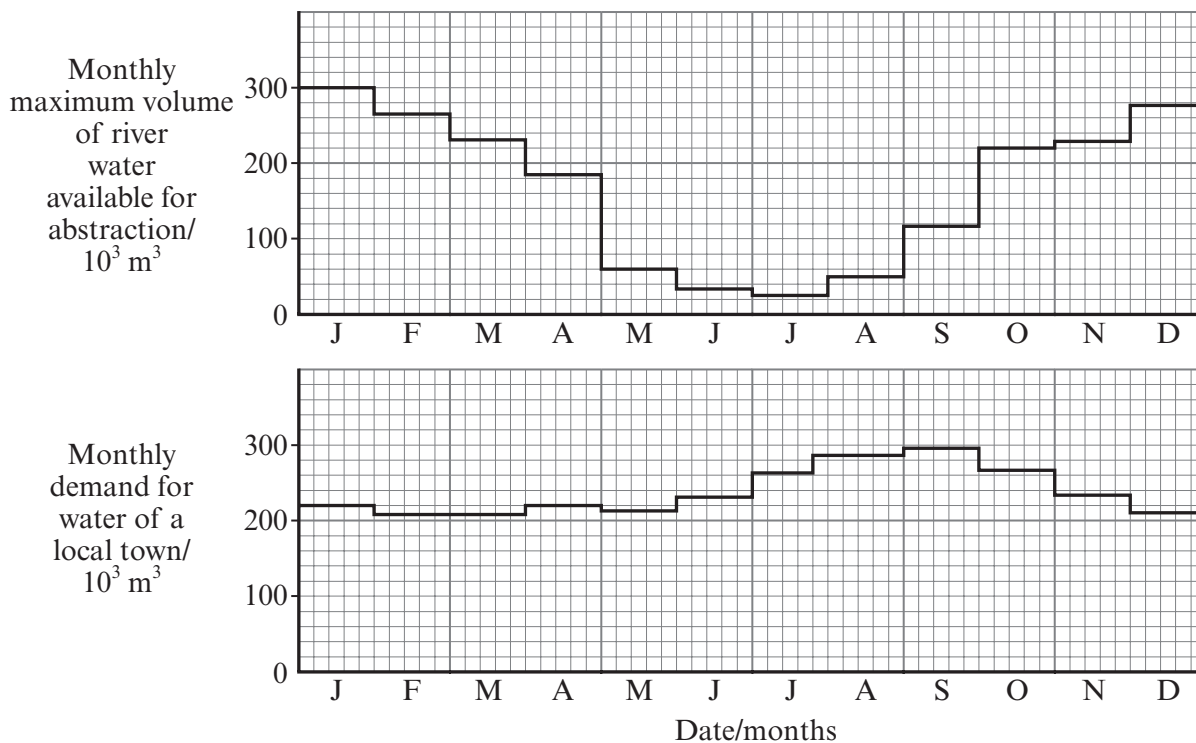
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 (1 mark)

(b) Suggest how the shortfall in future supplies in south east England might be met.

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(1 mark)

(c) The graphs show water availability from a river and the demand for water in an area in the UK.



(i) Use information from the graph to explain why this area may have temporary water shortages.

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(1 mark)

(ii) Suggest how a reservoir could be used to prevent these water shortages from occurring.

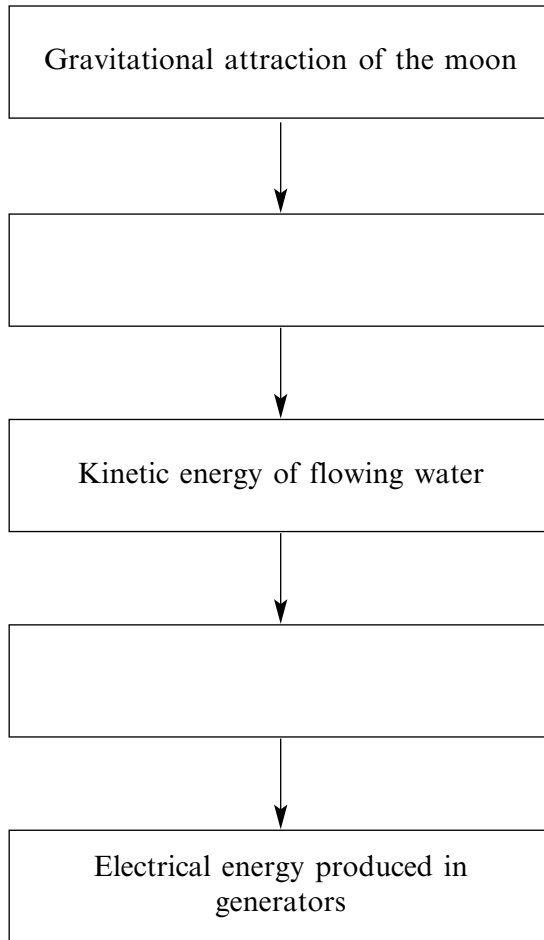
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(2 marks)

Turn over ►

4 Before an energy resource can be used it may be necessary for a number of energy conversions to occur.

(a) Complete the flow diagram to show the energy forms involved in harnessing tidal power.



(2 marks)

(b) Describe **one** locational factor which may make a site suitable for the exploitation of tidal power.

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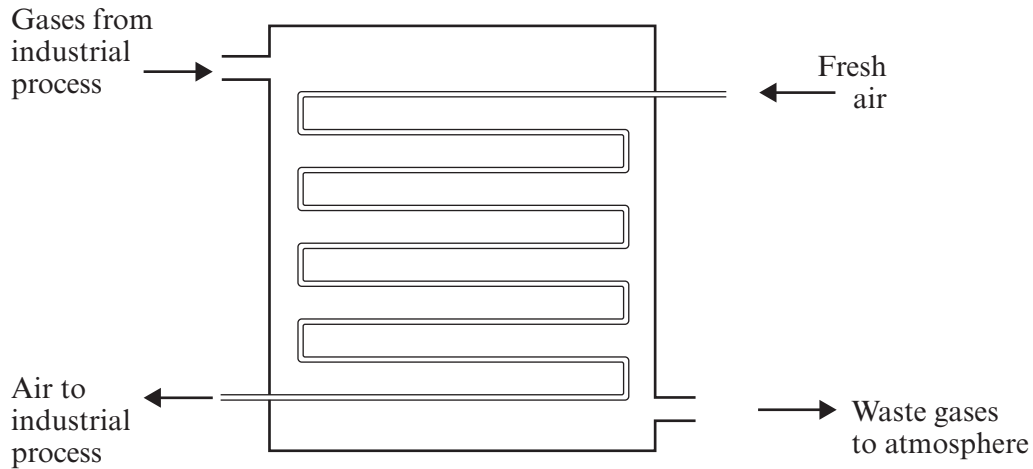
(2 marks)

(c) Explain why **not** all of the energy of the flowing water could be harnessed and turned into electricity.

.....  
.....

(1 mark)

5 The diagram shows a heat exchanger used for industrial heat recovery.



- (a) (i) Mark an **X** on the diagram to show where the highest temperatures would be found. *(1 mark)*
- (ii) Mark a **Y** on the diagram to show where the lowest temperatures would be found. *(1 mark)*

(b) Use the diagram to explain how a heat exchanger may be used to reduce the waste of energy in industry.

.....

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*(2 marks)*

(c) Outline **one** way in which the heat exchanger may be designed to increase the efficiency of energy conservation.

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*(2 marks)*

(d) Outline **one** method by which the design of vehicles may reduce fuel consumption.

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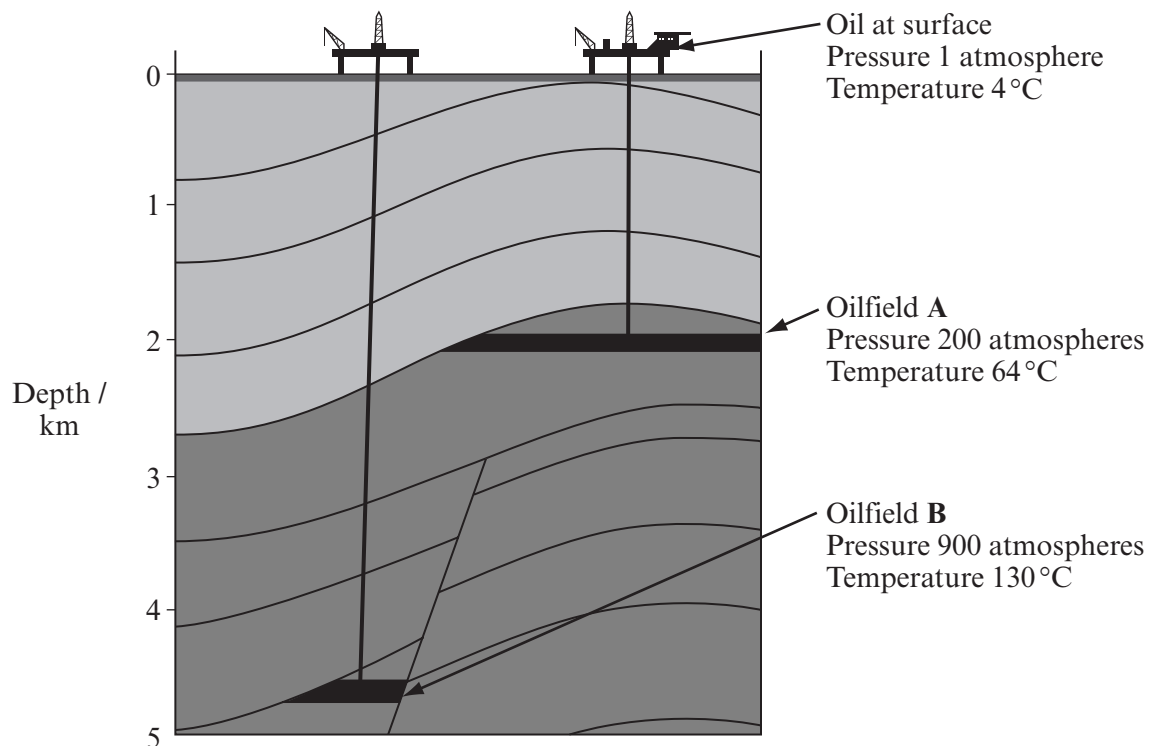
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*(2 marks)*

*(2 marks)*  
**Turn over** ►

6 The diagram shows the geological structures and oilfield conditions for two oilfields.



(a) Explain why oilfield **B** would have a higher oil recovery rate than oilfield **A**.

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(3 marks)

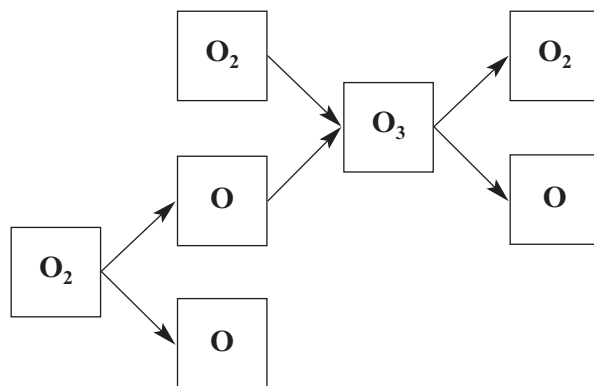
(b) What features of an oil trap are necessary for it to collect oil?

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(2 marks)



7 The diagram shows some of the reactions which occur in the ozone layer.



(a) Outline the role of ultraviolet light (UV) in these reactions in the stratosphere.

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(3 marks)

(b) Describe the significance of the ozone layer for life on Earth.

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(2 marks)

(c) Describe how reactions involving chlorofluorocarbons (CFCs) affect the amount of ozone in the stratosphere.

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(3 marks)

Turn over ►

8 (a) (i) Name **one** greenhouse gas which is thought to cause global climate change.

.....  
(1 mark)

(ii) Give **two** different human activities which cause the atmospheric concentration of this gas to increase.

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

2. ....  
.....  
(1 mark)

(iii) Describe how emissions of this gas may be reduced.

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(3 marks)

