Version 1.1

Surname		Other Names	
Centre Number			Candidate Number	
Candidate Signature			

For Examiner's Use

General Certificate of Education
SPECIMEN UNIT
Advanced Level Examination

ASSESSMENT and QUALIFICATIONS ALLIANCE

ENVIRONMENTAL STUDIES **ENVS3**
Unit 3 Energy Resources and Environmental Pollution

Date and Time

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

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

Time allowed: 1 hour and 30 minutes

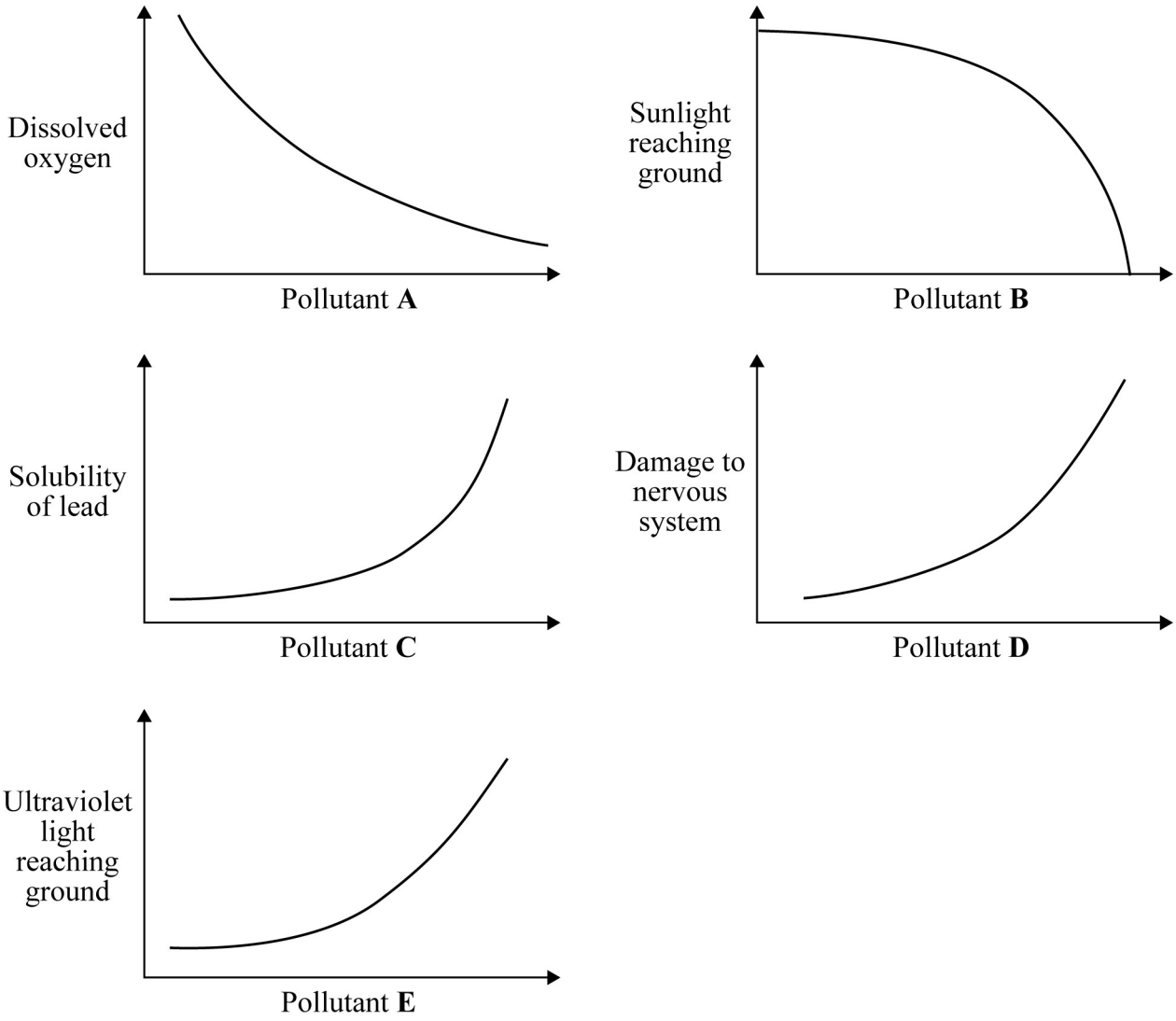
Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Answers written in margins or on blank pages will not be marked.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The maximum mark for this paper is 80.
- The marks for questions are shown in brackets.
- You are reminded of the need for good English, clear presentation and appropriate use of specialist vocabulary.
  Question 8 should be answered in continuous prose. Quality of Written Communication will be assessed in this answer.
- This unit assesses your understanding of the relationship between the different aspects of the relationship between the different aspects of Environmental Science.

The specimen assessment materials are provided to give centres a reasonable idea of the general shape and character of the planned question papers and mark schemes in advance of the first operational exams.

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

1 The graphs illustrate the properties of selected pollutants.



Suggest pollutants which show the properties illustrated by each graph.

Pollutant **A** .....

Pollutant **B**.....

Pollutant **C** .....

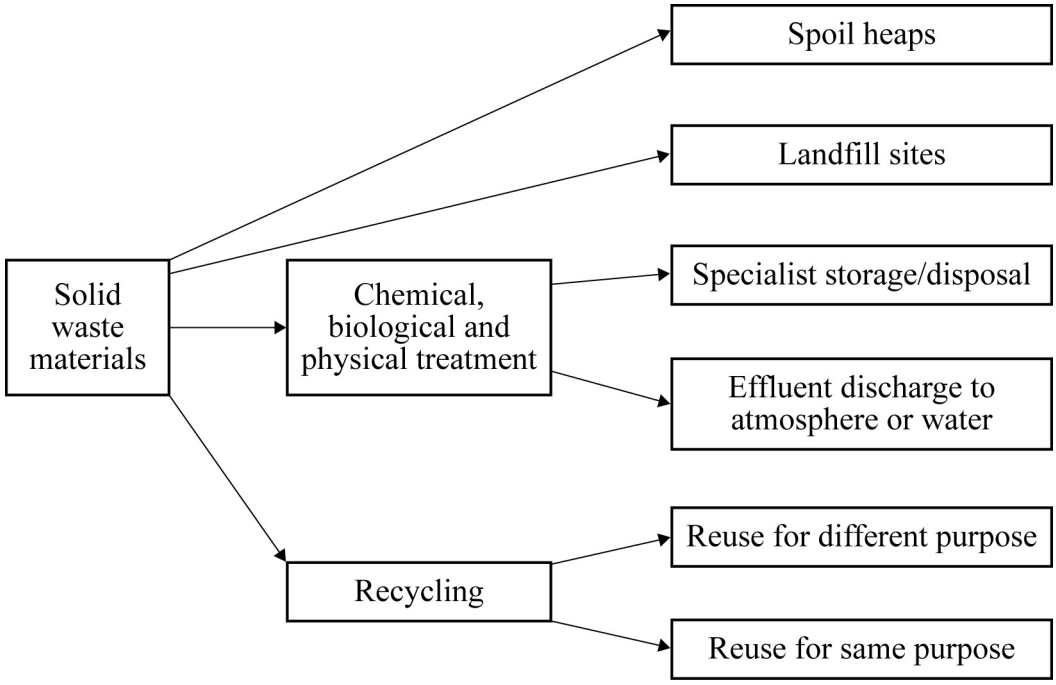
Pollutant **D** .....

Pollutant **E** .....

(5 marks)

5

2 The diagram shows some of the methods used to deal with solid wastes.



2 (a) Outline **one** named strategy that is used by the UK Government to reduce the amount of waste disposal using landfill sites.

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(1 mark)

2 (b) Outline **two** ways in which solid wastes may be used as energy resources.

1 .....

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2 .....

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(4 marks)

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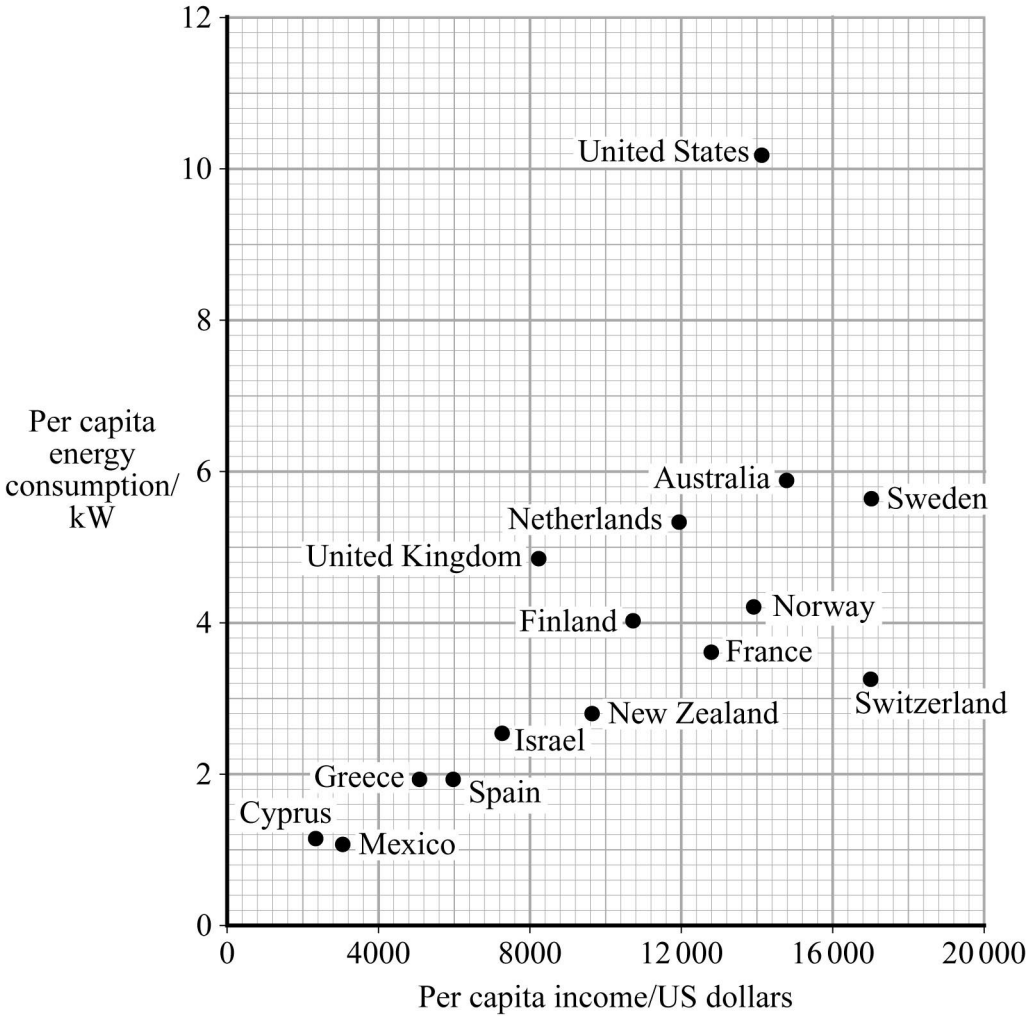
3 The per capita energy consumption in a country is affected by its level of affluence.

3 (a) The graph shows the relationship between income and energy consumption in a range of countries.



3 (a) (i) Describe the trend shown in the graph.

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(1 mark)

3 (a) (ii) Suggest why some countries have a position on the graph which is well away from the general trend.

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(4 marks)

3 (b) Explain how the level of energy use in more wealthy countries can have an impact on the development and environment of less wealthy countries.

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(5 marks)

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4 (a) Extraction and transport of fossil fuels can be a major cause of environmental damage.

Compare the environmental impacts of open-cast and deep mining for coal.

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(4 marks)

4 (b) Some pollution impacts are immediate such as when seabirds drown after being covered in oil.

Describe other ways in which a crude oil spill in the sea may affect seabirds.

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(2 marks)

4 (c) The number of oil fields that need to be exploited can be reduced if extraction efficiency is increased.

Outline **two** techniques which may be used to continue crude oil production when the natural pressure of primary recovery in the oilfield has declined.

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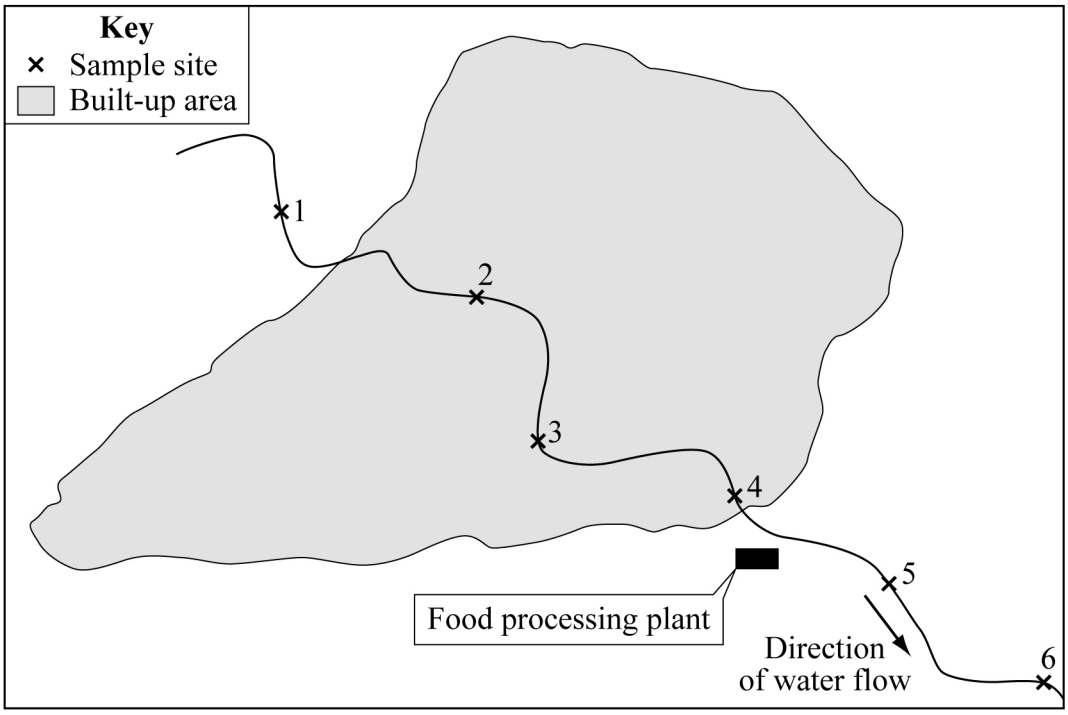
(4 marks)

10

Turn over for the next question

5 A student investigated whether discharges from a food processing plant was responsible for a series of fish deaths in a river. Water tests were taken at 6 points spaced at 500 m intervals along the stretch of the river shown on the map. The water samples were tested for dissolved oxygen content and Biochemical Oxygen Demand (BOD).



5 (a) Describe a method that could be used to measure *Biochemical Oxygen Demand (BOD)*.

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(3 marks)

5 (b) Describe precautions that should have been taken in the water sampling procedure that would have ensured a fair test.

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(4 marks)

The student's results are shown in the Table.

	Sample Site					
	1	**2**	**3**	**4**	**5**	**6**
Dissolved oxygen / % saturation	86	84	85	56	48	60
Biochemical Oxygen Demand / mg l^{-1}	0.8	1.2	1.2	11.6	12.5	11.4

5 (c) What do the results suggest about the source of the effluents that have caused the fish deaths?

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(1 mark)

5 (d) The food processing plant is permitted to release carefully controlled quantities of waste into the river.

Suggest why the permitted releases of waste are lower in summer than in winter.

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(2 marks)

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6 A student investigated the effect of acid rain on seed germination. Covered trays, each containing pea seeds on damp filter paper, were watered with a range of solutions. Every two days, the student recorded the number of seeds which had germinated. The student's recordings are shown in the table.

	Tray 1	**Tray 2**	**Tray 3**	**Tray 4**
Number of seeds	42	47	42	60
Watering solution	Water only (control) pH 7.0	Dilute sulfuric acid pH 4.0	Dilute nitric acid pH 3.5	Dilute sulfuric and nitric acid pH 4
Number of seeds germinated				
Day 1	0	0	0	0
Day 3	0	0	0	0
Day 5	3	0	0	0
Day 7	38	10	19	6
Day 9	38	37	34	12

6 (a) Suggest **three** ways in which the student's experimental design might have been improved.

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(3 marks)

6 (b) Comment on the student's conclusion that **Tray 4** illustrates synergistic action.

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(2 marks)

6 (c) Describe the direct and indirect effects of acid rain on living organisms.

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(5 marks)

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Turn over for the next question

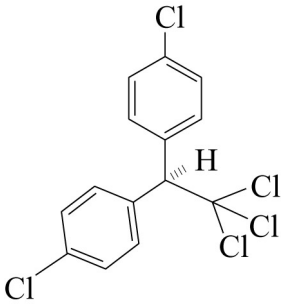
7 Read the article and then answer the questions that follow.

Pesticides as Pollutants

Understanding the properties of a pollutant is vital as these determine how it moves through the environment and its potential threat to living organisms. If a pollutant is short lived, it may be broken down before it can become dangerous. If it is not mobile, it will stay in one place and is unlikely to be taken up by organisms. Water-soluble pollutants, even if ingested, may do little harm before they are excreted. Pollutants that are liposoluble, however, may be retained for a long time. This is a huge problem if the pollutant then exerts a biological effect.

Consider DDT (**Figure 1**), which was the first pesticide to be used extensively. DDT is an example of a chlorinated hydrocarbon pesticide. In the 1940s in the USA, it was widely used to try to kill mosquitoes.

Figure 1



The key properties of chlorinated pesticides are that they are persistent, liposoluble and have biological effects. They accumulate in fatty tissue, biomagnify up the food chain and their breakdown products, for example, DDE, kill top predators such as peregrine falcons and bald eagles.

DDT has an environmental half-life of 15 years. So, 100 years after was field was sprayed to kill insects, DDT will still remain in the soil. Since the 1940s, it is estimated that 2.6 million tonnes of DDT have been applied.

Modern pesticides must be capable of being broken down rapidly in the environment by bacteria, fungi and algae. Some pesticides are structurally similar to the normal energy sources of bacteria, ie sugars, amino acids and aliphatic alcohols, and they are rapidly used as an energy source. Sometimes, the bacteria become adapted to pesticides by making enzymes to break them down. Consequently, the rate of breakdown rapidly increases. This ability is retained, making future applications of the pesticide less effective. Thus, there is a trade-off between environmental safety and profitability.

7 (a) Explain how the top predators received doses of DDT far higher than those applied.

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(4 marks)

7 (b) Suggest how the effectiveness of a pesticide is likely to be affected by its prolonged use.

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(2 marks)

7 (c) A scientist measured DDT concentrations in soil samples taken from an area sprayed exactly 30 years earlier.

7 (c) (i) Use the degradability of DDT to estimate the proportion of the original application that would be expected to be in the soil after 30 years.

Proportion =

(1 mark)

LEAVE MARGIN BLANK

7 (c) (ii) Explain why the actual concentration may differ from this proportion.

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(3 marks)

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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 and also for the organisation and presentation of the essay and use of grammar, punctuation and spelling.

EITHER **8** (a) Discuss the ways in which energy conservation would reduce environmental damage.

(20 marks)

OR **8** (b) Discuss how educational, legal, economic and technological strategies can be used to reduce pollution.

(20 marks)

OR **8** (c) Discuss how the risks of ionising pollution can be reduced by good industrial safety procedures and monitoring of people and the environment.

(20 marks)

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(20 marks)

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END OF QUESTIONS

There are no questions printed on this page

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