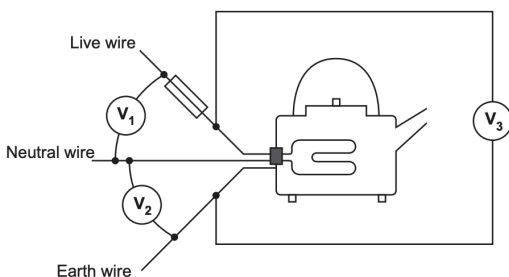


Powering Earth

Q1.(2018)

An electric kettle is plugged into a socket. The kettle is switched on. A qualified electrician uses three voltmeters, V_1 , V_2 and V_3 .



Use the relationship: $V_3 = V_1 + V_2$

Which row in the table, **A**, **B**, **C** or **D**, shows the correct readings for the three voltmeters?

	V_1 (V)	V_2 (V)	V_3 (V)
A	0	230	230
B	230	0	230
C	230	230	0
D	0	0	230

Your answer

[1]

Q2.a(2018)

The table shows some information about electrical appliances in the home.

Appliance	Power (W)	Current (A)	Resistance (Ω)
Hairdryer	1800	7.8	29.6
Heater	800	3.5	66.1
Iron	2000	8.7	26.4
Kettle	2500	10.9	21.0

(a) A teacher says: 'As power increases, resistance increases'

Is she correct?

Use data from the table to explain your answer.

.....

 [2]

Q2.b(2018)

The kettle is switched on for 60 seconds.

Calculate the energy transferred.

Answer = J [3]

Q2.c(2018)

Electricity companies do not use joules (J) in electricity bills. Electricity companies use kilowatt-hours (kWh).

- (i) A hairdryer has a power of 1800 W.

What is the **power** of the hairdryer in kilowatts (kW)?

Answer = kW [1]

Q2.d(2018)

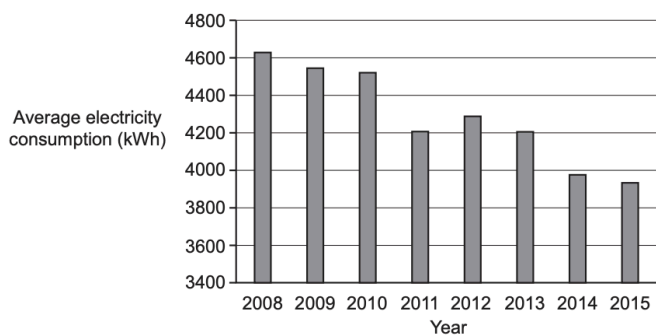
Suggest why electricity companies charge for electricity using kWh.

.....
..... [1]

Q2.e(2018)

The average electricity consumption per household changes every year.

The graph shows how this changes from the year 2008 to the year 2015.

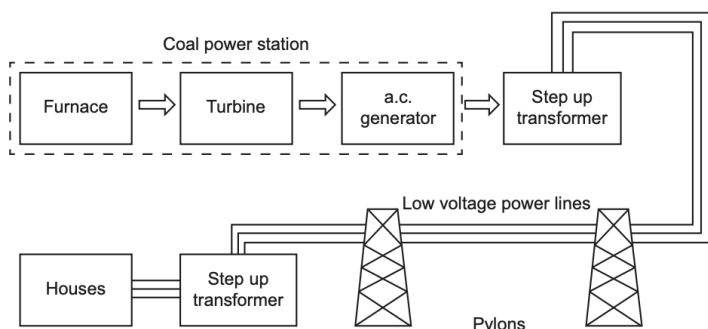


Describe **and** explain the trend shown by the graph.

.....
.....
..... [2]

Q3.a(2018)

A student draws a diagram to show the national grid.



(a) State the **two** mistakes in the diagram.

1.
2.

[2]

Q3.b(2018)

The national grid uses transformers.

Explain how using transformers makes the national grid more efficient.

.....

.....

.....

..... [2]

Q3.c(2018)

Explain the difference between direct voltage and alternating voltage.

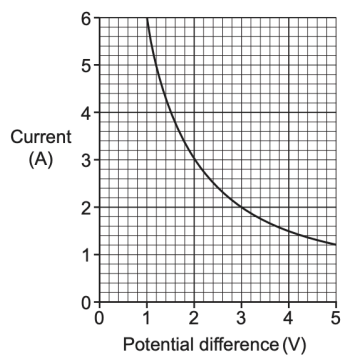
.....

.....

..... [2]

Q4.(2019)

This graph shows current and potential difference for the secondary coil of a transformer.



What happens to current as potential difference **doubles**?

- A It doubles
- B It halves
- C It stays the same
- D It triples

Your answer

[1]

Q5.(2019)

An astronaut lifts a 0.25 kg hammer 1.0 m above the surface of the Moon.

The gravitational field strength on the Moon is 1.6 N/kg.

Calculate the potential energy stored.

Use the equation: potential energy = mass $\times$ height $\times$ gravitational field strength

- A 0.16 J
- B 0.40 J
- C 6.40 J
- D 400 J

Your answer

[1]

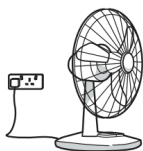
Q6.a(2019)

This question is about electrical devices.

(a) The diagram shows two different electrical devices.



Torch



Electric fan

(i) Write down the source of electrical energy for each device.

torch

electric fan [1]

Q6.b(2019)

Describe how energy is dissipated in the **electric fan**.

.....

..... [1]

Q6.c(2019)

The electric fan is rated 230 V, 0.3 A.

Calculate the power of the electric fan.

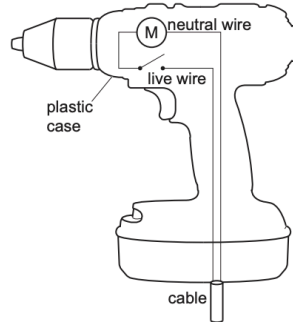
Use the equation: power = potential difference $\times$ current

Power = W [2]

Q7.(2019)

Diagram illustrating the electrical connections for a washing machine. The machine has a metal case and a motor (M). The motor is connected to a neutral wire, which is connected to a live wire. The live wire is connected to a cable, which is then connected to an earth wire. The earth wire is connected to the metal case.

Tumble dryer



Electric drill

Include the function of the earth, live and neutral wires in your answer.

[6]

A kinetic store $\rightarrow$ gravitational store
B gravitational store $\rightarrow$ kinetic store
C kinetic store $\rightarrow$ chemical store
D gravitational store $\rightarrow$ chemical store

7

[1]

Q9.a(2020)

A student wants to check the electrical power of a mains filament lamp.

He sets up the circuit in **Fig. 11.1**.

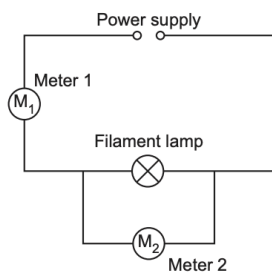


Fig. 11.1

(a) Complete the table to describe how he sets up the equipment in **Fig. 11.1**.

What is being measured?	Name of meter	Connected in
Potential difference	Meter 2 =	Parallel
.....	Meter 1 = Ammeter	

[2]

Q9.b(2020)

The student reads the meters in the circuit in **Fig. 11.1**.

- The value of the potential difference is 230 V.
- The value on the ammeter is 0.5 A.

Calculate the actual power of the mains filament lamp.

Use the equation: power = potential difference × current

Power = W [2]

Q9.c(2020)

Another lamp has a power of 100 W.
1 kW = 1000 W

What is the power of the lamp in kilowatts (kW)?

Put a ring around the correct answer.

0.1 kW 1 kW 100 kW 100 000 kW

[1]

Q9.d(2020)

Suggest how the student can make his readings more precise.

.....

.....

.....[1]

Q10.(2020)

This question is about domestic electricity.

(a) Draw lines to connect each **term** with the correct **description**.

Term	Description
National grid	Increases voltage.
Step-up transformer	Decreases voltage.
Alternating voltage	Network of wires connecting power stations to users.
Step-down transformer	Changes direction 50 times a second.

[3]

Q11.(2020)

Fig. 14.1 is a diagram of the wiring in a metal kettle.

The diagram in **Fig. 14.1** is incomplete.

Use these words to **label** the 3 wires on the diagram.

You may use each word once, more than once, or not at all.

Earth Live Neutral

[2]

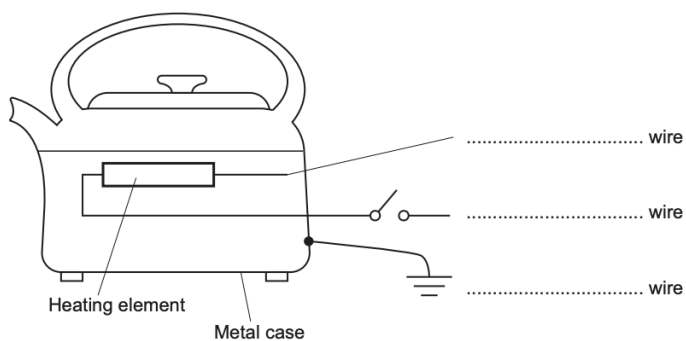


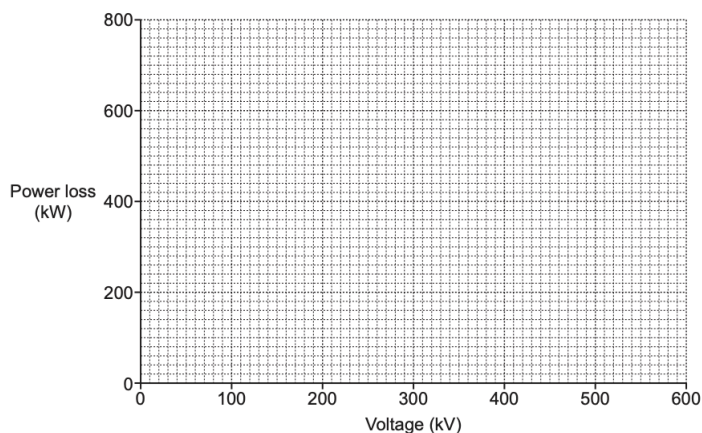
Fig. 14.1

Q12.a(2020)

The table shows power losses for different voltages in a power line.

Voltage (kV)	Power loss (kW)
200	720
300	320
400	180
500	115
600	80

- (i) Using the data in the table, plot a graph of power loss against voltage and draw a line of best fit.



[2]

Q12.b(2020)

Describe the relationship between power loss and voltage.

You **may** use values from the graph or table in your answer.

.....

.....

..... [2]

Q12.c(2020)

Explain why the national grid is an efficient way to transfer energy.

.....

..... [1]

Q13.(2021)

Which sentence describes a feature of the **live** wire in a plug?

- A** It carries current to earth if there is a fault.
- B** It completes the circuit.
- C** It is at a potential difference of 230 V compared to earth.
- D** It melts if the current is too small.

Your answer ☐

[1]

Q14.(2021)

Why are step-up transformers used in the national grid?

- A** To generate alternating currents.
- B** To increase the current from power stations.
- C** To increase the voltage from power stations.
- D** To reduce pollution from power stations.

Your answer ☐

[1]

Q15.(2022)

What is the function of the neutral wire?

- A** To bring current into an appliance
- B** To carry current if there is a fault
- C** To complete the circuit
- D** To melt if the current is too large

Your answer ☐

[1]

Q16.(2022)

A remote control can be used to operate a television.



Remote control

Television

Which row in the table describes how energy is transferred?

	Remote control	Television
A	3 V a.c. from batteries	230 V d.c. from domestic mains supply
B	3 V d.c. from batteries	230 V a.c. from domestic mains supply
C	230 V a.c. from domestic mains supply	3 V d.c. from batteries
D	230 V d.c. from domestic mains supply	3 V a.c. from batteries

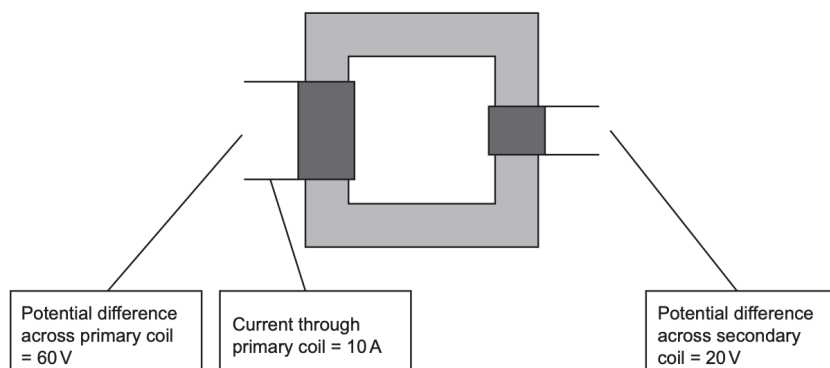
Your answer

[1]

Q17.(2022)

12 (a) Transformers are used to transfer energy efficiently.

This is a diagram of a transformer:



Calculate the current through the secondary coil.

Use the information in the diagram **and** the Data Sheet.

Current = A [3]

Q18.a(2022)

Energy use can be measured in kilojoules (kJ) or kilowatt hours (kWh).

(i) An electric shower has a power of 8.5 kW.

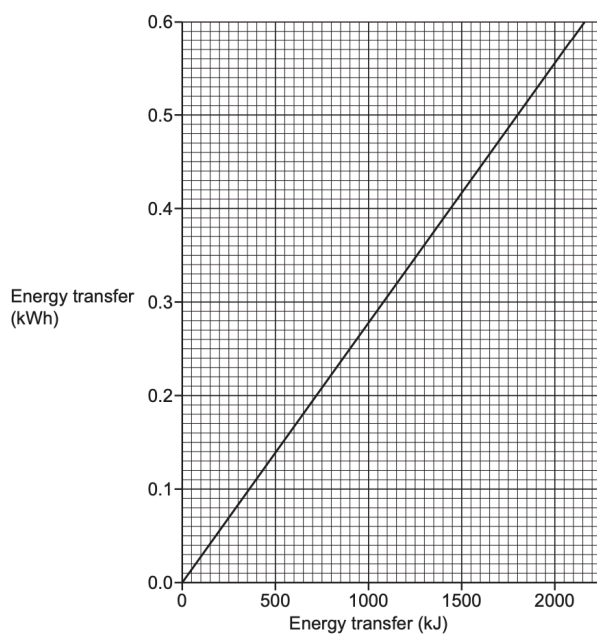
1 kW = 1000 W.

What is the power of the shower in watts (W)?

Power = W [1]

Q18.b(2022)

The graph shows the relationship between energy transfer in kJ and energy transfer in kWh.



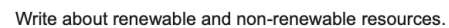
A kettle transfers 1800 kJ of energy.

Use the graph to find the energy transfer in kWh.

Energy transfer = kWh [1]

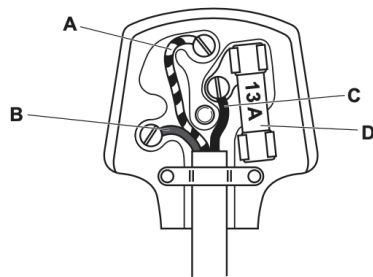
Q19.(2022)

The graph shows how electricity was generated in 2013 and 2018.



[6]

Which part of the plug is connected to the metal case of an appliance?

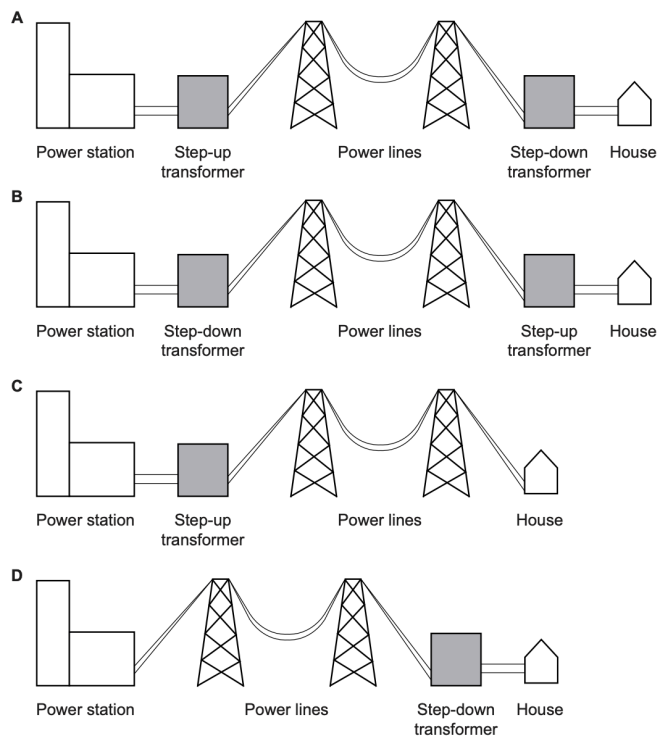


Your answer

[1]

Q21.(2023)

Which diagram shows how transformers are used in the national grid?



Your answer

[1]

Q22.(2023)

Which sentence is a **disadvantage** of using wind turbines?
Tick (✓) **one** box.

They are a renewable energy resource.

☐

They make carbon dioxide.

☐

They make dangerous waste products.

☐

They make noise pollution.

☐

[1]

Q22.(2023)

Which sentence is an **advantage** of using solar panels?
Tick (✓) **one** box.

They can be used in remote locations.

☐

They generate electricity at night.

☐

They make acid rain.

☐

They produce harmful gases.

☐

[1]

Q23.(2023)

Which energy resource produces the most energy per kilogram of fuel?

Put a **ring** around the correct answer.

coal

gas

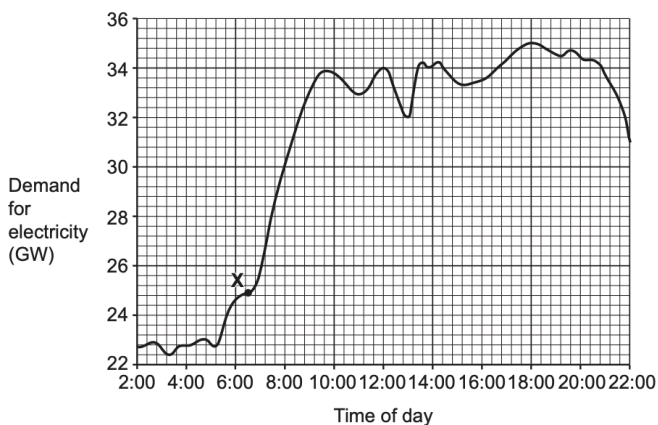
oil

nuclear

[1]

Q24.a(2023)

The graph shows how demand for electricity changes during a typical day.



(i) Which energy resource can be used to cope with the extra demand for electricity starting at X?

Put a **ring** around the correct answer.

tidal

gas

wind turbines

solar

[1]

Q24.b(2023)

Use the graph to estimate the **maximum** demand for electricity.

Maximum demand = GW [1]

Q24.c(2023)

At 12:00, the demand for electricity is 34 GW.

Calculate the percentage decrease in demand for electricity from 12:00 to 13:00.

Use the equation: $\text{percentage decrease} = \frac{\text{decrease in demand}}{\text{demand at 12:00}} \times 100 \%$

Give your answer to **1** decimal place.

Percentage decrease = % [3]

Q24.d(2023)

Suggest a reason for the decrease in demand for electricity at 12:00.

.....
..... [1]

Q25.(2024)

This question is about how electricity is generated.

A student writes down advantages and disadvantages of wind turbines.

	Advantage		Disadvantage
A	do not need fuel	C	do not produce carbon dioxide
B	produce renewable energy	D	take up lots of land

The student has made **one** mistake.

State the **letter** of the statement that is in the wrong place.

Letter =

[1]

Q26.a(2024)

The student writes down a list of renewable and non-renewable energy sources.

Renewable	Non-renewable
hydroelectric	coal
solar	wave

The student has made **one** mistake.

State the **name** of the energy source that is in the wrong place.

Name =

[1]

Q26.b(2024)

It might not be possible to replace all non-renewable energy sources with renewable energy sources to generate **enough** electricity in the future.

Suggest **two** reasons why this might not be possible.

1

.....

2

.....

[2]

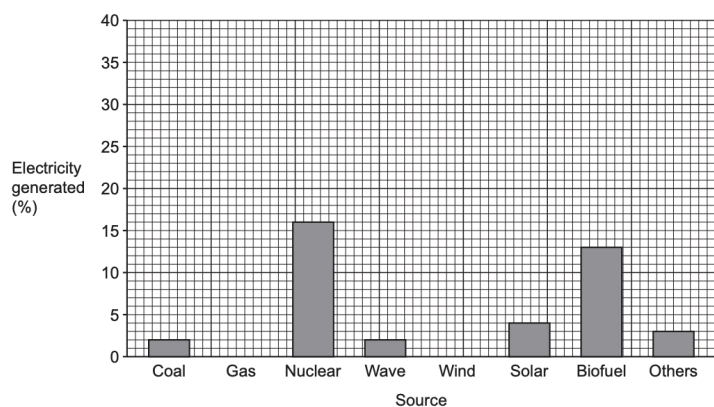
Q27.a(2024)

- (d) The table shows the percentages of electricity generated by different energy sources in the UK in 2020.

Source	Electricity generated (%)
Coal	2
Gas	36
Nuclear	16
Wave	2
Wind	24
Solar	4
Biofuels	13
Others	3

- (i) The student plots a bar chart using the data in the table.

Draw a bar for gas and a bar for wind on the bar chart.



[2]

Q27.b(2024)

The total electricity generated in the UK in 2020 was 315 TWh.

Solar produced 4% of the total electricity generated.

Calculate the amount of electricity generated in TWh from solar.

Amount of electricity = TWh [2]

Q27.c(2024)

The total electricity generated in the UK in 2020 was 315TWh.

1TWh = 1 000 000 000 kWh

What is the total amount of electricity generated in kWh?

Tick (✓) **one** box.

315000kWh

☐

315000000kWh

☐

315000000000kWh

☐

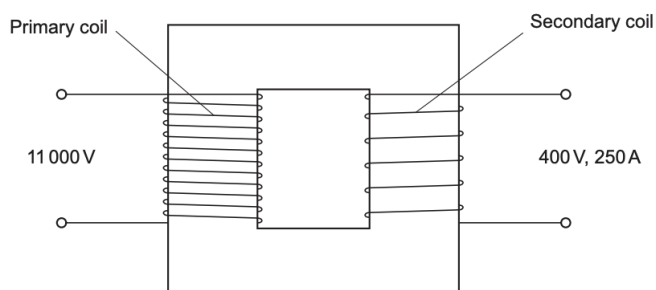
315000000000000kWh

☐

[1]

Q28.a(2024)

This is a diagram of a transformer.



Calculate the power output from the secondary coil.

Use the equation: power = potential difference $\times$ current

Power output = W [2]

Q28.b(2024)

Name the type of transformer shown in the diagram.

..... [1]

Q28.c(2024)

Where can this type of transformer be used in the national grid?

Tick (✓) **one** box.

Between the power lines and homes

☐

Between the power station and power lines

☐

In a phone charger

☐

In the power station

☐

[1]

Q28.d(2024)

The energy input to the primary coil is 200 kJ.

The energy output from the secondary coil is 180 kJ.

Calculate the efficiency of the transformer.

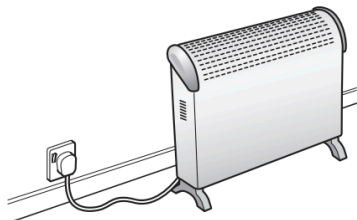
Use the equation: $\text{efficiency} = \frac{\text{useful output energy transfer}}{\text{input energy transfer}}$

Efficiency = [2]

Q29.(2024)

Fig. 16.1 shows a heater plugged into an electrical socket.

Fig. 16.1



The heater is operating normally.

What are the names of the two wires in the plug that carry a current?

Tick (✓) **one** box.

Earth and fuse

☐

Earth and neutral

☐

Live and fuse

☐

Live and neutral

☐

[1]

Q30.(2024)

A live wire is accidentally connected to the earth wire in the house. This causes a large current to flow in the earth wire.

This can cause electrocution.

Suggest **another** reason why this is dangerous.

.....
..... [1]

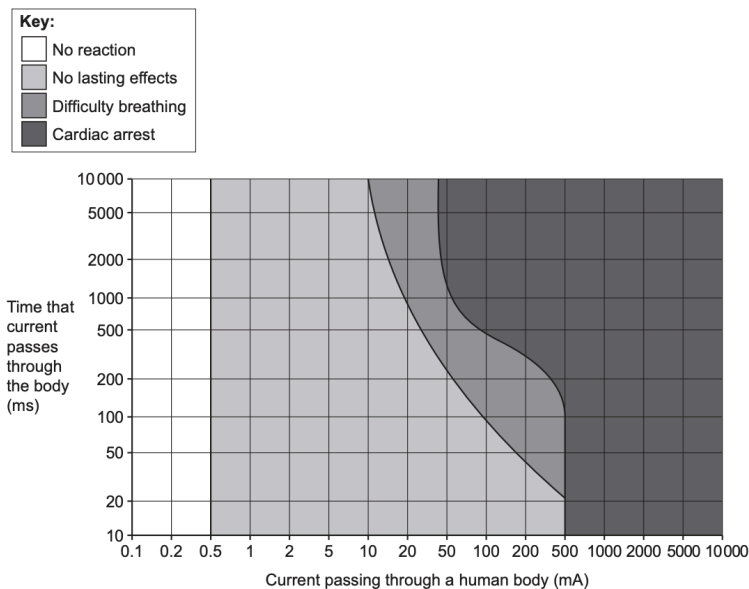
Q31.a(2024)

(d) A residual current device (RCD) is a safety feature found in homes.

The RCD turns off the electricity quickly if it detects a fault due to a difference between the current in the live wire and the current in the neutral wire.

Fig. 16.2 shows the effects that mains current has on a human body.

Fig. 16.2



(i) Describe **one** trend shown by Fig. 16.2.

.....
..... [1]

Q31.b(2024)

A current of 10 mA is passing through a human body.

How long can the current pass through the body before the person has difficulty breathing?

..... [1]

Q31.c(2024)

Calculate the charge flowing when 150 mA is in the human body for 0.3 s.

Use the equation: charge flow = current $\times$ time

Charge flow = C [3]

Q31.d(2024)

Sensitive RCDs are designed to shut off the electricity supply within 40 ms.

Suggest why this is an important feature for currents below 200 mA. Use Fig. 16.2.

.....
 [1]

Q31.e(2024)

An electrician has a choice of two different RCDs, **A** and **B**, to use in a house.

	RCD A	RCD B
Minimum difference in current needed between the live wire and neutral wire before electricity turns off (mA)	10	30
Time taken to turn off electricity (ms)	100	40

Suggest which RCD the electrician should use in the house.

Give **two** reasons. Use Fig. 16.2.

1

 2
 [2]