

11.1 Electric Current

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

KEY WORDS electric current 电流 • current density 电流密度 • drift velocity 漂移速度
• amperes 安培

Objective

Build the skills to answer exam questions on **electric current**.

You must be able to:

- define **electric current** 电流 as the rate of flow of charge, $I = \frac{dQ}{dt}$
- distinguish **conventional current** from electron flow
- relate current to **current density** 电流密度 and **drift velocity** 漂移速度
- apply **conservation of charge** to steady current

1 Worked examples

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

■ Current

$I = \frac{dQ}{dt}$, measured in amperes. Over a steady flow, $I = \frac{\Delta Q}{\Delta t}$.

■ Conventional current

The direction that **positive** charge would flow — opposite to the actual electron drift.

■ Microscopic picture

Current is carriers **drifting** slowly through the conductor; a potential difference across the conductor drives the flow, and charge is conserved.

2 Practice

2.1 A charge of 15 C flows past a point in 3.0 s. Find the current. [2]

2.2 State the direction of conventional current relative to the electron flow. [1]

2.3 State what drives a current through a conductor. [1]

3 Exam-style questions

3.1 Electric current is defined as [1]

- | | |
|---|---|
| A | B |
| C | D |
- A Q/V
B $\frac{dQ}{dt}$
C It
D V/R

3.2 Conventional current flows in the direction of [1]

- | | |
|---|---|
| A | B |
| C | D |
- A electron flow
B positive charge flow
C neutron flow
D no charge

3.3 A wire carries a steady current of 3.0 A.

(a) Find the charge that passes in 20 s. [2]

(b) State the conservation law obeyed by a steady current. [1]