

GCSE Combined Science: Trilogy

Worksheet: Series and parallel circuits

TIME 30 min	TOTAL 30 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Series and parallel circuits

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

Components can be connected in series or in parallel.

01.1

Which **two** statements about components connected in parallel are correct?

Tick (✓) **two** boxes.

The potential difference across each branch is the same.

☐

The current in each branch is always the same.

☐

The total current is the sum of the currents through the separate branches.

☐

The total resistance is the sum of the resistances of the components.

☐

[2 marks]

01.2

The lamps in a house are connected in parallel.

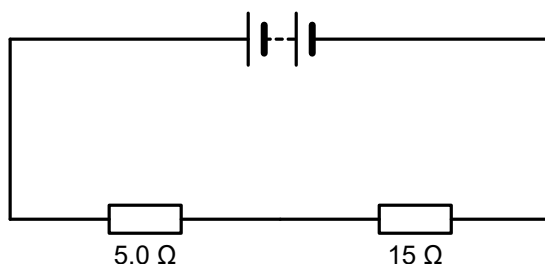
Give **two** advantages of connecting the lamps in parallel.

[2 marks]

0 2

Figure 1 shows a $5.0\ \Omega$ resistor and a $15\ \Omega$ resistor connected in series with a $10\ \text{V}$ battery.

Figure 1



0 2 . 1

Calculate the total resistance of the two resistors.

.....

.....

.....

Total resistance = Ω

[1 mark]

0 2 . 2

Which statement about the current is correct?

Tick (✓) **one** box.

The current is larger in the $5.0\ \Omega$ resistor.

The current is larger in the $15\ \Omega$ resistor.

The current is the same in both resistors.

☐

☐

☐

[1 mark]

0 2 . 3

Calculate the current in the circuit.

Use the equation:

potential difference = current $\times$ resistance

Current = A

[2 marks]

0 3

A $75\ \Omega$ resistor and a $100\ \Omega$ resistor are connected in parallel with each other, across a 9 V battery.

0 3 . 1

Calculate the current in each resistor.

Use the equation:

potential difference = current $\times$ resistance

.....

[2 marks]

0 3 . 2

Calculate the total current from the battery.

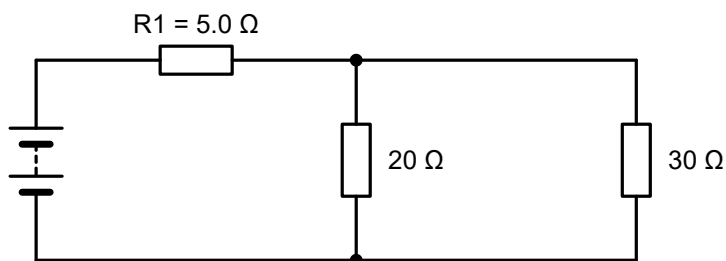
Total current = A

[1 mark]

0 4

Figure 2 shows a circuit. Resistor R1 has a resistance of $5.0\ \Omega$. The potential difference across the $20\ \Omega$ resistor is $6.0\ \text{V}$.

Figure 2



0 4 . 1

State the potential difference across the $30\ \Omega$ resistor.

.....

.....

.....

Potential difference = V

[1 mark]

0 4 . 2

Calculate the current in the $20\ \Omega$ resistor and the current in the $30\ \Omega$ resistor.

.....

.....

.....

.....

.....

.....

[3 marks]

0 4 . 3

Calculate the current in R1.

.....

.....

.....

Current = A

[1 mark]

0 4 . 4

Calculate the potential difference of the battery.

.....

.....

.....

.....

.....

Potential difference = V

[3 marks]

0 5

The sockets and lights in a house are connected in parallel to the mains supply, not in series.

0 5 . 1

Give **three** reasons why household wiring uses parallel circuits rather than series circuits.

.....

.....

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.....

.....

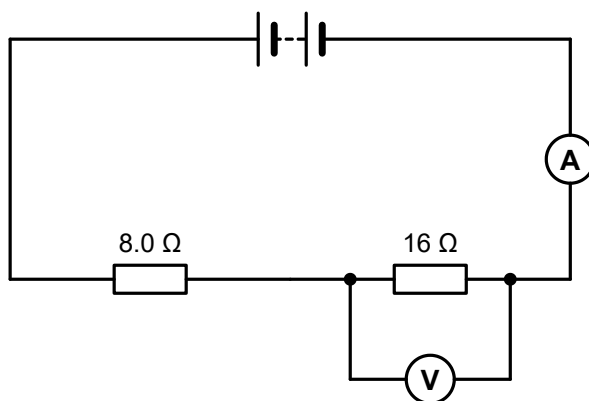
.....

[3 marks]

0 6

Figure 3 shows a circuit containing a 12 V battery, an $8.0\ \Omega$ resistor and a $16\ \Omega$ resistor.

Figure 3



0 6 . 1

Calculate the total resistance of the circuit.

.....

.....

.....

Total resistance = Ω

[1 mark]

0 6 . 2

Calculate the reading on the ammeter.

.....

.....

.....

.....

Current = A

[2 marks]

0 6 . 3

Calculate the reading on the voltmeter.

.....

.....

.....

.....

Potential difference = V

[2 marks]

0 6 . 4

The $8.0\ \Omega$ resistor is replaced with a $24\ \Omega$ resistor.
Explain what happens to the readings on the ammeter and on the voltmeter.

.....

.....

.....

.....

.....

.....

[3 marks]

END OF QUESTIONS

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

Mark scheme

GCSE Combined Science: Trilogy · Worksheet: Series and parallel circuits · 30 marks

Question 1 (4 marks)

01.1 [2 marks]

Correct: The potential difference across each branch is the same.; The total current is the sum of the currents through the separate branches.

01.2 [2 marks]

Answer: Any two from: each lamp can be switched on and off separately; if one lamp breaks the others stay on; each lamp has the full supply potential difference.

- each lamp can be switched on / off separately (1)
- if one lamp breaks / blows, the others still work (1)
- each lamp has the full (230 V) potential difference across it (1)

Any 2 of the points above.

Question 2 (4 marks)

02.1 [1 mark]

Answer: 20 Ω

- 20 (Ω) (1)
-

02.2 [1 mark]

Correct: The current is the same in both resistors.

02.3 [2 marks]

Answer: 0.50 A

- $I = 10 \div 20$ (1)
- $I = 0.50$ (A) (1)

Notes: Allow ECF from the first part.

Question 3 (3 marks)

03.1 [2 marks]

Answer: 0.12 A in the 75 Ω resistor; 0.09 A in the 100 Ω resistor

- current in the 75 Ω resistor = $9 \div 75 = 0.12$ (A) (1)
- current in the 100 Ω resistor = $9 \div 100 = 0.09$ (A) (1)

03.2 [1 mark]

Answer: 0.21 A

- total current = $0.12 + 0.09 = 0.21$ (A) (1)

Notes: Allow ECF from the previous part.

Question 4 (8 marks)

04.1 [1 mark]

Answer: 6.0 V

- 6.0 (V) (components in parallel have the same potential difference) (1)

04.2 [3 marks]

Answer: 0.30 A in the 20 Ω resistor; 0.20 A in the 30 Ω resistor

- $I = V \div R$ used (1)
- current in the 20 Ω resistor = $6.0 \div 20 = 0.30$ (A) (1)
- current in the 30 Ω resistor = $6.0 \div 30 = 0.20$ (A) (1)

04.3 [1 mark]

Answer: 0.50 A

- $0.30 + 0.20 = 0.50$ (A) (1)

Notes: Allow ECF from the previous part.

04.4 [3 marks]

Answer: 8.5 V

- potential difference across R1 = $0.50 \times 5.0 = 2.5$ (V) (1)
- battery potential difference = potential difference across R1 + potential difference across the parallel section (1)
- $= 2.5 + 6.0 = 8.5$ (V) (1)

Notes: Allow ECF from the previous part.

Question 5 (3 marks)

05.1 [3 marks]

Answer: Each appliance/lamp gets the full supply potential difference; each can be switched on/off independently; if one develops a fault or is disconnected, the others are unaffected.

- each appliance / lamp receives the full (230 V) supply potential difference, so it works at its rated power regardless of how many others are connected (1)
 - each appliance / lamp can be switched on or off independently of the others (1)
 - if one appliance / lamp develops a fault or is disconnected, the others are unaffected and keep working (1)
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Question 6 (8 marks)

06.1 [1 mark]

Answer: 24 Ω

- 24 (Ω) (1)
-

06.2 [2 marks]

Answer: 0.50 A

- $12 = I \times 24$ (1)
 - $I = 0.50$ (A) (1)
-

Notes: Allow ECF from an incorrect total resistance.

06.3 [2 marks]

Answer: 8.0 V

- $V = 0.50 \times 16$ (1)
 - $V = 8.0$ (V) (1)
-

Notes: Allow ECF from an incorrect current.

06.4 [3 marks]

Answer: The total resistance increases, so the ammeter reading decreases; the 16 Ω resistor now has a smaller share of the 12 V (smaller current $\times$ same resistance), so the voltmeter reading decreases.

- the total resistance increases (1)
 - so the current / ammeter reading decreases (1)
 - the voltmeter reading decreases because the current in the 16 Ω resistor is smaller / it has a smaller share of the battery pd (1)
-