

# 2.3 Energy Transfers

## Question Paper

Course	AQA GCSE Physics
Section	2. Electricity
Topic	2.3 Energy Transfers
Difficulty	Medium

**Time allowed:** 60  
**Score:** /50  
**Percentage:** /100

**Question 1a**

**Figure 3** shows a battery powered drone.

**Figure 3**



The battery for the drone is marked as 1300 mAh.

This means that it could supply a current of 1300 mA for 1 hour.

Battery voltage = 14.8 V

(a) Show that the energy stored in the battery is about 70 kJ.

**[2 marks]**

[2 marks]

**Question 1b**

The drone can fly for 20 minutes before it needs to be recharged.

(b) State the equation linking power (P), energy (E) and time (t).

**[1 mark]**

[1 mark]

### Question 1c

(c) Calculate the power of the drone.

**[2 marks]**

[2 marks]

### Question 1d

(d) Calculate the current that flows through the drone while it is flying.

**[3 marks]**

[3 marks]

### Question 1e

(e) Calculate the resistance of the drone.

**[3 marks]**

[3 marks]

**Question 2a**

The electric kettle in **Figure 4** below uses the ac mains electricity supply.

**Figure 4**



(a) Explain what is meant by the term 'ac'.

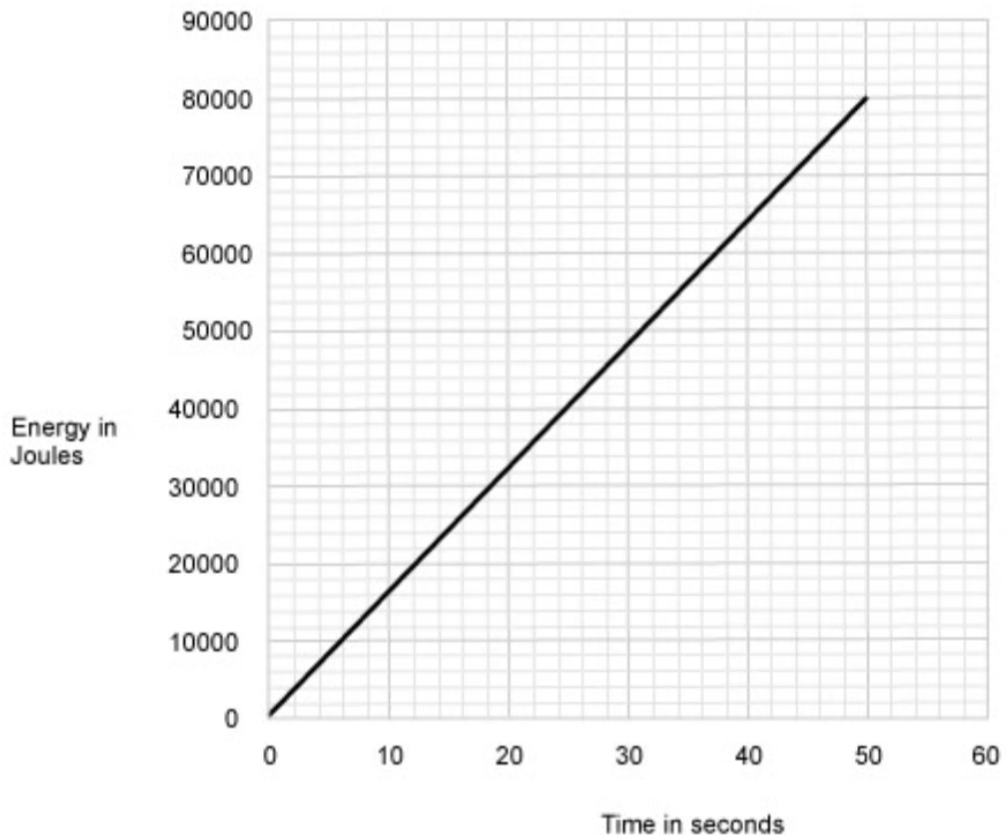
**[2 marks]**

[2 marks]

**Question 2b**

(b) The graph in **Figure 5** below shows how the energy transferred by the kettle changes with time.

**Figure 5**



The gradient of the graph gives the power output of the kettle.

Calculate the power output of the kettle.

**[2 marks]**

[2 marks]

### Question 2c

(c) State the equation that links current ( $I$ ), charge flow ( $Q$ ) and time ( $t$ ).

**[1 mark]**

[1 mark]

### Question 2d

(d) Calculate the current through the kettle when 417 coulombs of charge flow through the kettle in 1 minute.

**[3 marks]**

[3 marks]

### Question 2e

(e) Calculate the resistance of the kettle.

Give your answer to **2** significant figures.

**[4 marks]**

[4 marks]

**Question 3a**

A wind turbine converts kinetic energy in the wind to electrical energy, which it then transfers to the National Grid.

The wind farm in **Figure 5** below contains 5 wind turbines, each with an average power output of 3 MW.

**Figure 6**



(a) Calculate the total energy generated by the wind farm in 30 minutes.

Show all your working.

**[3 marks]**

[3 marks]

**Question 3b**

(b) In a single turbine, the current through the generator is 450 A.

Calculate the output voltage of one turbine.

**[3 marks]**

[3 marks]

**Question 3c**

(c) A step up transformer is used to increase the output voltage to 132 kV for transmission.

Explain why the voltage is stepped up in this way.

**[4 marks]**

[4 marks]



### Question 4a

Table 1 shows a range of household appliances and their power ratings.

Table 1

Appliance	Power rating	Current drawn
Desk lamp	14 W	
55 inch OLED TV	125 W	
Toaster	480 W	
Microwave	900 W	

(a)

Complete Table 1 by adding the values for the current drawn for each appliance.

Give your answers to 2 significant figures.

[4 marks]

[4 marks]

### Question 4b

(b)

Calculate the electrical work done by using the toaster on full power for 3 minutes.

[3 marks]

Work done = ..... J

[3 marks]

**Question 4c**

(c)

Calculate the amount of charge that flowed through the toaster circuit during the 3 minutes of use.

Give your answer to 2 significant figures.

[3 marks]

Charge (2 significant figures) = ..... C

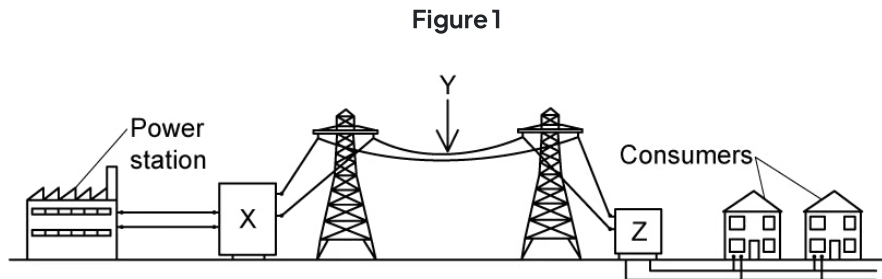
[3 marks]

**Question 5a**

The National Grid is a system of transformers and cables that connects power stations to consumers.

(a)

**Figure 1** shows a simplified diagram of the National Grid.



State which transformer, X or Y, is the step-up transformer.

[1 mark]

[1 mark]

**Question 5b**

(b)

The transmission cables in **Figure 1** have a current of 63.2 A at a potential difference of 400 000 V when travelling between the two transformers.

The resistance of the cable is 200  $\Omega$ .

Calculate the power transferred in heating up the cable.

[3 marks]

Power = ..... W

[3 marks]

### Question 5c

(c)

Which statements are true about step-down transformers?

[3 marks]

Tick (✓) **three** boxes.

Have more turns on the primary coil

Have more turns on the secondary coil

Used to decrease the potential difference

Used to increase the potential difference

Used to reduce wasted energy in transmission

Used to make energy supplied to houses safer

[3 marks]