



Name	
Date	
Score	/ 50

GCSE PHYSICS · QUESTION PACK

Electricity and circuits

Higher tier · components, I–V characteristics, series and parallel circuits, power, static, the National Grid

Suggested time: 1 hour · Total: 50 marks

You will need

- a black pen, a pencil and a ruler
- a scientific calculator
- the Physics Equations Sheet (at the back of this pack)

Instructions

- Answer **all** questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for each question are shown in brackets.
- Try to complete the pack in the suggested time, without your notes.

Marking your work

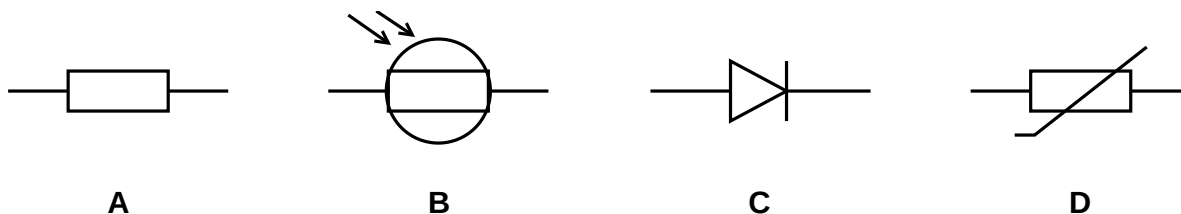
The mark scheme is at the back of this pack. Mark your answers in a different coloured pen, then go back over any questions where you lost marks.

Your marks	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	/ 50

Exam-style questions written by Oakleaf Learning in the style of AQA GCSE Physics (8463), Higher tier. Not an official AQA resource.

Figure 1 shows the circuit symbols for four components.

Figure 1



0 1 . 1 Name component **A**.

.....
[1 mark]

0 1 . 2 Name component **C**.

.....
[1 mark]

0 1 . 3 Which component has a resistance that decreases as the light intensity increases?
Write the letter.

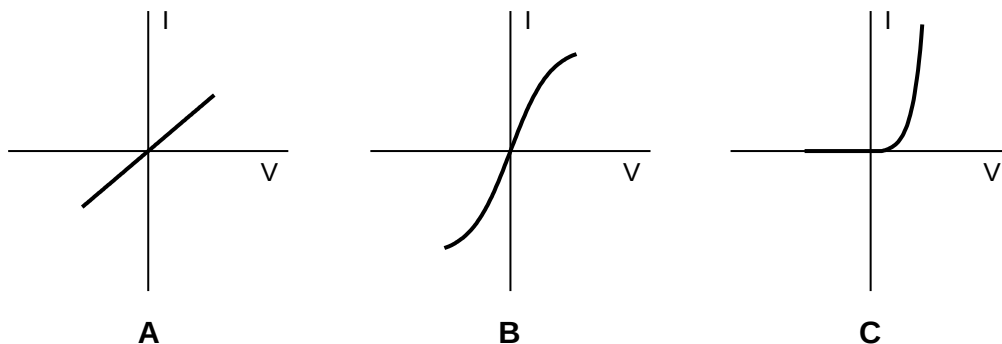
Answer
[1 mark]

0 1 . 4 Which component has a resistance that decreases as its temperature increases?
Write the letter.

Answer
[1 mark]

Figure 2

11



02 . **1** Which graph shows the I–V characteristic of a diode?

Answer

[1 mark]

0	2
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 .

2

 Graph A is for a fixed resistor at constant temperature. Graph B is for a filament lamp.

Compare the I–V characteristics of the fixed resistor and the filament lamp.

Explain the shape of each graph in terms of resistance.

[illegible]

[6 marks]

0 2 . 3

Table 1 shows some results for the fixed resistor.

Potential difference in V	1.0	2.0	3.0	4.0
Current in A	0.05	0.10	0.15	0.20

Table 1

Calculate the resistance of the fixed resistor.

.....

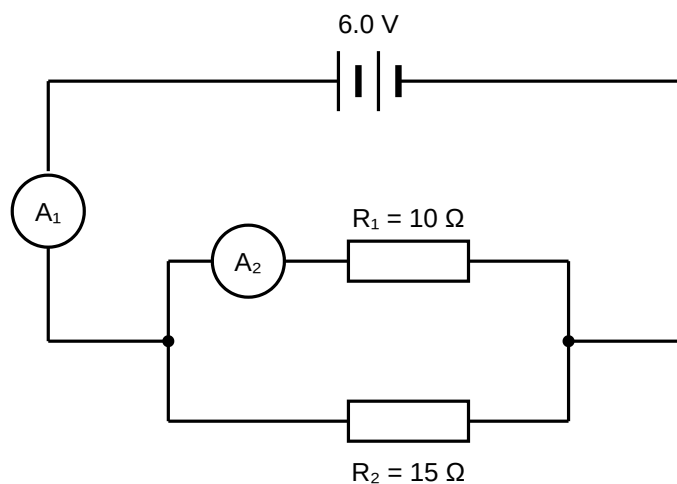
.....

.....

Answer Ω
[2 marks]

Figure 3 shows a circuit with two resistors connected in parallel.

Figure 3



0 3 . 1

What is the potential difference across resistor R_2 ?

Answer V
[1 mark]

0 3 . 2

Calculate the reading on ammeter A_2 .

.....

.....

.....

Answer A
[2 marks]

03 . 3 Calculate the reading on ammeter A_1 .

Answer _____ A

[3 marks]

03 . 4 Calculate the total resistance of the circuit.

Answer _____ Ω

[2 marks]

03 . 5 Explain why adding a resistor in parallel decreases the total resistance of a circuit.

[2 marks]

A hairdryer is connected to the 230 V mains supply. The current in the hairdryer is 8.0 A.

04 . 1 Calculate the power of the hairdryer.

Answer _____ W

[2 marks]

04 . 2

Calculate the energy transferred by the hairdryer in 5 minutes.

Answer J

[2 marks]

04 . 3

Calculate the resistance of the hairdryer.

Use an equation that links power, current and resistance.

Answer Ω

[3 marks]

04 . 4

The hairdryer has a metal case connected to the earth wire.

Explain how the earth wire protects the user if the live wire touches the metal case.

[2 marks]

A mobile phone is charged for 2.0 hours. The charging current is 0.50 A and the charging potential difference is 5.0 V.

0 | 5 . 1 Calculate the charge that flows into the phone.

Answer _____ C
[3 marks]

0 | 5 . 2 Calculate the energy transferred to the phone.

Answer _____ J
[2 marks]

This question is about static electricity.

0 | 6 . 1 Two balloons are rubbed with the same cloth and then hung next to each other. The balloons move apart.
Explain why.

[2 marks]

0 | 6 . 2 What is meant by an **electric field**?

[1 mark]

06 . 3

When a fuel tanker is refuelling an aircraft, the tanker and the aircraft are connected to earth.

Explain why.

[3 marks]

This question is about the mains supply and the National Grid.

07 . 1

Describe the difference between a direct potential difference and an alternating potential difference.

[2 marks]

07 . 2

What is the frequency of the UK mains supply?

Answer _____ Hz

[1 mark]

07 . 3

A step-up transformer at a power station has a primary coil with a potential difference of 25 000 V and a current of 4000 A.

The potential difference across the secondary coil is 400 000 V.

Calculate the current in the secondary coil.

Assume the transformer is 100% efficient. Use the Physics Equations Sheet.

Answer _____ A

[3 marks]

07 . 4

Why are step-down transformers used between the National Grid and homes?

[1 mark]

END OF QUESTIONS

Physics Equations Sheet

These are the equations given in the examination for the topics in this pack. Any other equation you need must be recalled.

1	potential difference across primary coil $\times$ current in primary coil = potential difference across secondary coil $\times$ current in secondary coil	$V_p I_p = V_s I_s$
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Mark scheme

GCSE Physics question pack · Electricity and circuits



How to use this mark scheme

- Mark in a different coloured pen to the one you wrote your answers in.
- For calculations, a correct final answer scores full marks even if no working is shown. If the final answer is wrong, award marks for each correct step of working.
- **ecf** (error carried forward): if you got an earlier part wrong, you can still get full marks for a later part that correctly uses your earlier answer.
- **allow** means the answer is also acceptable. **ignore** means the words do not gain or lose marks. **do not accept** means the answer scores no marks.
- For 6-mark questions, decide which level your answer fits best, then award the higher mark in that level if your answer is at the top of it.

Question	Answers	Extra information	Mark	AO
01.1	(fixed) resistor		1	AO1
01.2	diode		1	AO1
01.3	B		1	AO1
01.4	D		1	AO1
02.1	C		1	AO1

Question	Answers	Extra information	Mark	AO															
02.2	Level of response question. Indicative content: - graph A is a straight line through the origin - so current is directly proportional to potential difference - so the resistance of the fixed resistor is constant - graph B is a curve: the gradient decreases as the potential difference increases - so the resistance of the filament lamp increases as the current increases - a larger current makes the filament hotter - the ions in the metal vibrate more, so electrons collide with them more often, increasing the resistance - both graphs have the same shape for positive and negative potential differences (current can flow in either direction) <table><tr><th>Level</th><th>Descriptor</th><th>Marks</th></tr><tr><td>Level 3</td><td>A detailed and coherent explanation of the I–V characteristics of the resistor and the filament lamp, with clear links between causes and effects. The response is logically structured.</td><td>5–6</td></tr><tr><td>Level 2</td><td>A partial explanation of the I–V characteristics of the resistor and the filament lamp, with at least one clear link between a cause and its effect. Some detail may be missing.</td><td>3–4</td></tr><tr><td>Level 1</td><td>Simple relevant statements about the I–V characteristics of the resistor and the filament lamp, with little or no explanation.</td><td>1–2</td></tr><tr><td></td><td>No relevant content.</td><td>0</td></tr></table>	Level	Descriptor	Marks	Level 3	A detailed and coherent explanation of the I–V characteristics of the resistor and the filament lamp, with clear links between causes and effects. The response is logically structured.	5–6	Level 2	A partial explanation of the I–V characteristics of the resistor and the filament lamp, with at least one clear link between a cause and its effect. Some detail may be missing.	3–4	Level 1	Simple relevant statements about the I–V characteristics of the resistor and the filament lamp, with little or no explanation.	1–2		No relevant content.	0		6	AO1
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	No relevant content.	0																	
02.3	R = 1.0 / 0.05 (or any pair of values) R = 20 (Ω)		1 1	AO2															
03.1	6.0 (V)		1	AO2															
03.2	6.0 = I × 10 I = 0.60 (A)		1 1	AO2															
03.3	current in R ₂ = 6.0 / 15 = 0.40 (A) A ₁ = 0.60 + 0.40 = 1.0 (A)	allow ecf from 03.2 an answer of 1.0 (A) scores 3 marks	1 1 1	AO2															
03.4	R = 6.0 / 1.0 R = 6.0 (Ω)	allow ecf from 03.3	1 1	AO2															
03.5	adding a resistor in parallel provides an extra path for the current so the total current increases (for the same potential difference), so the total resistance decreases		1 1	AO1															
04.1	P = 230 × 8.0 P = 1840 (W)		1 1	AO2															

Question	Answers	Extra information	Mark	AO
04.2	$E = 1840 \times 300$ $E = 552\,000 \text{ (J)}$	allow ecf from 04.1 an answer of 9200 (J) (time not converted) scores 1 mark	1 1	AO2
04.3	$1840 = 8.0^2 \times R$ $R = 1840 / 64$ $R = 28.75 \text{ (}\Omega\text{)}$	allow ecf from 04.1 allow 29 (Ω) allow $R = V / I = 230 / 8.0 = 28.75 \text{ (}\Omega\text{)}$ for 3 marks	1 1 1	AO2
04.4	the earth wire provides a low-resistance path to the ground so current flows through the earth wire rather than through the user / the case does not become live		1 1	AO1
05.1	$t = 2.0 \times 3600 = 7200 \text{ (s)}$ $Q = 0.50 \times 7200$ $Q = 3600 \text{ (C)}$	an answer of 3600 (C) scores 3 marks an answer of 1.0 (C) scores 1 mark	1 1 1	AO2
05.2	$E = 3600 \times 5.0$ $E = 18\,000 \text{ (J)}$	allow ecf from 05.1	1 1	AO2
06.1	the balloons gain the same type of charge like charges repel		1 1	AO1
06.2	a region (around a charged object) where another charged object experiences a force		1	AO1
06.3	friction (as fuel flows) causes charge to build up a spark could jump if the potential difference becomes large, igniting the fuel (vapour) connecting to earth allows the charge to flow to the ground so no charge builds up		1 1 1	AO1
07.1	direct: the current flows in one direction only / the p.d. has a constant polarity alternating: the current repeatedly reverses direction / the p.d. changes polarity		1 1	AO1
07.2	50 (Hz)		1	AO1
07.3	$25\,000 \times 4000 = 400\,000 \times I_s$ $I_s = 100\,000\,000 / 400\,000$ $I_s = 250 \text{ (A)}$	an answer of 250 (A) scores 3 marks	1 1 1	AO2
07.4	to reduce the potential difference to a safe level (230 V) for use in homes		1	AO1

Total: 50 marks