

Exercise walk-through

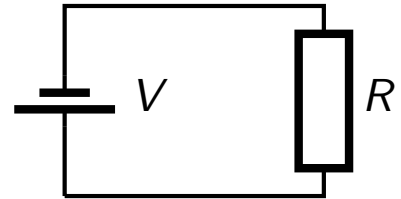
11.5

Compound DC Circuits

AP Physics 2

What we will cover

- 1 Electric current
- 2 Simple circuits and Ohm's law
- 3 Electric power
- 4 Series and parallel resistors
- 5 Kirchhoff's rules
- 6 RC circuits



Simple circuits and Ohm's law

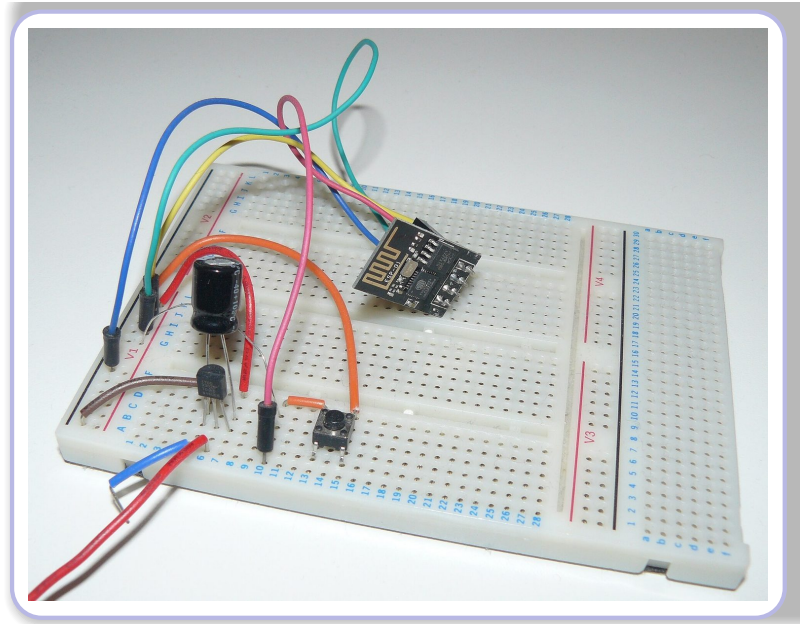
A **battery** pushes current around a complete loop – break it anywhere and current stops everywhere.

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

Exercises 2.1-2.3

2.1 Two $6.0\ \Omega$ resistors are connected in series. Find the total resistance. [1]

2.2 The same two $6.0\ \Omega$ resistors are connected in parallel. Find the total resistance. [2]

2.3 A battery of emf $12\ \text{V}$ and internal resistance $0.50\ \Omega$ drives a current of $2.0\ \text{A}$. Find the terminal voltage. [2]

Exercises 2.1·2.3

2.1 Two $6.0\ \Omega$ resistors are connected in series. Find the total resistance. [1]

2.1

- $R_s = 6.0 + 6.0 = 12\ \Omega$

2.2 The same two $6.0\ \Omega$ resistors are connected in parallel. Find the total resistance. [2]

2.2

- $\frac{1}{R_p} = \frac{1}{6.0} + \frac{1}{6.0} = \frac{2}{6.0} \Rightarrow R_p = 3.0\ \Omega$

2.3 A battery of emf $12\ \text{V}$ and internal resistance $0.50\ \Omega$ drives a current of $2.0\ \text{A}$. Find the terminal voltage. [2]

2.3

- $V = \varepsilon - Ir = 12 - 2.0(0.50) = 11\ \text{V}$

Exercises 3.1-3.2

3.1 Resistors in series have a total resistance equal to

[1]

☐

A less than the smallest

B the sum of the individual resistances

C their average

D their product

3.2 Adding another resistor in parallel makes the total resistance

[1]

☐

A larger

B smaller

C unchanged

D infinite

Exercises 3.1-3.2

3.1 Resistors in series have a total resistance equal to

[1]

☐

- A less than the smallest
- B the sum of the individual resistances
- C their average
- D their product

3.1 B

- the sum of the individual resistances.

3.2 Adding another resistor in parallel makes the total resistance

[1]

☐

- A larger
- B smaller
- C unchanged
- D infinite

3.2 B

- smaller.

Exercise 3.3 (a)

3.3 A $3.0\ \Omega$ and a $6.0\ \Omega$ resistor are in parallel across a 12 V supply.

(a) Find the combined resistance.

[2]

Exercise 3.3 (a)

3.3 A $3.0\ \Omega$ and a $6.0\ \Omega$ resistor are in parallel across a 12 V supply.

(a) Find the combined resistance.

[2]

(a)

- $$\frac{1}{R_p} = \frac{1}{3.0} + \frac{1}{6.0} = \frac{3}{6.0} \Rightarrow R_p = 2.0\ \Omega$$

Exercise 3.3 (b)

3.3 A $3.0\ \Omega$ and a $6.0\ \Omega$ resistor are in parallel across a $12\ \text{V}$ supply.

(b) Find the total current drawn from the supply.

[2]

Exercise 3.3 (b)

3.3 A $3.0\ \Omega$ and a $6.0\ \Omega$ resistor are in parallel across a $12\ \text{V}$ supply.

(b) Find the total current drawn from the supply.

[2]

(b)

- $$I = \frac{V}{R_p} = \frac{12}{2.0} = 6.0\ \text{A}$$