

SPH3U UNIVERSITY PHYSICS

ELECTRICITY & MAGNETISM


- ⚡ Electric Current
(P.516-441)

What Is Electricity?

*Electricity is something we generally take for granted. It is something we cannot see, hear, or touch. Electricity is also difficult to describe. In physics, the word "electricity" refers to electrical energy and the movement of charge. This movement of charge is known as **electric current (I)** and is measured in amperes (A).*

ELECTRIC CURRENT (I)

- ❖ movement of charge
- ❖ SI unit is amperes (A)




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The Direction of Electric Current

In the mid 1700s Benjamin Franklin, a well-known American scientist, flew a kite during a lightning storm to investigate the nature of electricity. He decided that when describing electricity, an excess of electricity (or the charge that makes up the electricity) is positive and a deficit of electricity is negative. In other words, the charge moves from the positive terminal to the negative terminal of the source of electric potential.

ELECTRIC CURRENT (I)


- ❖ movement of charge
- ❖ SI unit is amperes (A)



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The Direction of Electric Current

NOTE!
The lightning did not strike the kite directly; that would have immediately destroyed the kite and seriously injured, or killed, him.



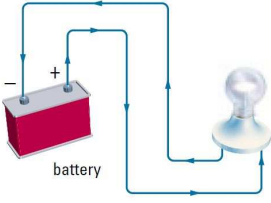
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The Direction of Electric Current

*This assumption about the direction of the electric current was called **conventional current** or just **electric current**.*

CONVENTIONAL CURRENT

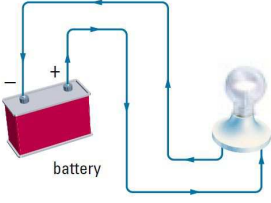
- ❖ or electric current
- ❖ charge moves from the + terminal through the circuit to the - terminal of the source



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The Direction of Electric Current

NOTE!
This convention of describing electricity became entrenched in science, but ~ 150 years later the electron was discovered. It soon became clear that what actually constituted an electric current in a metallic conductor (such as a wire) was a flow of negatively charged electrons from the negative terminal to the positive terminal of the source of electric potential.



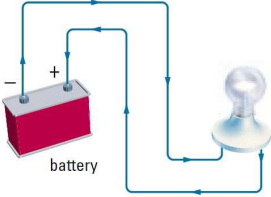
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The Direction of Electric Current

This method of describing the direction of electric current is referred to as **electron flow**.

ELECTRON FLOW

- negatively charged electrons move from the - terminal through the circuit to the + terminal of the source

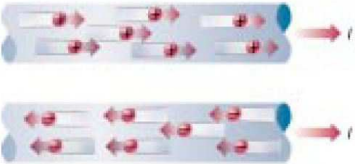


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The Direction of Electric Current

NOTE!

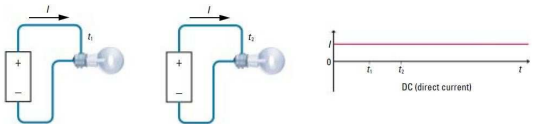
It might help to realize that a positive charge flowing east along a wire is electrically equivalent, in every way, to a negative charge flowing west.



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Electric Current

Electric current comes in two forms: direct current and alternating current. In **direct current (DC)**, the current flows in one direction only and doesn't increase or decrease in magnitude. Direct current is produced by an electric cell, such as a battery, to power portable electrical devices.



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Electric Current

DIRECT CURRENT (DC)

- ❖ current flows in one direction only
- ❖ batteries, solar cells, ...

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Electric Current

*In **alternating current (AC)**, the current moves back and forth, alternating direction. Alternating current is produced by generators at electric generating stations. Alternating current is used because it is a more efficient method of distributing electrical energy over long distances. Wall outlets provide alternating current.*

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Electric Current

ALTERNATING CURRENT (AC)

- ❖ current moves back and forth (i.e. alternates direction)
- ❖ more efficient method of distributing electrical energy over long distances
- ❖ wall outlets, generators, ...

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Electric Current

An **ammeter** is a device that measures the amount of electric current in a circuit. It is connected directly into the path of the moving charges, as shown. This type of connection is called a **series connection**.

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Electric Current

AMMETER

- ❖ used to measure the current in a circuit
- ❖ connected in series with load
- ❖ circuit symbol is

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Electric Current


PRACTICE

1. A student connected an ammeter as shown. Did the student connect the ammeter correctly? Explain.

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Electric Current – DYK?


The nerve cells in your body communicate with each other by creating very small electric currents. If a larger current is transmitted through your body it can overload your nervous system. By touching a wire with a current flowing through it, you can affect the current in your body. Muscles will contract and you may not be able to let go of the wire. The electric current will also cause burns, because some of the electrical energy will be transformed into thermal energy.



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Electric Current – DYK?

NOTE!
A current of 0.016 A is sometimes referred to as the "**let-go threshold**," because if the current is above this value, the person cannot let go of the object giving the electric shock.



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✓ Check Your Learning

TEXTBOOK
P.515 Q.2,3,5 (PJ: Benjamin Franklin)

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