

Lesson Plan:

Insulators and Conductors

Grades 3rd-5th

NGSS Standards:

4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

Objective: Students will examine electric current flow and electrical conductors and insulators in order to explain the difference between the two.

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Overview



Part 1

Lesson Introduction (~15-20 minutes)

- Students will complete the readings “How Do Electrons Move Along a Wire” and “Conductors and Insulators: What are they?”
- Students will complete Quiz #1 questions

Part 2 (~15-20 minutes)

- Students will watch the Ring Toss demo video.
- Student will complete Quiz #2

Outline

1. Part 1

- a. Reading, “How Do Electrons Move Along A Wire?”
- b. Reading, “Conductors and Insulators: What are they?”
- c. Quiz #1

2. Part 2

- a. Ring Toss Demo Video
- b. Quiz #2

3. Glossary



Part I

How Do Electrons Move Along a Wire?

Atoms have negatively charged particles called electrons. Electrons flow easily and freely through materials that are **conductors**. Conductors are made of atoms, and each atom has electrons. When there are electrons in a conductor, the electrons will move from one atom to the next, creating the flow of electrons, or electric current. Look at the diagram below to for an illustration of how electrons flow.

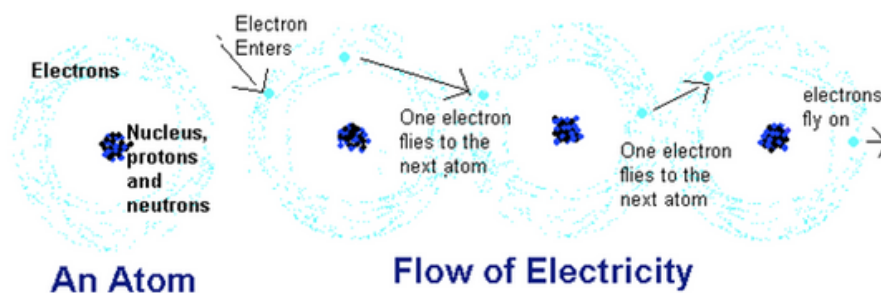


Image Source: <http://www.grg.northwestern.edu/projects/vss/docs/power/2-whats-electron-flow.html>

Conductors and Insulators: What are they?

Conductors are objects or materials that electricity can flow through easily. These materials hold LOOSELY on to their electrons, so they flow through these materials easily. In other words, the electrons in these materials pass electrical energy easily from one particle to another and transfer energy in the form of electricity. Metals are the most common conductors of electricity, although some metals are more conductive than others. Some examples of good conductors can be seen on the next page.



Part I, continued

Some examples of conductors are:

Copper



Gold



Silver

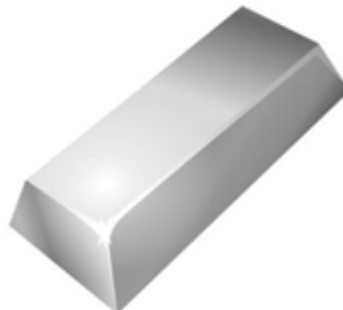


Image Sources:

<https://blog.atltechnology.com/cable-101-what-is-the-conductor>
<https://edu.glogster.com/glog/gold/26trju1l3cq?=glogpedia-source>
<https://science4fun.info/conductors-and-insulators/>



Part I, continued

Insulators materials that do NOT let electric current flow through it. These materials contain atoms that hold onto their electrons very TIGHTLY. Insulators resist or block the electric current from passing through them. Insulators are commonly used to protect us from dangerous effects of electricity.

Examples of insulators are:

Wood



Plastic



Glass



Rubber



Image Sources:

<https://unsplash.com/s/photos/wood-pile>

<https://www.azocleantech.com/article.aspx?ArticleID=790>

<https://www.technoad.com/products/rubber-washers/>



Part I, continued

The pictures below show that the rubber or plastic on the electrical cord is the insulation for the wires. Rubber or plastic is used since these are insulators and the electricity cannot go through the rubber or plastic. The electricity follows the more conductive path which is the copper wire.

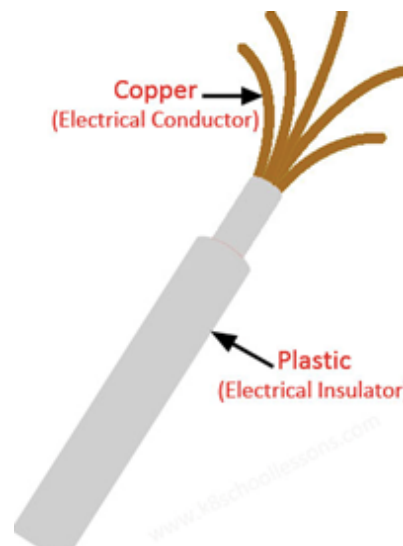
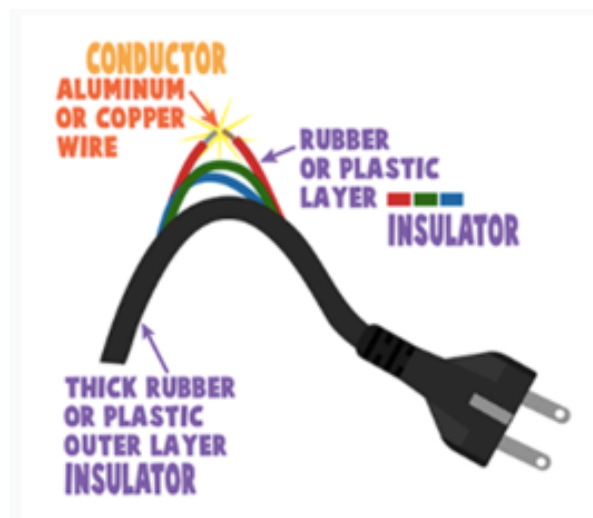


Image Sources:

<https://c03.apogee.net/mvc/home/hes/land/el?utilityname=gru&spc=kids&id=16185>
<https://k8schoollessons.com/conductors-and-insulators/>



Quiz #1

1. What type of materials allow electricity to flow freely?
 - a. Inductors
 - b. Insulators
 - c. Currents
 - d. Conductors
2. What type of materials are resistant to the flow of electricity?
3. Since metals are good conductors of electricity, electric wires are made of metals.
 - a. True
 - b. False
4. Which of the following is NOT an insulator?
 - a. Glass
 - b. Copper
 - c. Plastic
 - d. Rubber
5. Is plastic a conductor or an insulator?
6. What is the difference between a conductor and an insulator?
 - a. An insulator allows electricity to flow through it easily and a conductor does not.
 - b. An insulator is magnetic, and a conductor is not.
 - c. A conductor allows electricity to flow through it easily and an insulator does not.
 - d. A conductor is magnetic, and an insulator is not.

Answer Key:
1. D
2. Insulators
3. A
4. B
5. Insulator
6. C



Part II

[Click here](#) to watch our Ring Toss Demo Video.

Directions: After watching the video, answer the following questions.

Quiz #2

1. We know that most metals are conductors. In the Ring Toss video, the iron bar had an electric current running through it. Why did the metal rings travel up the iron bar?
2. If the brass ring is the least conductive metal, why did it barely move up the iron bar?
3. Why did the brass ring with the break in it not travel up the iron bar?
4. If we put a ring made out of rubber or plastic on the iron bar, what would happen? Explain.

Answer Key:
1) They are conductor and the electric current flowing through them allowed them to travel up the bar
2) not as many electrons flowing through it
3) the current cannot circulate or travel around the ring
4) It wouldn't move because rubber and plastic are insulators



Glossary

Circuit- The path through which electrical current flows.

Conductor- An object or material that allows the transfer of electrons (electricity).

Current- The movement of electrons.

Electron- A very small, negatively charged particle.

Energy- The ability to do work.

Insulator- An object or material in which electrons do not flow freely.