

Exercise walk-through

11.3

Resistance, Resistivity, and Ohm's Law

AP Physics 2

Simple circuits and Ohm's law

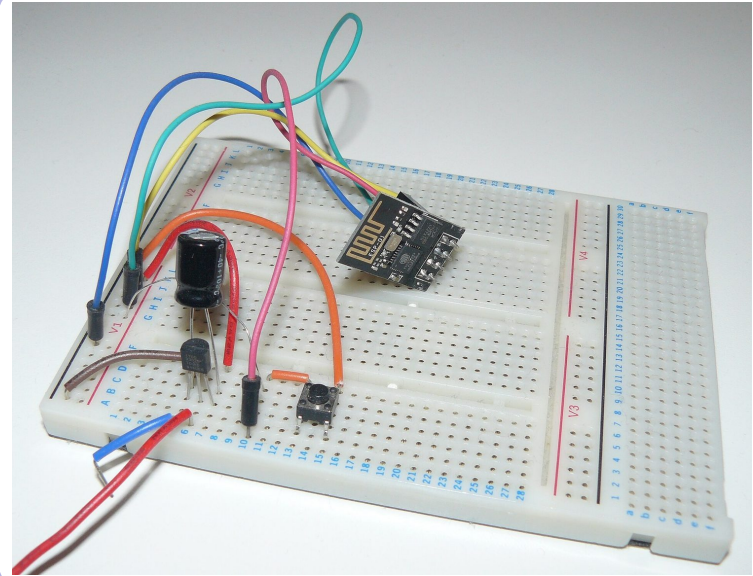
A **battery** pushes current around a complete loop – break it anywhere and current stops everywhere.

Ohm's law

$$V = IR, \quad R = \frac{\rho \ell}{A}$$

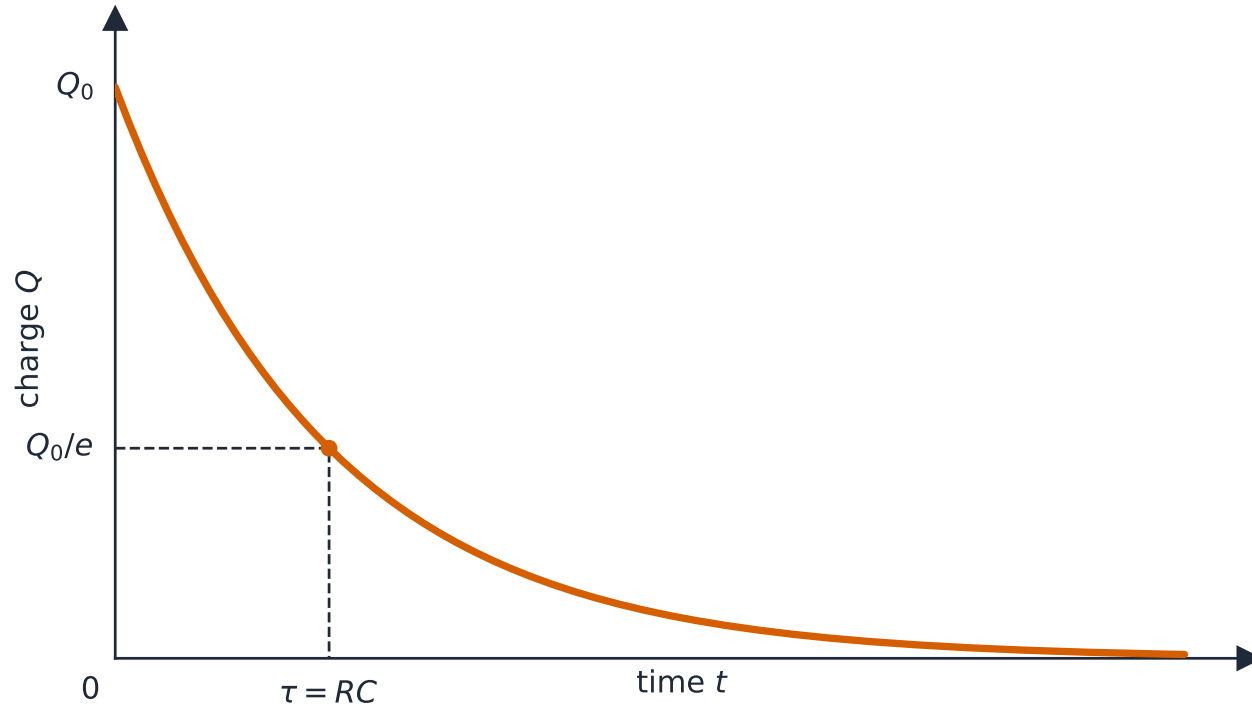
A device is **ohmic** if its I - V graph is a straight line.

12 V across $4\ \Omega$: $I = 3\ \text{A}$.



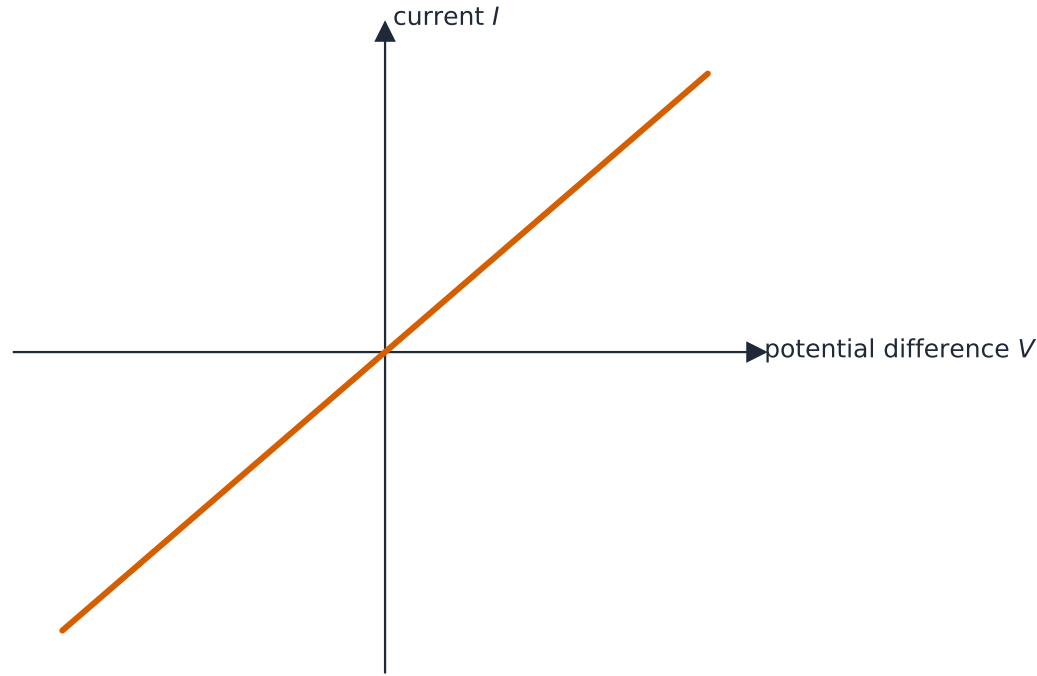
Circuits route charge through components

The charge on a capacitor decays exponentially



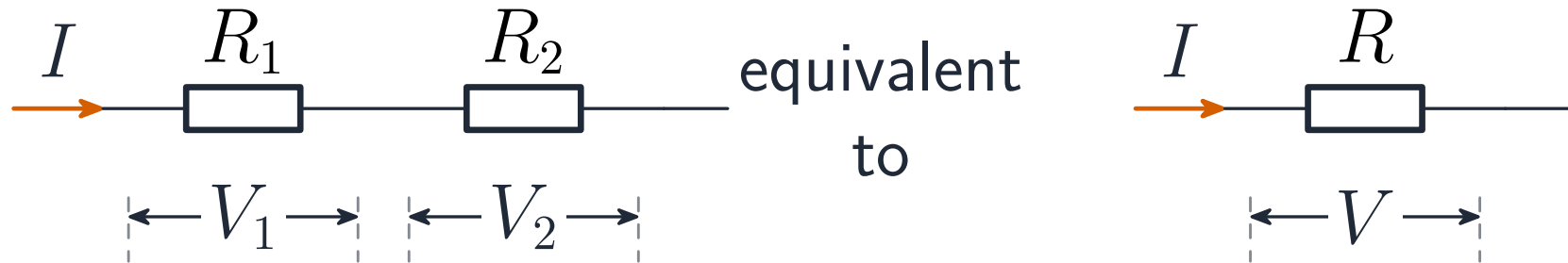
The charge on a capacitor decays exponentially as it discharges

Resistance, Resistivity, and Ohm's Law



The I-V line of an ohmic conductor is straight through the origin

Compound DC Circuits



Resistors in series add to a single equivalent resistance

Exercises 2.1-2.3

2.1 A 6.0 V supply drives 2.0 A through a resistor. Find its resistance. [2]

2.2 State how the resistance of a wire changes if it is made longer. [1]

2.3 Describe the current-voltage graph of an ohmic conductor. [1]

Exercises 2.1-2.3

2.1 A 6.0 V supply drives 2.0 A through a resistor. Find its resistance. [2]

2.1

- $$R = \frac{V}{I} = \frac{6.0}{2.0} = 3.0 \, \Omega$$

2.2 State how the resistance of a wire changes if it is made longer. [1]

2.2

- it increases (resistance is proportional to length)

2.3 Describe the current-voltage graph of an ohmic conductor. [1]

2.3

- a straight line through the origin (constant resistance)

Exercises 3.1-3.2

3.1 Ohm's law is

[1]

☐

A $V = IR$

B $P = IV$

C $R = \rho\ell/A$

D $Q = It$

3.2 The resistance of a wire increases if it is made

[1]

☐

A shorter

B thicker

C longer

D cooler

Exercises 3.1-3.2

3.1 Ohm's law is

[1]

☐

A $V = IR$

B $P = IV$

C $R = \rho \ell / A$

D $Q = It$

3.1 A

- $V = IR$.

3.2 The resistance of a wire increases if it is made

[1]

☐

A shorter

B thicker

C longer

D cooler

3.2 C

- longer.

Exercise 3.3 (a)

3.3 A resistor obeys Ohm's law. A voltage of 9.0 V produces a current of 0.30 A .

(a) Find its resistance.

[2]

Exercise 3.3 (a)

3.3 A resistor obeys Ohm's law. A voltage of 9.0 V produces a current of 0.30 A.

(a) Find its resistance.

[2]

(a)

- $R = \frac{9.0}{0.30} = 30 \, \Omega$

Exercise 3.3 (b)

3.3 A resistor obeys Ohm's law. A voltage of 9.0 V produces a current of 0.30 A.

(b) Find the current when the voltage is raised to 15 V.

[2]

Exercise 3.3 (b)

3.3 A resistor obeys Ohm's law. A voltage of 9.0 V produces a current of 0.30 A.

(b) Find the current when the voltage is raised to 15 V. [2]

(b)

- $$I = \frac{V}{R} = \frac{15}{30} = 0.50 \text{ A}$$