

Current Electricity

Prior to 1767, the only electricity known was that developed from friction or rubbing, which is today known as static electricity.

The first mention of current electricity, though it wasn't known at the time, was made around this time by Luigi Galvani. He observed that a dead frog's leg would twitch when exposed to electricity. He called this "animal electricity."

In 1800, Alessandro Volta constructed the first device to produce a large electric current, called a **voltaic cell** (shown to the right). Modern day batteries are based on the design of the voltaic cell.

The voltaic cell was capable of producing a continuous flow of charges through a metal conductor (such as a wire). This charge flow became known as **current electricity**.

Electric Charge

Electric charge (Q) is a physical property of matter that causes it to experience a force when near other charged objects. It comes in two types: **positive** and **negative**.

The metric unit of electric charge is the coulomb (C). One coulomb is equal to the amount of charge on 6.25×10^{18} electrons.

From the definition of the coulomb, it is possible to determine the amount of charge on a single proton ($Q_p = +1.6 \times 10^{-19} C$) or a single electron ($Q_e = -1.6 \times 10^{-19} C$).

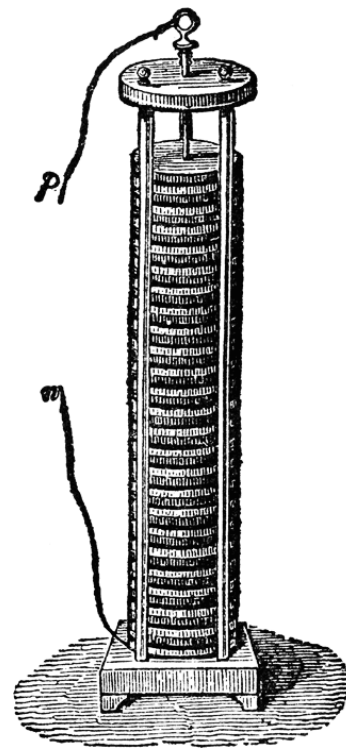
Electric Current

Electric current (I) is defined as the rate of flow of electric charge through a conductor. In other words, it is the amount of charge that flows through a conductor per second. The conductor is typically a wire. Mathematically, this definition can be written as:

$$\text{current} = \frac{\text{amount of charge}}{\text{time}} \quad \text{or} \quad I = \frac{Q}{t}$$

The metric unit for measuring the electric current is the **ampere** (A), or amp. One amp is equivalent to one coulomb of charge flowing through a wire per second.

Note: When using this equation, time must be in seconds.



Example 1

A battery is producing 2.6 C of charge every 2.0 s . What is the current being produced by this battery?

Example 2

A conducting wire carries an electric current of 1.75 A for 5 minutes. Determine the amount of charge that flows through the wire in this time.

Current Worksheet

1. The filament of a light bulb has 3150 C of charge flow through it in 35 minutes. What is the current in the filament?
2. A load has a current of 0.088 A flowing through it. What quantity of charge flows through the load in 51 s ?
3. A heater has a current of 11 A flow through it. How many hours will it take for 80000 C of charge to flow through the heater?
4. A load has a current of 0.012 A flow through it. How much charge flows through the load in 35 s ?
5. How long does it take a current of 0.005 A to deliver 15 C of charge?
6. There is a current of 0.5 A through a light bulb for 5 minutes. How much charge passes through the bulb in this time?
7. If 110 C of charge pass through a hair dryer in 55 s , what is the current flowing through the hair dryer?
8. A motor draws 2.0 A for 20 s . Calculate the amount of charge that flows through the motor in this time?
9. A car battery can provide 60 A of current for 1 hour. How much charge is stored in the battery?
10. Complete the table:

Current (A)	Charge (C)	Time (s)
16		30
	1200	450
5	125	
12.5	750	
	90000	1500
1.8		60