Q1. Three energy sources used to generate electricity are given in **List A**.
Statements about the energy sources used to generate electricity are given in **List B**.

Draw **one** line from each energy source in **List A** to the statement about the energy source in **List B**.

List A **Energy source**	**List B** **Statement about energy source**
	Uses energy from falling water
Geothermal	
	Uses energy from inside the Earth
Hydroelectric	
	Is unpredictable
Nuclear	
	Produces dangerous waste

(Total 3 marks)

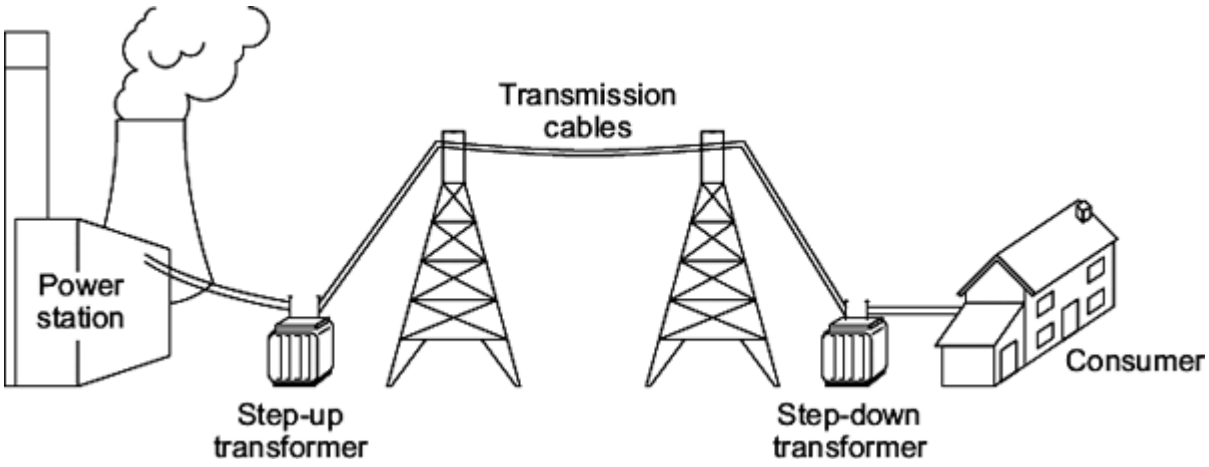
Q2. In the UK, most electricity is generated in power stations that burn fossil fuels.

(a) Which type of fossil fuel power station has the shortest start-up time?

.....

(1)

(b) The diagram shows how electricity is distributed around the UK.



(i) Which of the parts labelled in the diagram form the National Grid?

.....

(1)

(ii) A step-up transformer is used near the power station.

Draw a ring around the correct answer in each box to complete each sentence.

A step-up transformer increases the

current.
power.
voltage.

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Using a step-up transformer makes the distribution of electricity

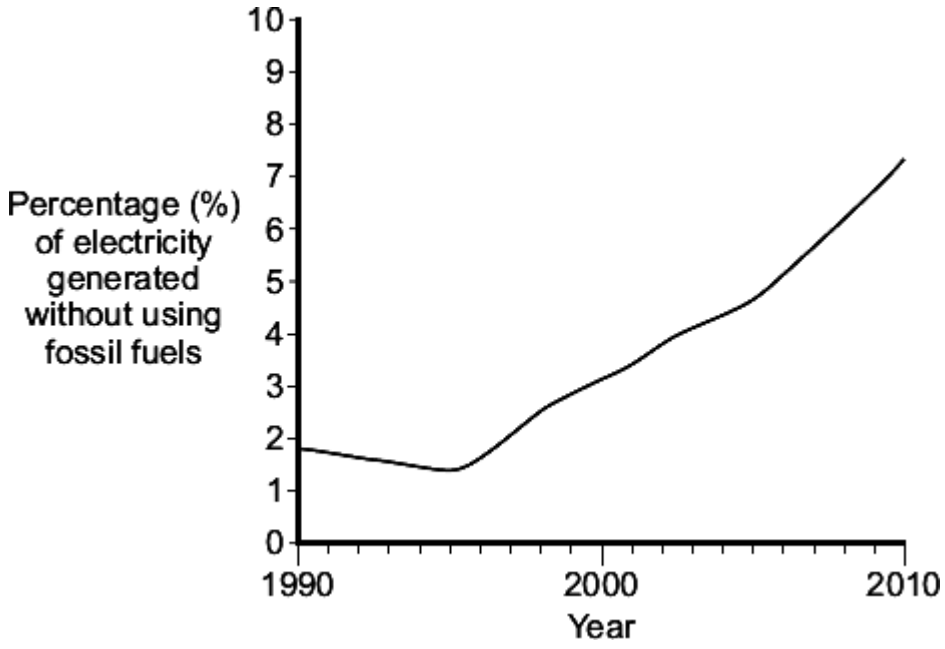
ess dangerous.
more efficient.
work faster.

style='height:0.10pt'>

(2)

(c) Electricity in the UK is also generated without using fossil fuels.

The graph shows how the percentage of electricity generated in the UK without using fossil fuels changed between 1990 and 2010.



What does the data in the graph suggest will probably happen to the percentage of electricity generated in the UK without using fossil fuels over the next 10 years?

.....

.....

(1)

(Total 5 marks)

Q3. The world's biggest offshore wind farm, built off the Kent coast, started generating electricity in September 2010.

(a) One advantage of using the wind to generate electricity is that it is a renewable energy source.

(i) Give **one** other advantage of using the wind to generate electricity.

.....

.....

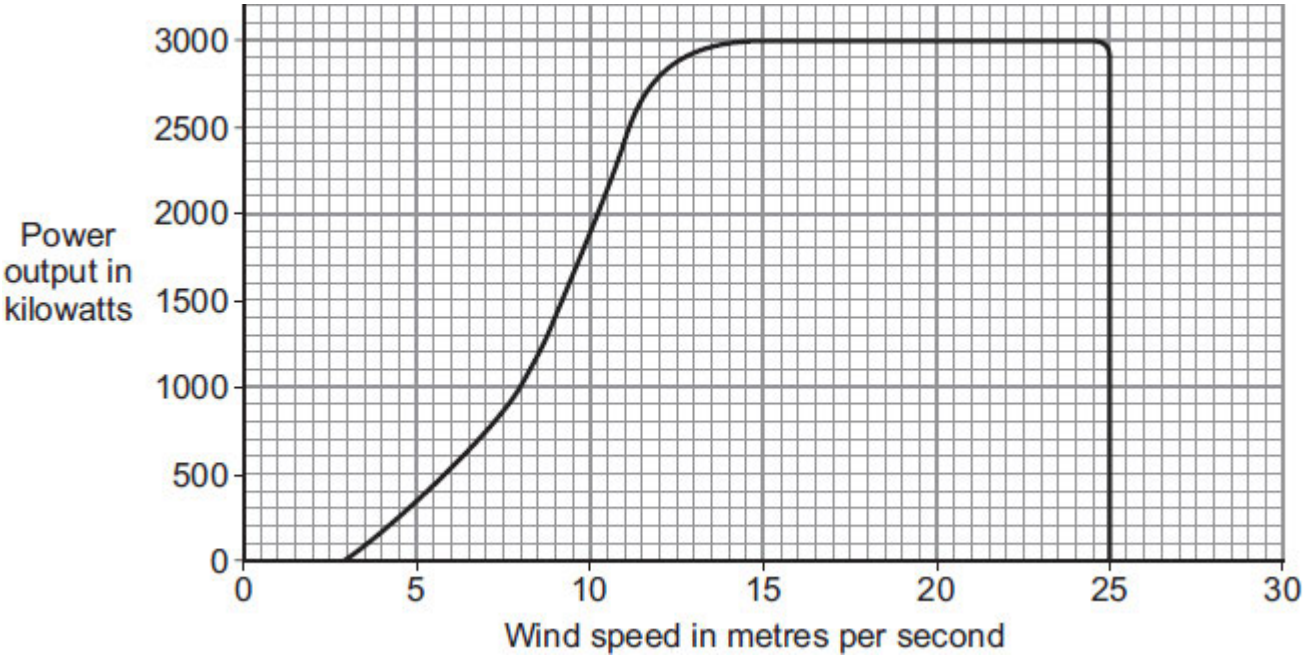
(1)

(ii) Name **one** other renewable energy source used to generate electricity.

.....

(1)

(b) The graph shows how wind speed affects the power output from a large wind turbine.



(i) What is the maximum possible power output from this wind turbine?

.....

(1)

(ii) Read this part of a newspaper article.

Cold weather stops wind turbines

For the past two weeks, most of the UK's wind turbines have been generating less than one sixth of their maximum power output. To avoid major power cuts in the future, some experts have said that more nuclear power stations need to be built to provide a reliable source of energy.

Use the graph to explain why the power output from the wind turbines was less than one sixth of the maximum.

.....

.....

.....

.....

(2)

(iii) Having more nuclear power stations will help to avoid power cuts in the future.

Which **two** of these reasons explain why?

Put a tick (✓) in the boxes next to your answers.

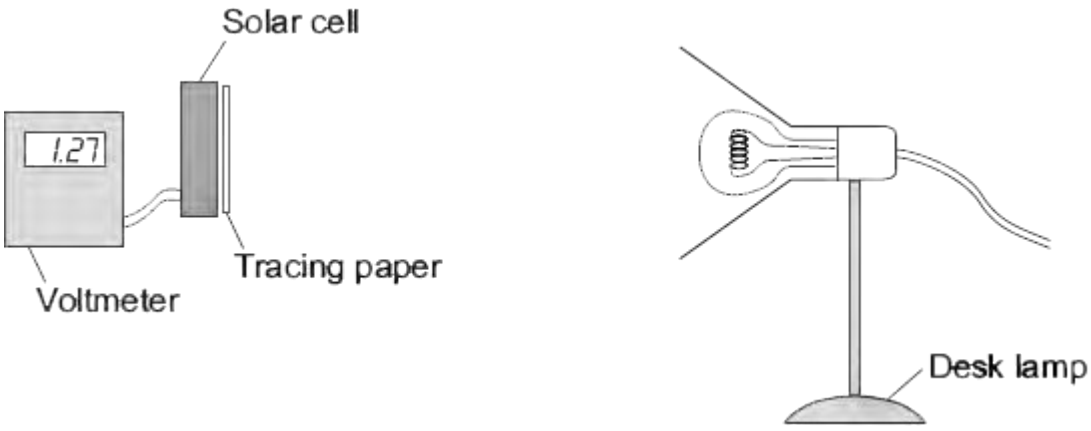
☐ The radioactive waste produced must be stored for many years.

☐ Nuclear power stations do not depend on the weather to generate electricity.

(1)
(Total 6 marks)

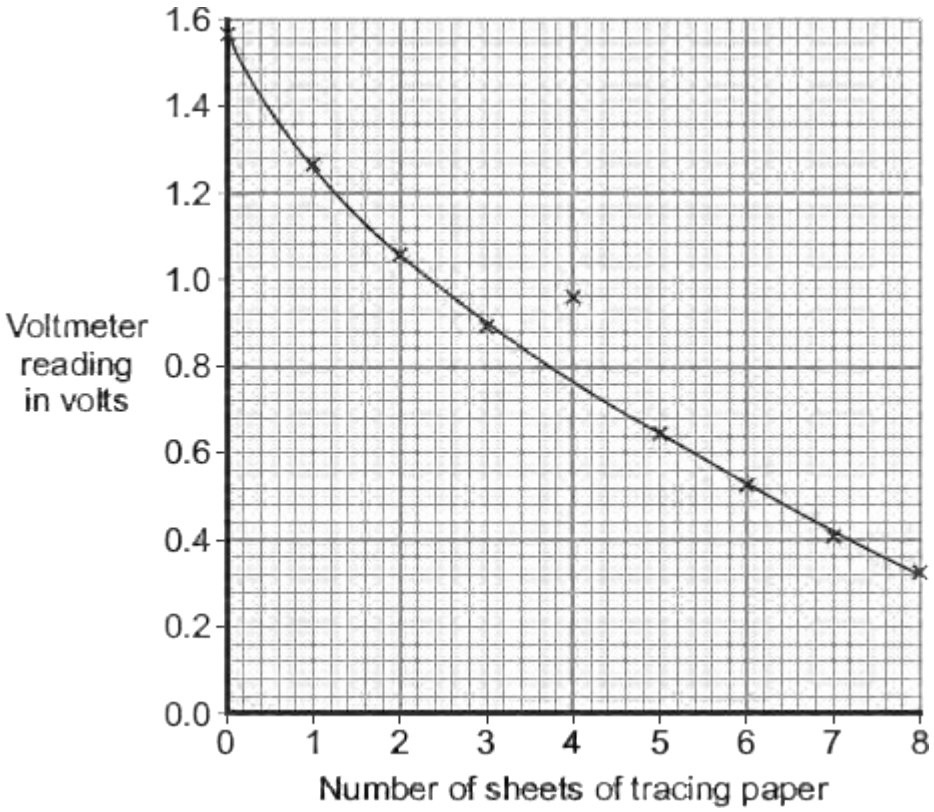
Q4. A student has read that a solar cell with a dirty surface will not work as well as a solar cell with a clean surface.

To test the effect of a dirty surface on a solar cell, the student set up the following equipment.



The student put the desk lamp a fixed distance from the solar cell. To represent the effect of a dirty surface, the student covered the surface of the solar cell with pieces of tracing paper. Each time the student added a piece of paper, she measured the output voltage of the solar cell.

(a) The results taken by the student have been used to draw the graph below.



(i) One of the results seems to be anomalous.

Draw a ring around the anomalous data point on the graph.

(1)

(ii) The larger the number of sheets of tracing paper used, the lower the intensity of the light reaching the solar cell.

Draw a ring around the correct answer in the box to complete the sentence.

A decrease in the intensity of the light reaching the solar cell causes

a decrease in
no change to
an increase in

(1)

the output voltage from the solar cell.

(b) People can buy panels of solar cells to generate electricity for their homes.Any surplus electricity can be sold to the electricity supply company.

(i) Give **one** environmental advantage of generating electricity using solar cells rather than generating electricity in a coal-burning power station.

.....

.....

(1)

(ii) A homeowner pays £7600 to have solar panels fitted on the roof of their house.
The homeowner expects to save £950 each year from reduced energy bills and from selling the electricity.

Assuming these figures to be correct, calculate the pay-back time for the solar panels.

Show clearly how you work out your answer.

.....

.....

.....

Pay-back time = ... years

(2)

(iii) Draw a ring around the correct answer in the box to complete the sentence.

Allowing the surface of the solar panels to become very dirty will

decrease
not change
ncrease

the pay-back time.

(1)

(iv) Explain your answer to part (b)(iii).

.....

.....

.....

.....

(2)

(Total 8 marks)

Q5. Electricity is generated in power stations. It is then sent to all parts of the country through a network of cables.

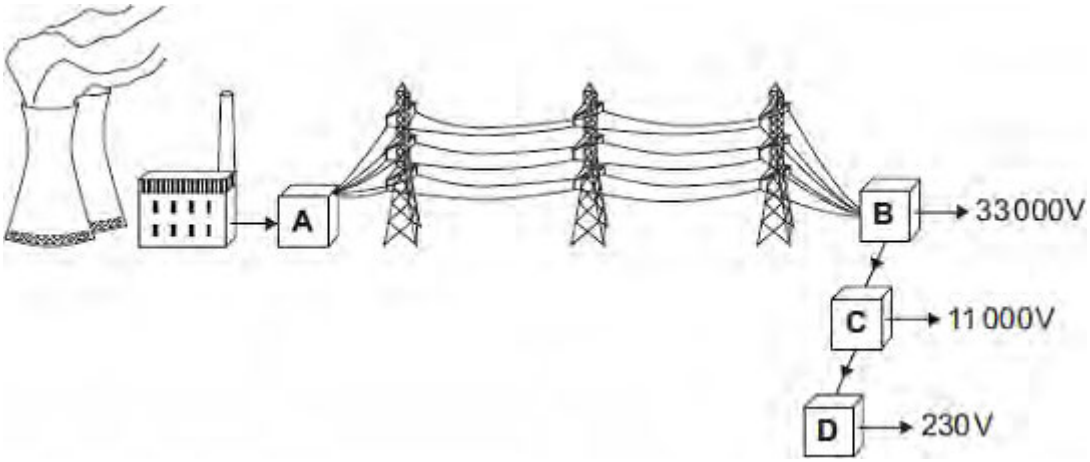
(a) Complete the following sentence by using **one** of the words in the box.

Grid	**Power**	**Supply**

The network is called the National ..... .

(1)

(b) In the diagram, **A**, **B**, **C** and **D** are transformers.



(i) Which transformer, **A**,**B**,**C** or **D**, is a step-up transformer?

Transformer .....

(1)

(ii) Which transformer, **A**, **B**, **C** or **D** will supply homes, offices and shops?

Transformer .....

(1)

(c) Complete the following sentence by drawing a ring around the correct line in the box.

In a step-up transformer, the potential difference (p.d.) across the

primary coil is

less than
the same as
more than

the p.d. across the secondary coil.

(1)
(Total 4 marks)

Q6. Wind and tides are energy sources that are used to generate electricity.

(a) Complete each sentence by putting a tick (✓) in the box next to the correct answer.

(i) The wind is

a non-renewable energy source. ☐

a constant energy source. ☐

an unreliable energy source. ☐

(1)

(ii) The tides are

a renewable energy source. ☐

a constant energy source. ☐

an unreliable energy source. ☐

(1)

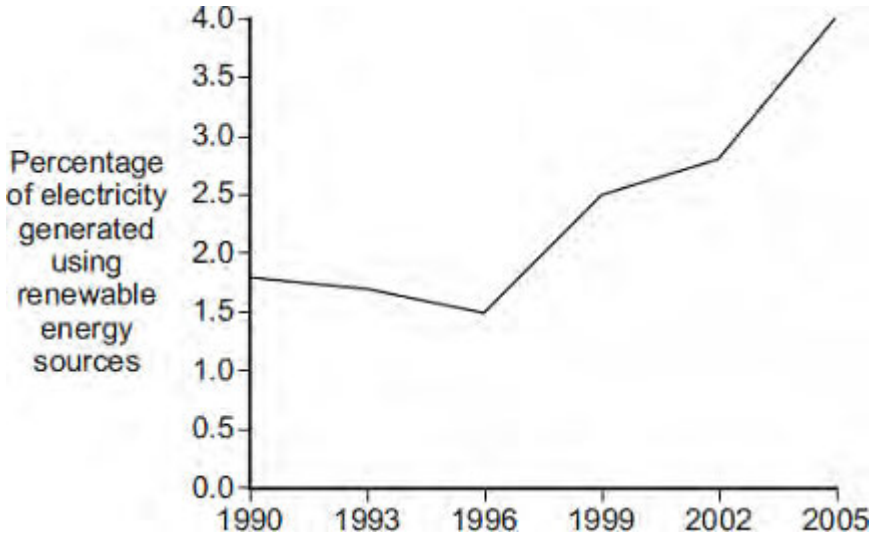
(b) If wood is to be used as a renewable energy source, what must be done each time a tree is chopped down?

.....

.....

(1)

(c) In the UK, electricity is generated using renewable and non-renewable energy sources. The graph shows the percentage of electricity generated using renewable energy sources between 1990 and 2005.



Complete the following sentence by drawing a ring around the correct answer in the box.

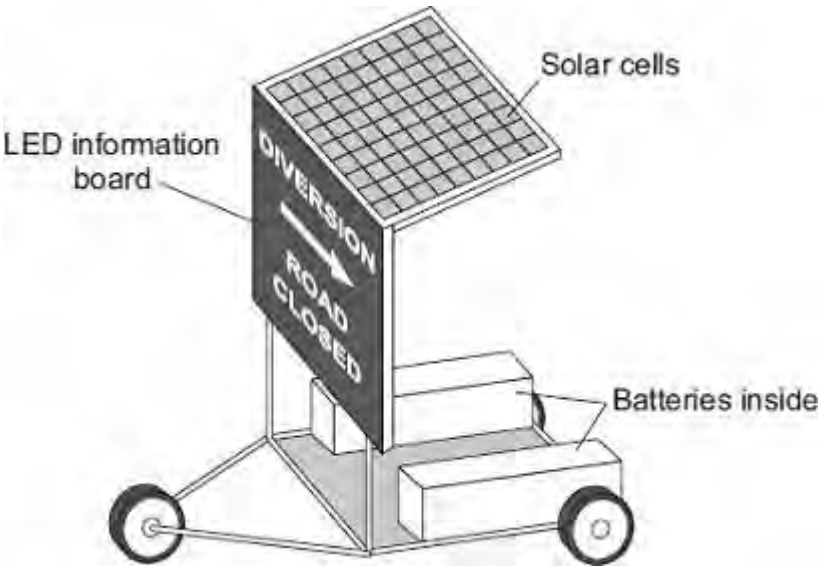
In 2015, the percentage of electricity generated using renewable energy sources

is most likely to be

greater than 4 %.
equal to 4 %.
less than 4 %.

(1)
(Total 4 marks)

Q7. The picture shows a temporary road traffic information board.



The batteries power the LEDs used in the information board.
The solar cells keep the batteries charged.

(a) Use words from the box to complete each of the following sentences.

chemical	electrical	light	sound

The solar cells transfer light energy to ..... energy.

The batteries transfer ..... energy to electrical energy.

The LEDs transfer electrical energy to ..... energy.

(3)

(b) When the total energy input to the solar cells is 200 joules, the useful energy output from the solar cells to the batteries is 50 joules.

Calculate the efficiency of the solar cells.

.....

.....

.....

Efficiency = ...

(2)

(c) Which **one** of the following statements gives the reason for using solar cells to charge the batteries?

Tick (✓) **one** box.

Solar cells will charge the batteries day and night. ☐

The information board can be used anywhere it is needed. ☐

A small number of solar cells produce a lot of electricity. ☐

(1)
(Total 6 marks)

Q8. Energy resources can be renewable or non-renewable.

(a) Coal is a non-renewable energy resource.

Name **two** other non-renewable energy resources.

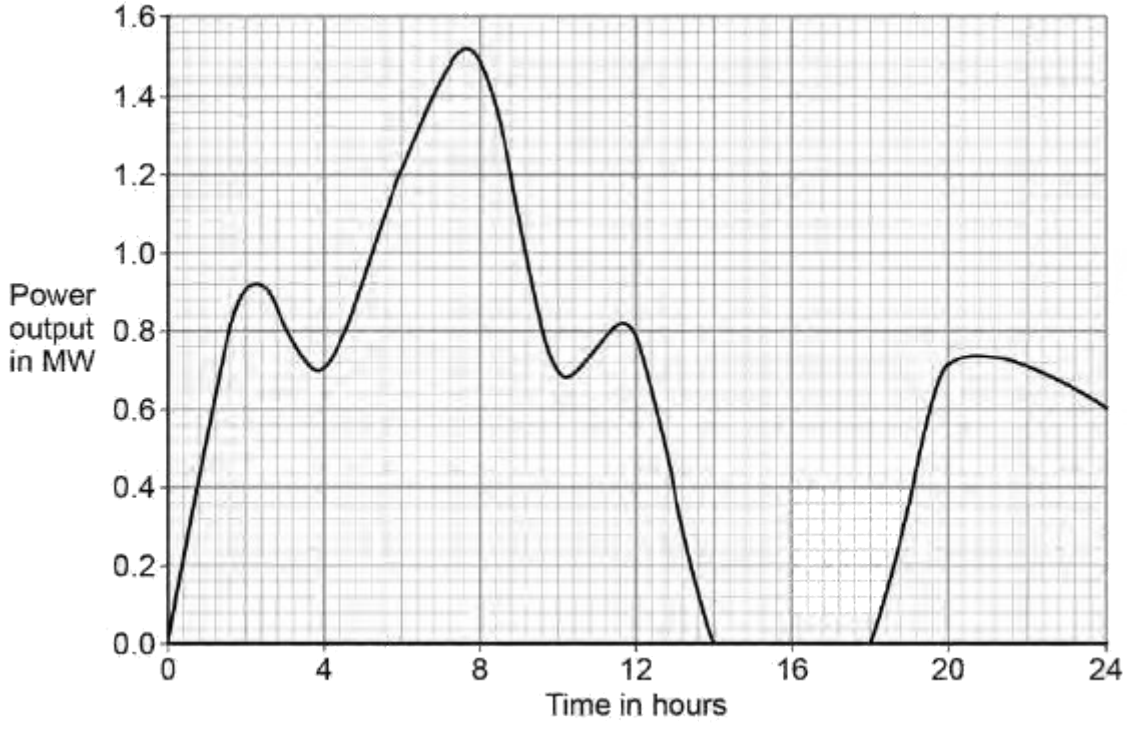
1 .....

2 .....

(2)

(b) Wind turbines are used to generate electricity.

The graph below shows how the power output of a wind turbine changes over one day.



A wind turbine does not generate electricity constantly.

For how many hours did the wind turbine generate no electricity?

.....

Time = ... hours

(1)

(c) Electrical power is transferred from power stations to the National Grid.

What is the National Grid?

Tick **one** box.

- a system of cables and pylons ☐
- a system of cables and transformers ☐
- a system of cables, transformers and power stations ☐

(1)

(d) An island has a large number of wind turbines and a coal-fired power station.

The island needs to use the electricity generated by the coal-fired power station at certain times.

Choose **one** reason why.

Tick **one** box.

- Wind is a renewable energy resource. ☐
- Wind turbine power output is constant. ☐
- The power output of wind turbines is unpredictable. ☐
- The fuel cost for wind turbines is very high. ☐

(1)

(e) A wind turbine has an average power output of 0.60 MW.

A coal-fired power station has a continuous power output of 1500 MW.

Calculate how many wind turbines would be needed to generate the same power output as one coal-fired power station.

.....

.....

Number of wind turbines = ...

(2)

(f) It is important that scientists develop new energy resources.

Choose **one** reason why.

Tick **one** box.

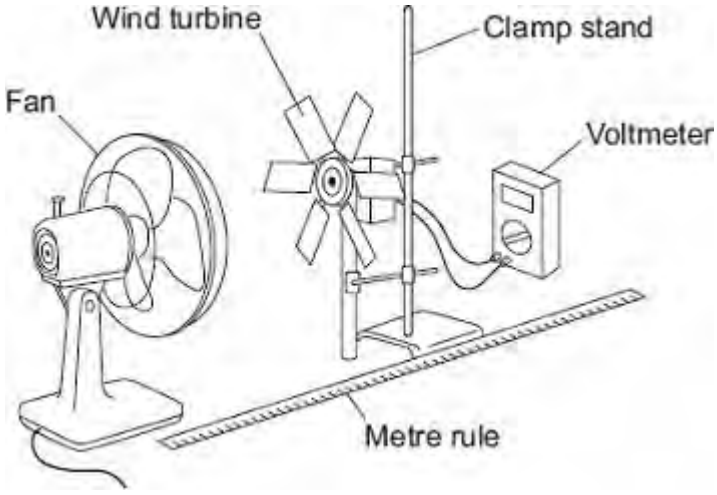
All energy resources are running out.	☐
All energy resources are used to generate electricity.	☐
Most energy resources have negative environmental effects.	☐

(1)
(Total 8 marks)

Q9.(a) A student investigated how the number of blades on a wind turbine affects the output voltage

of the turbine.

The student used the apparatus shown in the diagram.



The fan was used to turn the wind turbine.

(i) The fan was always the same distance from the wind turbine.

Why?

.....

.....

(1)

(ii) After switching the fan on, the student waited 20 seconds before taking the voltmeter reading.

Suggest why.

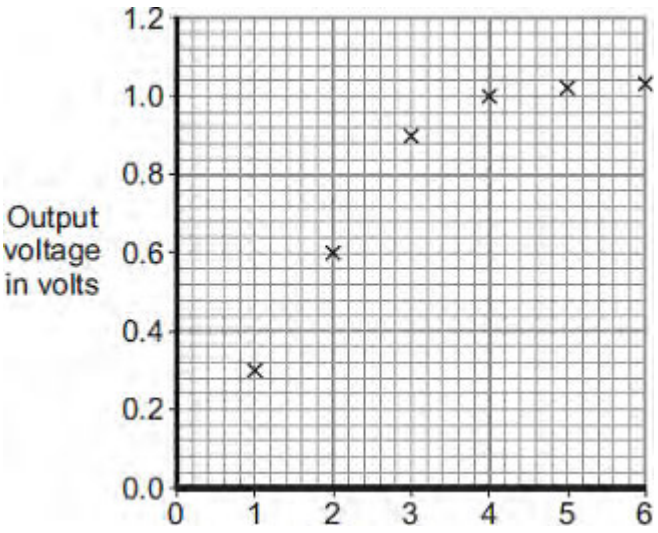
.....

.....

(1)

(iii) The student changed the number of blades on the wind turbine.

The student's results are shown in the scatter graph.



What conclusion can be made from the results in the scatter graph?

.....

.....

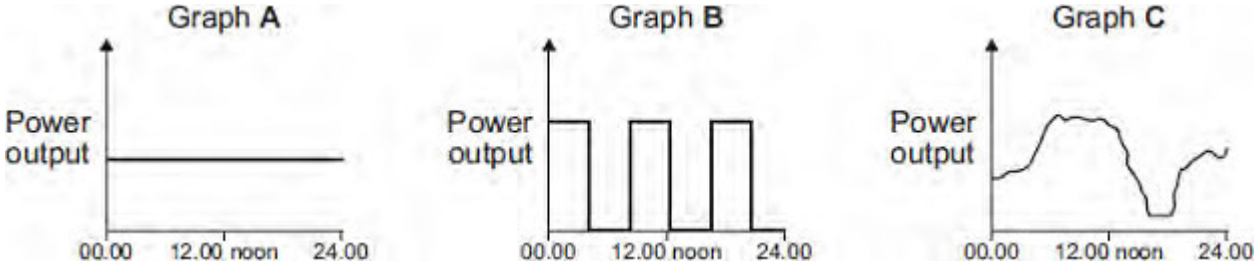
.....

.....

(2)

(b) The amount of electricity generated using wind turbines is increasing.

Which graph, **A**, **B** or **C**, is most likely to show the electrical power output from a wind turbine over one day?



Write the correct answer, **A**, **B** or **C**, in the box.

Give a reason for your answer.

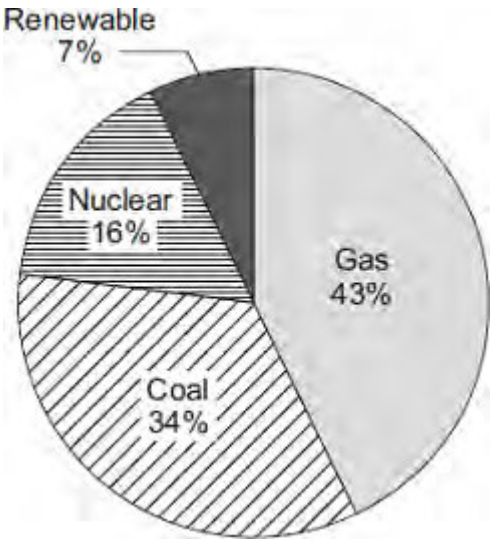
.....

.....

.....

(2)
(Total 6 marks)

Q10.(a) The pie chart shows the proportions of electricity generated in the UK from different energy sources in 2010.



(i) Calculate the percentage of electricity generated using fossil fuels.

.....

Percentage = ... %

(1)

(ii) The pie chart shows that 7% of electricity was generated using renewable energy sources.

Which **one** of the following is **not** a renewable energy source?

Tick (✓) **one** box.

Oil ☐

Solar ☐

Wind ☐

(1)

(b) Complete the following sentence.

In some types of power station, fossil fuels are burned to heat ..... to produce steam.

(1)

(c) Burning fossil fuels releases carbon dioxide into the atmosphere.

Why do many scientists think adding carbon dioxide to the atmosphere is harmful to the environment?

Tick (✓) **one** box.

Carbon dioxide is the main cause of acid rain.	☐
Carbon dioxide causes global warming.	☐
Carbon dioxide causes visual pollution.	☐

(1)
(Total 4 marks)

Q11. Iceland is a country that generates most of its electricity using geothermal power stations and hydroelectric power stations.

(a) (i) Complete the following sentences to describe how some geothermal power stations work.

In regions where volcanoes are active, the ground is hot.

Cold ..... is pumped down into the ground

and is ..... by hot rocks.

It returns to the surface as steam. The steam is used to turn a turbine.

The turbine drives a ..... to produce electricity.

(3)

(ii) Which **one** of the following statements about geothermal power stations is true?

Tick (✓) **one** box.

Geothermal power stations use fossil fuels. ☐

Geothermal power stations produce carbon dioxide. ☐

Geothermal power stations provide a reliable source of electricity. ☐

(1)

(b) What is needed for a hydroelectric power station to be able to generate electricity?

Tick (✓) **one** box.

Falling water ☐

A long coastline ☐

Lots of sunny days ☐

(1)
(Total 5 marks)