SNC 1P1 3.4 WHAT IS ELECTRIC CURRENT?

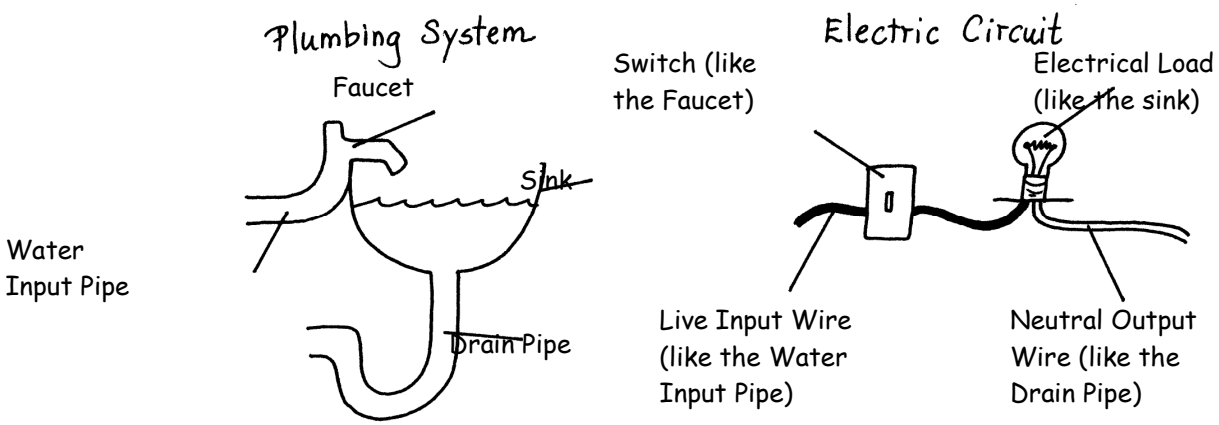
- In order to study electricity, we need to define some important terms:
- Electric Current – Electric current is when electricity (moving electrons) move from one place to another. Electric current is measured in a unit called amperes (A), or amps for short.
- Voltage – Voltage is a measure of the force that moves electrons through a circuit. Voltage is measured in volts (V).
- Resistance – Resistance is trying to slow down the electrons flowing in a circuit. It is measured in ohms (Ω).
- In order to understand electric current, let's compare it to how water flows in pipes.

COMPARING ELECTRIC CURRENT TO THE FLOW OF WATER

- We can compare voltage in electrical wires with the pressure of water in pipes. We can also compare electric current with how much water flows through pipes, therefore;

  Voltage (V) = Pressure of Water

  Electric Current (A) = Amount of Water
- Let's take a look at how both systems operate:



- The black wire is the "hot" or "live" wire and can be compared to the water supply pipe.
- The white wire is known as the "neutral" wire and allows the current to leave the circuit. It can be compared to the drain pipe.

ELECTRIC CURRENT RATINGS

- Every electrical device requires current in order to work (since current is electricity flowing through a circuit). Smaller devices use less current than larger devices. Remember that electric current is measured in amps (A).
- A 100W light bulb uses just less than 1A (0.833A), a calculator uses 0.002A, a colour TV uses 4.1A, and a toaster uses 13.6A.
- All the items just listed are called "electrical loads." An electrical load is a device that converts electricity into another form of energy such as light or heat.

HUMAN RESPONSE TO ELECTRIC SHOCK

- How much electric current is dangerous? Would the current in a light bulb (less than 1A) harm you?
- A very small amount of electric current is dangerous.
- Our bodies use a small amount of electricity in order to contract our muscles. The electricity in our bodies is produced by nerve cells.
- Our bodies have the ability to become part of electric circuits if we touch a live circuit. If the circuit is carrying enough electricity, it starts to contract our muscles. The contraction of muscles does not end unless the electric current stops.
- If the current is large enough, the muscles contract hard enough that the person can no longer let go of the circuit. This is called the "let-go threshold."
- If the current passes through the chest, the muscles that keep you breathing (specifically the diaphragm) become paralyzed and the person actually suffocates to death.
- People do not feel electric current under 0.001A.
- At 0.002A (the amount used in a calculator), people start to feel a tingling sensation.
- 0.005A is the maximum amount of current that is considered safe for humans to be exposed to.
- At 0.016A (the amount of current in an electric clock), muscles contract, and humans can suffocate to death because the diaphragm contracts.
- A current of 0.050A will cause the heart muscles to fail. The muscle will "flutter" and is known as "ventricular fibrillation." At this point, the heart needs to be restarted using defibrillation paddles to give the heart a controlled amount of electricity to restart. 0.050A is usually fatal.
- Notice that the amount of current in a 100W light bulb is 0.833A. That is almost 17 times greater than the fatal amount of 0.050A! The amount of current in a 100W light bulb is strong enough to suffocate 50 adult humans!