

**Questions are for both separate science and combined science students  
unless indicated in the question**

**Q1.**

The figure below shows a wind turbine.



Wind turbines may generate electricity when the electricity is not needed.

Two methods that can be used to store the energy from the turbine are:

**Method A:** Heating water to a high temperature.

**Method B:** Pumping water uphill into a reservoir.

(a) Which energy store increases when water is heated?

\_\_\_\_\_ (1)

(b) Which energy store increases when water is pumped uphill into a reservoir?

\_\_\_\_\_ (1)



- (d) Decreasing the amount of carbon dioxide released by different activities will help slow down climate change.

Transport and generating electricity are the two activities that released the largest amounts of carbon dioxide in the UK in 2018.

Explain **one** change that would reduce the amount of carbon dioxide released by **each** activity.

Transport \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Generating electricity \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

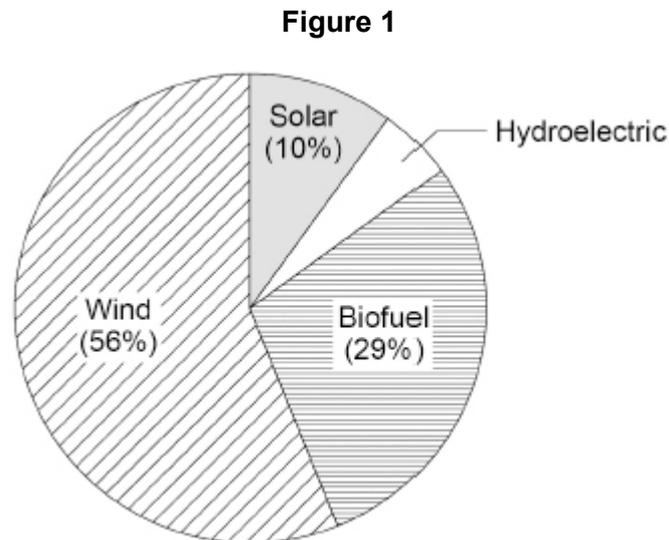
(4)

(Total 10 marks)

**Q2.**

The UK uses renewable energy resources to generate some of its electricity.

**Figure 1** shows the proportion of electricity generated by different renewable energy resources in the UK in 2020.



- (a) Calculate the percentage of electricity generated using hydroelectric power.

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Percentage = \_\_\_\_\_ %

**(2)**

A remote village in the UK uses a hydroelectric generator to provide electricity.

- (b) The mass of water that passes through the hydroelectric generator each day is 2 500 000 kg.

The change in vertical height of the water is 15.0 m.

gravitational field strength = 9.8 N/kg

Calculate the decrease in gravitational potential energy of the water.

Use the equation:

gravitational potential energy = mass  $\times$  gravitational field strength  $\times$  height

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Decrease in gravitational potential energy = \_\_\_\_\_ J

(2)

Use the Physics Equations Sheet to answer parts (c) and (d).

(c) Write down the equation which links energy ( $E$ ), power ( $P$ ) and time ( $t$ ).

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(1)

(d) The hydroelectric generator transfers electrical power of 3000 W to the village.

Calculate the energy transferred to the village in 60 minutes.

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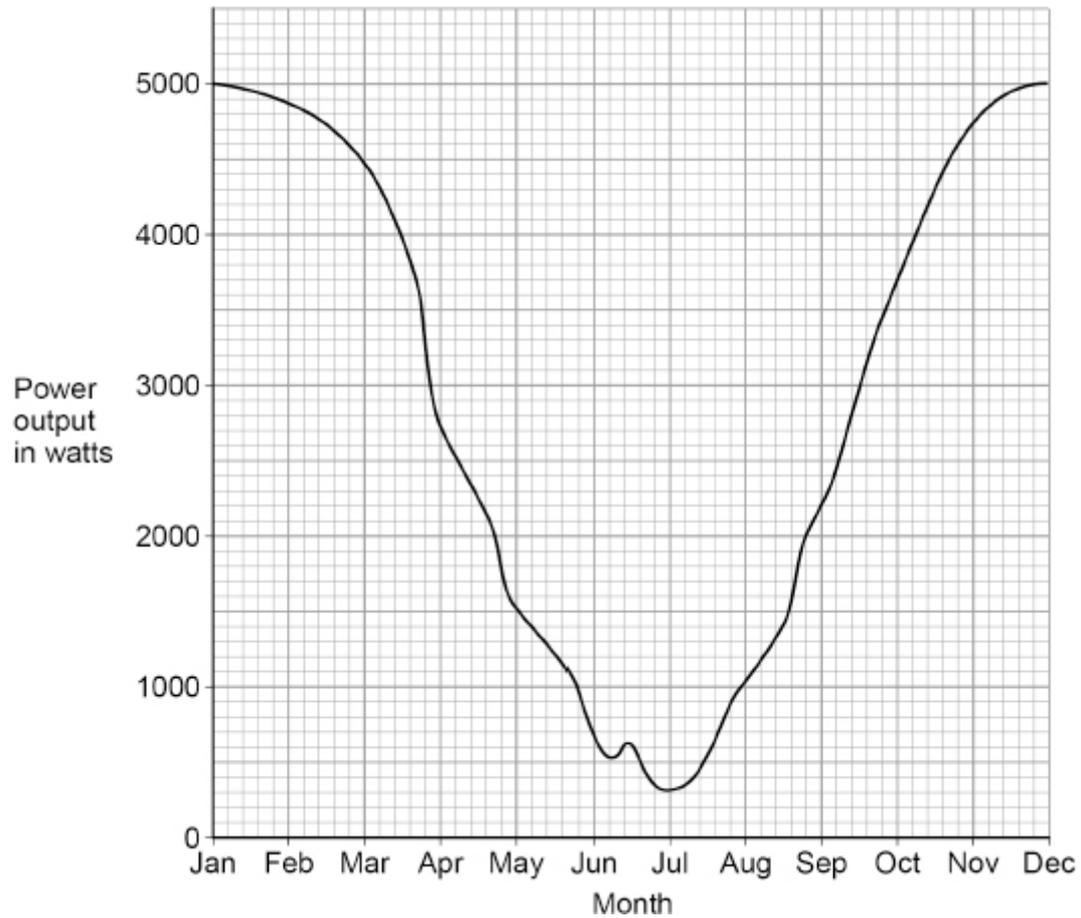
Energy transferred = \_\_\_\_\_ J

(3)

- (e) The hydroelectric generator is turned by falling river water.

**Figure 2** shows how the power output of the hydroelectric generator varied during one year.

**Figure 2**



Explain **one** reason why the power output varied.

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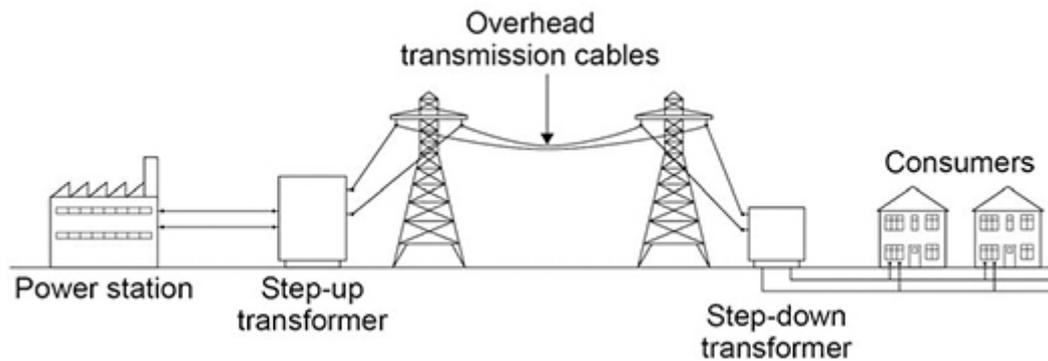
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(2)  
(Total 10 marks)

**Q3.**

The figure below shows how electricity is supplied to consumers. **(Physics only)**



- (a) Electricity from the power station can be generated using renewable or non-renewable energy resources.

Complete table below to show which energy resources are renewable and which are non-renewable.

Tick (✓) **one** box in **each** row.

Energy resource	Renewable	Non-renewable
biofuel		
coal		
nuclear		
tides		

(2)  
(Total 2 marks)

**Q4.**

The figure below shows a large wind farm off the coast of the UK.



The mean power output of the wind farm is 696 MW, which is enough power for 580 000 homes.

- (a) Calculate the mean power needed for 1 home.

Give your answer in watts.

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Mean power needed for 1 home = \_\_\_\_\_ W

(2)

- (b) On one day the demand for electricity in the UK was 34 000 MW.

Suggest **two** reasons why wind power was not able to meet this demand.

1. \_\_\_\_\_

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2. \_\_\_\_\_

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(2)

- (c) Some of the energy from the wind used to rotate a wind turbine is wasted.

An engineer oils the mechanical parts of a wind turbine.

Explain how oiling would affect the efficiency of the wind turbine.

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**(3)**

- (d) In most homes in the UK there are many different electrical devices.

Explain why people should be encouraged to use energy efficient electrical devices.

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**(2)**

**(Total 9 marks)**