Exercise walk-through

Kirchhoff's Junction Rule ▪ 11.7

eXercise

You must be able to

- state **Kirchhoff's junction rule** 基尔霍夫电流定律: the current into a junction equals the current out
- explain the junction rule as a statement of **conservation of charge** 电荷守恒
- apply it with the loop rule to find unknown currents

Method — The junction rule

At any junction, $\sum I_{in} = \sum I_{out}$: charge is not created or destroyed, so what flows in must flow out.

Method — Why it holds

Charge is conserved, and it cannot pile up at a point, so the currents must balance.

Method — Example

If 5.0 A enters a junction and splits into two branches carrying 2.0 A and I, then $I = 3.0$ A.

Practice 2.1 ▪ 1 mark

State Kirchhoff's junction rule.

Solution 2.1

Method: The junction rule

Worked steps

the total current into a junction equals the total current out of it B1.

Practice 2.2 ▪ 1 mark

State the conservation law that the junction rule expresses.

Solution 2.2

Method: The junction rule

Worked steps

conservation of charge B1.

Practice 2.3 ▪ 2 marks

At a junction, 4.0 A enters and one branch carries 1.5 A out. Find the current in the other branch.

Solution 2.3

Method: Example

Worked steps

$4.0 - 1.5 = 2.5$ A **M1** **A1**.

Exam-style 3.1 ▪ 1 mark

Kirchhoff's junction rule states that the current into a junction equals the current

A stored there

B out of it

C squared

D halved

Solution 3.1

Method: The junction rule

A stored there

B out of it ✓

C squared

D halved

Worked steps

B.

Exam-style 3.2 ▪ 1 mark

The junction rule is a statement of conservation of

A energy

B charge

C momentum

D power

Solution 3.2

Method: The junction rule

A energy

B charge ✓

C momentum

D power

Worked steps

B.

Exam-style 3.3 ▪ 2 marks

At a node, 6.0 A enters and two branches leave; one carries 2.5 A.
(a) Find the current in the other branch.
(b) State the conservation law you used.

Solution 3.3

Method: Example

Worked steps

(a) $6.0 - 2.5 = 3.5$ A M1 A1. (b) conservation of charge B1.