

Topic 1 Energy F

Name: _____

Class: _____

Date: _____

Time: **40 minutes**

Marks: **39 marks**

Comments:

Q1.Energy resources can be renewable or non-renewable.

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

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

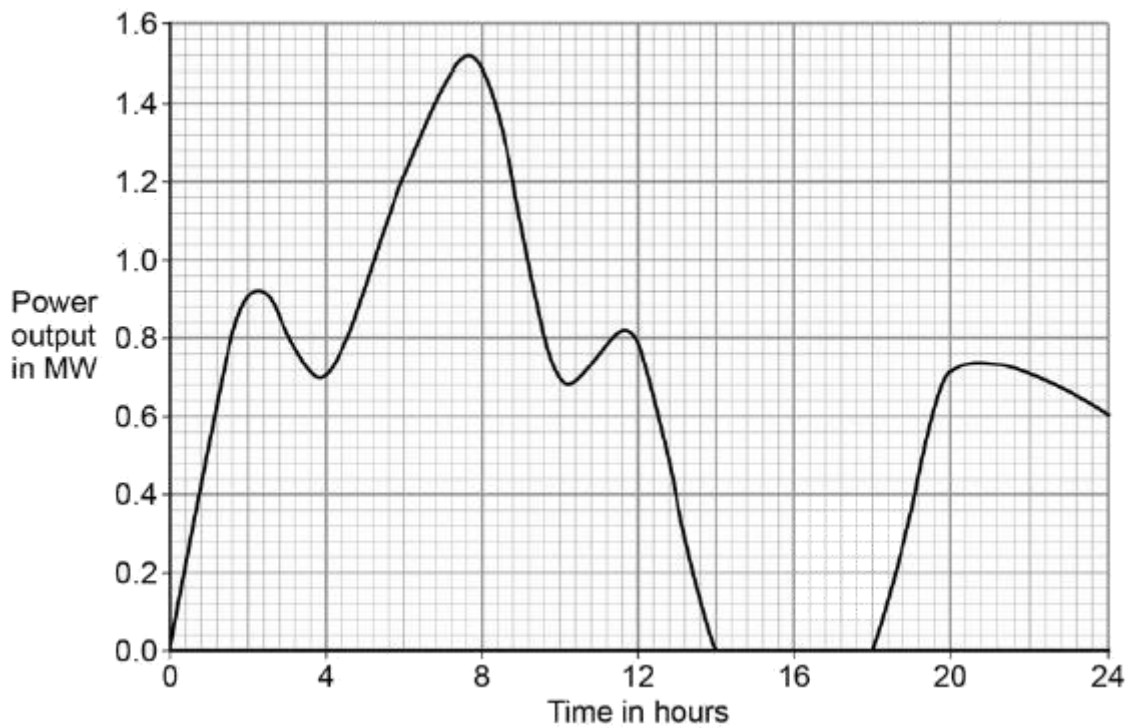
1

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)

Q2. Different energy sources are used to generate electricity.

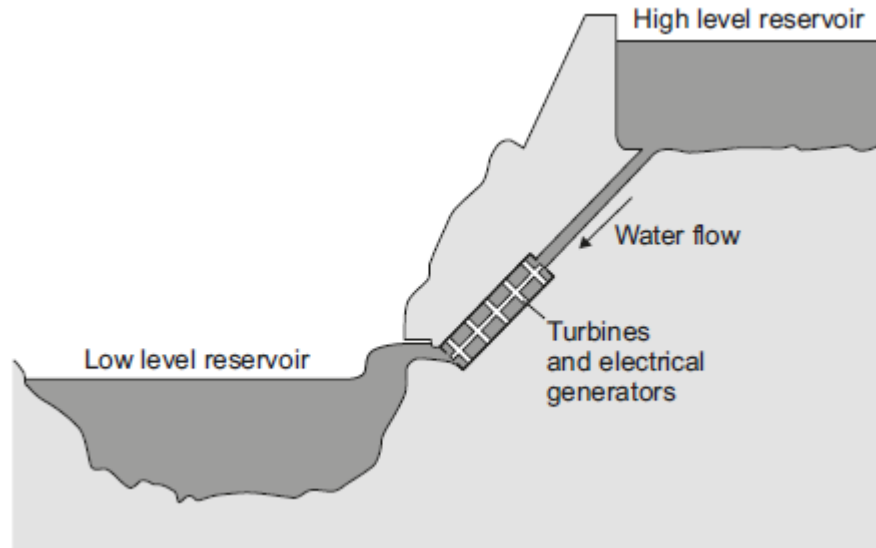
(a) Use words from the box to match the correct energy source to each of the descriptions given in the table.

biofuel	coal	geothermal	nuclear	waves
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Description	Energy source
Energy from the Earth's core is used to heat water.	
Fission of uranium nuclei is used to heat water.	
Gases from rotting plant material are burned to heat water.	

- (b) Energy can be stored in a pumped storage power station.

The figure shows a pumped storage power station.



When electricity is needed, the water in the high level reservoir is allowed to flow to the low level reservoir. The flowing water generates electricity.

Use the correct answer from the box to complete each sentence.

electrical	gravitational potential	kinetic	nuclear	sound
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The water in the high level reservoir stores energy.

The flowing water has energy.

The water turns the turbine which is connected to the generator.

The generator produces some, this is wasted energy.

(3)

- (c) The total power input to a pumped storage power station is 600 MW.

The useful power output is 540 MW.

- (i) Calculate the efficiency of this pumped storage power station.

.....
.....

.....

Efficiency =

(2)

(ii) Calculate how much power is wasted by the pumped storage power station.

.....

Power = MW

(1)

(iii) How is the temperature of the surroundings affected by the energy wasted by the pumped storage power station?

.....

(1)

(Total 10 marks)

Q3.The image shows a man using a leaf blower to move some leaves.



The leaf blower is powered by an electric motor connected to a battery.

(a) Energy transfers take place when the leaf blower is being used.

Use the correct answer from the box to complete each sentence.

chemical	electrical	kinetic	nuclear	sound
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The battery stores energy which is transferred into electrical energy.

The electric motor transfers electrical energy usefully into energy.

The motor wastes energy as energy and as energy that heats the surroundings.

(3)

- (b) The total power input to the leaf blower is 750 W.
The useful power output of the leaf blower is 360 W.

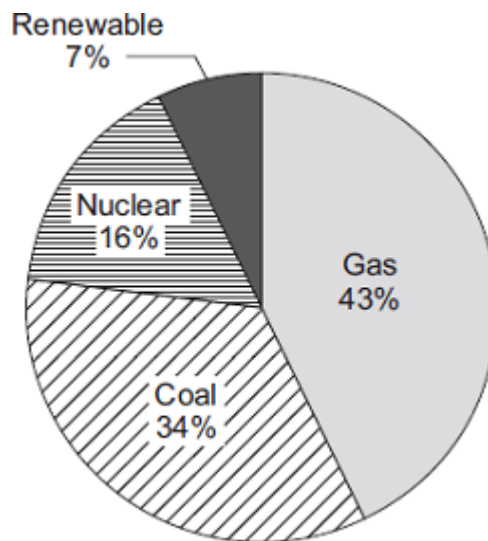
Calculate the efficiency of the leaf blower.

.....
.....
.....
.....

Efficiency =

(2)
(Total 5 marks)

- Q4.(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.

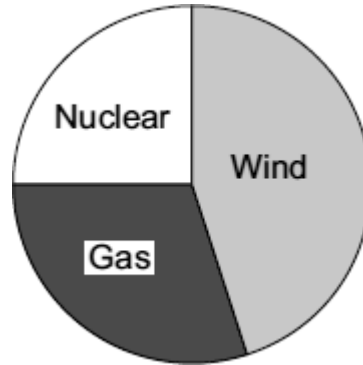
Carbon dioxide causes global warming.

Carbon dioxide causes visual pollution.

(1)
(Total 4 marks)

- Q5.** (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
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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:

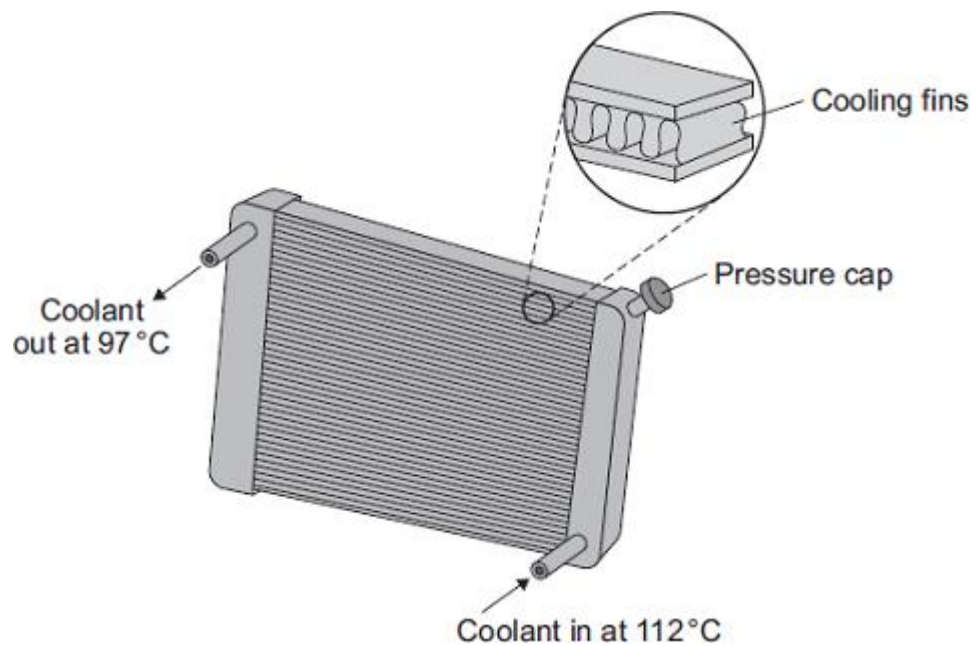
More wind farms, wave powered generators, solar generators and nuclear power stations would need to be built

Why is the statement made in the newspaper incorrect?

.....

(1)
(Total 3 marks)

Q6. The diagram shows a car radiator. The radiator is part of the engine cooling system.



Liquid coolant, heated by the car engine, enters the radiator. As the coolant passes through the radiator, the radiator transfers energy to the surroundings and the temperature of the coolant falls.

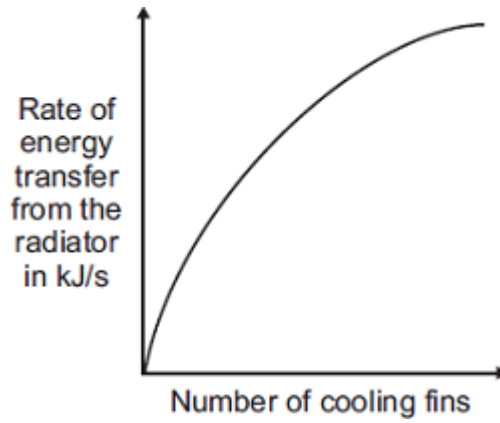
(a) Why is the radiator painted black?

.....
.....
.....
.....

(2)

(b) Different radiators have different numbers of cooling fins along the length of the radiator.

The sketch graph shows how the number of cooling fins affects the rate of energy transfer from the radiator.



The number of cooling fins affects the rate of energy transfer from the radiator.

Explain how.

.....

.....

.....

.....

(2)

- (c) When the car engine is working normally, 2 kg of coolant passes through the radiator each second. The temperature of the coolant falls from 112 °C to 97 °C.

Calculate the energy transferred each second from the coolant.

Specific heat capacity of the coolant = 3800 J/kg °C.

.....

.....

.....

.....

Energy transferred each second = J

(3)

- (d) On cold days, some of the energy transferred from a hot car engine is used to warm the air inside the car. This is a useful energy transfer.

What effect, if any, does this energy transfer have on the overall efficiency of the car engine?

Draw a ring around the correct answer.

**decreases the
efficiency**

**does not change the
efficiency**

**increases the
efficiency**

Give a reason for your answer.

.....
.....
.....

(2)
(Total 9 marks)

- M1.(a)** any **two** from:
- nuclear
 - oil
 - (natural) gas
- 2
- (b) 4 (hours)
- 1
- (c) a system of cables and transformers
- 1
- (d) The power output of wind turbines is unpredictable
- 1
- (e) 1500 / 0.6
- 1
- 2500 (wind turbines)
- 1
- allow 2500 with no working shown for 2 marks*
- (f) Most energy resources have negative environmental effects.
- 1

[8]

- M2.(a)** geothermal
- 1
- nuclear
- 1
- biofuel
- 1
- (b) gravitational (potential)
- 1
- kinetic
- 1
- sound
- 1
- (c) (i) 90% or 0.9(0)
- an answer of 0.9(0) with a unit gains 1 mark*
- 2
- (ii) 60 (MW)

allow 10%

1

(iii) increased

1

[10]

M3.(a) chemical
correct order only

1

kinetic

1

sound

1

(b) 48% or 0.48

an answer of 0.48 with a unit gains 1 mark
an answer of 0.48% gains 1 mark
an answer of 48 with or without a unit gains 1 mark

2

[5]

M4.(a) (i) 77

1

(ii) Oil

1

(b) water
accept H₂O

1

(c) Carbon dioxide causes global warming

1

[4]

M5. (a) *marks are awarded only for the reason but must match the ringed answer*

for both marks a **MAYBE** answer should include a **YES** and **NO** response answers in terms of the sources being renewable or non-renewable are insufficient

any **two** from:

YES answers may include:

- wind produces no pollutant gases
accept wind burns no fuel
accept CO₂ / SO₂ / oxides of nitrogen / greenhouse gas for pollutant gases
- nuclear produces no pollutant gases
accept nuclear burns no fuel
- (burning) gas does not produce SO₂
accept gas does not cause acid rain
do not accept they don't / none produce pollutant gases

NO answers may include:

- nuclear produces radioactive waste
- (burning) gas produces CO₂ / pollutant gases / air pollution
accept contributes to global warming / greenhouse effect

2

- (b) nuclear power stations use a non-renewable fuel
accept uranium / plutonium is non-renewable
do not accept some are unrenewable

1

[3]

- M6.(a)** (matt) black is a good emitter of infrared / radiation
accept heat for infrared / radiation ignore reference to good absorber attracts heat negates this marking point

1

to give maximum (rate of) energy transfer (to surroundings)
accept temperature (of coolant) falls fast(er)
accept black emits more radiation for 1 mark
black emits most radiation / black is the best emitter of radiation for 2 marks

1

(b) the fins increase the surface area
accept heat for energy

1

so increasing the (rate of) energy transfer **or** so more fins greater (rate of) energy transfer

1

(c) 114 000

allow 1 mark for correct temperature change, ie 15 (°C)

or

allow 2 marks for correct substitution, ie $2 \times 3\,800 \times 15$

*answers of 851 200 **or** 737 200 gain 2 marks*

or

*substitution $2 \times 3800 \times 112$ **or** $2 \times 3800 \times 97$ gains 1 mark*

an answer of 114 kJ gains 3 marks

3

(d) increases the efficiency

1

less (input) energy is wasted
accept some of the energy that would have been wasted is (usefully) used

or

more (input) energy is usefully used
accept heat for energy

1

[9]