

Series Parallel Circuits

GCSE Physics · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

Two lamps are in series with a 6.0 V battery. The p.d. across one lamp is 2.5 V. Calculate the p.d. across the other lamp. (2 marks)

Step 1 · Series rule

The supply p.d. is shared between components in series.

Step 2 · Subtract

$$6.0 - 2.5 = 3.5 \text{ V}$$

Answer: 3.5 V

Check: $2.5 + 3.5 = 6.0 \text{ V}$, the supply p.d.

2. Now try one with the steps

A 2.0Ω and a 4.0Ω resistor are in series with a 12 V supply. Calculate the current and the p.d. across each resistor. (4 marks)

Step 1 · Total resistance

Step 2 · Current

Step 3 · p.d. across each

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

- 1.** State how the current compares at different points in a series circuit. [1]

- 2.** A 4.0Ω resistor and a 6.0Ω resistor are connected in series. Calculate the total resistance in ohms. [1]

- 3.** Two lamps are connected in parallel to a 6.0 V battery. State the potential difference across each lamp. [1]

4. Two lamps A and B are in series with a 12 V supply. The p.d. across A is 5.0 V. Calculate the p.d. across B. [2]

5. In a parallel circuit, the branch currents are 0.40 A and 0.60 A. Calculate the current from the supply, in amperes. [2]

6. Explain why all the lamps in a series string go out when one lamp breaks. [1]

7. A $10\ \Omega$ and a $20\ \Omega$ resistor are in series with a 9.0 V supply. Calculate the current in amperes. [3]

8. For the circuit in question 7, calculate the potential difference across the $20\ \Omega$ resistor. [2]

9. Three identical lamps are connected in series with a 12 V supply. State the p.d. across each lamp. [1]

10. A $4.0\ \Omega$ and a $6.0\ \Omega$ resistor are connected in parallel to a 12 V supply. Calculate the total current from the supply, in amperes. [3]

11. Explain why lights and sockets in a house are connected in parallel. [2]

12. Explain why the total resistance of two resistors in parallel is less than the resistance of either one. [2]

13. Two $12\ \Omega$ resistors are connected in parallel to a $6.0\ \text{V}$ supply. Calculate the total resistance of the circuit, in ohms. [3]

14. A $15\ \Omega$ resistor and an unknown resistor R are in series with a $6.0\ \text{V}$ supply. The current is $0.20\ \text{A}$. Calculate R , in ohms. [3]

4. Before you hand it in

"In parallel, the p.d. is shared between the branches."

Series: current the same, p.d. shared. Parallel: p.d. the same, current shared.

Adding parallel resistances: $3\ \Omega$ and $6\ \Omega$ give $9\ \Omega$

In parallel the total is less than the smallest branch. Find the branch currents, add them, then use $R = V \div I$.

Using the supply p.d. with one series resistor: $I = 12 \div 2$ for the $2\ \Omega$ resistor

Find the total resistance first, then the current, then the p.d. across each part.

"The first lamp in a series circuit is brightest because it gets the current first."

Identical lamps in series are equally bright; current does not get used up along the loop.