



LESSON PLAN

PROPERTIES OF ELEMENTS GRADES 6-8

SUMMARY

Students conduct an investigation to observe the property of conductivity and determine that sodium is a conductor of electricity while carbon, hydrogen, and oxygen are not.



NOTE: There is no performance expectation explicitly connected to this topic in the middle school grade band. There is a high school performance expectation (HS-PS1-1) that states “Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.” Therefore, this lesson is written with the Generation Genius intentions, but it does not align with middle school performance expectations.

HS-PS1-1. Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

Science & Engineering Practices	Connections to Classroom Activity
<p>Developing and Using Models</p>	<ul style="list-style-type: none"> Students will conduct an investigation to discover that properties of elements determine how they are arranged on the periodic table.
Disciplinary Core Ideas	Connections to Classroom Activity
<p>PS1.A: Structure and Properties of Matter</p> <p>Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons.</p> <p>The periodic table orders elements horizontally by the number of protons in the atom’s nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states.</p>	<ul style="list-style-type: none"> Students understand that all elements have properties and those properties can be investigated. The way electrons are arranged outside the nucleus of an atom can impact how that atom combines with others and the properties of different compounds.

Cross Cutting Concepts

Connections to Classroom Activity

Patterns

- Students use the periodic table to observe patterns in how elements are arranged based on their properties.

DURATION

45 min.



ENGAGE

Show students a simple battery circuit already assembled. Ask them to predict what will happen when the wires touch the battery to complete the circuit. Students will predict the light bulb will light up. Demonstrate the phenomenon of completing the circuit and lighting the bulb. Ask students to explain to a shoulder partner why they think the light bulb lit up. Some students will say it is because the wires are conductors of electricity. Others may explain the components of a basic circuit. The objective is to get students thinking about conductivity as a property of matter—that some materials conduct electricity and others do not.

Students will know from previous grade levels which materials are conductors of electricity. Ask students to list materials they think conduct electricity and ones that don't. Record their responses on a poster paper or dry erase board and display it publicly for the class. Also have students make a list of questions they have about the circuit and/or conductivity as a property. Ask students if they think water is a conductor of electricity and why. Tell students all matter has properties and by observing the properties of matter, you can determine more about what a substance is. The property of matter they will be investigating is conductivity.



EXPLORE

Have students work in pairs to build the same circuit and tell them they are going to perform an investigation to answer questions we have about conductivity. Prepare both a sugar-water solution and salt-water solution by dissolving sugar and salt into separate containers of water. Attempt to dissolve as much sugar and salt into the water without oversaturating the solution.

Have students complete the circuit and test both solutions to determine if they complete the circuit and light the bulb. Tell students to make observations about what happens with the light bulb and ask questions about the phenomenon they observe.

Some questions may be:

- Why does salt water light the bulb and sugar water does not?
- What is sugar?
- What is salt?

Tell students that sugar is a combination of carbon, hydrogen, and oxygen atoms, and salt is a combination of sodium (Na) and chlorine (Cl) atoms. Further explain to students that when you dissolve sugar in water, the smallest particles are still sugar molecules. Salt, on the other hand breaks apart into sodium and chloride. Ask students to find the elements on



the periodic table and make observations about sodium and chloride compared to carbon, hydrogen, and oxygen based upon their position on the periodic table. Ask students to share questions they have after conducting their investigation and record those for the class on a dry erase board or poster paper. Some student questions that may arise are:

- Why does salt conduct electricity and sugar does not?
- What is different about sodium compared to hydrogen, oxygen, and carbon?



EXPLAIN



WATCH THE GENERATION GENIUS PROPERTIES OF ELEMENTS VIDEO AS A GROUP



ELABORATE

Have students get into groups and tell them to look at the periodic table of elements. Either have them identify 10 conductors of electricity, or provide them a list of 10 metals in the table. Younger students and those requiring differentiation would benefit from a list. Examples include: silver, gold, copper, aluminum, titanium, nickel, iron, sodium, magnesium, and calcium.

Ask students to make connections between the property of conductivity and position of the elements on the periodic table. The students should notice and share with each other that metals are conductors of electricity and non-metals are not. All elements, including metals, are found in a particular position on the periodic table.



EVALUATE

There are multiple ways to assess your students' understanding of this topic. The exit ticket is an opportunity for students to use the science ideas they built in the lesson in a new context. Alternatively, you can use the Kahoot! quiz (which provides downloadable scores at the end of the game) and/or the paper quiz. All these resources are located right below the video in the assessment section.



EXTENSION

Have students observe and record the properties of baking soda, water, and pink lemonade in three separate containers. Have students observe a clear, glass beaker and feel it for temperature. Combine equal parts pink lemonade and baking soda into a clear, glass beaker with water. Have students record their observations of the reaction occurring in the beaker. Students will observe gas bubbles (carbon dioxide) and also note a temperature change when feeling the sides and bottom of the beaker. This is because the citric acid in the lemonade combines with the carbonate in the baking soda creating a chemical reaction that results in a gas being produced and temperature change.