11 Current, resistance, and power – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary

Write each word three times.

English	**Write it 3 times** (English)		
Electric current			
amperes			
series			
parallel			
Resistance			
Ohm's law			
Electric power			

Recall

You have built simple circuits before:

- A battery pushes a **current** around a loop of wire to light a bulb.
- More **voltage** pushes a bigger current; more **resistance** holds it back.
- You have wired bulbs in a line (series) and side by side (parallel).

This sheet lines these ideas up with exact formulas. Each idea has a worked example.

New ideas

1 Electric current

Electric current is the rate at which charge flows past a point, measured in **amperes** (A):

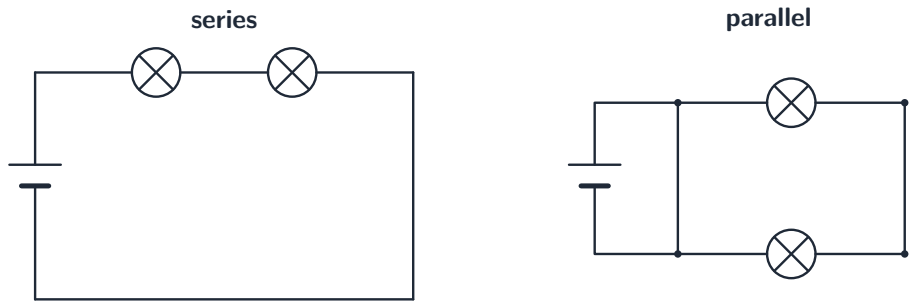
$$I = \frac{\Delta q}{\Delta t}.$$

A current needs a complete loop and a source (a battery) to push it.

Worked example. If 6.0 C of charge flows past a point in 3.0 s, the current is $I = \dfrac{\Delta q}{\Delta t} = \dfrac{6.0}{3.0} = 2.0$ A.

2 Series and parallel

- In a **series** circuit the components are in one line, so the **same current** flows through each.
- In a **parallel** circuit they sit on separate branches, so the **same voltage** is across each.

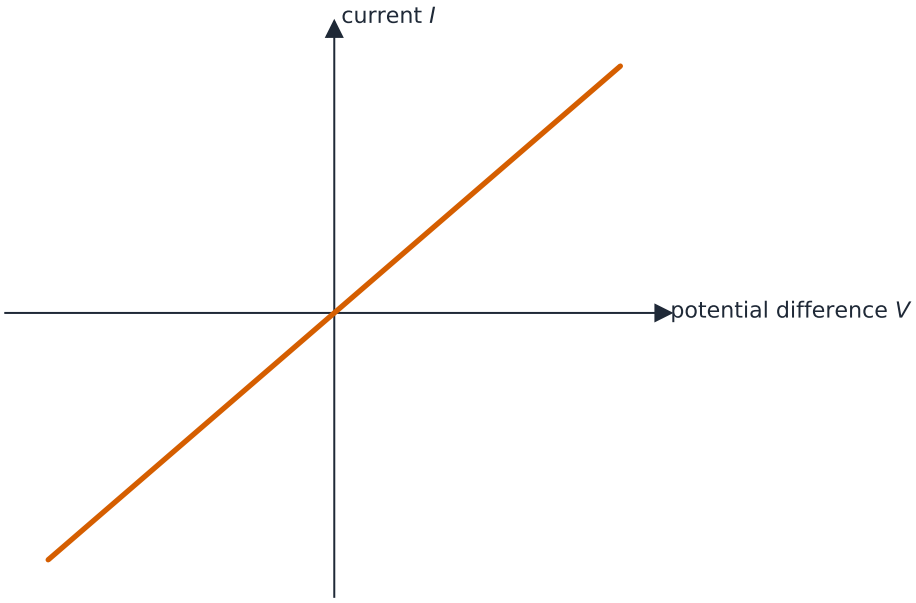


3 Resistance and Ohm's law

Resistance R (in ohms) opposes the current. **Ohm's law** links voltage, current, and resistance:

$$V = IR.$$

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Worked example. A 2.0 A current through a 6.0 Ω resistor needs a voltage $V = IR = 2.0 \times 6.0 = 12$ V.

4 Electric power

Electric power is the rate a component turns electrical energy into heat, light or motion:

$$P = IV = I^2R = \frac{V^2}{R}.$$

Pick the form that uses what you know.

Worked example. The 6.0 Ω resistor carrying 2.0 A uses $P = I^2R = 2.0^2 \times 6.0 = 24$ W.

Watch out: in **series** the current is the same everywhere; in **parallel** the **voltage** is the same across each branch. Mixing these up is the most common circuit mistake.

Practice

Try these in order. The methods are all above.

2.1 A charge of 10 C flows past a point in 5.0 s. Find the current. [2]

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2.2 State what is the same for every component in (a) a series circuit, (b) a parallel circuit. [2]

2.3 A 3.0 A current flows through a 4.0 Ω resistor. Find the voltage across it. [2]

2.4 A resistor carries 0.50 A with 6.0 V across it. Find the power it uses. [2]

2.5 A 12 V battery drives a current of 2.0 A through a bulb. Find the bulb's resistance and its power. [3]

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