Electricity

HOW WOULD YOUR LIFE BE DIFFERENT WITH NO ELECTRICITY?

A power outage has just happened in your city…

Question:

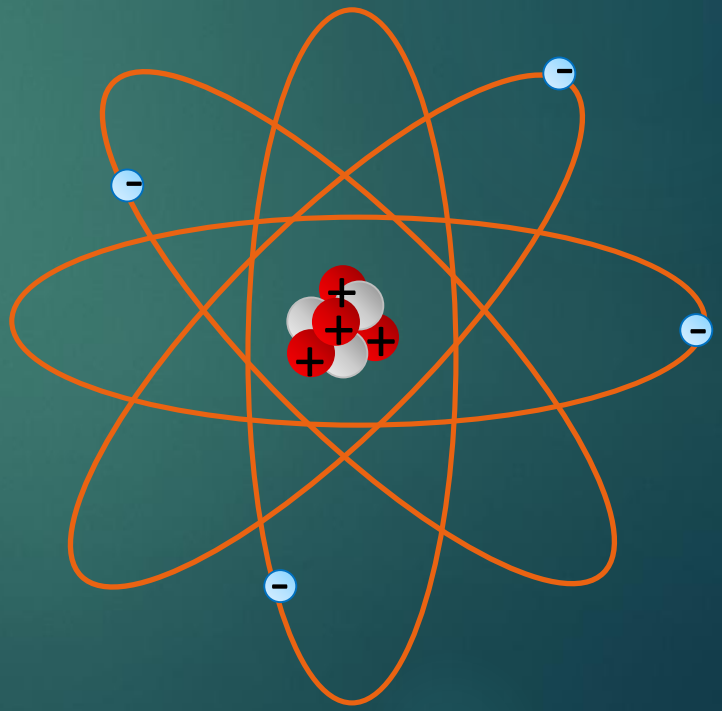
What actions from your daily life would not be possible without electricity?

Topic Preview

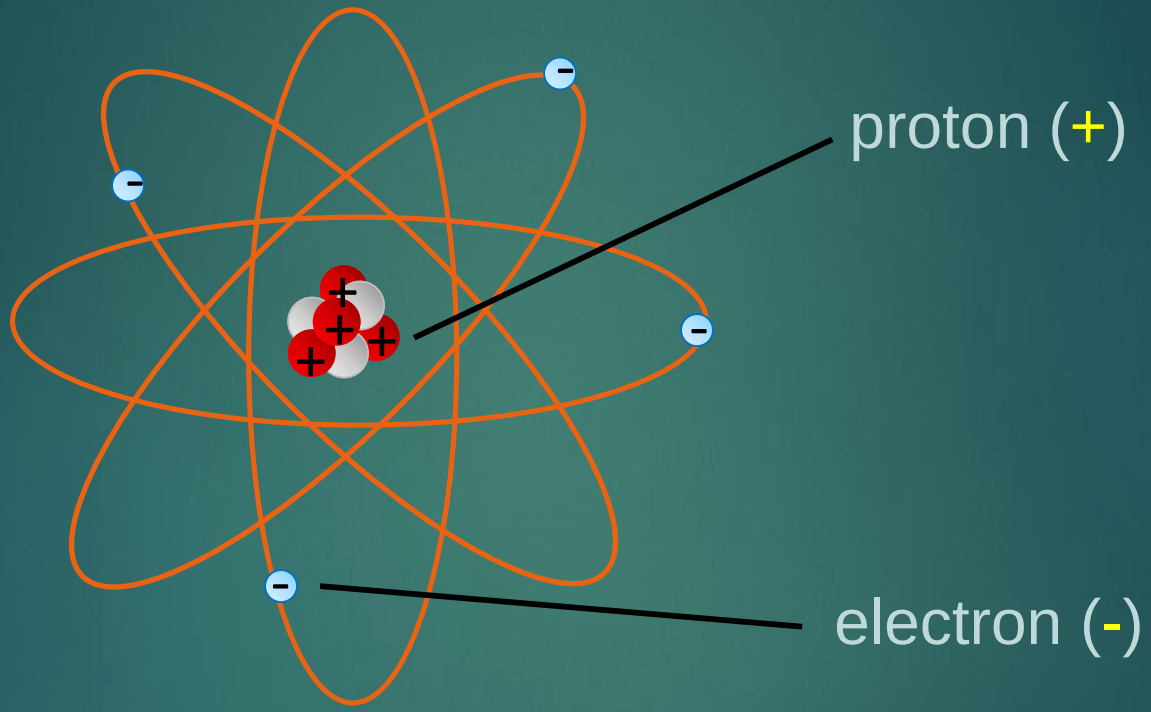
- Electricity
- Conductors
- Insulators
- Current
- Static charge

What Are Atoms?

- The basic unit of all elements of matter
- Made of electrons, protons and neutrons
- The nucleus of an atom is in the center, which is where the protons and neutrons are located



What Are Electrons (e^-)?



- Have a negative electric charge
- Are attracted to protons

Electricity is…

…the presence or flow of electrons

Conductors

- Materials in which electricity (electrons) can easily flow
- When current is applied, electrons move in the same direction
- Metals make good conductors

Example: Copper

- Conducts electricity

Insulators

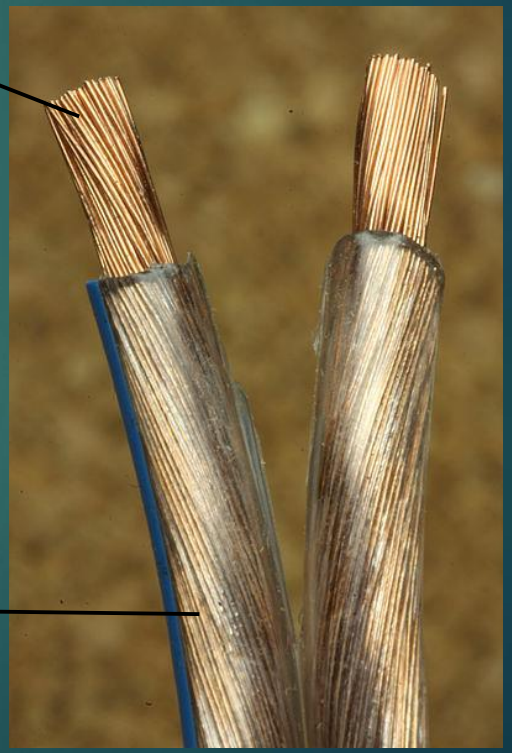
- A material in which electricity can not easily flow
- Glass, wood and rubber make good insulators
- Often used for safety purposes, such as covering electrical wires

Example: Rubber

- A good insulator
  - and a poor conductor

Electrons travel easily through conductors and poorly through insulators

conductor
freely move electrons



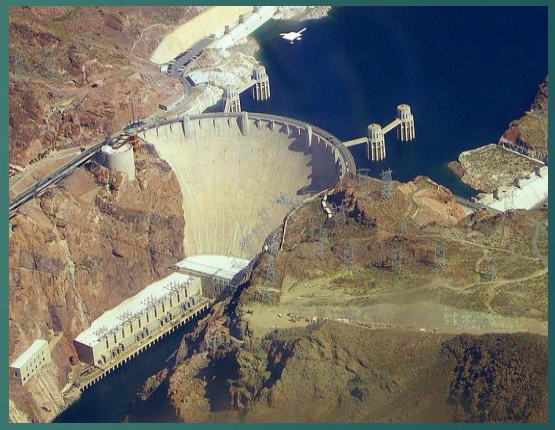
insulator
hold onto their electrons

Current

Similarities between water and electrical systems

We often use well-known systems to better understand more complex systems.

Nile River



Hoover Dam

Electrons act like water molecules in that they can flow like rivers or collect in dams.

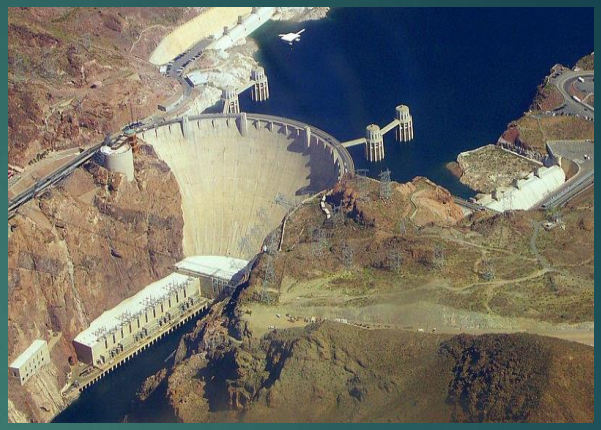
Current

In water systems,
current is the flow of water.

In electrical systems,
current is the flow of electrons.

Static Charge

Dammed water collects, but cannot flow



Static charge, or static electricity, collects charge, but cannot flow

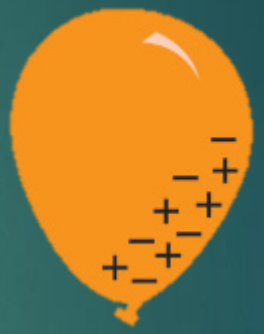
Static Charge

Think positive (+) and negative (+)

Objects may gain or lose electrons (-).

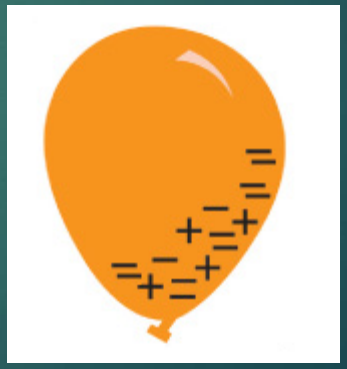
Rubbing the balloon on hair causes more electrons(-) to go onto the balloon from the hair.

The hair loses electrons, thus becoming positively charged (+). The balloon becomes negatively charged (-)



neutral (0)

neutral (0)



net negative charge (-)

net positive charge (+)

Review Questions

Do you think electrical current flows more easily in conductors or insulators?

Electrical current flows more easily in conductors because electrons move better in conductors.

Static electricity builds up more easily in insulators because electrons cannot move well in insulators.

Review Questions

What do we call the flow of charged particles?

Electricity!

Does it matter if they are a positive or negative?

No, but typically electricity is the flow of electrons (negative charge)

Review Questions

We have shown that copper is a conductor.
Name three more conductors.

Gold, silver, aluminum

Where would an electrician use an insulator?
What type of material would it be?
Why would an electrician use an insulator?

An electrician would use insulator material either around electrical wires or around the handles of the electrician's tools. Usually, electricians use rubber. Insulators help to protect the electrician because current does not travel very well through insulators.

Review Questions

If you wanted to design an electrical system that stored static electricity, would you use a conductor or an insulator? Why?

To build an static electricity storage system, you would want to use an insulator, because insulators reduce electron flow.

Finish the analogy:
River IS TO water molecules AS wire is to electrons