

Series and Parallel Circuits

AQA GCSE Physics · Electricity

Series and Parallel

In a circuit, current and voltage behave differently depending on whether components are in series or in parallel.

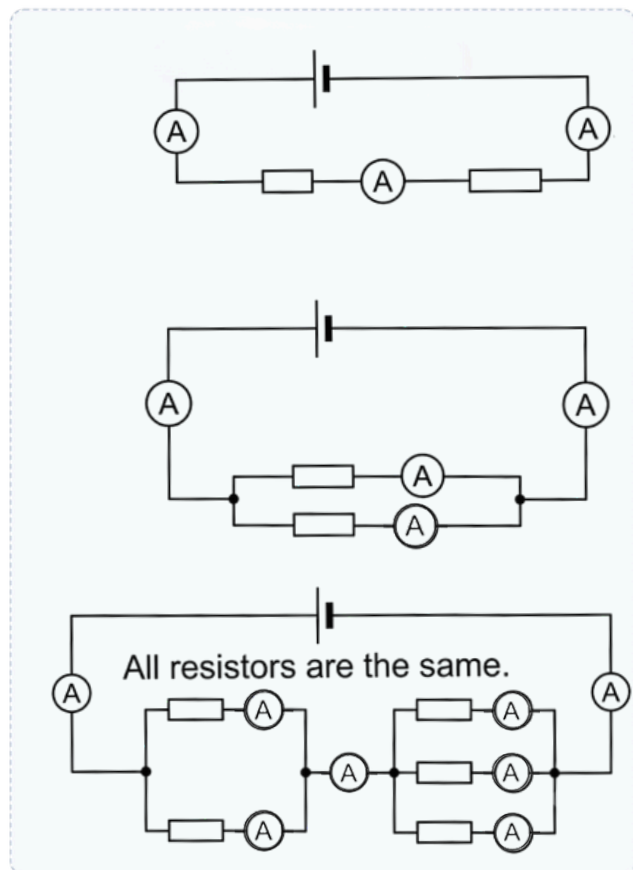
The rules — write “same” or “split” in each box

	SERIES	PARALLEL
Current		
Voltage		

Example

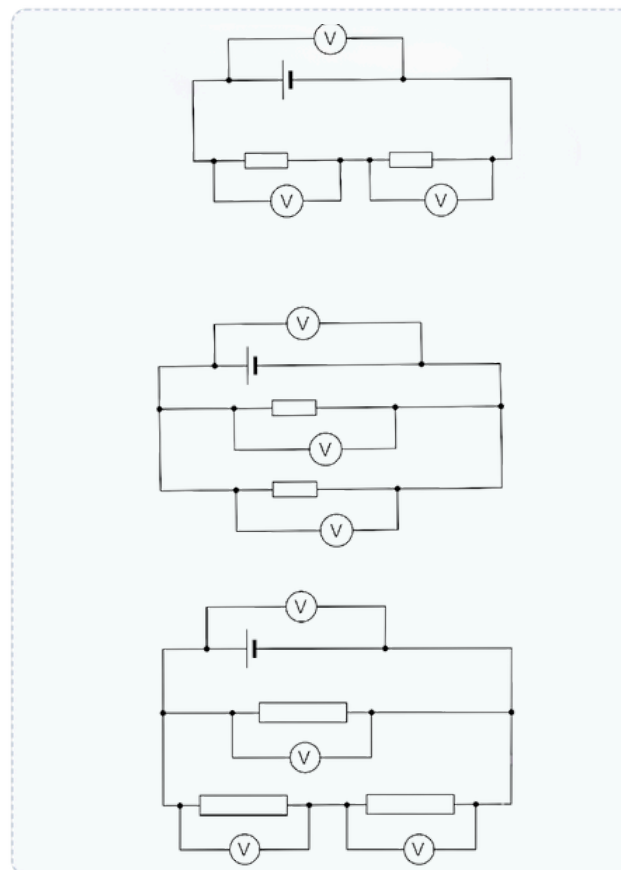
Current

Make up a sensible current reading for **each ammeter (A)** so that it obeys the rules. All the resistors are the same.



Voltage

Make up a sensible voltage reading for **each voltmeter (V)** so that it obeys the rules.



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Sensing Circuits

Exam-style questions. Each is worth **6 marks** — answer parts (a), (b) and (c). Use $V = IR$ and show your working on the right.

1 [6 marks]

An LDR is in series with a $1000\ \Omega$ fixed resistor and a 6 V battery. The output across the LDR switches on a security light when it gets dark.

(a) The light intensity decreases. State what happens to the current and to the p.d. across the LDR. [2 marks]

Current _____ p.d. across LDR _____

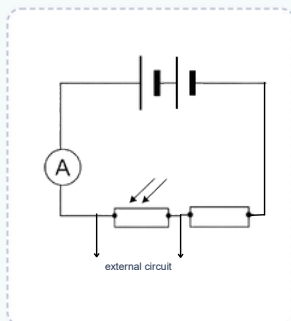
(b) The p.d. across the LDR is 4 V . Calculate its resistance and give a reason. [2 marks]

Resistance = _____ Ω

(c) Calculate the current when the LDR's resistance is $5000\ \Omega$. Give your answer to 2 s.f. [2 marks]

Current = _____ A

CIRCUIT



Battery = 6 V
Fixed resistor = $1000\ \Omega$

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2 [6 marks]

A thermistor is in series with a $2000\ \Omega$ fixed resistor and a 12 V battery. The output across the thermistor switches on a cooling fan when it gets hot.

(a) The temperature increases. State what happens to the current and to the p.d. across the thermistor. [2 marks]

Current _____ p.d. across thermistor _____

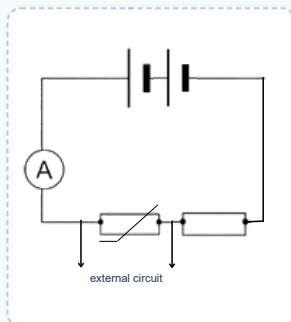
(b) The p.d. across the thermistor is 4 V . Calculate its resistance and give a reason. [2 marks]

Resistance = _____ Ω

(c) Calculate the current when the thermistor's resistance is $4000\ \Omega$. Give your answer to 2 s.f. [2 marks]

Current = _____ A

CIRCUIT



Battery = 12 V
Fixed resistor = $2000\ \Omega$

WORKING & ANSWERS

3 [6 marks]

A variable resistor is in series with a $300\ \Omega$ fixed resistor and a 9 V battery. It is used to control the current in the circuit.

(a) The variable resistor's resistance is increased. State what happens to the current and to the p.d. across the fixed resistor. [2 marks]

Current _____ p.d. across fixed R _____

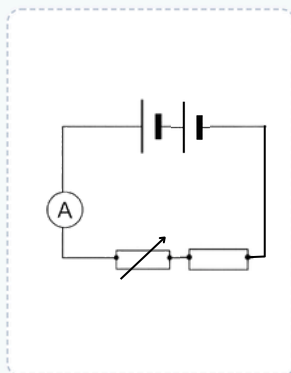
(b) The p.d. across the fixed resistor is 3 V . Calculate the resistance of the variable resistor and give a reason. [2 marks]

Resistance = _____ Ω

(c) Calculate the current when the variable resistor is set to $1500\ \Omega$. Give your answer to 2 s.f. [2 marks]

Current = _____ A

CIRCUIT



Battery = 9 V
Fixed resistor = $300\ \Omega$

WORKING & ANSWERS

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Series & Parallel Calculations

Use the electricity equations — $V = IR$, series & parallel rules — to answer each 6-mark question. Show your working on the right.

1 SERIES · [6 marks]

A 12 V cell is connected in **series** with two resistors, R_1 and R_2 .

cell = 12 V $R_1 = 3 \Omega$ $R_2 = 5 \Omega$

(a) Calculate the total resistance. [1 mark]

$R_{\text{total}} = \text{_____} \Omega$

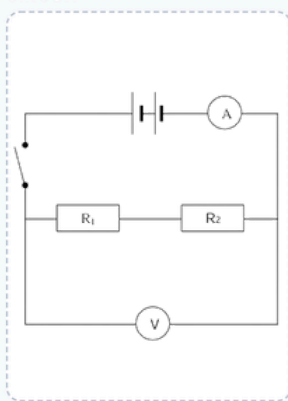
(b) Calculate the current through the cell. [2 marks]

$I = \text{_____} \text{ A}$

(c) Calculate the potential difference across **each** resistor. [3 marks]

$V_1 = \text{_____} \text{ V}$ $V_2 = \text{_____} \text{ V}$

CIRCUIT



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2 PARALLEL · [6 marks]

A 6 V cell is connected to two resistors in **parallel**, R_1 and R_2 .

cell = 6 V $R_1 = 3 \Omega$ $R_2 = 6 \Omega$

(a) State the potential difference across each resistor. [1 mark]

$V = \text{_____} \text{ V}$

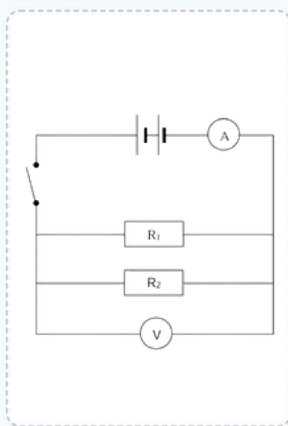
(b) Calculate the current through each resistor and the total current from the cell. [3 marks]

$I_1 = \text{_____} \text{ A}$ $I_2 = \text{_____} \text{ A}$ $I_{\text{total}} = \text{_____} \text{ A}$

(c) Calculate the total resistance of the circuit. [2 marks]

$R_{\text{total}} = \text{_____} \Omega$

CIRCUIT



WORKING & ANSWERS

3 DESIGN · [6 marks]

The circuit shows a 12 V cell connected to a single 6Ω resistor. The current from the cell is now 2 A. Change the circuit so the current from the cell is **doubled to 4 A**.

cell = 12 V existing resistor = 6Ω
present current = 2 A target current = 4 A

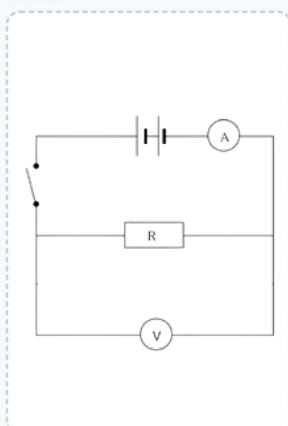
(a) On the circuit, draw **one extra resistor** to double the current from the cell. [2 marks]

(b) Calculate the resistance the new resistor must have. [2 marks]

$R = \text{_____} \Omega$

(c) Explain why adding this resistor increases the current from the cell. [2 marks]

CIRCUIT — add your new branch



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