

GCSE Physics

Worksheet: Current, resistance and potential difference

TIME 35 min	TOTAL 32 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Current, resistance and potential difference

NAME	CLASS	DATE
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- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

01

The current in the coil of an electromagnet is 0.86 A. The resistance of the coil is 7 Ω .

01.1

Calculate the potential difference across the coil.

Use the equation:

potential difference = current $\times$ resistance

Potential difference = V

[2 marks]

0 2

A resistor is connected to a battery.

0 2 . 1

What is the unit of resistance?

Tick (✓) **one** box.

ampere

☐

ohm

☐

volt

☐

watt

☐

[1 mark]

0 2 . 2

The current in the resistor is 0.50 A. The resistance of the resistor is 12 Ω .

Calculate the potential difference across the resistor.

Use the equation:

potential difference = current $\times$ resistance

.....

.....

.....

.....

Potential difference = V

[2 marks]

0 2 . 3

The resistor is replaced with a resistor that has a greater resistance. The potential difference across it stays the same.

What happens to the current in the resistor?

Tick (✓) **one** box.

It decreases.

☐

It increases.

☐

It stays the same.

☐

[1 mark]

0 3

The current in a car headlamp filament is 3.8 A. The resistance of the filament is 3.2 Ω .

0 3 . 1

Calculate the potential difference across the filament.

Use the equation:

potential difference = current $\times$ resistance

.....

.....

.....

.....

Potential difference = V

[2 marks]

0 4

0 4 . 1

Which quantity is calculated by dividing potential difference by current?

Tick ($\checkmark$) **one** box.

Charge

☐

Energy

☐

Power

☐

Resistance

☐

[1 mark]

0 4 . 2

A current of 0.20 A flows through a component of resistance 25 Ω .

Calculate the potential difference across the component.

Use the equation:

potential difference = current $\times$ resistance

.....

.....

.....

.....

Potential difference = V

[2 marks]

0 5

A student has two $10\ \Omega$ resistors and wants to investigate the combined resistance when they are connected first in series and then in parallel.

0 5 . 1

Describe how the student could measure the combined resistance of the two resistors when they are connected in series.

.....

.....

.....

.....

[2 marks]

0 5 . 2

State how you would expect the parallel combined resistance to compare with the series combined resistance.

.....

.....

[1 mark]

0 6

A student measures the resistance of a fixed length of wire three times, obtaining $4.8\ \Omega$, $4.9\ \Omega$ and $4.8\ \Omega$. A second student, using a different ammeter and voltmeter, obtains $5.6\ \Omega$ for the same wire. The true resistance of this length of wire, calculated from the manufacturer's data, is $6.0\ \Omega$.

0 6 . 1

Are the first student's three results repeatable? Justify your answer.

.....

.....

[1 mark]

0 6 . 2

Is the first student's result reproducible? Use the second student's result to justify your answer.

.....

.....

[1 mark]

0 6 . 3

Comment on the accuracy and precision of the first student's three results, given that the true resistance is $6.0\ \Omega$.

.....

.....

.....

.....

[2 marks]

0 6 . 4

Suggest one systematic error that could cause all of the first student's readings to be lower than the true value, and explain how it would have this effect.

.....

.....

.....

.....

[2 marks]

0 7

An LED is connected in a circuit so that it lights. The potential difference across the LED is 2.0 V .

0 7 . 1

The current in the LED is 20 mA .
Calculate the resistance of the LED under these conditions.

.....

.....

.....

.....

Resistance = Ω

[2 marks]

0 7 . 2

The LED is now connected in series with a protective resistor and a 6.0 V battery, so that the LED still has 2.0 V across it and a current of 20 mA. Calculate the resistance needed for the protective resistor.

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.....

.....

.....

.....

Resistance = Ω

[3 marks]

0 8

Table 1 shows current and potential difference readings for component Z.

Table 1

Potential difference in V	Current in A	Resistance in Ω
1.0	0.20	
2.0	0.35	
3.0	0.42	
4.0	0.46	

0 8 . 1

Complete Table 1 by calculating the resistance of component Z at each potential difference.

.....

.....

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.....

.....

[4 marks]

0 8 . 2

State, with a reason, whether component Z is ohmic.

.....

.....

.....

.....

[2 marks]

0 8 . 3

Suggest what component Z could be.

.....

.....

.....

.....

[1 mark]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Physics · Worksheet: Current, resistance and potential difference · 32 marks

Question 1 (2 marks)

01.1 [2 marks]

Answer: 6.02 V

- $V = 0.86 \times 7$ (1)
 - $V = 6.02$ (V) (1)
-

Question 2 (4 marks)

02.1 [1 mark]

Correct: ohm

02.2 [2 marks]

Answer: 6.0 V

- $V = 0.50 \times 12$ (1)
 - $V = 6.0$ (V) (1)
-

02.3 [1 mark]

Correct: It decreases.

Question 3 (2 marks)

03.1 [2 marks]

Answer: 12.16 V

- $V = 3.8 \times 3.2$ (1)
 - $V = 12.16$ (V) (1)
-

Question 4 (3 marks)

04.1 [1 mark]

Correct: Resistance

04.2 [2 marks]

Answer: 5.0 V

- $V = 0.20 \times 25$ (1)
 - $V = 5.0$ (V) (1)
-

Question 5 (3 marks)

05.1 [2 marks]

Answer: Connect the two resistors in series with a battery, a switch and an ammeter, with a voltmeter connected across both resistors together; calculate the combined resistance using $R = V \div I$.

- connect the two resistors in series with a battery and an ammeter (1)
 - connect a voltmeter across both resistors together, and calculate resistance using $R = V \div I$ (1)
-

05.2 [1 mark]

Answer: The parallel combined resistance would be much smaller (less than either single resistor, and less than the series value).

- the parallel combined resistance would be much smaller (less than either single resistor, and less than the series value) (1)
-

Question 6 (6 marks)

06.1 [1 mark]

Answer: Yes — repeating the reading with the same equipment and method gives very similar values (within $0.1\ \Omega$).

- yes — the three readings are close together / show little spread, using the same equipment and method (they are repeatable) (1)

06.2 [1 mark]

Answer: No — the second student, using different meters, obtained $5.6\ \Omega$, which is noticeably different from the first student's results (about $4.8\ \Omega$).

- no — the second student's result ($5.6\ \Omega$), obtained with different equipment, is noticeably different from the first student's results (about $4.8\ \Omega$), so the result is not reproducible (1)

06.3 [2 marks]

Answer: The results are precise (they are close together, with a small spread), but not accurate (all three are noticeably lower than the true value of $6.0\ \Omega$).

- precise: the three readings are close together / have a small spread (1)
- not (very) accurate: they are all noticeably lower than the true value of $6.0\ \Omega$, suggesting a systematic error (1)

06.4 [2 marks]

Answer: A zero error on the ammeter that makes it read a higher current than the true value (or on the voltmeter, reading a lower potential difference than the true value) would cause resistance, calculated as $V \div I$, to come out too low every time.

- a systematic error, e.g. a zero error on the ammeter (reading too high) or on the voltmeter (reading too low), or the clips placed so that the length of wire between them is shorter than intended (1)
- a correct link to why this makes every calculated resistance too low, e.g. $R = V \div I$ with I too high or V too low, or a shorter length of wire has a smaller resistance (1)

Notes: Do not accept resistance of the leads or of the crocodile clips: extra resistance would make the measured value too high, not too low.

Question 7 (5 marks)

07.1 [2 marks]

Answer: 100 Ω

- $R = 2.0 \div 0.020$ (1)
- $R = 100$ (Ω) (1)

Notes: An answer of 0.1 (Ω) (current not converted to amps) scores 1 mark.

07.2 [3 marks]

Answer: 200 Ω

- potential difference across the protective resistor = $6.0 - 2.0 = 4.0$ (V) (1)
- $R = 4.0 \div 0.020$ (1)
- $R = 200$ (Ω) (1)

Notes: An answer of 300 (Ω) ($6.0 \div 0.020$) scores 1 mark.

Question 8 (7 marks)

08.1 [4 marks]

Answer: 5.0 Ω , 5.7 Ω , 7.1 Ω , 8.7 Ω

- $1.0 \div 0.20 = 5.0$ (Ω) (1)
 - $2.0 \div 0.35 = 5.7$ (Ω) (1)
 - $3.0 \div 0.42 = 7.1$ (Ω) (1)
 - $4.0 \div 0.46 = 8.7$ (Ω) (1)
-

08.2 [2 marks]

Answer: Not ohmic — its resistance increases as the potential difference (and current) increases, instead of staying constant.

- not ohmic (1)
- (because) the resistance increases as the potential difference / current increases, instead of staying constant (1)

Notes: Allow ECF from the previous part. The reason mark depends on 'not ohmic'.

08.3 [1 mark]

Answer: A filament lamp

- (filament) lamp (1)
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