

Electricity – GCSE Physics Paper 1

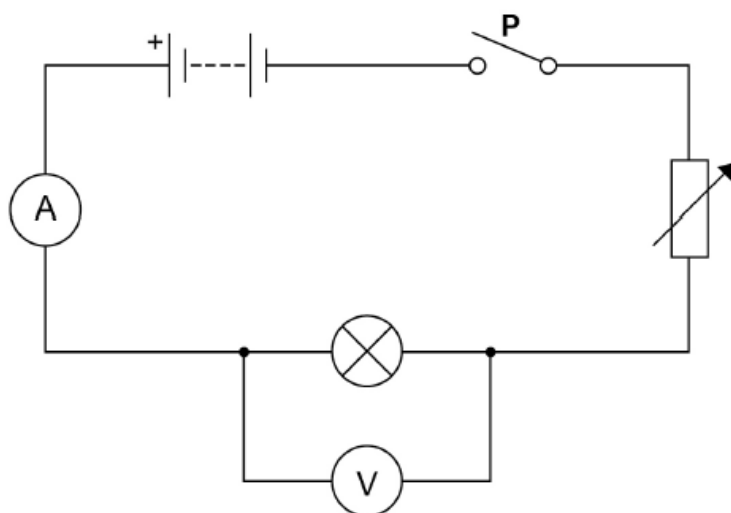
1. No.1

0 1

A student investigated how the current in a filament lamp varies with the potential difference across the lamp.

Figure 1 shows the circuit used.

Figure 1



0 1 . 1

What is component **P**?

[1 mark]

0 1 . 2

Complete the sentences.

Choose answers from the box.

[2 marks]

charge

current

energy

potential difference

power

The ammeter in the circuit measures _____.

The voltmeter in the circuit measures _____.

0 1 . 3

How will **increasing** the resistance of the variable resistor in **Figure 1** affect each of the following quantities?

[3 marks]

Tick (✓) **one** box in **each** row.

Quantity	Decreases	Stays the same	Increases
Current in the circuit			
Potential difference across the lamp			
Total resistance of the circuit			

0 1 . 4

A charge flow of 15 coulombs passed through the filament lamp in a time of 60 seconds.

Calculate the current in the lamp.

Use the equation:

$$\text{current} = \frac{\text{charge flow}}{\text{time}}$$

[2 marks]

Current = _____ A

01.5

When the current in the filament lamp is 0.12 A, the potential difference across the lamp is 6.0 V.

Calculate the resistance of the filament lamp.

Use the equation:

$$\text{resistance} = \frac{\text{potential difference}}{\text{current}}$$

[2 marks]

Resistance = _____ Ω

0 1 . 6

The student repeated the investigation after replacing the lamp with a resistor at constant temperature and then a diode.

The student plotted a graph for each component.

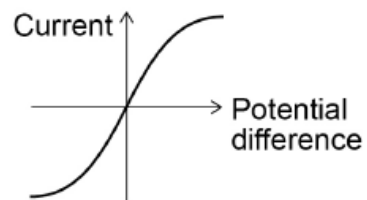
Draw **one** line from each component to its graph.

[2 marks]

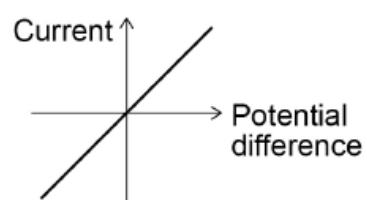
Component

Graph

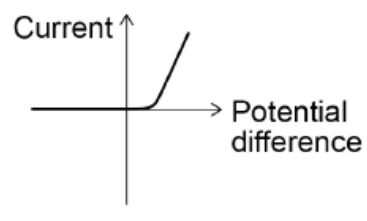
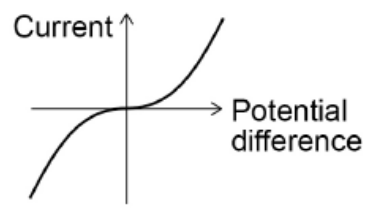
Diode



Filament lamp



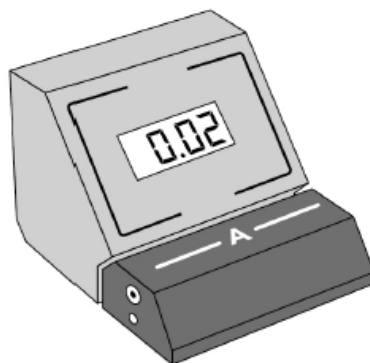
Resistor



0 1 . 7 Figure 2 shows an ammeter.

The ammeter is **not** connected to a circuit.

Figure 2



What type of error does the ammeter display?

[1 mark]

Tick (✓) **one** box.

A positive error

☐

A random error

☐

A zero error

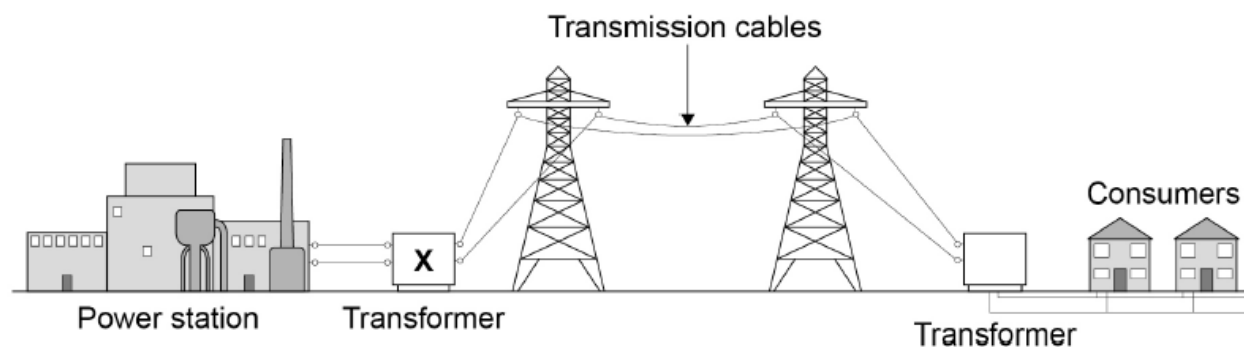
☐

2. No.8

0 8

Figure 11 shows how the National Grid connects a power station to consumers.

Figure 11



0 8 . 1

Complete the sentences.

[2 marks]

Transformer X causes the potential difference to _____.

Transformer X causes the current to _____.

Use the Physics Equations Sheet to answer questions 08.2 and 08.3.

0 8 . 2

Which equation links current (I), power (P) and resistance (R)?

[1 mark]

Tick (✓) one box.

$$P = \frac{I}{R} \quad \boxed{}$$

$$P = \frac{I}{R^2} \quad \boxed{}$$

$$P = I^2 R \quad \boxed{}$$

$$P = IR \quad \boxed{}$$

08.3

A transmission cable has a power loss of 1.60×10^9 W.

The current in the cable is 2000 A.

Calculate the resistance of the cable.

[3 marks]

Resistance = _____ Ω

Use the Physics Equations Sheet to answer questions 08.4 and 08.5.

08.4

Write down the equation which links efficiency, total energy input and useful energy output.

[1 mark]

08.5

The total energy input to the National Grid from one power station is 34.2 GJ.

The National Grid has an efficiency of 0.992

Calculate the useful energy output from this power station to consumers in GJ.

[3 marks]

Useful energy output = _____ GJ

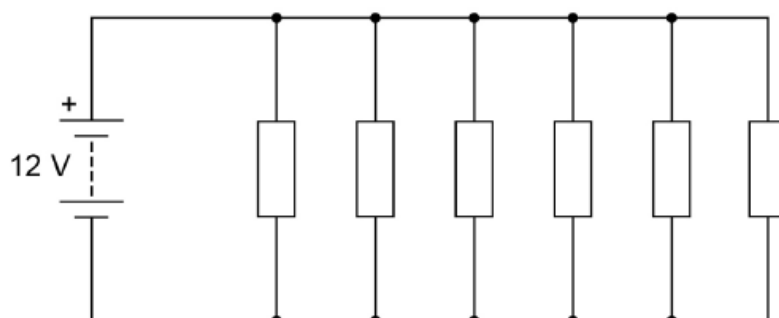
3. No.10

1 0

Figure 14 shows an electrical circuit used to heat the windscreen of a car.

Each resistor in the circuit represents a heating element.

Figure 14



1 0 . 1

The 12 V battery supplies direct potential difference.

What is meant by 'direct potential difference'?

[1 mark]

Use the Physics Equations Sheet to answer questions 10.2 and 10.3.

1 0 . 2

Which equation links charge flow (Q), energy (E) and potential difference (V)?

[1 mark]

Tick (✓) **one** box.

$E = \frac{V}{Q}$ ☐

$E = QV$ ☐

$E = \frac{Q}{V}$ ☐

$E = \frac{V^2}{Q}$ ☐

1	0	.	3
---	---	---	---

Calculate the charge flow through the 12 V battery when the battery transfers 5010 J of energy.

[3 marks]

Charge flow = _____ C

1	0	.	4
---	---	---	---

Ice forms on the windscreen at a temperature of 0 °C.

The electrical circuit transfers 5010 J of energy to the ice.

A mass of 0.015 kg of ice melts.

Calculate the specific latent heat of fusion of water.

Use the Physics Equations Sheet.

[3 marks]

Specific latent heat of fusion of water = _____ J/kg

1	0
---	---

5

The electrical circuit was left switched on while the ice changed from a solid to a liquid and increased in temperature to 5 °C.

Explain the changes in the arrangement and movement of the particles as the ice melted and the temperature increased to 5 °C.

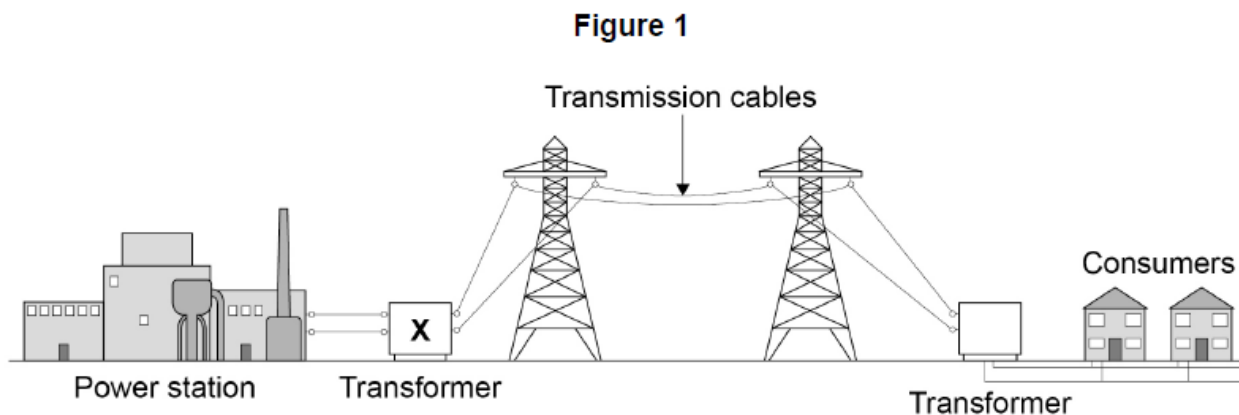
[6 marks]

[illegible]

4. No.1

0 1

Figure 1 shows how the National Grid connects a power station to consumers.



0 1 . 1

Complete the sentences.

[2 marks]

Transformer **X** causes the potential difference to _____.Transformer **X** causes the current to _____.

Use the Physics Equations Sheet to answer questions 01.2 and 01.3.

0 1 . 2

Which equation links current (I), power (P) and resistance (R)?

[1 mark]

Tick (✓) **one** box.

$$P = \frac{I}{R} \quad \square$$

$$P = \frac{I}{R^2} \quad \square$$

$$P = I^2 R \quad \square$$

$$P = IR \quad \square$$

01.3 A transmission cable has a power loss of 1.60×10^9 W.

The current in the cable is 2000 A.

Calculate the resistance of the cable.

[3 marks]

Resistance = _____ Ω

Use the Physics Equations Sheet to answer questions 01.4 and 01.5.

01.4 Write down the equation which links efficiency, total energy input and useful energy output.

[1 mark]

01.5 The total energy input to the National Grid from one power station is 34.2 GJ.

The National Grid has an efficiency of 0.992

Calculate the useful energy output from this power station to consumers in GJ.

[3 marks]

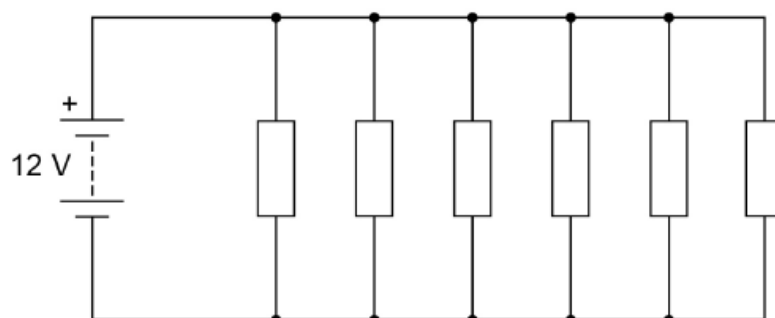
Useful energy output = _____ GJ

5. No.3

0 3

Figure 4 shows an electrical circuit used to heat the windscreen of a car.

Each resistor in the circuit represents a heating element.

Figure 4

0 3 . 1

The 12 V battery supplies direct potential difference.

What is meant by 'direct potential difference'?

[1 mark]

Use the Physics Equations Sheet to answer questions 03.2 and 03.3.

0 3 . 2

Which equation links charge flow (Q), energy (E) and potential difference (V)?**[1 mark]**Tick (✓) **one** box.

$$E = \frac{V}{Q} \quad \boxed{}$$

$$E = QV \quad \boxed{}$$

$$E = \frac{Q}{V} \quad \boxed{}$$

$$E = \frac{V^2}{Q} \quad \boxed{}$$

0 3 . 3

Calculate the charge flow through the 12 V battery when the battery transfers 5010 J of energy.

[3 marks]

Charge flow = _____ C

0 3 . 4

Ice forms on the windscreen at a temperature of 0 °C.

The electrical circuit transfers 5010 J of energy to the ice.

A mass of 0.015 kg of ice melts.

Calculate the specific latent heat of fusion of water.

Use the Physics Equations Sheet.

[3 marks]

Specific latent heat of fusion of water = _____ J/kg

[6 marks]

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper has a slight shadow on its right side, suggesting it's resting on a surface.

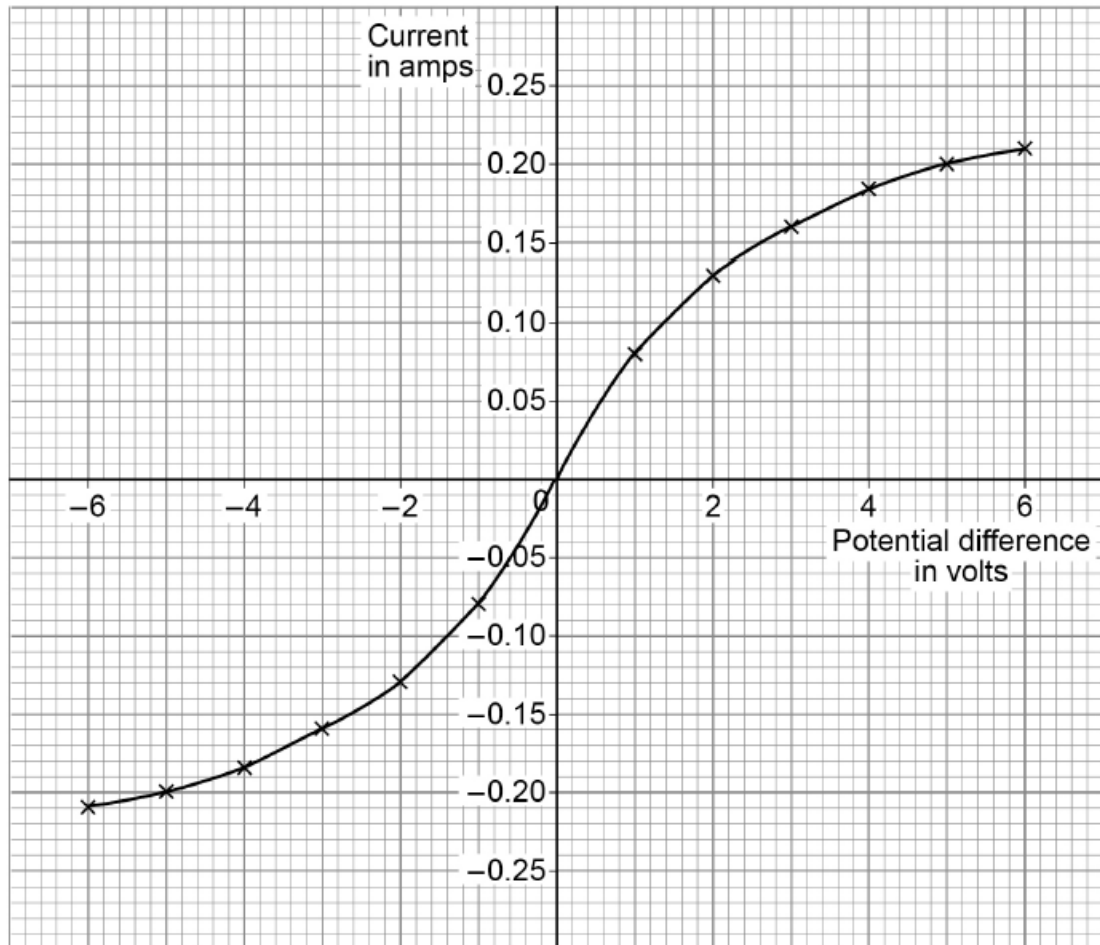
6. No.6

0 6

A student investigated how the current in a filament lamp varies with the potential difference across the filament lamp.

Figure 6 shows the results.

Figure 6



Describe a method the student could use to obtain these results.

[6 marks]

[illegible]

0	6	.	2
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Determine the resistance of the filament lamp when the potential difference across it is +3.0 V.

Use the Physics Equations Sheet.

Use **Figure 6** on page 18.

[3 marks]

Resistance = _____ Ω

0	6	.	3
---	---	---	---

The current in the lamp is 0.21 A when the potential difference across the lamp is 6.0 V.

Calculate the energy transferred by the filament lamp in 30 minutes.

Use the Physics Equations Sheet.

[5 marks]

Energy transferred = _____ J

06.4

The power output of the lamp is 1.0 W when the potential difference across the lamp is 5.0 V.

A student predicts that the power output would be 4.0 W if the potential difference was doubled.

Explain why the student is **not** correct.

[2 marks]
