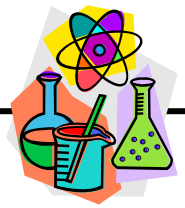
Grade 9 Unit D: Electrical Principles and Technologies



Transferring and Controlling Electricity

Have you ever received an electrical shock when you touched a television, car or another person? That is an electrical charge. Many objects become charged when they are rubbed, touched or put next to other objects.

For example, rubbing a balloon on your head charges it so that it will cling to other objects, such as a wall.

The charge of an object can be:

neutral: equal positive and negative charges cancel out one another

positive: more positive than negative charges

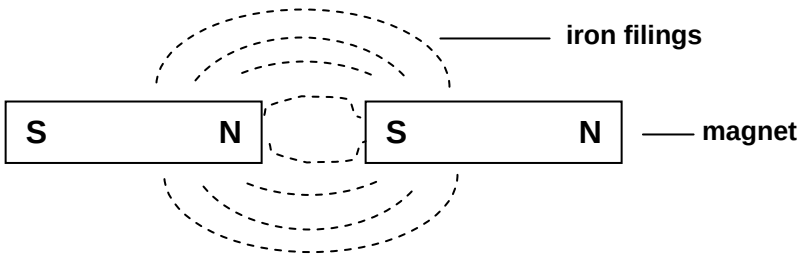
negative: more negative than positive charges.

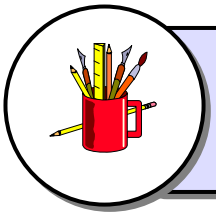
1. Plan and conduct an experiment to investigate the effects of like and unlike charges. Try the following experiment. Before you begin, make sure you understand the process of Scientific Inquiry.

   Question: How do like and unlike charges react toward each other?

   Procedure: Place magnets on table.
   Place a piece of paper over the top. Sprinkle iron filings on top of the paper.
   Keeping magnets under the paper, tap the paper. Observe what happens to the iron filings.
   Now adjust magnets so North Poles are together. Observe what happens to the iron filings.

   Example:





Use Tools Planning an Experiment, Experiment/Investigation Template I and Analyzing and Interpreting Experiment Results.

Laws of Charges

- Unlike charges are attracted to one another, e.g., the north and south parts of a magnet.
- Like charges repel one another, e.g., two north magnets.
- Charged objects attract neutral objects, e.g., a charged magnet attracts a neutral paper clip.

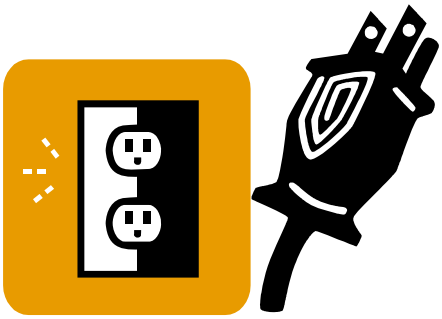
Electrical charges are used in many industries. For example, paint can be charged so that it is attracted to a neutral wall. This paint is applied with a sprayer with little waste.

Current The rate of flow of electricity.

Volt A unit that measures electric current.

Amperage The strength of an electric current measured in amps.

2. Investigate safety concerns related to electrical devices and create a poster that illustrates these hazards. Include information on how to safely use these devices. Consider:
   - how to safely access power
   - safe operating conditions
   - inspecting the device for damage
   - what you should know about current, voltage and amperage.

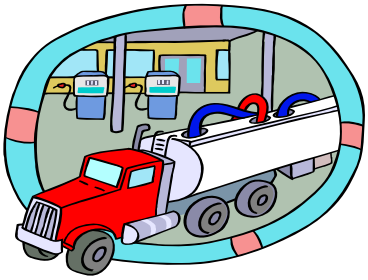


3. Share examples of your experiences with static electricity. Reflect on the following questions.

- When and how can static electricity become a problem? For example, dust and dirt become attracted to objects such as computers and TVs, which become charged with static electricity.
- When or how is static electricity useful? For example, dusting tools can be charged so that they attract and trap particles.

Did You Know? Gasoline trucks become charged as they travel along highways. Before delivering gas, they must get rid of the charge or a spark could set the gas on fire. For example, trucks have grounding strips.

4. Discuss how ground wires and grounding strips work to reduce static electricity on homes, buildings, vehicles and electrical appliances.



5. Compare static and current electricity using a Venn diagram. Show characteristics they share and things that are different between them.

Use Tool Venn Diagram.

Conductor A material or thing that allows electricity to flow through it.

Example: copper

Insulator A material or thing that protects against electrical current (does not allow electricity to flow through it).

Example: rubber

6. Investigate and list at least five conductors and five insulators in the chart below.

Conductors	Insulators

Label the insulator and the conductor in the picture.

Electrical Currents and Circuits

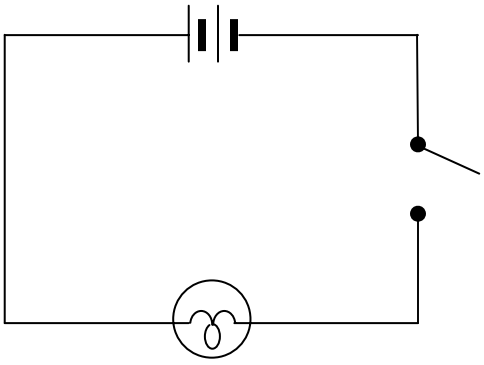
Before you begin, review Safety in Science. Working with electricity can be dangerous. Discuss risks and safety precautions with your teacher and classmates.

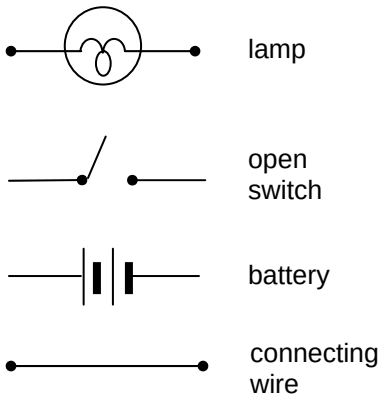
Current: The amount of charge that passes through a certain point every second. Current is measured in amperes or amps (A).
Example:

- A current of 0.4 amps means that 0.4 amps of charge pass through the object every second.

7. Create a simple circuit. Observe what happens when the switch is closed. Answer the following questions.
   - When is the electrical current moving?
   - What is the source of power or charge?
   - How do you know your circuit is complete?

Diagram of a simple circuit:





8. Complete the following experiment or create another experiment to examine electrical currents. Before you begin, make sure you understand the process of Scientific Inquiry.

Question
What are the properties of working circuits?
Hypothesis/prediction
_____ _____ _____
Materials
Minimum: 2 batteries — 4 copper wires 1 3.7 V light bulb — 1 switch
Procedure
1. Draw a diagram of the circuit you are going to create. 2. Create the circuit using the materials you have. 3. Rearrange the circuit in a variety of ways and/or add more wires, switches, lights and resistant wires. 4. Observe what happens when one light bulb is removed when all equipment is attached. 5. Record your results.
Diagram/sketch
Results: List below or on a separate page. Use a chart and/or graph to show your results.
_____ _____
Conclusion: Compare findings with prediction and classmates' results. Write a conclusion and/or inference statement. Relate your conclusion to the use of household lights and Christmas tree lights.
_____ _____ _____

9. Define the following terms used when measuring electricity.

ampere

_____

_____

_____

volt

_____

_____

_____

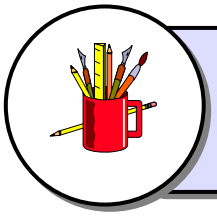
ohm

_____

_____

_____

10. With a group, discuss the relationship amongst current, voltage and resistance using the terms above. Work together to create a diagram that explains the relationship amongst current, voltage and resistance. Share your diagram with others in the class.



Use Tool Discussion Notes.