MR SULLY UNFOLDS PHYSICS ANSWERS

Potential difference and resistance

AQA 4.2.1.3 · RP3
Electricity · Paper 1
Foundation & Higher · Required practical 3

Name _____ Class _____ Date _____

Resistance tells you how much a component opposes the flow of current. The bigger the resistance, the smaller the current for the same p.d.

KEY EQUATION

$$V = I R$$

V = potential difference (volts, V)
I = current (A)
R = resistance (ohms, Ω)

WORKED EXAMPLE

A resistor has 6 V across it and 0.3 A through it.
R = V ÷ I = 6 ÷ 0.3 = **20 Ω**

Section A · Recall

Grade 4–5

1 State the unit of resistance. [1]

The ohm (Ω)

2 How should an ammeter and a voltmeter be connected to measure the resistance of a component? [2]

Ammeter in series with the component.

Voltmeter in parallel across the component.

3 Calculate the p.d. across a 15 Ω resistor with a current of 2 A through it. [2]

V = 2 × 15 = 30 V

Section B · Calculate

Grade 5–6

4 Complete the table. [4]

V (V)	I (A)	R (Ω)
12	3	**4**
4.5	0.5	9
230	**10**	23
6	0.02	**300**

5 A student investigates how the length of a wire affects its resistance.

a Name the independent and dependent variables. [2]

Independent: length of wire

Dependent: resistance (found from V and I)

b Give one control variable. [1]

Material / thickness (diameter) of the wire / temperature

c Explain why the student should switch off the circuit between readings. [2]

So the wire doesn't heat up,

because a hotter wire has a higher resistance, which would affect the results.

Section C · Stretch

Grade 7+

6 The student's results show that a 40 cm wire has a resistance of 2.0 Ω. Predict the resistance of an 80 cm length of the same wire, and explain your prediction. [2]

4.0 Ω

Resistance is directly proportional to length, so doubling the length doubles R.

Exam-style question

AQA style

7 A student measures the current through a resistor for different potential differences.

a When the p.d. is 3.0 V the current is 0.15 A. Calculate the resistance. [2]

R = V ÷ I = 3.0 ÷ 0.15

R = 20 Ω

b Calculate the current through this resistor when the p.d. is 5.0 V. [2]

I = V ÷ R = 5.0 ÷ 20

I = 0.25 A

c The student's graph of resistance against wire length does not go through the origin. Suggest a reason. [2]

A systematic error / zero error,

e.g. resistance of the connecting leads or contact resistance at the crocodile clips.

d The student then connects two 10 Ω resistors to a 6.0 V supply, first in series and then in parallel. Predict the current from the supply in each case and explain. [3]

Series: total R = 20 Ω, so I = 6.0 ÷ 20 = 0.3 A.

Parallel: each branch carries 0.6 A, so the total current is 1.2 A.

In parallel the total resistance (5 Ω) is less than either resistor, because there are two paths.

Total: _____ / 25

How confident am I?	Not yet	Nearly	Got it
I can use V = IR and rearrange it	☐	☐	☐
I can describe the resistance practical, including resistors in series and parallel	☐	☐	☐
I can explain how temperature affects resistance	☐	☐	☐