

Surname						Other Names					
Centre Number						Candidate Number					
Candidate Signature											

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General Certificate of Education
 January 2004
 Advanced Subsidiary Examination



ENVIRONMENTAL SCIENCE
Unit 1 Energy, Atmosphere and Hydrosphere

ESC1

Friday 9 January 2004 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

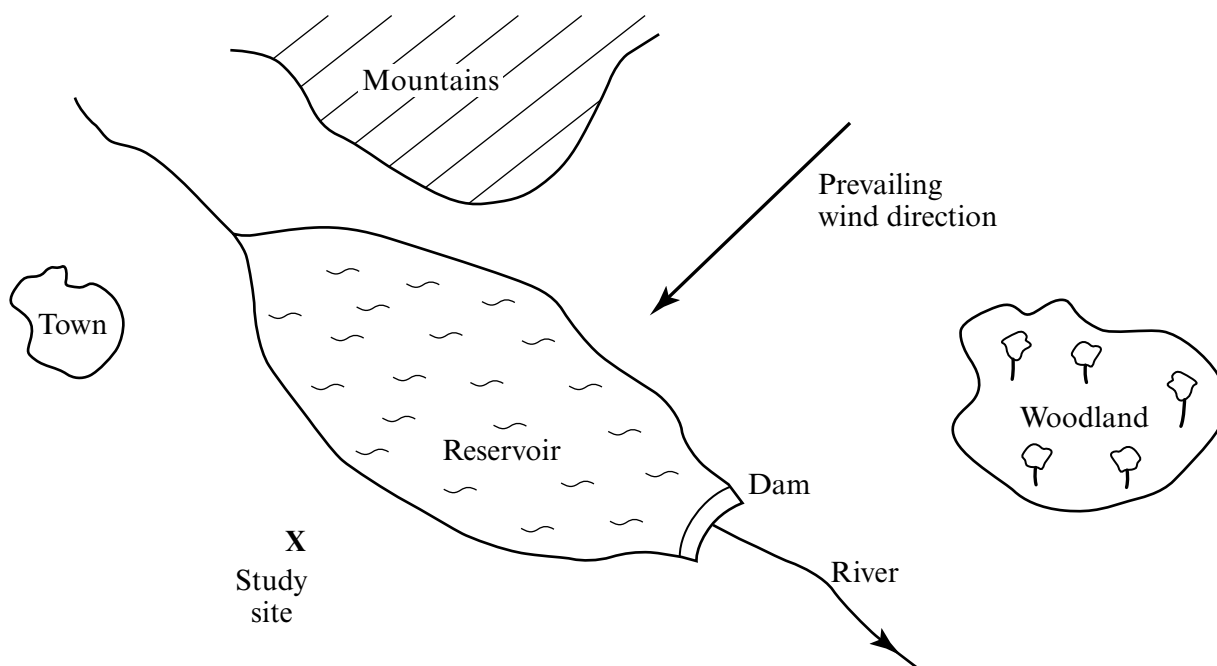
- The maximum mark for this paper is 60.
- Mark allocations are shown in brackets.
- You will be assessed on your ability to use an appropriate form and style of writing, to organise relevant information clearly and coherently, and to use specialist vocabulary, where appropriate.
- The degree of legibility 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			
6			
7			
Total (Column 1)			
Total (Column 2)			
TOTAL			
Examiner's Initials			

Answer all questions in the spaces provided.

1 Many human activities produce microclimates.

The diagram shows a reservoir and some features of the surrounding area.



Explain how the following climatic features at Study site X may differ from before the reservoir was built.

(a) Temperatures

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(2 marks)

(b) Wind speed

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(2 marks)

(c) Insolation

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(2 marks)

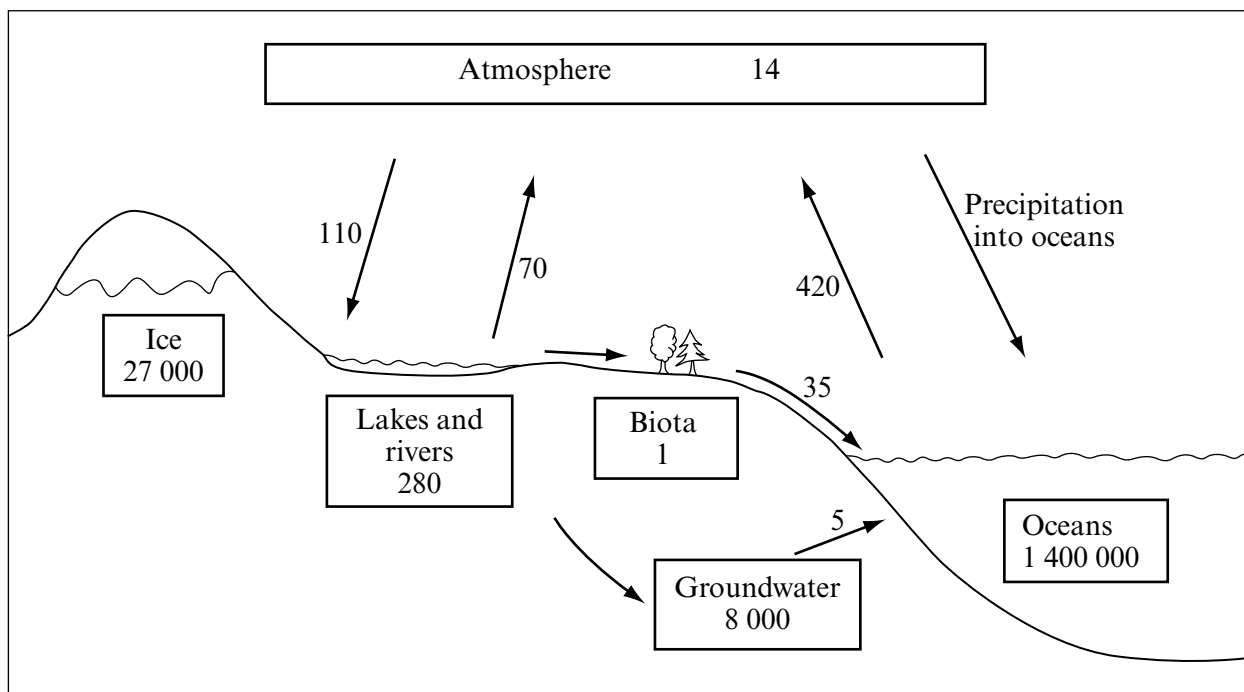
2

Question 2 not reproduced here, due to third-party copyright constraints.



Turn over ►

3 The diagram shows dynamic equilibrium in the water cycle.



Key

Ice 27 000 Water store 10^3 km^3

$\xrightarrow{35}$ Water movement $10^3 \text{ km}^3 \text{ yr}^{-1}$

- (a) Use the information from the diagram to calculate the annual water movement of precipitation into the oceans.

Show your working.

Answer 10^3 km^3
(1 mark)

(b) Use the formula to calculate the average residence time of water in oceans.

$$\text{Residence time} = \frac{\text{quantity of water in a water store}}{\text{flow out of (or into) the store per year}}$$

Show your working.

Answer
(1 mark)

(c) Name a rock which often forms aquifers.

.....
(1 mark)

(d) Outline one problem that may make groundwater unsuitable for irrigation of crops.

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(2 marks)

(e) Suggest how large-scale irrigation may alter the dynamic equilibrium of the water cycle.

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(1 mark)

6

TURN OVER FOR THE NEXT QUESTION

Turn over ►

4 Many organisations make predictions of how future energy supplies will be met. The graph shows the contributions which individual energy resources may make to total supplies.

Graph from: **An Introduction to Global Environmental Issues**, Routledge 1997 – not reproduced here, due to third-party copyright constraints.

(a) (i) What is the estimated total demand for energy in 2030?

.....EJ

(1 mark)

(ii) Estimate the amount of energy supplied by biomass in 2070.

.....EJ

(1 mark)

(b) Describe the predicted trend of biomass use compared with solar/wind energy in terms of the total amount of energy provided.

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(2 marks)

(c) Suggest two reasons why most predictions include a declining contribution from fossil fuels.

1.
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(2 marks)

2.
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(2 marks)

(d) Name two energy crops which are deliberately grown to provide biofuels.

1.
2.
(2 marks)

(e) Explain why biofuels may be better suited than wind power to replace vehicle fuels made from crude oil.

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(2 marks)

(f) Many governments supported nuclear power.

Suggest why many of them no longer do so.

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(2 marks)

Turn over ►

5 The table shows the composition of the atmosphere.

Component	Chemical formula	Abundance by volume*
	N ₂	78.08%
Oxygen	O ₂	
Argon	Ar	0.93%
Water vapour	H ₂ O	variable
Carbon dioxide	CO ₂	
Methane	CH ₄	2 ppmv
Carbon monoxide	CO	0.05–0.2 ppmv
Ozone		variable

*ppmv = parts per million by volume

(a) Complete the table by including the appropriate component, formula or abundance. (4 marks)

(b) Explain the variable abundance of:

(i) water vapour;

.....

(1 mark)

(ii) ozone.

.....

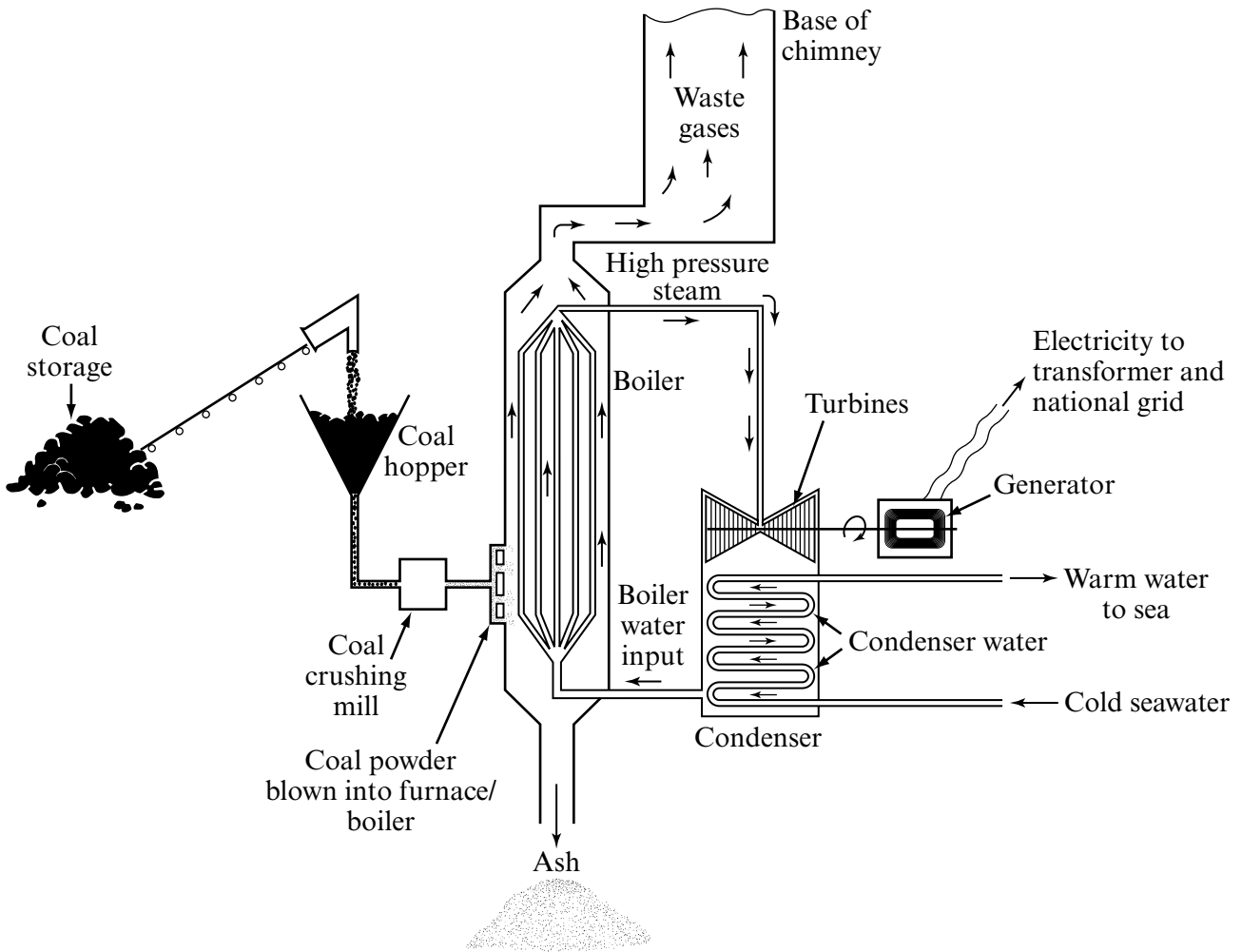
(1 mark)

6

TURN OVER FOR THE NEXT QUESTION

Turn over ►

6 The diagram shows the main uses of water in a coal-fired power station.



(a) Outline the purposes of the following features of the power station.

(i) Turbines

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(2 marks)

(ii) Condenser

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(2 marks)

- (b) Outline one technique that can be used to store surplus energy from the power station so it can be used later when demand for electricity is high.

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(2 marks)

- (c) The properties of water make it suitable for many industrial uses. The table shows the uses of water in selected industries.

Industry	Use of water
Textile factory	Washing
Nuclear power station	Cooling pond water
Coal fired power station	Boiler water
Coal fired power station	Seawater in condensers

Outline why the properties of water make it suitable material for two of the uses in the table.

Use 1

Property

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(1 mark)

Use 2

Property

.....

(1 mark)

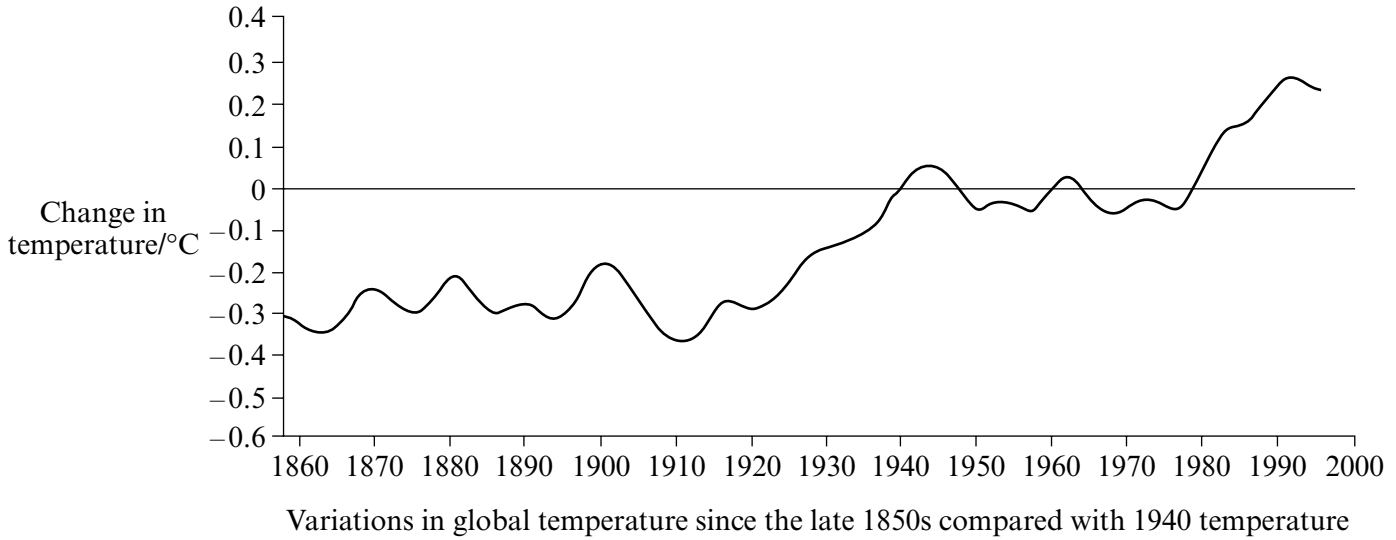
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TURN OVER FOR THE NEXT QUESTION

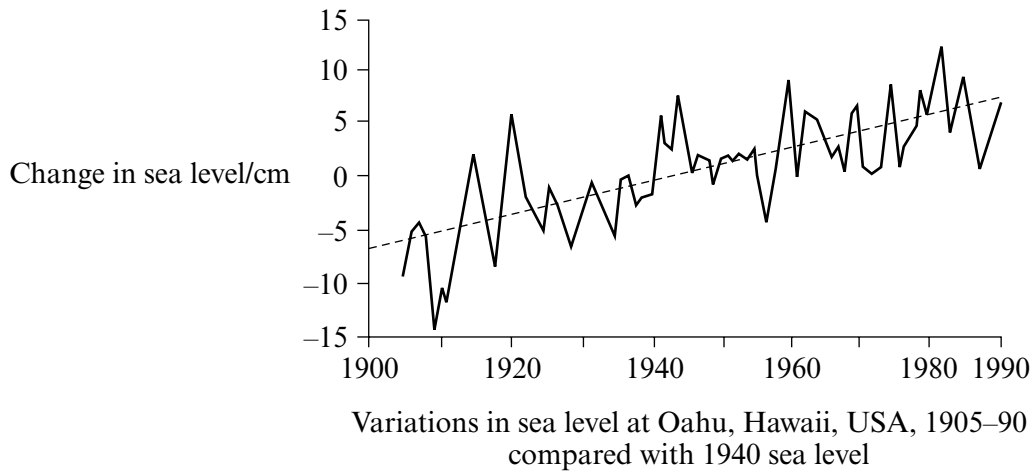
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7 Many scientists believe that the global climate is changing because of atmospheric pollution.

Graphs A and B show changes in global temperature and sea level in Hawaii.



Graph A



Graph B

Source of graphs: N. MIDDLETON, *The Global Casino* (Arnold) 1999

(a) Name two pollutants which are thought to contribute to global climate change.

1.
2.

(2 marks)

(b) Explain how such pollutants may cause atmospheric warming.

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(2 marks)

(c) Explain how the increasing temperatures shown in Graph A may have caused the sea level changes shown in Graph B.

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(3 marks)

(d) Explain the ways in which Global Climate Change may affect the amounts of water in different water stores and the rates of water movement in the water cycle.

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(8 marks)

END OF QUESTIONS

