AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

A-level
ENVIRONMENTAL STUDIES

Unit 3 Energy Resources and Environmental Pollution

Monday 13 June 2016 Morning Time allowed: 1 hour 30 minutes

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

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 7 should be answered in continuous prose.
  Quality of Written Communication will be assessed in this answer.

There are no questions printed on this page

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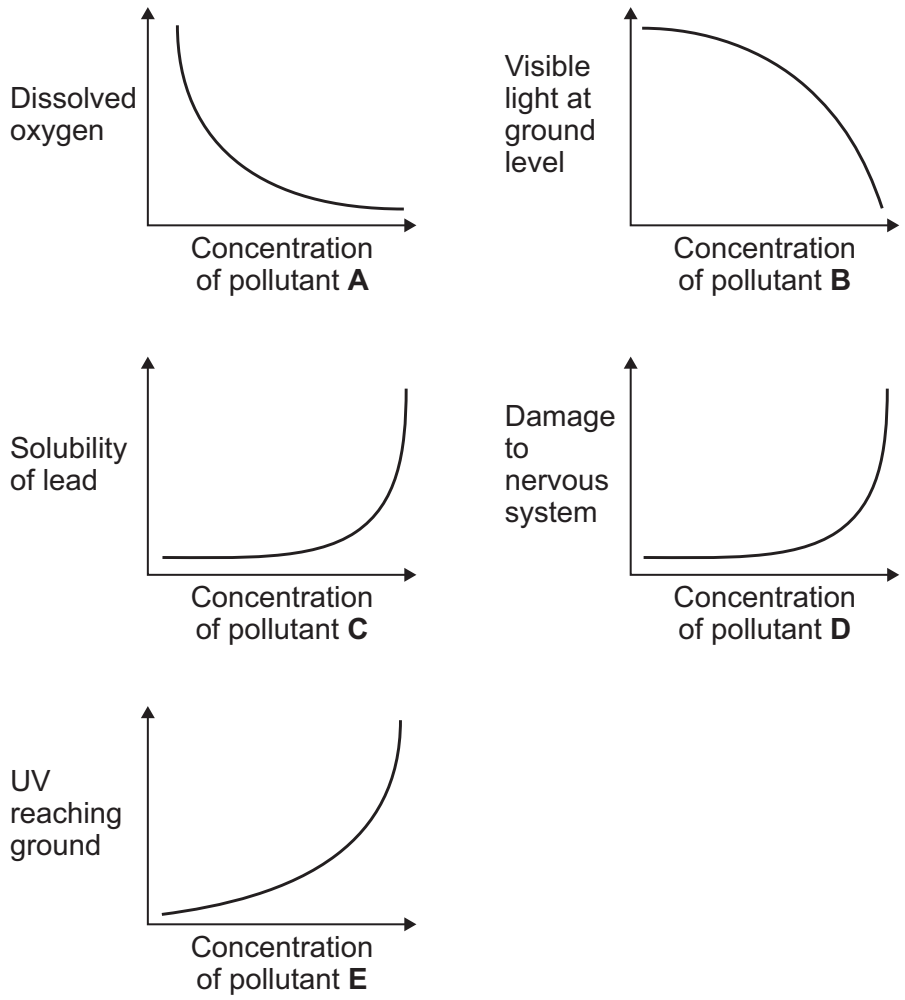
ANSWER IN THE SPACES PROVIDED

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

1 **Figure 1** illustrates the properties of selected pollutants.

Figure 1



Suggest names of pollutants that have the properties shown by each graph in **Figure 1**.

[5 marks]

Pollutant **A** _____

Pollutant **B** _____

Pollutant **C** _____

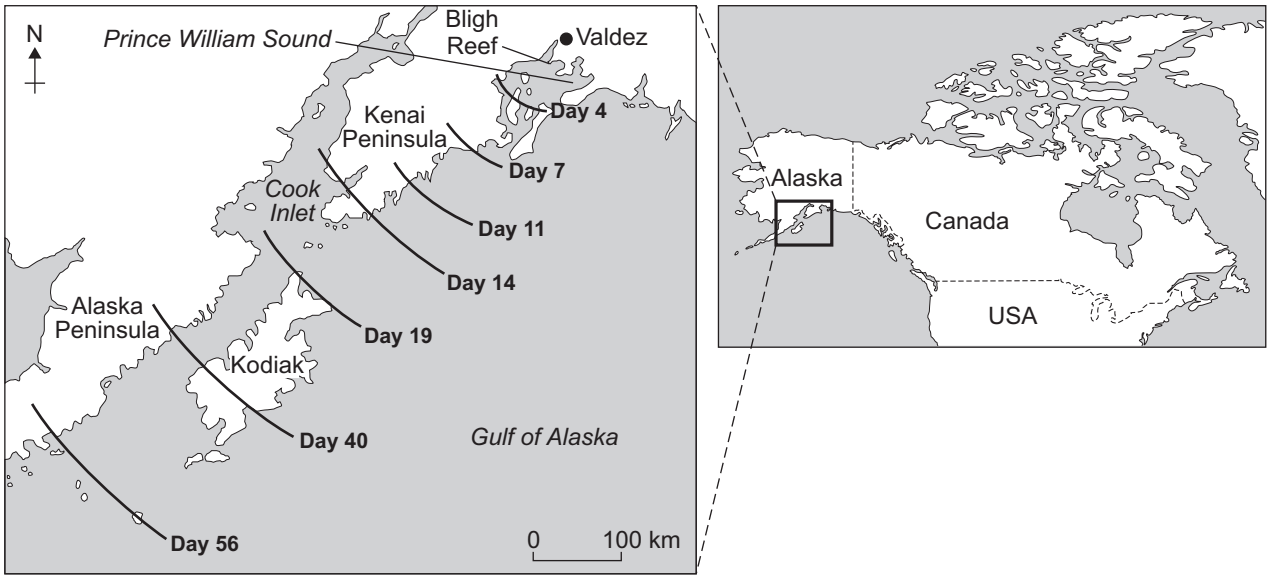
Pollutant **D** _____

Pollutant **E** _____

5

2 **Figure 2** shows a map of the area around the site of the 1989 Exxon Valdez oil spill. The spill affected over 2000 km of coastline and killed over 300 000 birds and 2600 sea otters.

Figure 2



2 (a) Explain how oil pollution may harm organisms even if they do not come in contact with the oil.

[2 marks]

2 (b) A study was carried out to investigate the effects on marine organisms of two different types of oil.

Table 1 shows mean mortality rates for five marine taxa when exposed to the two different types of oil.

Table 1

	Oil 560X		Oil 1100T	
Taxon	**Mean mortality / %**	**Standard deviation**	**Mean mortality / %**	**Standard deviation**
Dragonet fish	50.0	18.3	41.0	16.1
Sea squirt	3.0	5.5	38.0	11.4
Mantis shrimp	40.0	4.1	82.0	5.3
Bivalve mollusc *Anadara* sp.	5.5	3.5	1.5	3.4
Bivalve mollusc *Paphia* sp.	46.0	13.0	45.0	12.7

2 (b) (i) Use the data from **Table 1** to identify the taxon where the difference in the effect of the two oils is **most** statistically significant.

[1 mark]

_____

2 (b) (ii) Use the data from **Table 1** to identify the taxon where the difference in the effect of the two oils is **least** statistically significant.

[1 mark]

_____

Question 2 continues on the next page

2 (c) Describe how the risk of oil pollution from oil tankers may be reduced.

[6 marks]

10

Turn over for the next question

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3 The problems caused by pollutants are often the consequence of more than one property.

3 (a) Explain how the liposolubility of a named chemical may affect its ability to cause biomagnification.

[2 marks]

3 (b) Explain the similarity and difference between **mutagenicity** and **teratogenicity**.

[2 marks]

Similarity

Difference

3 (c) Describe the procedures involved in **Critical Group Monitoring** in order to control pollution.

[2 marks]

3 (d) Explain how features of the environment may affect the dispersal of atmospheric pollutants.

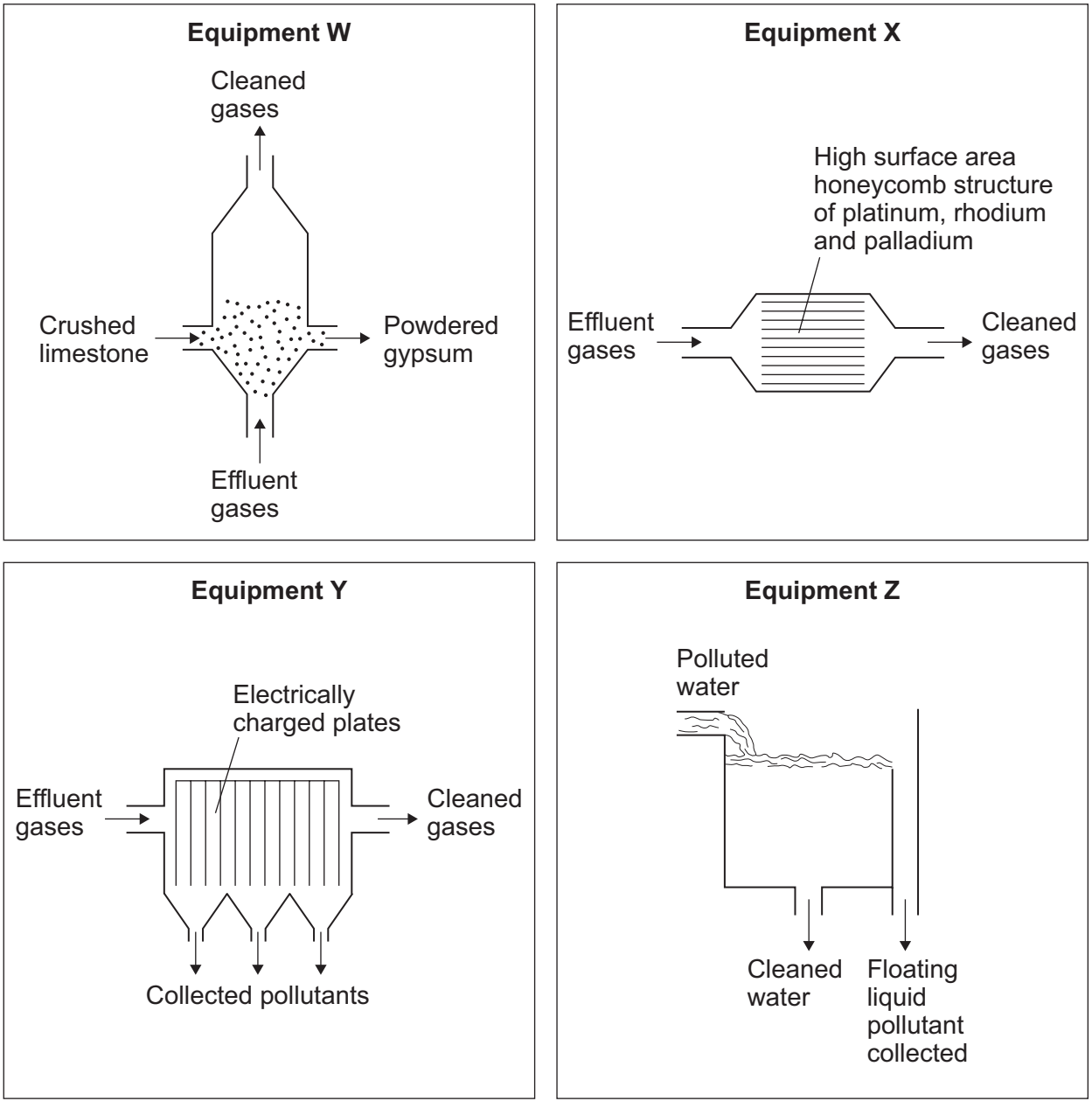
[4 marks]

10

Turn over for the next question

4 (a) **Figure 3** shows equipment used to control pollution.

Figure 3



Suggest **one** pollutant that is controlled by each piece of equipment **W**, **X**, **Y** and **Z**.

[4 marks]

Equipment **W** _____

Equipment **X** _____

Equipment **Y** _____

Equipment **Z** _____

4 (b) Various laws and taxes have been used to control atmospheric pollution.

Which atmospheric pollutant is controlled by Landfill Tax?

[1 mark]

Tick (✓) **one** box.

- Methane ☐
- Ozone ☐
- Peroxy acetyl nitrates (PANs) ☐
- Smoke (SPM) ☐
- Sulfur trioxide ☐

4 (c) Use tropospheric ozone to explain the meaning of secondary pollutant.

[2 marks]

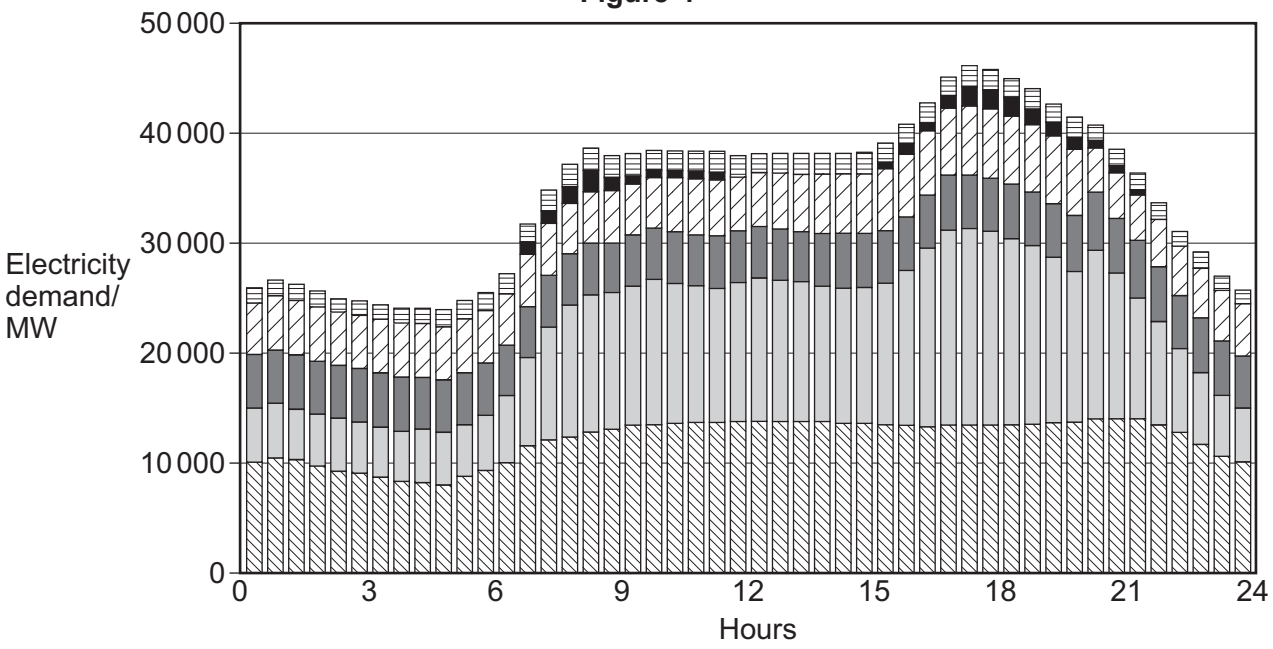
4 (d) Explain how tropospheric ozone increases the problems caused by acid rain.

[3 marks]

10

5 **Figure 4** shows the demand for electricity over a 24-hour period in the UK and the methods used to meet demand.

Figure 4



Key

- Coal
- Combined-cycle gas turbines
- Nuclear
- Wind
- Pumped storage HEP
- Other

5 (a) Describe how the amount of electricity generated by nuclear and combined-cycle gas turbines changed over the 24-hour period.

[2 marks]

Nuclear _____

_____

Combined-cycle gas turbines _____

_____

5 (b) Explain how peak shaving is used to reduce energy losses in the electricity supply industry.

[2 marks]

_____

_____

_____

_____

5 (c) Ffestiniog Pumped Storage HEP station in Wales can generate 360 MW for six hours. Four 75 MW pumps then run for 9.5 hours to refill the upper reservoir.

Calculate the overall efficiency of the station.
Show your working.

[2 marks]

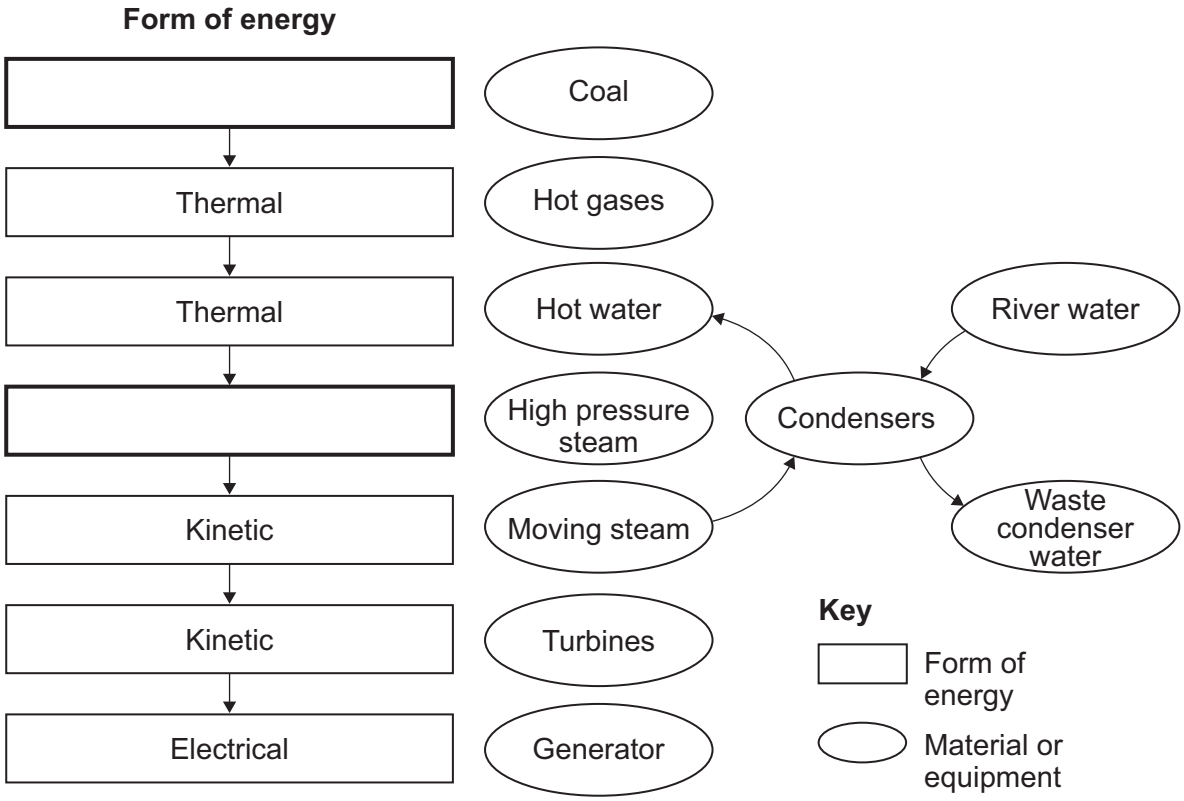
Efficiency = _____ %

5 (d) **Figure 5** shows the energy conversions and processes in a coal-fired power station.

Complete **Figure 5** by adding the missing forms of energy.

[2 marks]

Figure 5



Question 5 continues on the next page

5 (e) Explain how the waste water from the condensers may be used to increase the overall efficiency of a coal-fired power station.

[2 marks]

_____

_____

_____

_____

10

Turn over for the next question

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6 Read the passage below.

Reducing the energy used over the lifetime of a house involves a variety of strategies. These include the selection of the construction materials used, choice of the appliances installed and control of the behaviour of the occupants.

The design can avoid the use of materials with high embodied energy, such as concrete.

However, materials with disadvantages may also have advantages. Although concrete has a high carbon footprint, it also has a high heat capacity so it forms a good heat store, which can be used to reduce additional heating requirements during colder weather.

The use of renewable resources such as wood, during construction, can reduce the environmental impact as it can be carbon-neutral. However, although a material may be renewable, it can still be depleted if it is exploited unsustainably.

The outer structure of the house may be made of a material with a low thermal conductivity, which will reduce the energy needed for space heating. Different materials can be used for roofs, walls, floors and windows.

Once construction is complete, a range of low-energy appliances can be installed.

Although the construction of the house and the appliances used may be planned to reduce energy use, the behaviour of the residents is also important. An awareness of the need to conserve energy can result in energy savings by careful actions.

As well as reducing energy demand, a house can be designed to maximise the capture of energy by passive solar architecture.

Use information in the passage and your own knowledge to answer the questions that follow.

6 (a) Suggest how the embodied energy of materials may affect their environmental impact.

[2 marks]

6 (b) Explain how energy loss through walls may be reduced.

[2 marks]

6 (c) Explain the difference between a resource that is renewable and one that is non-depletable.

[2 marks]

6 (d) Explain how the use of a named low-energy appliance reduces energy use.

[2 marks]

Question 6 continues on the next page

6 (e) Suggest how **two** changes in occupant behaviour may produce major reductions in the amount of energy used by a typical household.

[2 marks]

6 (f) Describe a method to investigate the relationship between the volume of a container and the rate of heat loss.

[5 marks]

15

7 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.

You should answer this question in continuous prose.

Either

7 (a) Discuss the ways in which new and improved technologies will enable renewable resources to provide more energy.

[20 marks]

or

7 (b) Discuss the similarities and differences in the environmental impact of the use of renewable and non-renewable energy resources.

[20 marks]

or

7 (c) Describe the methods that are used to control the aquatic pollution caused by inorganic and organic nutrients.

[20 marks]

Which question have you chosen?

Tick (✓) **one** box.

7 (a) ☐

7 (b) ☐

7 (c) ☐

Extra space for Question 7

20

END OF QUESTIONS

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