

11.7 Kirchhoff's Junction Rule

Name: _____ Class: _____ Date: _____

Total: 9 marks

Objective

Build the skills to answer exam questions on **Kirchhoff's junction rule**.

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

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ 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.

■ Why it holds

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

■ Example

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

2 Practice

2.1 State Kirchhoff's junction rule. [1]

2.2 State the conservation law that the junction rule expresses. [1]

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

other branch.

[2]

3 Exam-style questions

3.1 Kirchhoff's junction rule states that 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 is a statement of conservation of

[1]

- **A** energy
- **B** charge
- **C** momentum
- **D** power

3.3 At a node, 6.0 A enters and two branches leave; one carries 2.5 A.

(a) Find the current in the other branch.

[2]

(b) State the conservation law you used.

[1]

4 Go further

- work through the **11.7 Kirchhoff's Junction Rule** lesson on the **Learn** page;
- read the **Electric Circuits** section of the AP Physics 2 handout on the **Know** page.

Solutions

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

2.2 conservation of charge.

2.3 $4.0 - 1.5 = 2.5$ A.

3.1 B.

3.2 B.

3.3 (a) $6.0 - 2.5 = 3.5$ A. (b) conservation of charge.