Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	

General Certificate of Education
Advanced Level Examination
June 2012

Environmental Studies ENVS3

Unit 3 Energy Resources and Environmental Pollution

Wednesday 30 May 2012 9.00 am to 10.30 am

You will need no other materials.
You may use a calculator.

Time allowed
- 1 hour 30 minutes

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 80.
  Two of these marks are for the Quality of Written Communication.
- You will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.
- Question 8 should be answered in continuous prose.
  Quality of Written Communication will be assessed in this answer.

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

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

1 The table shows the impacts of selected pollutants.

Complete the table by adding **one** tick to **each** row.
The first row has been completed.

Pollutants	**Pollution impacts**					
	Depletion of stratospheric O_3	Global climate change	Acid rain	Photo-chemical smogs	Smoke smogs	Neurotoxic effects
Chlorine free radicals from CFCs	✓					
SO_2, NO_x						
SPM (PM10)						
CO_2, CH_4, CFCs, NO_x, tropospheric O_3						
NO_x, PANs, waste hydrocarbons, tropospheric O_3						
Mercury						

(5 marks)

5

Turn over for the next question

2 The photographs show the experimental nuclear facility at Dounreay in Scotland and a sign on a nearby beach, warning the public of possible contamination caused by discharges in the 1960s and 1970s.

To limit the damage caused by pollutants, it is important to predict their behaviour after release and to monitor any damage caused.

2 (a) Describe how the following help to reduce pollution.

2 (a) (i) Critical Pathway Analysis

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(2 marks)

2 (a) (ii) Critical Group Monitoring

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(2 marks)

2 (b) Explain how Biotic Indices may be used to monitor pollution.

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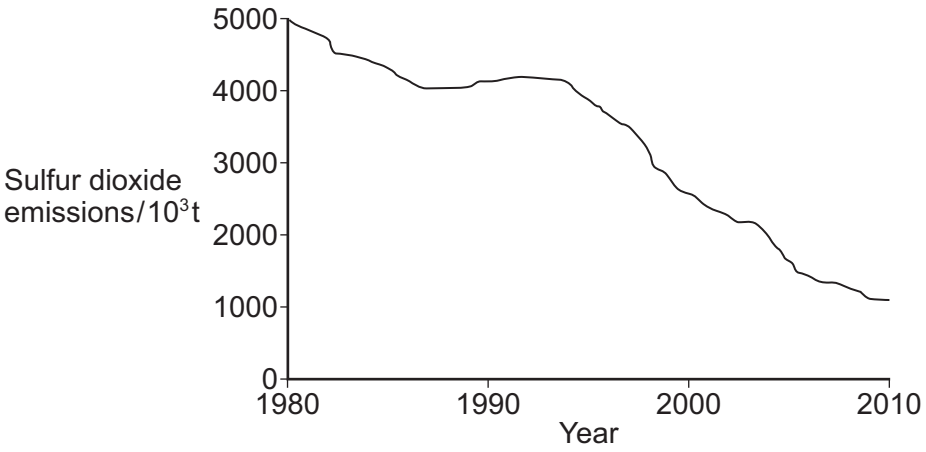
(6 marks)

10

Turn over for the next question

3 The graph shows how emissions of sulfur dioxide in the UK have declined since 1980.



3 (a) Suggest how the emissions of sulfur dioxide have declined due to changes in:

3 (a) (i) domestic activities

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(2 marks)

3 (a) (ii) industrial activities.

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(2 marks)

3 (b) Describe how the impact of pH on seed germination may be investigated.

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(6 marks)

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Turn over for the next question

4 The amount of energy available for use depends largely on the size of the resource available and the ability to extract or harness it.

4 (a) Explain how improvements in technology have increased the amount of energy that can be provided by:

4 (a) (i) a named fossil fuel

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(2 marks)

4 (a) (ii) solar power

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(2 marks)

4 (a) (iii) wind power.

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(2 marks)

4 (b) Raised areas, such as hills, are often the best sites for locating wind turbines.

Apart from land use issues, explain why it can be difficult to decide which is the best site on a hill for harnessing wind power.

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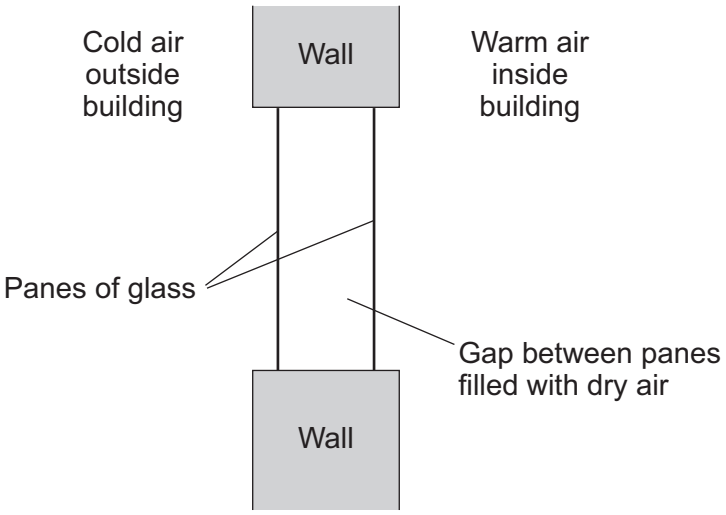
(4 marks)

10

Turn over for the next question

5 The diagram shows a cross section through a double glazed window.



5 (a) Explain how double glazed windows help to reduce heat loss.

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(2 marks)

5 (b) Suggest why the rate of heat loss would be reduced by replacing the air in the gap between the panes of glass with:

5 (b) (i) argon gas

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(1 mark)

5 (b) (ii) a vacuum.

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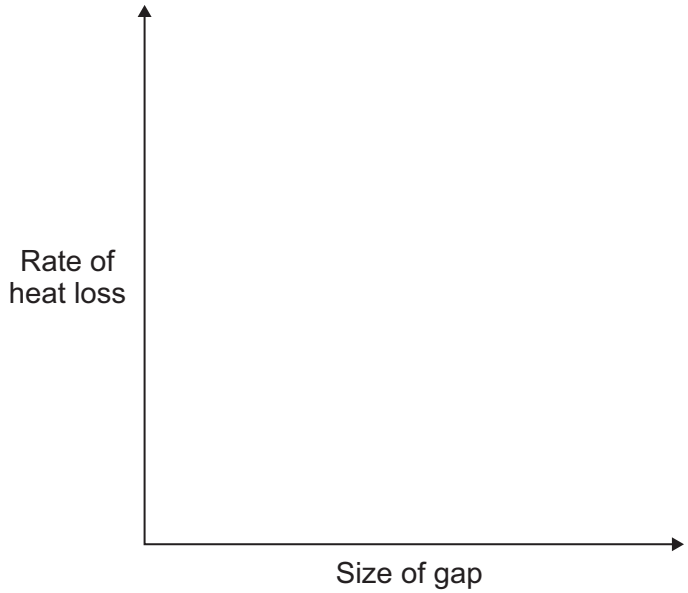
(1 mark)

5 (c) Draw a line on the graph to show the relationship between the size of the gap between the panes of glass and the rate of heat loss through the window.



(1 mark)

5 (d) Although windows can be a significant cause of heat loss, careful design can use windows as a method of gaining energy.

Suggest how building design can use windows to gain energy.

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(2 marks)

5 (e) Waste gases, such as stale air in houses or effluent gases from furnaces, are often hot.

Describe how the heat from these waste gases can be conserved when the gases are discharged.

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(3 marks)

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Turn over ▶

6 The properties that cause a substance to become a pollutant are not always understood when it is first developed, as was found with many chlorinated organic compounds. These include the insecticide DDT, and PCBs that were used as solvents in ink and as electrical insulators.

The picture shows a poster used to advertise DDT in the 1940s.

The 'staying power' of DDT was seen as a big advantage: it could be sprayed on crops and it would continue to kill pests for a long time because it did not break down quickly. This saved time and money because respraying was not required so soon. Because it was more soluble in fats and oils than in water, it was not easily washed away by rain and tended to stay in the area where it was sprayed. So DDT would continue to work by killing pests for a long time after its initial application.

Because DDT was not very poisonous to mammals, it was thought to be safe to use in houses and was included in paint and wallpaper so that flies and other pests would be killed. It is still used in some countries to control mosquitoes which carry malaria. The World Health Organisation has stated its policy that DDT should be used when necessary to control mosquitoes in houses but it should never be used on farmland.

By the late 1950s, there was concern that animals such as eagles, fish-eating birds and otters were dying of DDT poisoning. It was also found that DDT levels in humans were rising, including in the milk of breast-feeding mothers.

Although PCBs were used for different purposes than DDT, their chemical similarities give them similar properties so they caused similar problems. Discharges of PCBs into rivers resulted in raised levels of PCBs in fish, aquatic birds and mammals. Levels were often highest in organisms found in lakes and estuaries.

Long-term exposure to DDT and PCBs has caused significant concern over their impact on human health.

Chlorinated organic compounds, such as DDT and PCBs, can be very damaging to human health. Children with greater exposure can have lower birth weights, slowed growth and poorer performance in tests of brain development. Studies suggest that some of these compounds are toxic to the immune system, reproductive organs and the thyroid gland. Some inhibit enzymes in the nervous system, causing dizziness, tremor, irritability and convulsions. Many are probable human carcinogens.

Although DDT and PCBs break down in the environment, the rate of breakdown depends on environmental conditions. Under some conditions they can remain for decades.

Use the information in the article and your own knowledge to answer the questions.

6 (a) Suggest the environmental conditions that are likely to make the breakdown of organic compounds such as DDT and PCBs more rapid.

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(3 marks)

Question 6 continues on the next page

6 (b) Explain how the properties of DDT and PCBs caused such serious environmental problems.

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(7 marks)

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7 The photograph shows in-stream tidal turbines before installation. An advantage of these turbines over a tidal barrage is that they do not alter water turbidity.

Describe an experiment to investigate the relationship between the turbidity of water and the penetration of light through water.

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(5 marks)

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Turn over ▸

8 Write an essay on **one** of the following topics. Credit will be given for your understanding of the relationship between different areas of the subject, also for the organisation and presentation of the essay and for grammar, punctuation and spelling.

EITHER

8 (a) Discuss the difficulties involved in changing from a society powered by non-renewable energy resources to one powered by renewable energy resources. *(20 marks)*

OR

8 (b) Discuss the different ways in which legislation may be used to control pollution. *(20 marks)*

OR

8 (c) Discuss the ways in which changes in the exploitation of energy may reduce pollution. *(20 marks)*

Write the number of the question you have chosen in the box below.

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(20 marks)

Extra space for Question 8.....

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END OF QUESTIONS