AQA GCSE PHYSICS (HIGHER) · 8463

PHYSICS



EXAM QUESTION PACK

4.1.3 NATIONAL AND GLOBAL ENERGY RESOURCES (PACK 2)

SCORE	PERCENTAGE
/223	%

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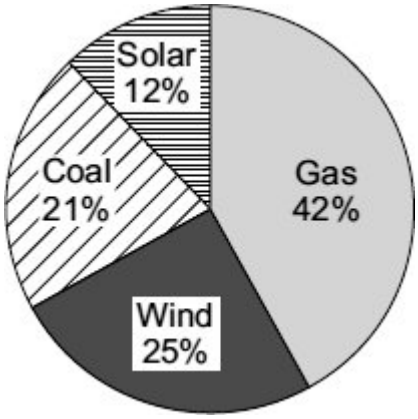
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Q1.

(a) The pie chart shows the energy sources used by one company to generate electricity.



(i) Which two energy sources used by the company do **not** produce any polluting gases?

_____ and _____

(1)

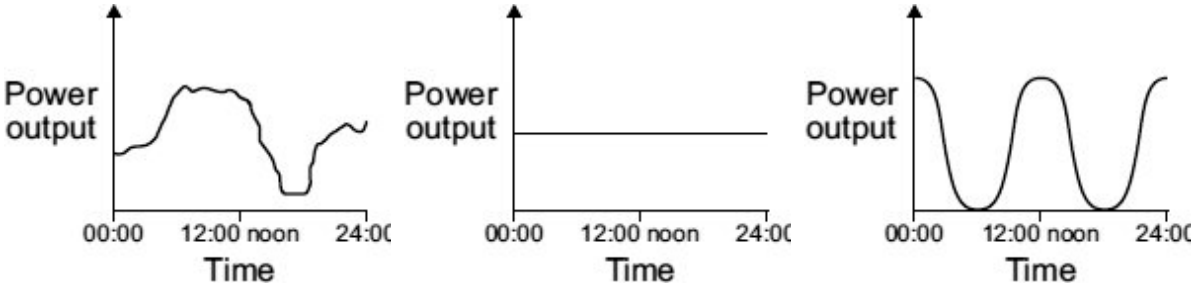
(ii) Calculate the percentage (%) of electricity that is generated using energy sources that do **not** produce any polluting gases.

Percentage = _____

(1)

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

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



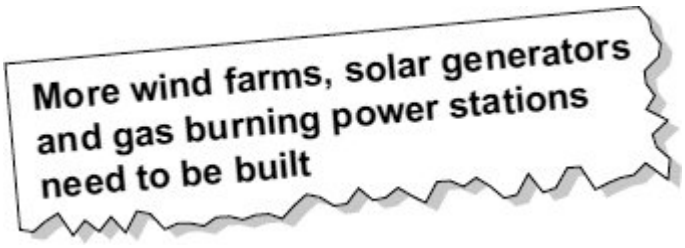
Graph **A** Graph **B** Graph **C**

Graph ☐

(1)

(c) The government has said that more electricity must be generated from renewable energy sources. A newspaper reported that:

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Why is the statement in the newspaper incorrect?

_____

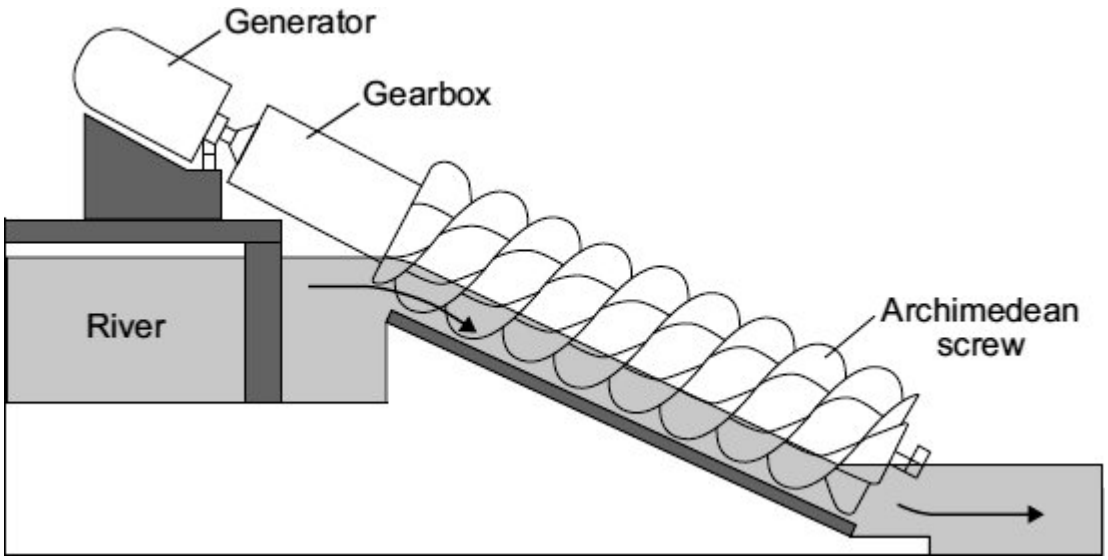
_____

(1)

(Total 4 marks)

Q2.

The diagram shows a small-scale, *micro-hydroelectricity* generator which uses the energy of falling river water to generate electricity. The water causes a device, called an Archimedean screw, to rotate.
The Archimedean screw is linked to the generator by a gearbox.



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

The gravitational potential energy of the falling water is transformed

into the

chemical
electrical
kinetic

energy of the Archimedean screw.

(1)

(b) A micro-hydroelectric system generates about 60 kW of electricity, enough for 50 homes. A conventional large-scale hydroelectric power station may generate more than 5 000 000 kW of electricity.

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(i) Give **one** advantage of a conventional large-scale hydroelectric power station compared to a micro-hydroelectric system.

_____

_____

(1)

(ii) Which **one** of the following statements gives a **disadvantage** of a conventional large-scale hydroelectric power station compared to a micro–hydroelectric system?

Put a tick (✓) in the box next to your answer.

Energy is wasted as heat and sound. ☐

Large areas of land are flooded. ☐

A constant flow of water is needed. ☐

(1)

(c) The electricity generated by the micro-hydroelectric system is transferred directly to local homes. The electricity generated by a conventional large-scale hydroelectric power station is transferred to homes anywhere in the country through a system of cables and transformers.

(i) What name is given to the system of cables and transformers used to transfer electricity to homes anywhere in the country?

_____

(1)

(ii) Using short cables to transfer electricity to local homes is much more efficient than using very long cables to transfer electricity to homes anywhere in the country.

Why?

_____

_____

(1)

(d) Nepal is a mountainous country with over 6000 rivers. In Nepal, 9000 kW of electricity are generated using micro-hydroelectric generators.

Suggest **one** reason why in the UK much less electricity is generated using micro-hydroelectric generators, than in Nepal.

_____

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_____

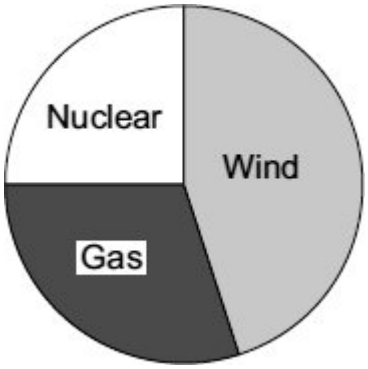
(1)

(Total 6 marks)

Q3.

(a) An electricity company claims to generate all of its electricity from environmentally friendly energy sources.

The energy sources used by the company are shown in the pie chart.



Do you think that the claim made by the company is correct?

Draw a ring around your answer.

Yes **No** **Maybe**

Explain the reasons for your answer.

_____

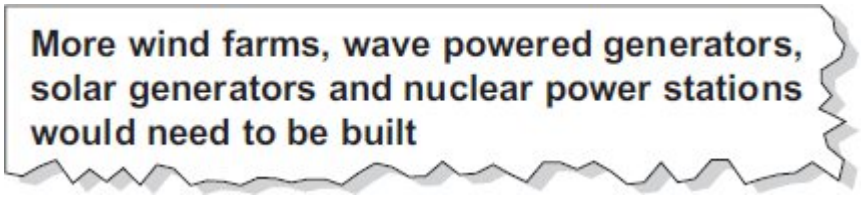
_____

_____

_____

(2)

(b) The government is committed to increasing the amount of electricity generated from renewable sources. A newspaper reported that:



Why is the statement made in the newspaper incorrect?

_____

_____

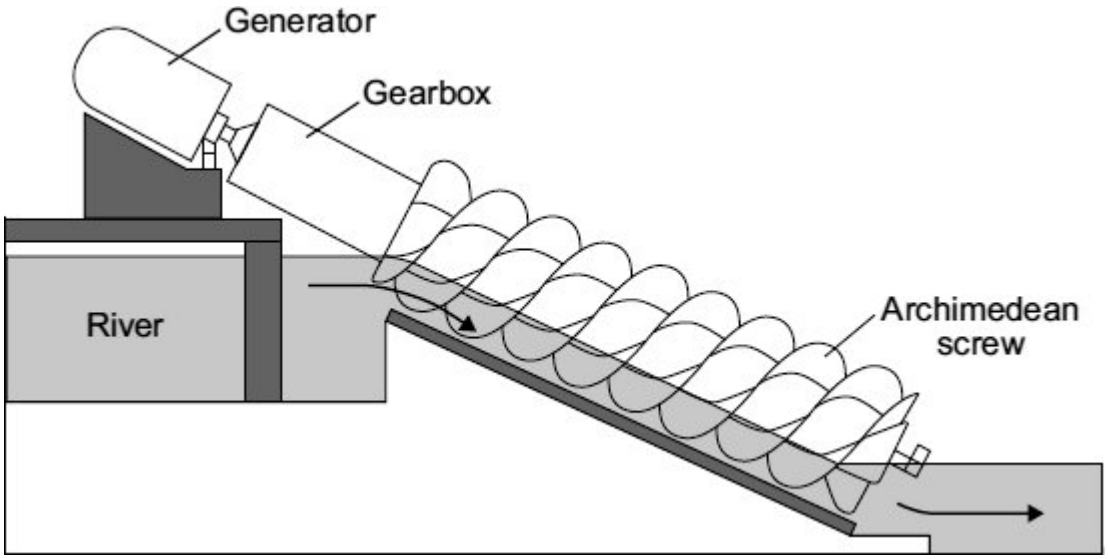
(1)

(Total 3 marks)

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Q4.

The diagram shows a small-scale, *micro-hydroelectricity* generator which uses the energy of falling river water to generate electricity. The water causes a device, called an Archimedean screw, to rotate.
The Archimedean screw is linked to the generator by a gearbox.



(a) Each second, the *micro-hydroelectricity* generator transforms 80 000 joules of gravitational potential energy into 60 000 joules of electrical energy.

(i) Fill in the missing word to complete the energy transformation diagram.

Gravitational potential energy of the falling water	→	_____ energy of the Archimedean screw	→	Electrical energy generated

(1)

(ii) Use the equation in the box to calculate the efficiency of the *micro-hydroelectricity* generator.

$$\text{efficiency} = \frac{\text{useful energy transferred by the device}}{\text{total energy supplied to the device}}$$

Show clearly how you work out your answer.

_____

_____

Efficiency = _____

(2)

(b) The power output from a conventional large-scale hydroelectric power station is 100 000 times more than the power output from a micro-hydroelectric system.

Give **one** disadvantage of a conventional large-scale hydroelectric power station compared to the micro-hydroelectric system.

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_____

_____

(1)

(c) The electricity generated by a micro-hydroelectric system is transferred via a transformer directly to local homes. The electricity generated by a conventional large-scale hydroelectric power station is transferred to the National Grid, which distributes the electricity to homes anywhere in the country.

(i) What is the National Grid?

_____

_____

(1)

(ii) Explain why transferring the electricity directly to local homes is more efficient than using the National Grid to distribute the electricity.

_____

_____

_____

_____

(2)

(Total 7 marks)

Q5.

(a) By 2023, nearly all of the existing nuclear power stations in the UK will be closed down.

(i) Before a nuclear power station can be demolished, the remaining nuclear fuel, radioactive waste materials and reactor must be carefully removed.

What is this process called?

Put a tick (✓) in the box next to your answer.

decommissioning ☐

decontaminating ☐

dismantling ☐

(1)

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(ii) The workers are exposed to radiation as they remove the reactor. One of the biggest risks is from the isotope cobalt-60, which has a half-life of 5.3 years.

Explain the advantage of waiting 11 years after a nuclear power station has closed down before starting to remove the reactor.

_____

_____

_____

_____

(2)

(b) It is almost certain that new nuclear power stations will be built in the UK.

The table shows the results of surveys asking people in the UK whether they were in favour of, or against, the building of new nuclear power stations.

	2001	**2005**	**2007**
Percentage (%) in favour	20	41	65
Percentage (%) against	60	28	20
Percentage (%) not sure	20	31	15

(i) From these surveys, how did public opinion on the building of new nuclear power stations change between 2001 and 2007?

_____

_____

(1)

(ii) Suggest a reason why some people may think that the results from these surveys are unreliable.

_____

_____

(1)

(iii) Give **one** reason in favour of building new nuclear power stations.

_____

_____

(1)

(c) The government of one Middle Eastern country has decided to build its first nuclear power station. The oil that would have been used to generate electricity can then be sold to other countries.

On what is this decision based?

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Put a tick (✓) in the box next to your answer.

economic issues ☐

ethical issues ☐

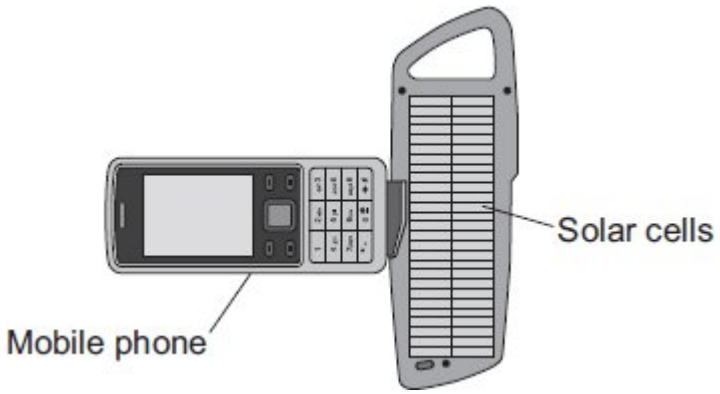
social issues ☐

(1)

(Total 7 marks)

Q6.

(a) The diagram shows a solar powered device being used to recharge a mobile phone.



On average, the solar cells produce 0.6 joules of electrical energy each second.
The solar cells have an efficiency of 0.15.

(i) Calculate the average energy input each second to the device.

Show clearly how you work out your answer.

_____

_____

Average energy input each second = _____ J/s

(2)

(ii) Draw a labelled Sankey diagram for the solar cells.
The diagram does **not** need to be drawn to scale.

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(1)

(b) Scientists have developed a new type of solar cell with an efficiency of over 40 %. The efficiency of the solar cell was confirmed independently by other scientists.

Suggest why it was important to confirm the efficiency independently.

_____

_____

(1)

(c) The electricity used in homes in the UK is normally generated in a fossil fuel power station.

Outline some of the advantages of using solar cells to generate this electricity.

_____

_____

_____

_____

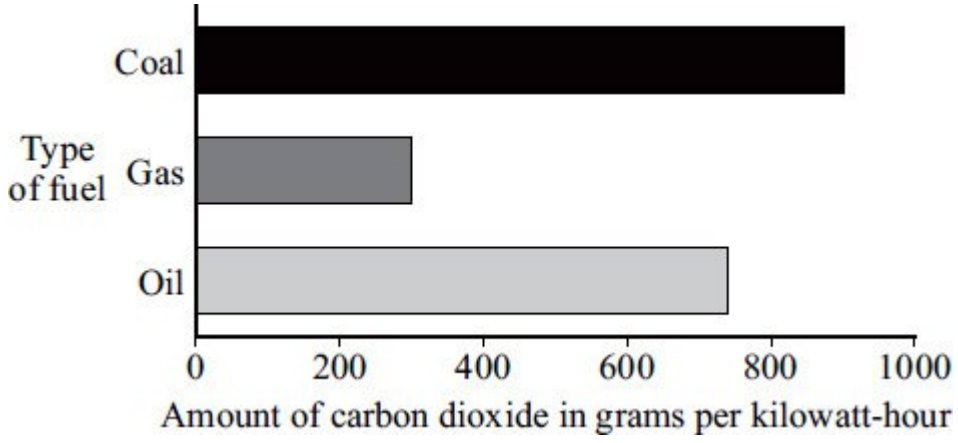
(2)

(Total 6 marks)

Q7.

(a) Most electricity in the UK is generated in power stations that burn fossil fuels.

The bar chart shows how much carbon dioxide is produced for each kilowatt-hour of electricity generated using a fossil fuel.



(i) Which fossil fuel produces the smallest amount of carbon dioxide for each kilowat-hour of electricity generated?

_____

(1)

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(ii) Which **one** of the following statements gives the reason why the data has been shown as a bar chart and not as a line graph?

Put a tick (✓) in the box next to your answer.

Both variables are categoric. ☐

Both variables are continuous. ☐

One variable is categoric, the other is continuous. ☐

(1)

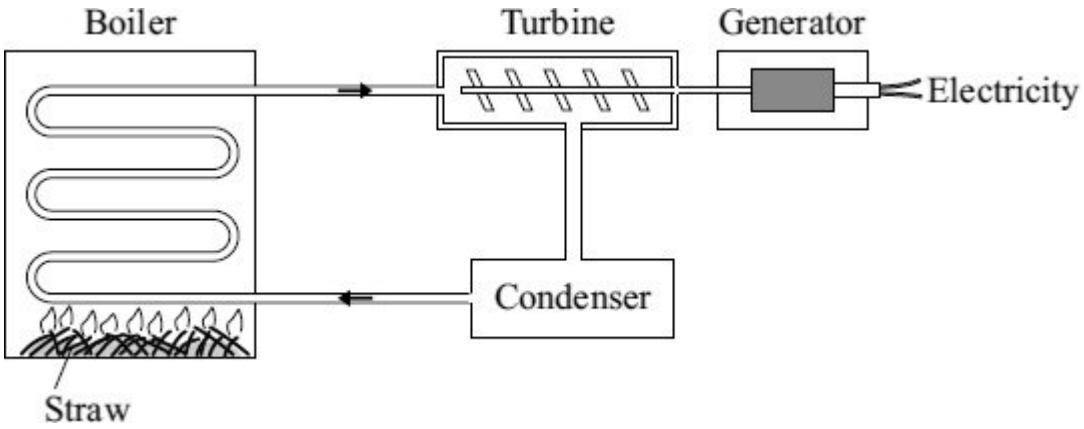
(iii) Why does a nuclear power station **not** produce any carbon dioxide?

_____

_____

(1)

(b) Some types of power station generate electricity by burning straw.



(i) Use words from the box to complete the following sentences.

boiler	gas	generator	steam	turbine	water

Straw is burned in a _____ Water is heated to make

_____ which is used to drive a _____

This turns a _____ to produce electricity.

(4)

(ii) Straw is a type of renewable energy source known as a biofuel.

Name **one** other type of renewable energy source used to produce electricity.

_____

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(1)

(iii) A power station generates 36 000 000 watts (36 MW) of electrical power by burning straw. The average power used in each home in the UK over one year is 2000 watts.

Calculate the number of homes that the power station could supply electricity to.

Show clearly how you work out your answer.

_____

_____

Number of homes = _____

(2)

(Total 10 marks)

Q8.

Over the next 15 years, some of the older nuclear power stations will be closed down, and the process of *decommissioning* will start. In the same period, several countries plan to build a number of new nuclear power stations.

(a) (i) What does it mean to *decommission* a nuclear power station?

_____

_____

(1)

(ii) How does *decommission*ing affect the overall cost of electricity generated using nuclear fuels?

_____

_____

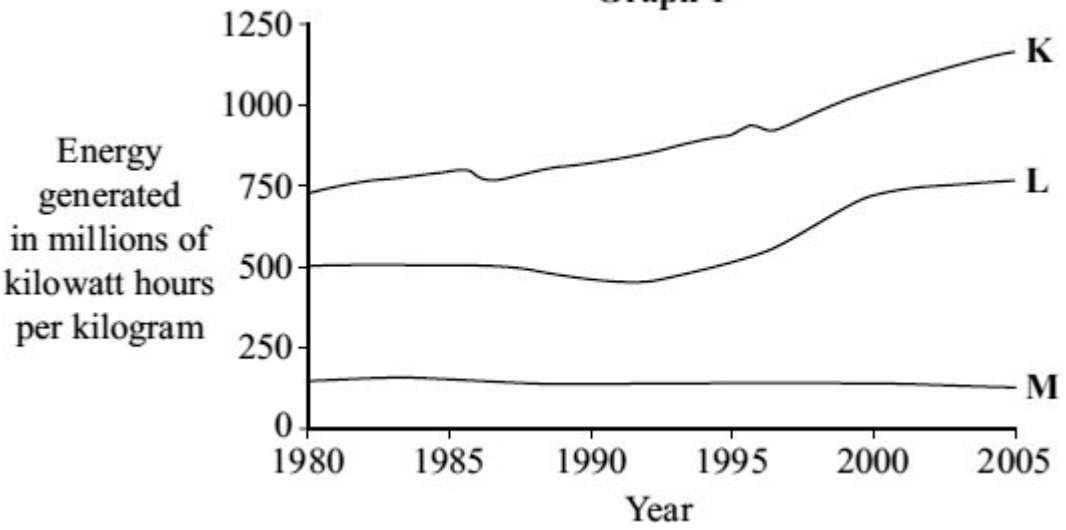
(1)

(b) Uranium is a fuel used in nuclear power stations to generate electricity.

Graph 1 compares how the electricity generated from one kilogram of nuclear fuel changed between 1980 and 2005 in three different types of nuclear power station.

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Graph 1



(i) Compare the efficiency of the three types of power station, **K**, **L** and **M**, between 1980 and 2005.

_____

_____

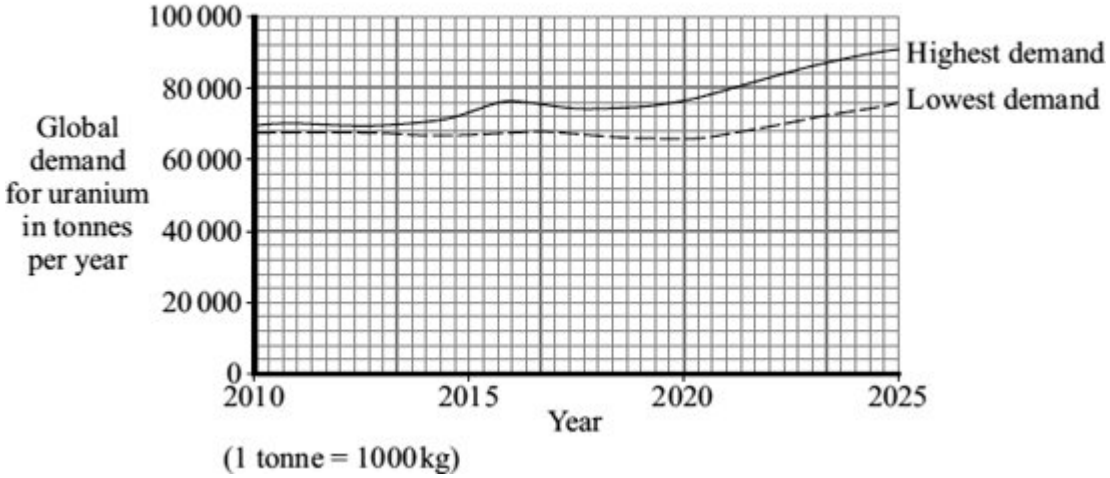
_____

_____

(2)

Graph 2 shows two different predictions for the global growth in uranium demand over the next few years.

Graph 2



(ii) Suggest reasons why it is **not** possible to predict accurately how much uranium will be needed in 2025.

_____

_____

_____

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_____

(2)

(Total 6 marks)

Q9.

Four students are talking about the different energy sources used to generate electricity in the areas where they live.

(a) Draw **one** line from where each student lives (**List A**) to the energy source in their area (**List B**).

Draw only **four** lines.

List A Where each student lives	**List B** Energy source
	Wind
Where I live is the sunniest part of the country.	
	Waves
Where I live, the land is very flat and it always seems to be windy.	
	Solar
Where I live, it is not safe to swim. The sea is always too rough.	
	Tides
Where I live, you can see steam coming out of the ground.	
	Geothermal

(4)

(b) All of the energy sources given in part **(a)** can be used to generate electricity.

What else do all these energy sources have in common?

_____

_____

(1)

(c) In a hydroelectric power station, the energy from falling water is used to generate electricity.

Which **one** of the following gives a **disadvantage** of a hydroelectric power station?

Put a tick (✓) in the box next to your answer.

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has a fast start-up time ☐

large areas of land are flooded ☐

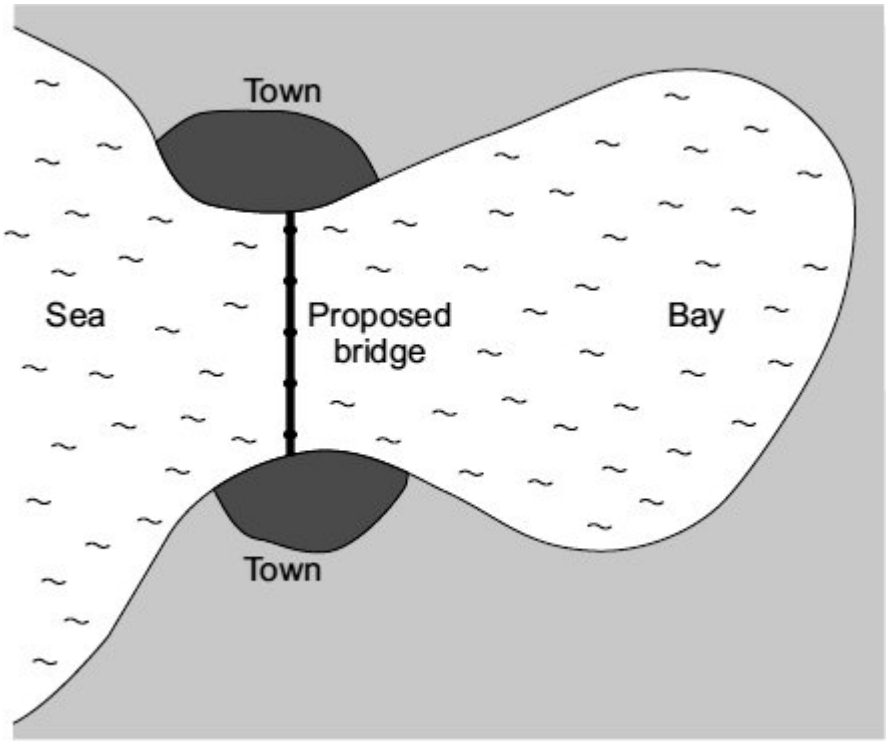
polluting gases are produced ☐

(1)

(Total 6 marks)

Q10.

The map shows the positions of two towns on either side of a very large coastal bay in England. The map also shows where a bridge may be built to link the towns. The road journey from one town to the other is about 60 kilometres at present.



(a) It is estimated that building turbines and generators inside the legs of the bridge would produce enough electricity for both towns. In addition, enough electricity would be generated to run electric buses over the bridge between the two towns.

(i) If the bridge is built, what form of renewable energy will be used to generate the electricity?

_____

(1)

(ii) Most people living in the area are in favour of the proposed bridge.

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Suggest **three** reasons why people would be in favour of building the bridge and the associated electricity generating scheme.

Reason 1 _____

_____

Reason 2 _____

_____

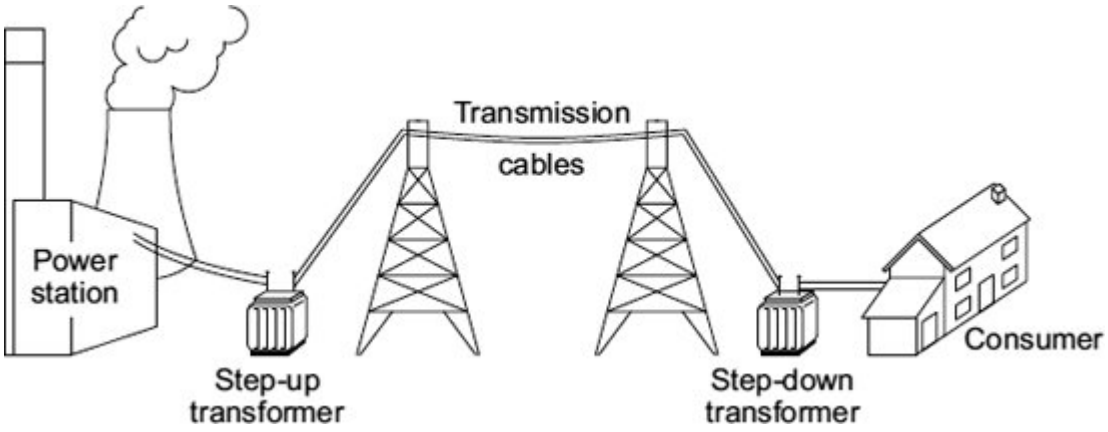
Reason 3 _____

_____

(3)

(b) Even with the proposed bridge, the two towns will need to stay connected to the National Grid.

The diagram shows part of the National Grid.



(i) Give **one** reason why the towns need to stay connected to the National Grid.

_____

_____

(1)

(ii) Explain how the step-up transformer increases the efficiency of the National Grid.

_____

_____

_____

_____

(2)

(Total 7 marks)

Q11.

The picture shows a solar-powered aircraft. The aircraft has no pilot.

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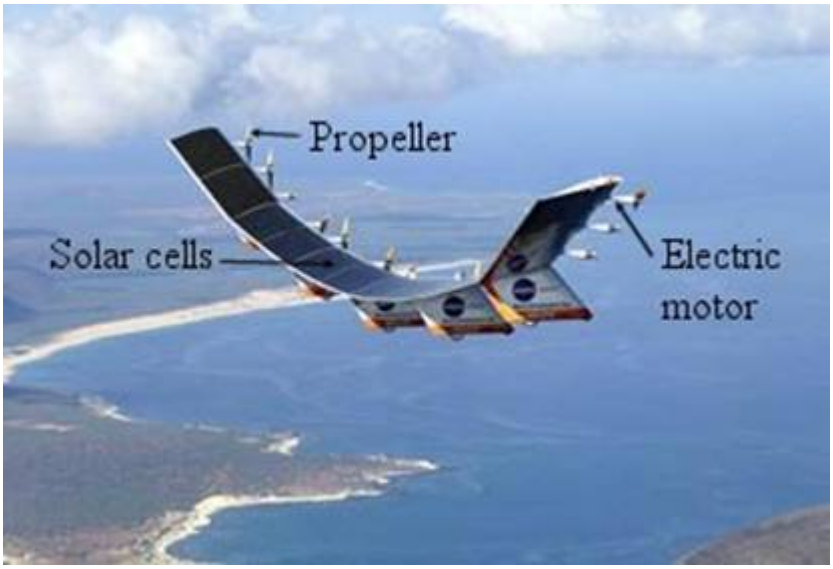


Photo by NASA.

(a) On a summer day, 175 000 joules of energy are supplied to the aircraft's solar cells every second. The useful energy transferred by the solar cells is 35 000 joules every second.

(i) Use the equation in the box to calculate the efficiency of the solar cells.

$$\text{efficiency} = \frac{\text{useful energy transferred by the device}}{\text{total energy supplied to the device}}$$

Show clearly how you work out your answer.

_____

_____

Efficiency = _____

(2)

(ii) What happens to the energy that is **not** usefully transferred by the solar cells?

_____

(1)

(b) The aircraft propellers are driven by electric motors. As well as the solar cells, there are fuel cells that provide additional power to the electric motors.

(i) Suggest **one** advantage of the aircraft having fuel cells as well as the solar cells.

_____

(1)

(ii) Give **one** environmental advantage of using electric motors to drive the aircraft propellers rather than motors that burn a fuel.

_____

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_____

(1)

(iii) Eventually, the designers want to produce an unmanned aircraft that can fly at twice the height of a passenger jet for up to six months.

Suggest **one** possible use for an aircraft such as this.

_____

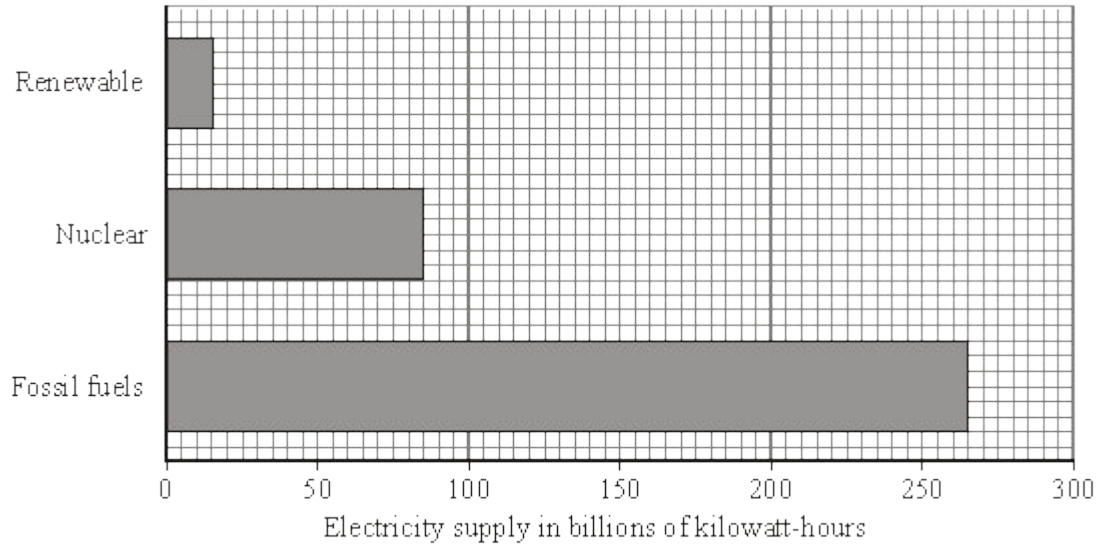
_____

(1)

(Total 6 marks)

Q12.

The bar chart shows the different energy sources used to generate the UK's electricity in 2007.



(a) (i) The wind is a renewable energy source.

Name **one** more renewable energy source used to generate electricity.

_____

(1)

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

Using less fossil fuels to generate electricity will

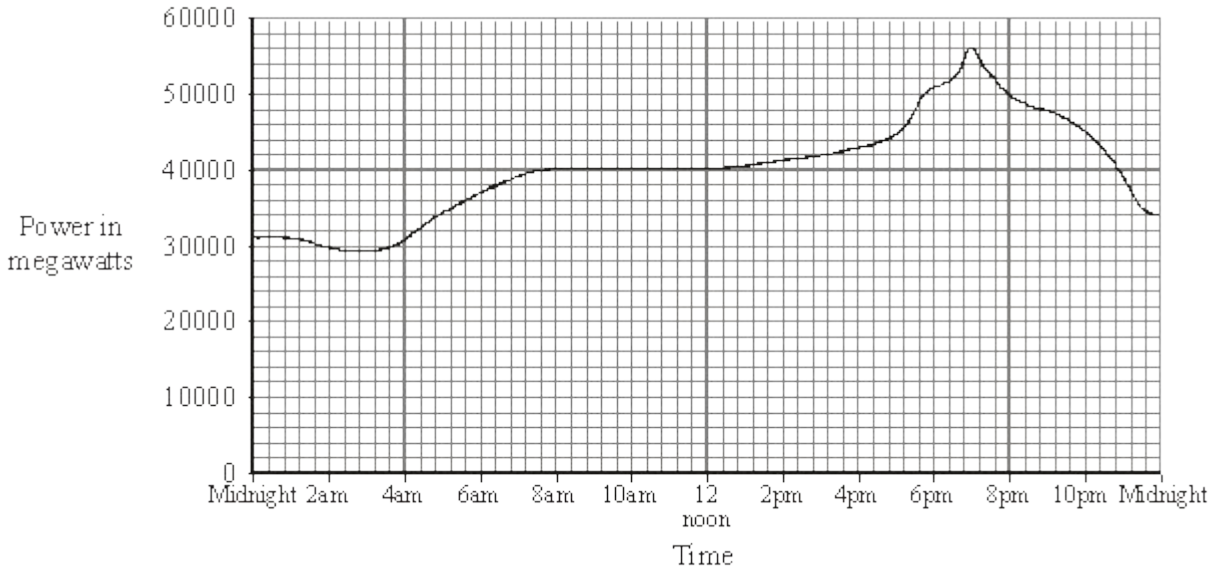
decrease
not change
increase

the amount of carbon dioxide emitted into the atmosphere.

(1)

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(b) The graph shows how the demand for electricity in the UK varied over one day in the winter.



(i) Describe how the demand for electricity varied between 4.00 am and 10.00 am.

_____

_____

_____

_____

(2)

(ii) Which type of power station has the fastest start-up time?

Draw a ring around your answer.

coal **natural gas** **nuclear** **oil**

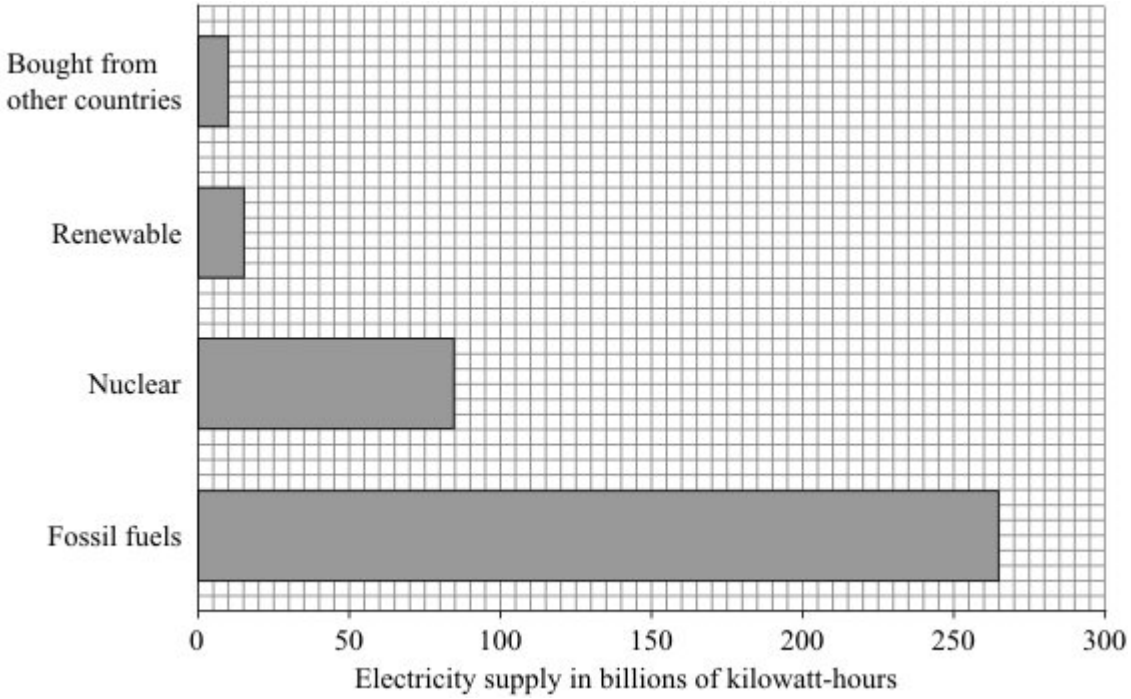
(1)

(Total 5 marks)

Q13.

The bar chart shows how the UK's electricity demands in 2007 were met.

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(a) What proportion of electricity was generated using renewable energy sources?

Show clearly how you work out your answer.

_____

_____

_____

_____

(2)

(b) By 2020, most of the UK's nuclear reactors and one-third of coal-fired power stations are due to close, yet the demand for electricity is expected to increase.

Four students, **A**, **B**, **C** and **D**, were asked how a demand of 380 billion kilowatt-hours could be met. They made the suggestions given in the table.

Student	Fossil fuels	Nuclear	Renewable	Bought from other countries
A	200	100	40	40
B	80	240	40	20
C	160	80	100	40
D	280	0	100	0

(i) Which student has made the suggestion most likely to result in the lowest carbon dioxide emissions?

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_____

Give a reason for your answer.

_____

_____

(2)

(ii) Suggest **one** realistic way in which a householder could help to reduce the annual electricity demand.

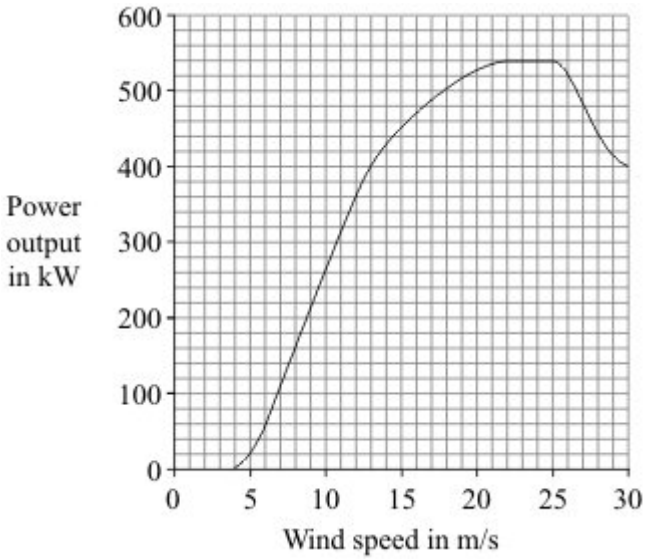
_____

_____

(1)

(c) To increase the amount of electricity generated using renewable energy resources would probably involve erecting many new wind turbines.

The graph shows the power curve of a wind turbine.



(i) Describe, in detail, how the power output of the turbine varies with the wind speed.

_____

_____

_____

_____

_____

_____

(3)

(ii) Give **one** disadvantage of using wind turbines to generate a high proportion of the electricity required in the UK.

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_____

_____

(1)

(Total 9 marks)

Q14.

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

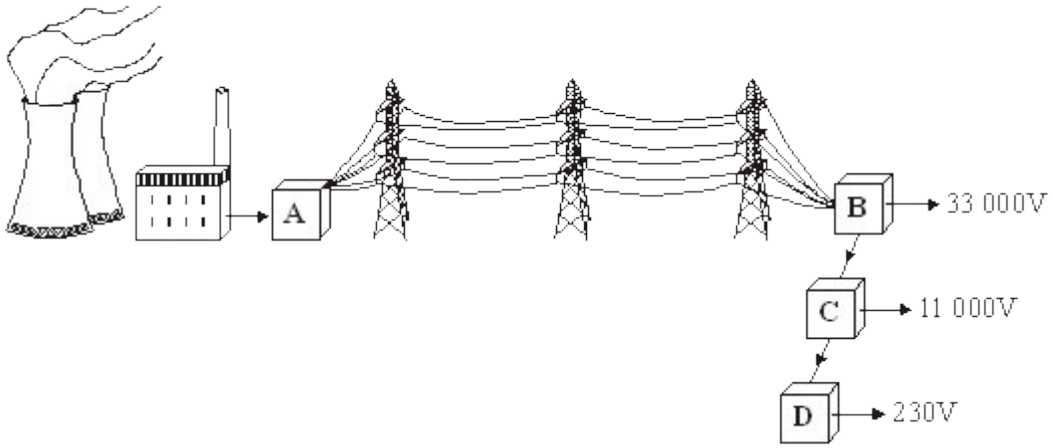
(a) Complete the following sentence by using **one** of the words in the box.

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-down 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.

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(1)

(Total 4 marks)

Q15.

Wind and tides are renewable 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 predictable energy source. ☐

a constant energy source. ☐

an unreliable energy source. ☐

(1)

(ii) The tides are:

a predictable 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?

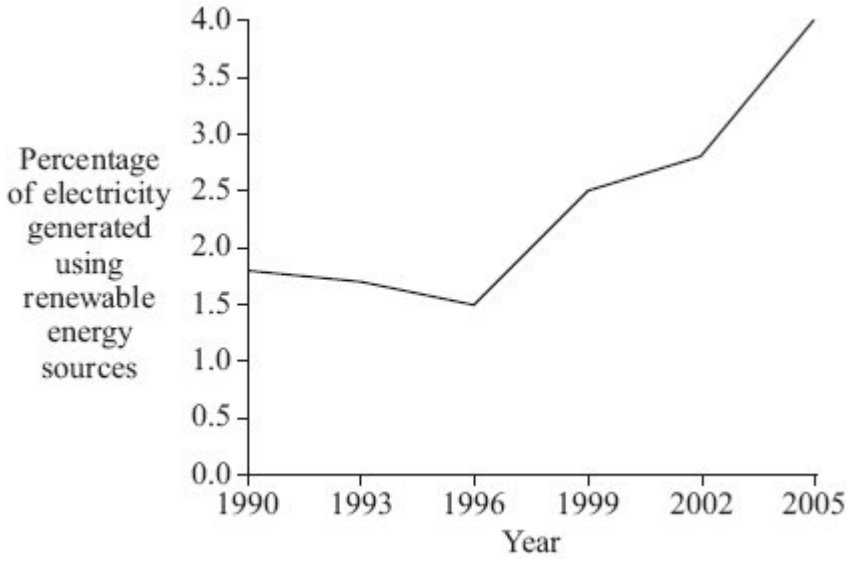
_____

_____

(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.

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Complete the following sentence by drawing a ring around the correct line 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%

.

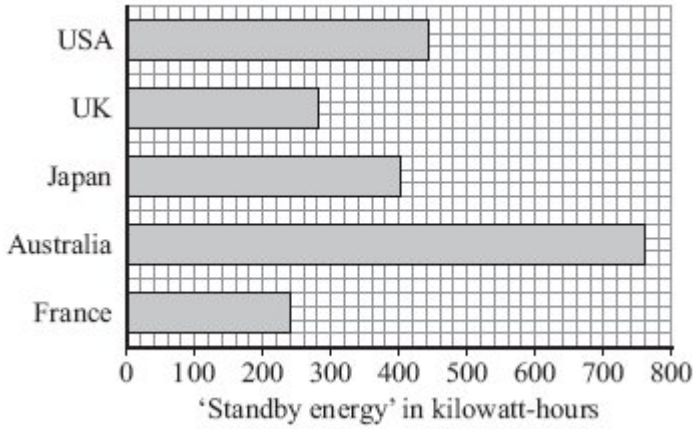
(1)

(Total 4 marks)

Q16.

Electrical appliances that are left on standby still use energy.

The bar chart compares the *average* amount of 'standby energy' wasted each year in every home in five countries.



(i) In which country are the homes that waste, on average, the smallest amount of 'standby energy'?

Draw a ring around your answer.

Australia **France** **Japan** **UK** **USA**

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(1)

(ii) Suggest a reason why an *average* value is used for the 'standby energy' wasted in the homes.

_____

_____

(1)

(b) (i) Australia has one of the lowest electricity prices in the world.

How does this low price seem to affect the amount of 'standby energy' wasted?

_____

_____

(1)

(ii) In Australia, most electricity is generated in coal-burning power stations. The Australian government wants less electricity to be wasted.

Wasting less electricity would be good for the Australian environment.

Explain why.

_____

_____

_____

_____

(2)

(c) Energy is not usually measured in kilowatt-hours.

Which **one** of the following units is usually used to measure energy?

Draw a ring around your answer.

hertz **joule** **watt**

(1)

(d) (i) Electricity in Japan costs the equivalent of 17 pence per kilowatt-hour.

Use the information in the bar chart and the equation in the box to calculate how much the 'standby energy' used in an average Japanese home costs each year.

total cost = number of kilowatt-hours × cost per kilowatt-hour

Show clearly how you work out your answer.

Give your answer in pence.

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_____

_____

Cost = _____ pence

(3)

(ii) In Japan, the largest proportion of electricity is generated using nuclear fuels.

Which **one** of the following statements gives a good reason for using nuclear fuels to generate electricity?

Put a tick (✓) in the box next to your answer.

A nuclear power station is very expensive to build. ☐

A small amount of nuclear fuel generates a large amount of electricity. ☐

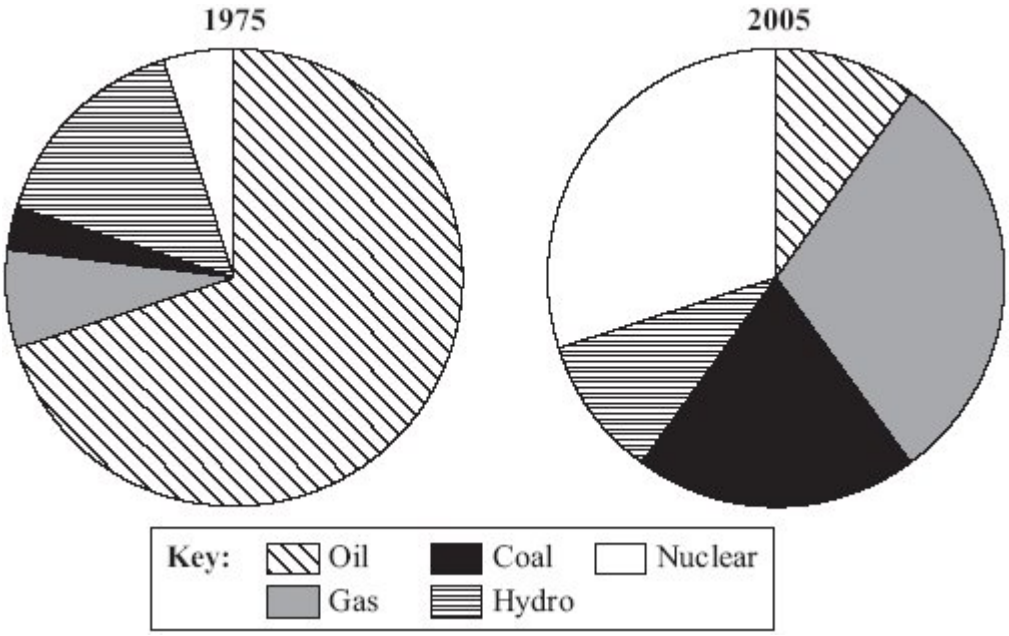
It is easy to store nuclear waste safely. ☐

(1)

(Total 10 marks)

Q17.

The pie charts show the relative proportions of electricity generated in Japan from different energy sources in 1975 and 2005.



(a) Describe the main differences in the energy sources used in 2005 compared with 1975.

_____

_____

(1)

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(b) In the UK, nuclear fuels are used to generate about 21% of the total electricity supply.

(i) What is the name of the process by which a nuclear fuel produces heat?

_____

(1)

(ii) Explain how the heat released from a nuclear fuel is used to generate electricity in power stations.

_____

_____

_____

_____

(2)

(iii) Some people have suggested that more nuclear power stations should be built in the UK.

Give **two** reasons to support this suggestion.

1. _____

_____

2. _____

_____

(2)

(iv) Nuclear power stations create dangerous waste.

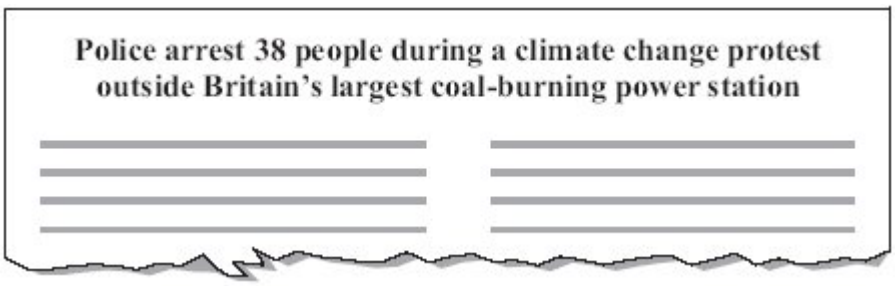
Why is the waste from a nuclear power station dangerous?

_____

_____

(1)

(c) A headline from a newspaper article is shown below.



Explain the possible link between *climate change* and *coal-burning power stations*.

_____

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_____

_____

_____

(2)

(Total 9 marks)

Q18.

(a) Water waves are a renewable energy source.

The government wants more electricity to be generated from renewable energy sources. Some people do not think this is a good idea.

What reasons could a government scientist give to show people that using more renewable energy sources is a good idea?

_____

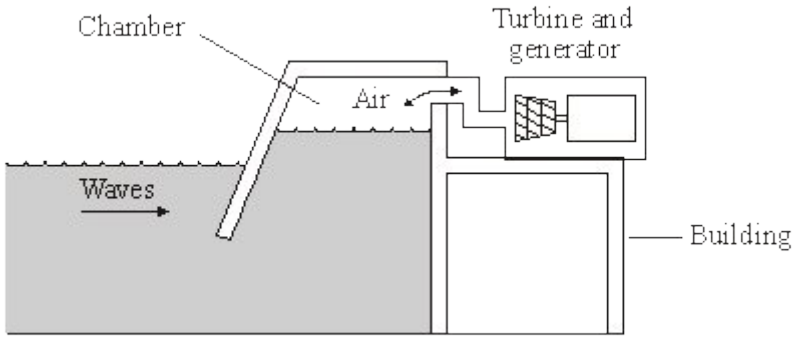
_____

_____

_____

(2)

(b) The diagram shows a wave-powered generator. The generator transforms kinetic energy from the waves to electrical energy.



AQA GCSE SCIENCE CORE FOUNDATION STUDENT'S BOOK by Graham Hill, Nigel Heslop, Christine Woodward,Steve Witney and Toby Houghton. Published by Hodder and Stoughton 2006 © Reproduced by permission of John Murray (Publishers) Ltd

The following sentences describe how the wave generator works. The sentences are in the wrong order.

R Waves push air up and down a chamber inside the building.
S The turbine turns the generator.
T The generator transforms kinetic energy to electrical energy.
U The air rushes through a turbine making it spin.
V Strong waves move towards the wave-powered generator.

Arrange these sentences in the correct order. Start with letter **V**.

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(3)

(Total 5 marks)

Q19.

(a) Electricity is distributed from power stations to consumers along the National Grid.

(i) Transformers are part of the National Grid. Transformers are *efficient* devices. What is meant by a device being *efficient*?

_____

_____

(1)

(ii) When electricity flows through a cable, some energy is transformed into heat.

Explain how the National Grid system reduces the amount of energy lost as heat.

_____

_____

_____

_____

(2)

(b) Read this information taken from a recent newspaper article.

- Researchers have found that children living close to overhead power cables are more likely to develop leukaemia.
- The researchers studied two groups of children. One group had developed leukaemia, the other group was healthy.
- Although the researchers found a link, they are unable to explain why it happened. They say that the results may have happened by chance.
- Other factors that have not been investigated, such as the environment, the geographical area or the children's genes, could be important.
- A cancer research charity said that childhood leukaemia was most likely to be caused by factors that parents were unable to control.

(i) Why did the researchers study a group of healthy children?

_____

_____

(1)

(ii) The information does not say how many children were studied.

Why should this data have been included in the article?

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_____

_____

(1)

(iii) The researchers could not be certain that the overhead power cables were responsible for the increased chance of children developing leukaemia.

Explain why.

_____

_____

_____

_____

(2)

(iv) The results of the research carried out by scientists may worry some people.

What do you think scientists should do?

Put a tick (✓) in the box next to your choice.

Scientists should publish their research findings straight away.	☐
Scientists should not publish their research findings until they have found out as many facts as possible.	☐

Give a reason for your choice.

_____

_____

(1)

(Total 8 marks)

Q20.

(a) Different energy sources are used to generate electricity.

Which **two** of the energy sources in the box are likely to be used up first?

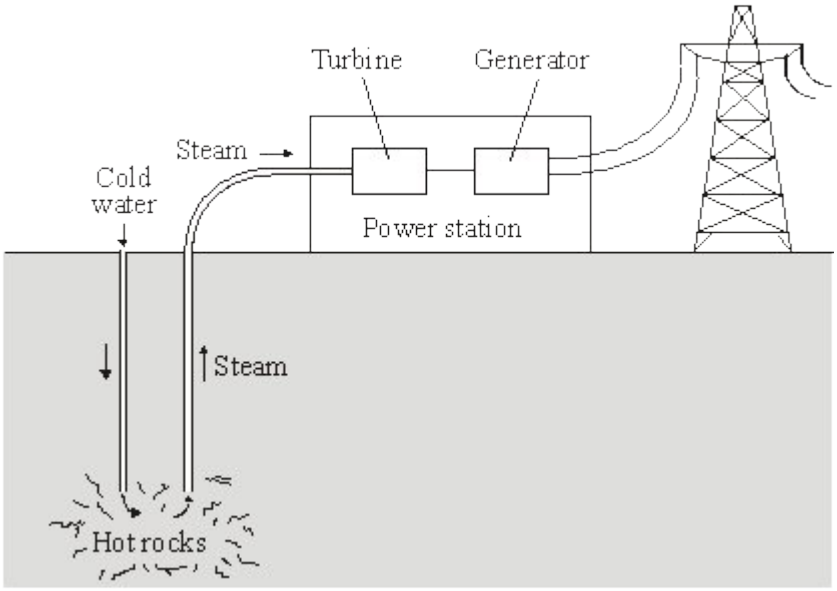
Draw a ring around each of your answers.

gas	**oil**	**Sun**	**tides**	**waves**	**wind**

(2)

(b) The diagram shows a geothermal power station. Hot rocks in the Earth's crust heat water to produce steam. The steam is used to drive turbines that turn electrical generators.

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How is the way in which a geothermal power station generates electricity the same as the way in which a coal burning power station generates electricity?

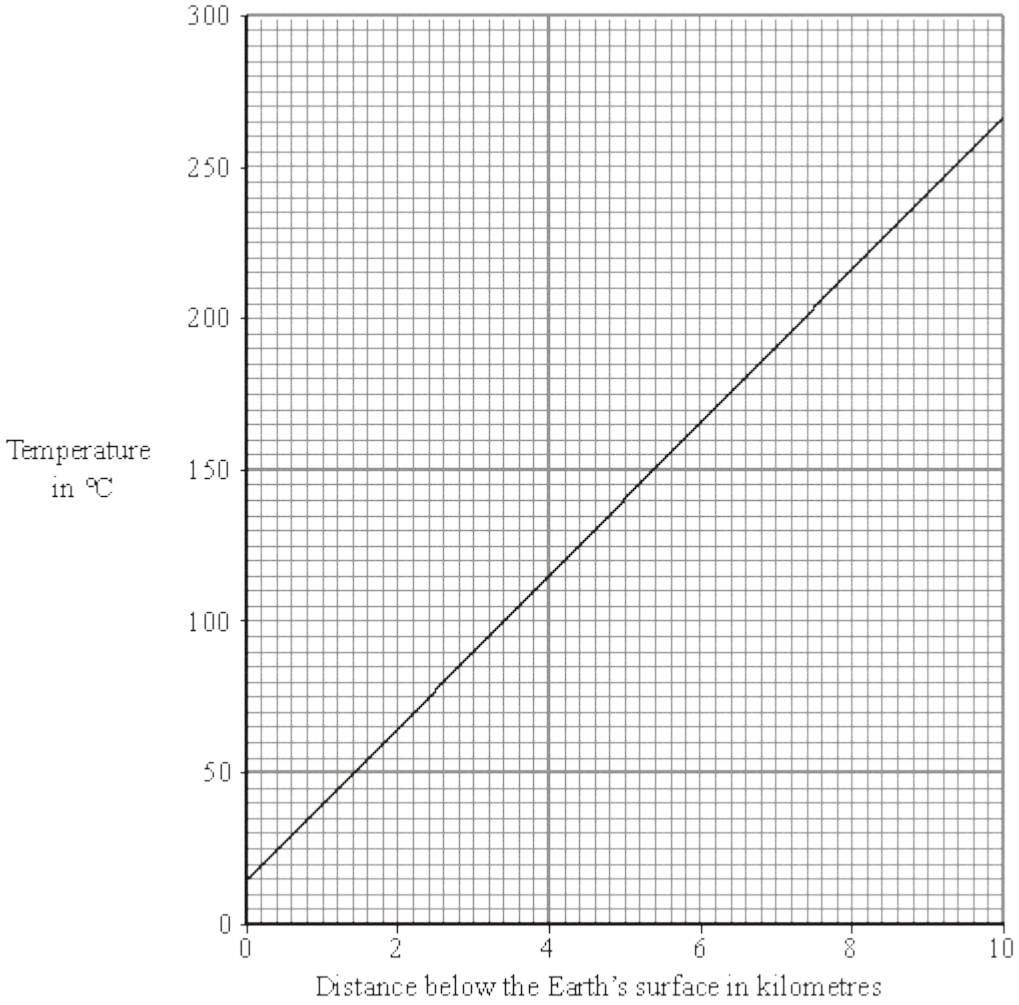
_____

_____

(1)

(c) The graph shows how the temperature of the rocks in the Earth's crust depends on how far the rocks are below the Earth's surface.

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Estimate the temperature of the rocks 5 kilometres below the Earth's surface.

Show clearly how you have used the graph to get your answer.

_____

_____

Temperature = _____ °C

(2)

(d) Scientists have estimated that one quarter of the world's electricity could be generated using geothermal energy.

Give **one** reason that scientists might use to persuade a government to spend large amounts of money building geothermal power stations.

_____

_____

(1)

(Total 6 marks)

Q21.

(a) Solar energy is a *renewable* energy source that can be used to generate electricity.

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(i) What is meant by an energy source being *renewable*?

_____

(1)

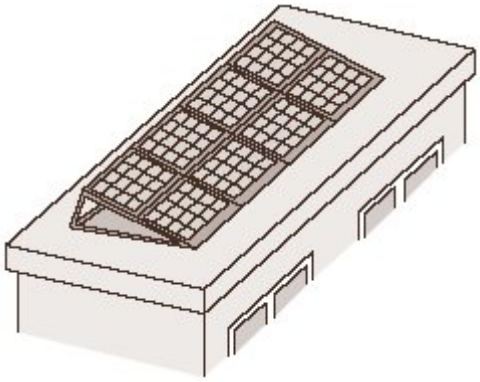
(ii) Name **two** further renewable energy sources used to generate electricity.

1. _____

2. _____

(1)

(b) A householder uses a bank of solar cells to generate electricity for his home. The solar cells are tilted to receive the maximum energy input from the Sun.



The data in the table gives the average energy input each second (in J/s), to a 1 m^2 area of solar cells for different angles of tilt and different months of the year.

Month	**Angle of tilt**			
	20°	30°	40°	50°
February	460	500	480	440
April	600	620	610	600
June	710	720	680	640
August	640	660	640	580
October	480	520	500	460
December	400	440	420	410

(i) Use the data in the table to describe how the average energy input to the solar cells depends on the angle of tilt.

_____

_____

_____

_____

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(2)

(ii) The bank of solar cells used by the householder has an area of 8 m^2.

The efficiency of the solar cells is 0.15

Calculate the average **maximum** electrical energy available from the bank of solar cells each second in June.

Show clearly how you work out your answer.

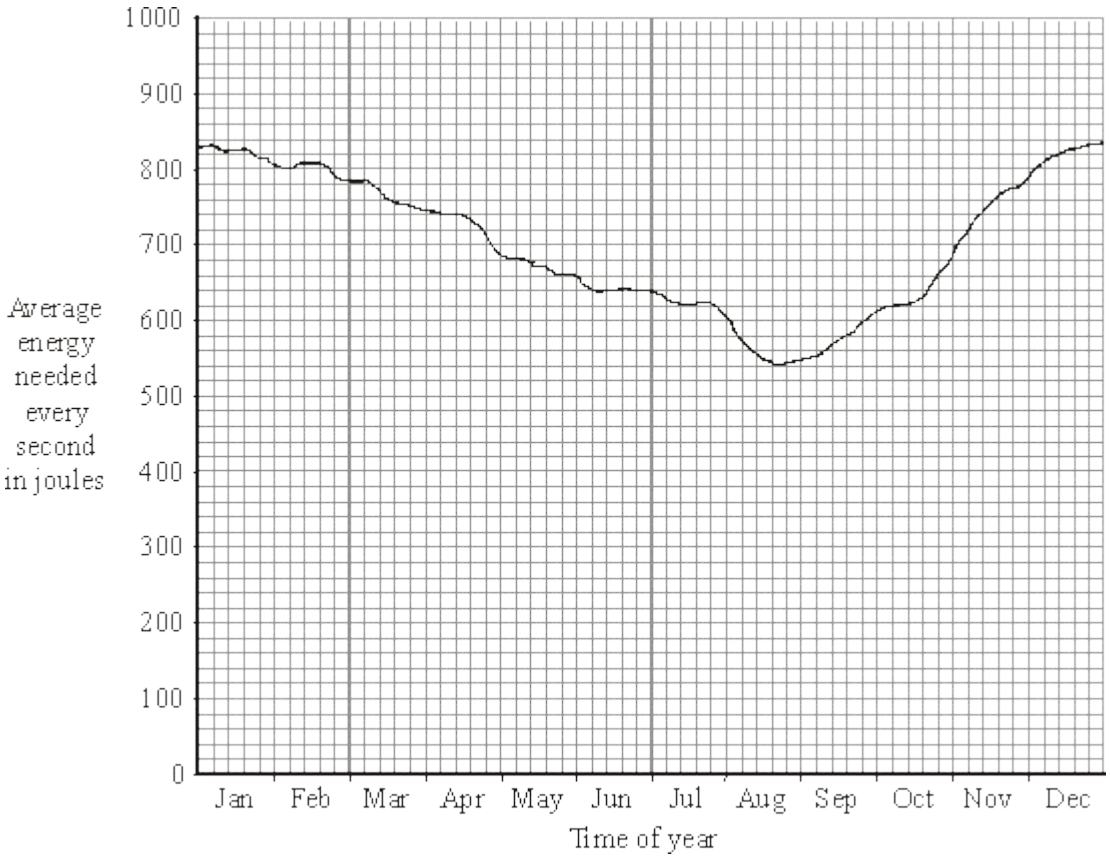
_____

_____

Maximum energy = _____ joules/second

(3)

(c) The graph shows how the householder's electrical energy needs change over one year.



Why would it be advisable for the householder to remain connected to the National Grid?

_____

_____

(1)

(Total 8 marks)

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Q22.

There is an increasing demand for electricity and the reserve of fossil fuels is decreasing. A way to meet increasing demand for electricity is to build new nuclear power stations. Some people feel that no new nuclear power stations should be built because of the risks associated with nuclear fuels.

(a) Outline the arguments that a scientist working in the nuclear power industry could use to justify the building of more nuclear power stations in the future.

_____

_____

_____

_____

_____

(3)

(b) Nuclear waste is a problem that must be dealt with. One possible solution would be to bury the waste deep underground.

Suggest **one** reason why some people are against burying nuclear waste.

_____

_____

(1)

(c) Electricity can also be generated using renewable energy sources.

Look at this information from a newspaper report.

- The energy from burning bio-fuels, such aswoodchip and straw, can be used to generate electricity.
- Plants for bio-fuels use up carbon dioxideas they grow.
- Farmers get grants to grow plants forbio-fuels.
- Electricity generated from bio-fuels can besold at a higher price than electricity generated from burning fossilfuels.
- Growing plants for bio-fuels offers newopportunities for rural communities.

Suggest why, apart from the declining reserves of fossil fuels, power companies should use more bio-fuels and less fossil fuels to generate electricity.

_____

_____

_____

_____

_____

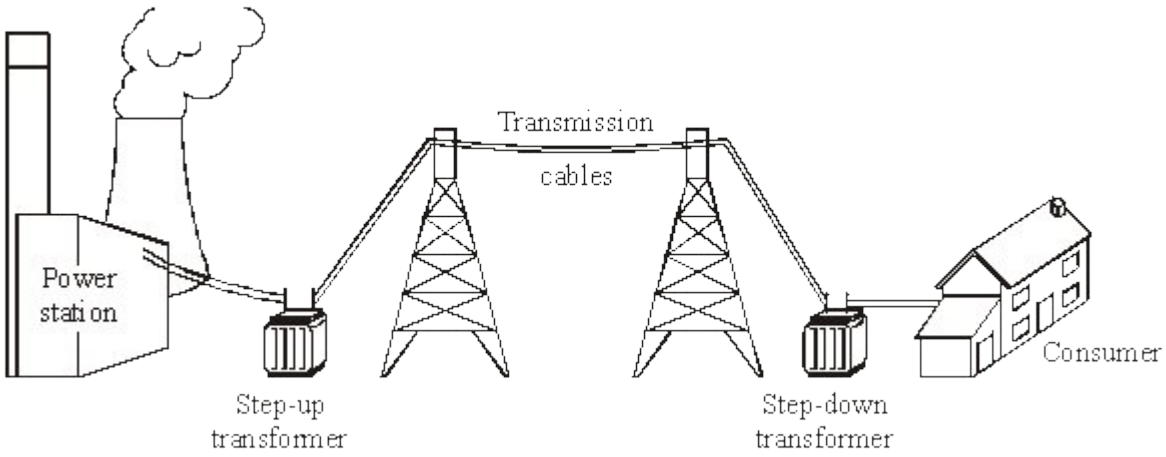
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(3)

(Total 7 marks)

Q23.

The diagram shows how electricity gets from power stations to consumers.



(a) Complete the following sentences by drawing a ring around the correct line in each box.

(i) The network of cables and transformers linking power stations to consumers

is called the national

grid
line
network

(1)

(ii)

A step-up transformer

decreases voltage
increases current
increases voltage

(1)

(iii)

Electricity is supplied to consumers' homes at

230 V
25 000 V
400 000 V

(1)

(iv)

Making the current in the cables smaller will

increase

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make no difference to
reduce

the energy lost in the cables.

(1)

(b) Transformers always waste some energy.

(i) What effect does the waste energy from a transformer have on the air around the transformer?

_____

(1)

(ii) Which **one** of the following describes the efficiency of a transformer?

Draw a ring around your answer.

always 100 % **less than 100 %** **more than 100%**

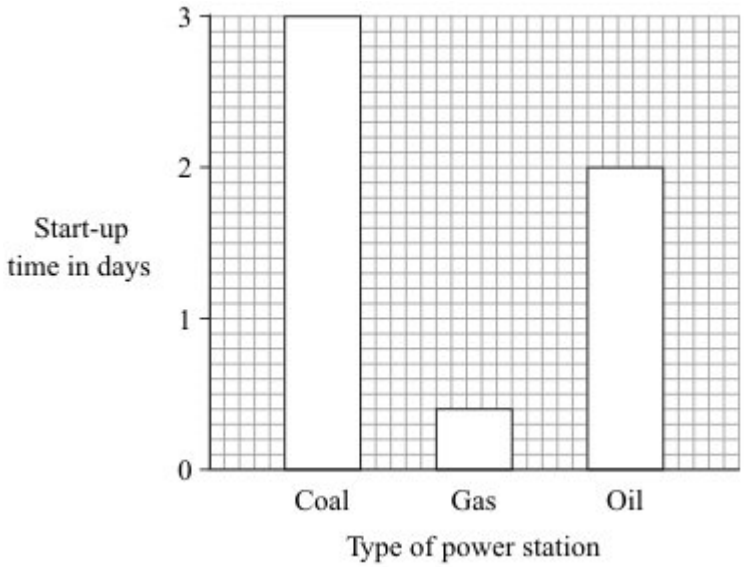
(1)

(Total 6 marks)

Q24.

Much of the world's electricity is generated in power stations that burn fossil fuels.

(a) The bar chart shows the start-up times for the three types of fossil fuel power station.



Which of these power stations would take the longest to start generating electricity?

_____

(1)

(b) Which **two** of the following statements are good reasons for using fossil fuels to generate electricity?

Put a tick (✓) in the box next to each of your choices.

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Supplies of fossil fuels are limited. ☐

Fossil fuels can be used to generate electricity at any time. ☐

Fossil fuels are non-renewable. ☐

A few large power stations can generate the electricity for a million homes. ☐

Burning fossil fuels produces carbon dioxide. ☐

(2)

(c) Electricity can be generated using energy from the wind.

(i) Why does a wind-powered generator **not** produce carbon dioxide?

_____

_____

(1)

(ii) Which form of energy is transferred from the wind to generate electricity?

Draw a ring around your answer.

heat **kinetic** **light** **sound**

(1)

(iii) Many people say that wind-powered generators are a good idea because:

"**when the wind blows they generate electricity"**
"they produce no pollution"
"they generate electricity cheaply"

But not everyone wants more wind-powered generators to be built.



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What reasons may be given by the people who think that wind-powered generators are **not** a good idea?

_____

_____

_____

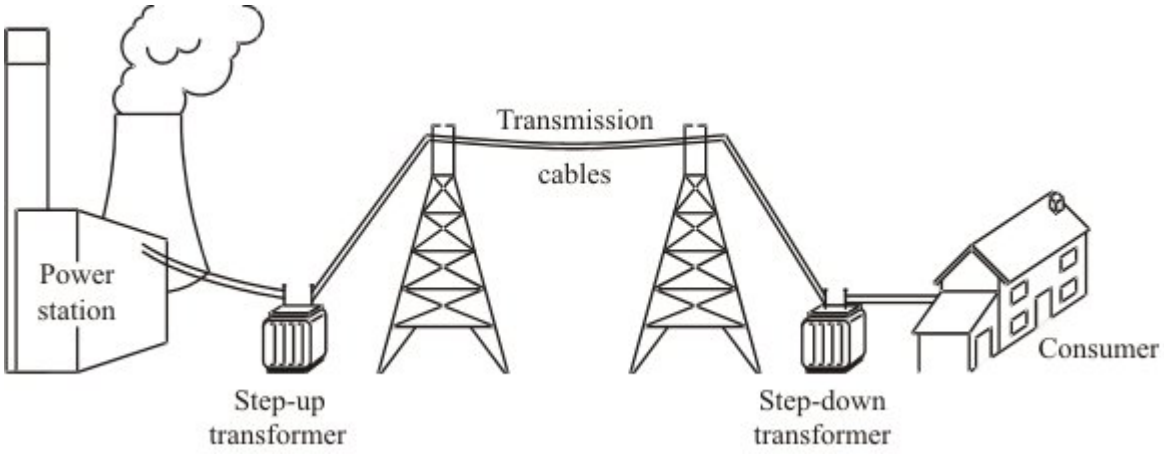
_____

(2)

(Total 7 marks)

Q25.

The diagram shows how electricity is distributed from power stations to consumers.



(a) (i) What name is given to the network of cables and transformers that links power stations to consumers?

_____

(1)

(ii) What does a step-up transformer do?

_____

(1)

(iii) Explain why step-up transformers are used in the electricity distribution system.

_____

_____

_____

_____

(2)

(b) Most of the world's electricity is generated in power stations that burn fossil fuels.

State **one** environmental problem that burning fossil fuels produces.

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_____

_____

(1)

(c) Electricity can be generated using energy from the wind. A company wants to build a new wind farm. Not everyone thinks that this is a good idea.



(i) What arguments could the company give to persuade people that a wind farm is a good idea?

_____

_____

_____

_____

(2)

(ii) What reasons may be given by the people who think that wind farms are **not** a good idea?

_____

_____

_____

_____

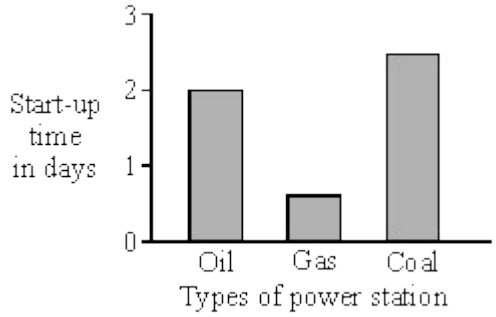
(2)

(Total 9 marks)

Q26.

(a) The bar chart shows the start-up time for different types of fuel-burning power stations.

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Which type of power station would be the quickest to start producing electricity?

_____

(1)

(b) A fuel-burning power station is more reliable than a wind generator at producing electricity. Explain why.

_____

_____

_____

_____

(2)

(c) Fuel-burning power stations may produce air pollution. Why does a wind generator not produce any air pollution?

_____

_____

(1)

(Total 4 marks)

Q27.

(a) In Britain most power stations burn fuel to produce heat. The diagram shows the stages by which the heat is transferred into electrical energy.
Complete the diagram by filling in the missing word.

Water heated to produce steam	→	Steam turns a turbine	→	Turbine turns a coil in a _____	→	Electricity is produced

(1)

(b) A fuel burning power station uses 2000 joules of fuel energy to generate 600 joules of electrical energy. The rest of the fuel energy is wasted as heat.

(i) For every 600 joules of electrical energy generated, how much fuel energy is wasted as heat?

_____

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_____

(1)

(ii) Calculate the efficiency of the power station.
Show clearly how you work out your answer.

_____

_____

efficiency = _____

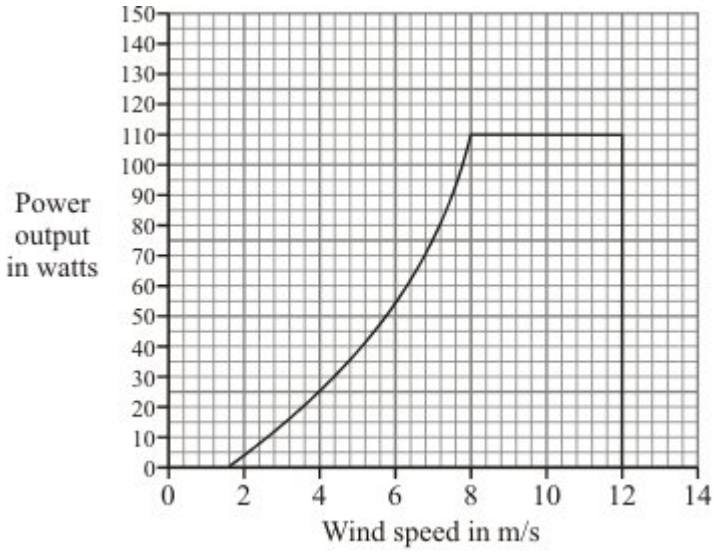
(2)

(c) List **A** gives three energy resources used to generate electricity. List **B** gives environmental problems that may be caused by using different energy resources. Draw a straight line from each energy resource in List **A** to the environmental problem it may cause in List **B**. Draw **three** lines only.

List A **Energy resource**	**List B** **Environmental problem that may be caused**
Wind	Destroys the habitat of wading birds in river estuaries
Tides	Produces a lot of noise
Falling water (hydroelectricity)	Produces the gas sulphur dioxide
	Floods land used for farming or forestry

(3)

(d) A small wind generator is used to charge a battery. The graph shows the power output of the generator at different wind speeds.



(i) What is the maximum power produced by the generator?

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_____ watts

(1)

(ii) The generator is designed to stop if the wind speed is too high.

At what wind speed does the generator stop working?

_____ m/s

(1)

(iii) Give **one** disadvantage of using a wind generator to charge a battery.

_____

_____

(1)

(Total 10 marks)

Q28.

(a) Explain how energy is produced in the Sun.

_____

_____

_____

_____

(3)

(b) Read the following article that appeared in a magazine.

"Conservation of energy is important in today's society. Energy sources, such as oil and coal, which have been used for the development of an industrial society, cannot be relied upon as heavily in the future. Renewable energy sources cannot provide such large quantities of energy for society without causing problems."

(i) Give **two** reasons why oil should not be relied on as a major source of energy for the future.

1. _____

_____

2. _____

_____

(2)

(ii) Energy from the wind is a renewable energy resource. State **three** problems which may arise if the wind were to be used to meet the energy requirements of a large industrial city in Britain.

1. _____

_____

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_____

2. _____

_____

_____

3. _____

_____

_____

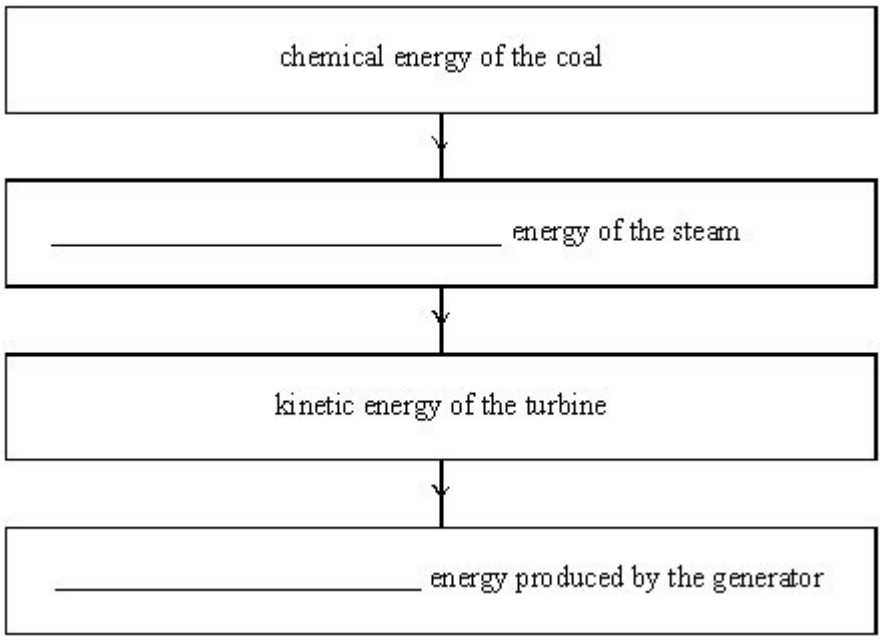
(3)

(Total 8 marks)

Q29.

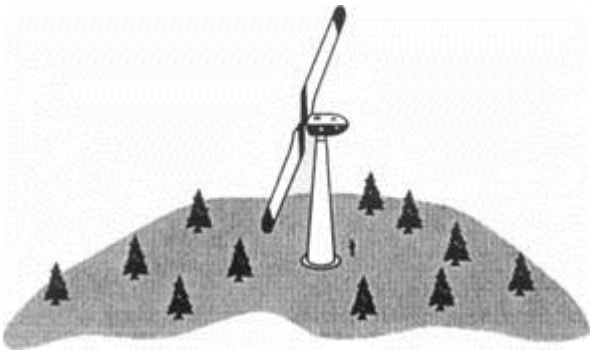
(a) Most electricity in Britain is generated by coal fired power stations.

Complete the sequence of useful energy transfers which take place in the power station.



(1)

(b) The diagram shows a wind turbine which is used to produce electricity using energy from the wind.



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(i) What is the source of energy which creates winds?

_____

(1)

(ii) Explain the advantage of using a wind turbine to produce electricity.

_____

_____

_____

(2)

(Total 4 marks)

Q30.

(a) A swimming pool has a wave making machine. The diagram shows the water wave pattern for 3 seconds.



(i) How many water waves are shown in the diagram?

_____

(1)

(ii) What is the frequency of the water waves?

_____

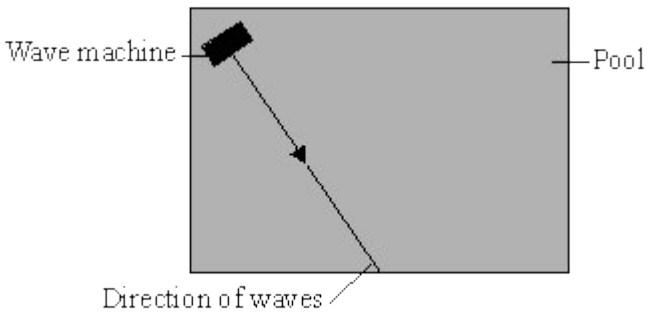
(1)

(iii) Which **one** of the units below is used to measure frequency? Underline your answer.

hertz joule watt

(1)

(b) The diagram shows the direction of the waves across the pool. The waves reflect off the side of the pool.

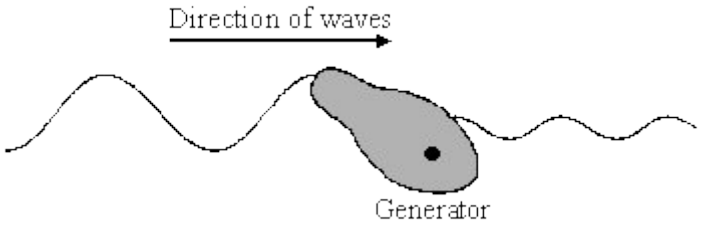


Draw a line on the diagram to show the direction of the waves after they hit the side of the pool.

(1)

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(c) The swimming pool is used to test a model of an electricity generator. The waves make the floating generator move up and down. This energy is transferred to electricity.



(i) In the following sentence, cross out the **two** lines that are wrong in the box.

The diagram shoes that the amplitude of the waves

gets larger
stays the same
gets smaller

as the waves pass the generator.

(1)

(ii) What type of energy does the generator transfer to electricity?

_____

(1)

(iii) Energy from ocean waves could be used to generate electricity. Would this be a renewable or non-renewable energy resource?

_____

(1)

(Total 7 marks)

Q31.

(a) (i) A student wrote "Coal traps energy from the Sun". Explain what the student means.

_____

_____

_____

(2)

(ii) How is energy released from coal?

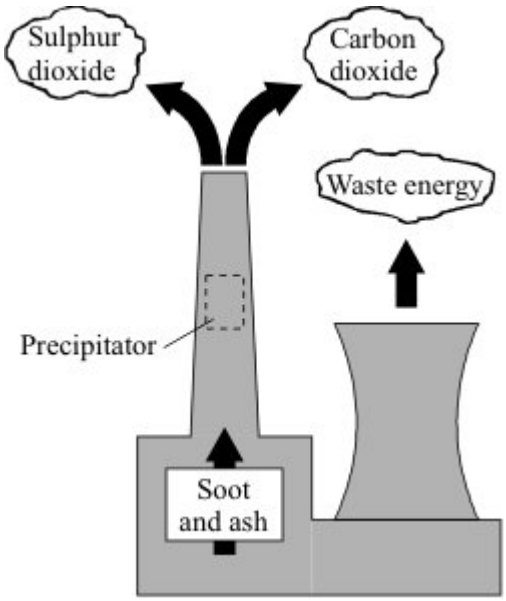
_____

_____

(1)

(b) The diagram shows the waste products from a coal-fired power station.

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(i) In what form does the power station waste energy?

_____

(1)

(ii) Carbon dioxide released into the atmosphere will lead to a rise in the Earth's temperature. Why?

_____

_____

(1)

(Total 5 marks)

Q32.

(a) Electricity can be generated using different energy resources.

(i) Draw lines to link each way of producing electricity to a statement about an energy resource.

Method of producing electricity	Energy resource statements
Tidal barrage	Produces only a small amount of electricity
Solar panel	Is built across a river estuary
Wind turbine	Produces a lot of unwanted noise
Nuclear power station	Rough seas are needed
Wave machine	The waste is very dangerous

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(4)

(ii) Which **one** of these methods of producing electricity uses a non-renewable energy resource?

_____

(1)

(b) The wind is a renewable energy resource.

(i) **One** of the following statements describes the source of energy that creates a wind. Tick the box next to the correct statement.

The Earth turning on its axis. ☐

The gravity pull of the Moon. ☐

Heat from the Sun. ☐

(1)

(ii) Complete the sentence by choosing the correct word from the box.

heat	kinetic	sound

A wind turbine transfers _____ energy to electrical energy.

(1)

(iii) A wind turbine does not produce electricity all of the time. Why not?

_____

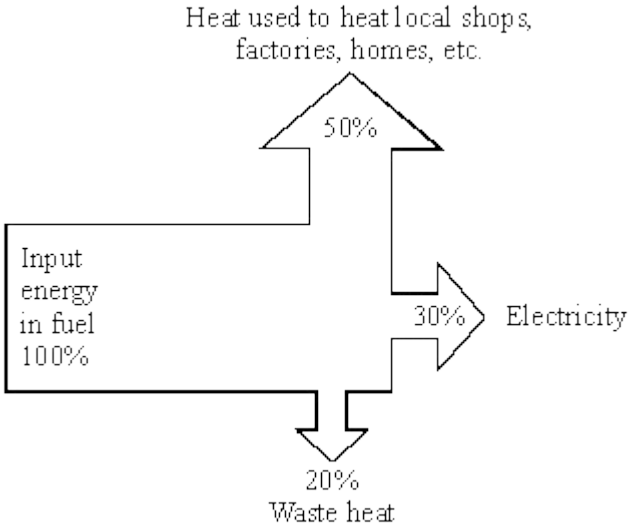
(1)

(Total 8 marks)

Q33.

In a traditional power station 30% of the energy input is usefully transferred to electricity, the rest is wasted as heat. The diagram shows the energy transfers in a combined heat and power (CHP) station.

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Explain why replacing traditional power stations by CHP stations may be beneficial to the environment.

_____

_____

_____

_____

(Total 2 marks)

Q34.

(a) Coal, gas, oil and wood are all examples of fuels.

(i) What are fuels?

_____

(1)

(ii) Write the names of these fuels in the table below to show which are renewable and which are non-renewable.

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RENEWABLE FUELS	NON-RENEWABLE FUELS

(2)

(b) The list below shows energy resources which are not fuels.

geothermal nuclear solar tides wind

Write the names of the energy resources in the table below to show which are renewable and which are non-renewable.

RENEWABLE FUELS	NON-RENEWABLE FUELS

(2)

(c) Why is it better to use more renewable energy resources rather than non-renewable resources?

_____

_____

_____

_____

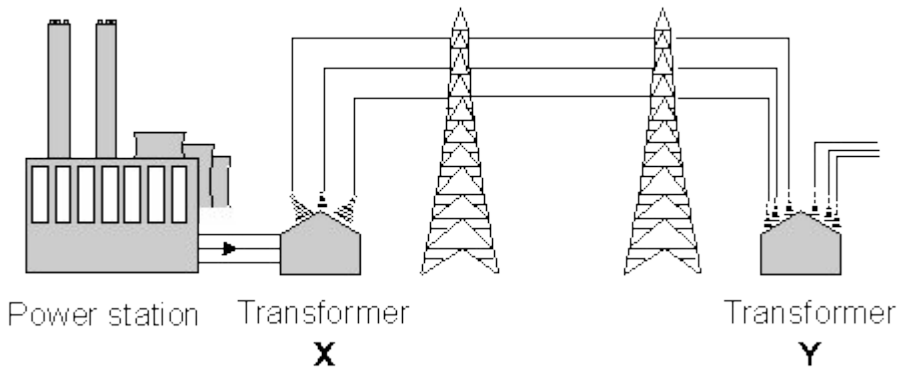
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(2)

(Total 7 marks)

Q35.

The outline diagram below shows part of the National Grid. At **X** the transformer increases the voltage to a very high value. At **Y** the voltage is reduced to 240 V for use by consumers.



(i) At **X** a transformer increases the voltage. What happens to the current as the voltage is increased?

_____

(1)

(ii) Why is electrical energy transmitted at very high voltages?

_____

_____

(1)

(iii) The transformer at **Y** reduces the voltage before it is supplied to houses. Why is this done?

_____

_____

(1)

(Total 3 marks)

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