

GCSE Physics

Worksheet: Series and parallel circuits

TIME 35 min	TOTAL 32 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Series and parallel circuits

NAME

CLASS

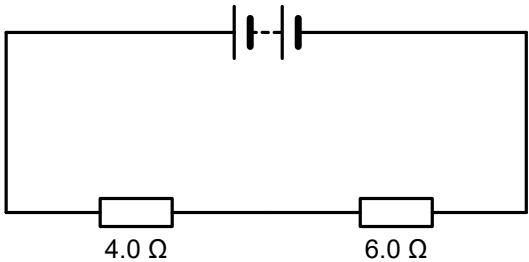
DATE

- 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

Figure 1 shows two resistors connected in series with a battery.

Figure 1



01.1

Calculate the total resistance of the two resistors.
Use the equation:
total resistance = $R_1 + R_2$

Total resistance = Ω

[1 mark]

0 1 . 2

Which statement about the current in the circuit is correct?

Tick (✓) **one** box.

The current is larger in the $4.0\ \Omega$ resistor.

☐

The current is larger in the $6.0\ \Omega$ resistor.

☐

The current is the same in both resistors.

☐

[1 mark]

0 1 . 3

The potential difference of the battery is 5.0 V . The potential difference across the $4.0\ \Omega$ resistor is 2.0 V .

What is the potential difference across the $6.0\ \Omega$ resistor?

Tick (✓) **one** box.

2.0 V

☐

3.0 V

☐

5.0 V

☐

7.0 V

☐

[1 mark]

0 1 . 4

Calculate the current in the circuit.

Use the equation:

current = potential difference $\div$ resistance

.....

.....

.....

.....

Current = A

[2 marks]

0 2

Components can be connected in series or in parallel.

0 2 . 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]

0 2 . 2

The lamps in a house are connected in parallel.

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

.....

.....

.....

.....

[2 marks]

0 3

A $40\ \Omega$ resistor and a $20\ \Omega$ resistor are connected in parallel with each other, across a 24 V battery.

0 3 . 1

Calculate the current in each resistor.

Use the equation:

potential difference = current $\times$ resistance

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.....

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.....

.....
[2 marks]

0 3 . 2

Calculate the total current from the battery.

.....

.....

.....

Total current = A

[1 mark]

0 4

A $27\ \Omega$ resistor is connected in series with a $56\ \Omega$ resistor and a 12 V battery.

0 4 . 1

Calculate the potential difference across the $56\ \Omega$ resistor.

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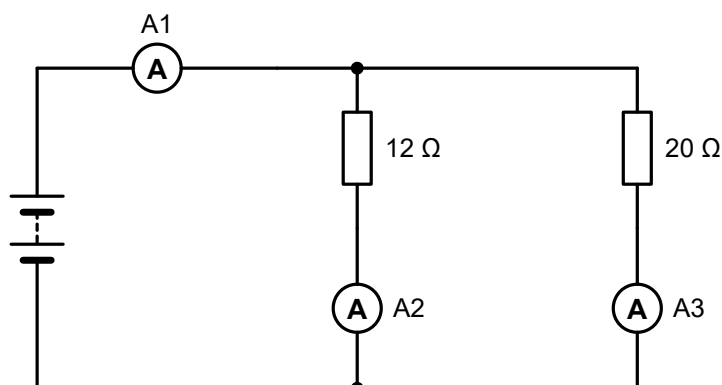
Potential difference = V

[4 marks]

0 5

Figure 2 shows a $12\ \Omega$ resistor and a $20\ \Omega$ resistor connected in parallel with a $6.0\ \text{V}$ battery.

Figure 2



0 5 . 1

State the potential difference across the $20\ \Omega$ resistor.
Give a reason for your answer.

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.....

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Potential difference = V

[2 marks]

0 5 . 2

Calculate the readings on ammeters A2 and A3.

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.....

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[3 marks]

0 5 . 3

Calculate the reading on ammeter A1.

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.....

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Current = A

[1 mark]

0 5 . 4

Calculate the total resistance of the circuit.

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.....

Total resistance = Ω

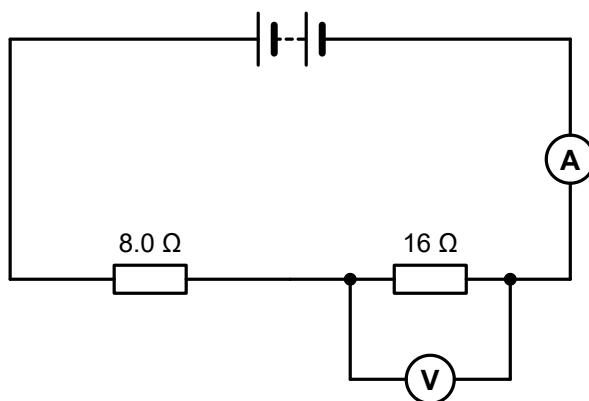
[2 marks]

.....

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.

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.....

Total resistance = Ω

[1 mark]

0 6 . 2

Calculate the reading on the ammeter.

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Current = A

[2 marks]

0 6 . 3

Calculate the reading on the voltmeter.

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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.

.....

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[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 Physics · Worksheet: Series and parallel circuits · 32 marks

Question 1 (5 marks)

01.1 [1 mark]

Answer: 10 Ω

- 10 (Ω) (1)
-

01.2 [1 mark]

Correct: The current is the same in both resistors.

01.3 [1 mark]

Correct: 3.0 V

01.4 [2 marks]

Answer: 0.50 A

- $I = 5.0 \div 10$ (1)
 - $I = 0.50$ (A) (1)
-

Notes: Allow ECF from an incorrect total resistance.

Question 2 (4 marks)

02.1 [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.

02.2 [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 3 (3 marks)

03.1 [2 marks]

Answer: 0.6 A in the 40 Ω resistor; 1.2 A in the 20 Ω resistor

- current in the 40 Ω resistor = $24 \div 40 = 0.6$ (A) (1)
- current in the 20 Ω resistor = $24 \div 20 = 1.2$ (A) (1)

03.2 [1 mark]

Answer: 1.8 A

- total current = $0.6 + 1.2 = 1.8$ (A) (1)

Notes: Allow ECF from the previous part.

Question 4 (4 marks)

04.1 [4 marks]

Answer: 8.10 V

- total resistance = $27 + 56 = 83$ (Ω) (1)
 - $I = 12 \div 83 (= 0.145 \text{ A})$ (1)
 - $V = 0.145 \times 56$ (1)
 - $V = 8.10$ (V) (1)
-

Question 5 (8 marks)

05.1 [2 marks]

Answer: 6.0 V — the potential difference across each branch of a parallel circuit is the same (as the battery).

- 6.0 (V) (1)
- the potential difference across each branch / component in parallel is the same (as the supply) (1)

Notes: The reason mark can be awarded without the value.

05.2 [3 marks]

Answer: $A_2 = 0.50 \text{ A}$, $A_3 = 0.30 \text{ A}$

- $6.0 = I \times 12 / I = 6.0 \div 12$ (1)
 - reading on $A_2 = 0.50 \text{ (A)}$ (1)
 - reading on $A_3 = 0.30 \text{ (A)}$ (1)
-

05.3 [1 mark]

Answer: 0.80 A

- $0.50 + 0.30 = 0.80 \text{ (A)}$ (1)

Notes: Allow ECF from incorrect branch currents.

05.4 [2 marks]

Answer: 7.5Ω

- $R = 6.0 \div 0.80$ (1)
- $R = 7.5 \text{ (}\Omega\text{)}$ (1)

Notes: Allow ECF from an incorrect total current.

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)
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