

Exercise walk-through

11.7

Kirchhoff's Junction Rule

AP Physics C: Electricity and Magnetism

You must be able to

- state **Kirchhoff's junction rule** $\sum I_{\text{in}} = \sum I_{\text{out}}$
- explain it as a consequence of **conservation of charge**
- write **junction equations** for the nodes of a circuit
- combine it with the loop rule to find **branch currents**

1

The method

Method — The junction rule

At any junction, $\sum I_{\text{in}} = \sum I_{\text{out}}$ – the current arriving equals the current leaving.

Exercises 2.1-2.3

2.1 State Kirchhoff's junction rule.

[1]

2.2 State the conservation law the junction rule expresses.

[1]

2.3 At a junction, 5.0 A enters and two branches carry 2.0 A and I out. Find I .

[2]

Exercises 2.1-2.3

2.1 State Kirchhoff's junction rule.

[1]

2.1

- the total current into a junction equals the total current out

2.2 State the conservation law the junction rule expresses.

[1]

2.2

- conservation of charge

2.3 At a junction, 5.0 A enters and two branches carry 2.0 A and I out. Find I .

[2]

2.3

- junction rule, current in = current out:

$$5.0 \text{ A} = 2.0 \text{ A} + I$$

- $I = 3.0 \text{ A}$

Exercises 3.1-3.2

3.1 By the junction rule, the current into a junction equals the current

[1]

☐

A stored there

B out of it

C squared

D halved

3.2 The junction rule expresses conservation of

[1]

☐

A energy

B charge

C momentum

D power

Exercises 3.1-3.2

3.1 By the junction rule, the current into a junction equals the current

[1]

☐

A stored there

B out of it

C squared

D halved

3.1 B

- out of it.

3.2 The junction rule expresses conservation of

[1]

☐

A energy

B charge

C momentum

D power

3.2 B

- charge.

Exercise 3.3 (a)

3.3 At a node, 8.0 A enters by one wire; three branches leave carrying 3.0 A, 2.0 A, and I .

(a) Find I .

[2]

Exercise 3.3 (a)

3.3 At a node, 8.0 A enters by one wire; three branches leave carrying 3.0 A, 2.0 A, and I .

(a) Find I .

[2]

(a)

- junction rule, current in = current out:

$$8.0 \text{ A} = 3.0 \text{ A} + 2.0 \text{ A} + I$$

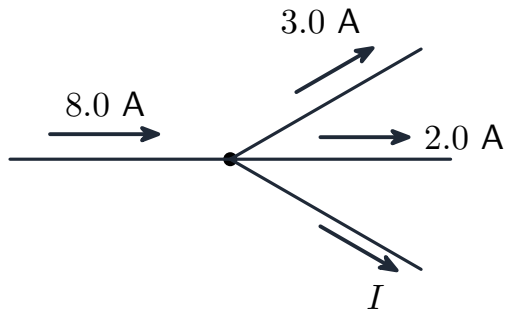
- $I = \mathbf{3.0 \text{ A}}$

Exercise 3.3 (b)

3.3 At a node, 8.0 A enters by one wire; three branches leave carrying 3.0 A, 2.0 A, and I .

(b) Name the law used.

[1]

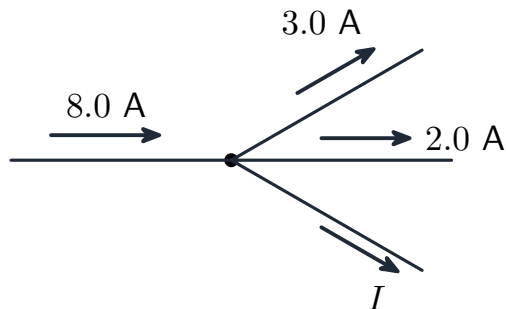


Exercise 3.3 (b)

3.3 At a node, 8.0 A enters by one wire; three branches leave carrying 3.0 A, 2.0 A, and I .

(b) Name the law used.

[1]



(b)

- Kirchhoff's junction rule