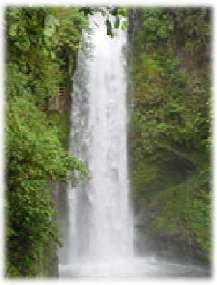
SNC1D PHYSICS

THE CHARACTERISTICS OF ELECTRICITY

- Electric Current (P.439-441)

Electric Current

*For any electrical device to operate, there must be a flow of electrons. The rate at which electrons flow past a specific point in a circuit is called **electric current**. To better understand the concept of electric current, consider a waterfall. Imagine that you are standing near the top of the cliff. If you counted the number of water molecules flowing past the top of the cliff during a given time period, you would get the rate at which the water is flowing past that point.*

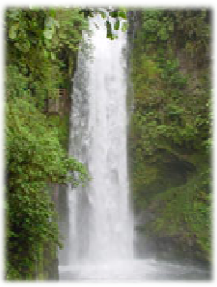


Electric Current

*In the same way, electric current is a measure of the rate at which a large number of electrons are flowing past a specific point in a circuit. The SI unit for electric current is the **ampere (A)** and the symbol is **I**.*

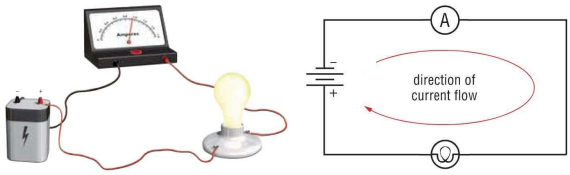
ELECTRIC CURRENT (I)

- rate at which electrons flow past a specific point in a circuit
- SI unit is ampere (A)



Measuring Current

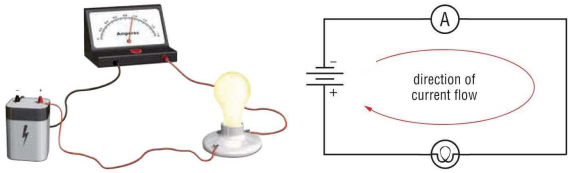
*In order to measure the current flowing through the different loads of a circuit an **ammeter** must be connected in series with the load. For example, to measure the current through the light bulb in the circuit below, you must connect the ammeter in series with the light bulb. This ensures that all of the electrons that flow through the lamp will also flow through the ammeter.*



Measuring Current

AMMETER

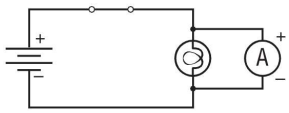
- device used to measure current
- must be connected in series with the load
- circuit symbol is —(A)—



Measuring Current

PRACTICE

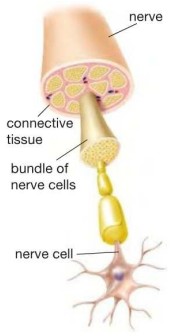
1. A student connected an ammeter as shown. Did the student connect the ammeter correctly? Explain.



no – it is connected in parallel

Electric Current & The Human Body

The electric potentials that cause muscle movement in the human body are produced by nerve cells and are typically about 0.08 V. When muscles are stimulated by electrochemical impulses from the nerve cells, the fibres in the muscle cells contract. The larger the electric current, the more strongly the muscles contract. Even small electrical shocks can be dangerous. An electric current of about 0.002 A gives you a tingling sensation. 0.005 A is the maximum level of current considered safe.



Electric Current & The Human Body

*A current of 0.016 A causes the muscles of the body to contract or convulse. This level 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. If the current is flowing from one hand to the other through the chest, the breathing muscles may become paralyzed, and the victim will suffocate unless the current is stopped.*

Electric Current & The Human Body

*If a current of 0.050 A or more passes through the chest, the heart muscles stop their regular pumping action and merely flutter – known as **ventricular fibrillation**. After a few seconds, the victim will become unconscious. Currents above 0.200 A usually cause severe burns. A current of 1.0 to 4.3 A will stop your heart.*

Electric Current & The Human Body

ELECTRIC CURRENT & THE HUMAN BODY

- 0.002 A — tingling sensation
- 0.005 A — maximum safe-level
- 0.016 A — let-go threshold (muscles convulse & suffocation)
- 0.050 A — ventricular fibrillation (usually fatal)

REMEMBER - CURRENT KILLS!!

✔ Check Your Learning

1. Why is it dangerous to try to help someone who is experiencing an electric shock? What you should do if you wish to help the person?

   if you were to help you would get shocked as well – turn off the power (if possible) and call 911

✔ Check Your Learning

2. Why is it necessary to help a person who is suffering form ventricular fibrillation as soon as possible? What treatment is necessary?

   you need to help because the person could die – a defibrillator is necessary to jump-start the heart again

✔ Check Your Learning

3. Why is electric current dangerous?

because it can kill you