GENERATIONGENIUS
STREAM. EDUCATE. ENTERTAIN.

LESSON PLAN

PROPERTIES OF MATTER
GRADES 3-5

SUMMARY

Students understand what matter is, and what types of properties can be used to define different types of matter. They first explore properties of different types of matter through a hands-on investigation and then watch Dr. Jeff show off some exciting demonstrations of properties of matter.

NEXT GENERATION SCIENCE STANDARDS CORRELATION

5-PS1-3 Make observations and measurements to identify materials based on their properties.

5-PS1-4 Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

Science & Engineering Practices	Connections to Classroom Activity
Planning and Carrying Out Investigations (5-PS1-3, 5-PS1-4)	• Make observations of different materials and their properties.

Disciplinary Core Ideas	Connections to Classroom Activity
PS1.A: Structure and Properties of Matter Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic scale mechanism of evaporation and condensation.) (5-PS1-3)	• Observe and compare relative hardness, density, solubility and other properties of various materials. • Mix ingredients with certain properties and create materials with different properties.

PS1.B: Chemical Reactions When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS1-4)	
Crosscutting Concepts	**Connections to Classroom Activity**
Scale, Proportion, and Quantity (5-PS1-3)	• Use standard units of measure to make slime.

DURATION

One to two 45-minute classroom periods

PRE-ASSESSMENT QUESTIONS

Please see Discussion Questions. These can be discussed as a group or answered individually in student science notebooks.

MATERIALS

- Science notebooks
- Pencils
- Hand specimen of quartz
- Hand specimen of calcite
- Aluminum can
- Steel can (can be full so no sharp edges)
- Magnet
- Three sealable zipper bags
- Ice
- Water
- Salt
- Oil
- Two clear plastic cups
- Two plastic spoons

ENGAGE

Show students a photo (or real jewelry if you wear it) of a diamond, cubic zirconia, or other gem commonly mistaken for a diamond. Explain to students that this may be a real diamond that is worth thousands of dollars, or it may be a fake—how can we tell? Explain to students that properties of matter help us identify different materials and help us choose the right type of material for a desired use.

EXPLORE

Explain to students that they will be observing and attempting to identify some matter based on its properties. Set up the following stations around the room:

STATION 1

Place a piece of quartz labeled A and a piece of calcite labeled B that look similar.

STATION 2

Place both the aluminum and steel cans.

STATION 3
Use three zipper bags here. One should contain ice. The second should contain about a cup of water. The third should be inflated with a warm breath (some condensation might help them identify it as water vapor) and sealed.

STATION 4
Place a cup or container of salt (labeled C), a cup or container of oil (labeled D), and a cup of water, as well as two clear plastic cups and spoons for mixing.

STATION 1	STATION 2
This station contains two solid materials. One is the mineral calcite, and the other is the mineral quartz. One property of calcite is that it is soft—soft enough to be scratched with a fingernail. Quartz is hard. Which material is calcite? Which is quartz?	Before you are two cans—one is made from the material aluminum, the other from steel—and a magnet. What evidence can you observe that indicates which can is which? Also, write down why you think each material was used to make each can (what are the properties of the material that make it useful for that type of can?).
STATION 3	**STATION 4**
Which of these three bags contains matter? Explain your reasoning. Describe properties of the matter you observe.	Pour some water into each of the two cups. Mix a spoonful of material C into the first cup. Using the other spoon, mix a spoonful of material D into the second cup. Which of the materials dissolves in water? What do you think material C is? What do you think material D is? What properties informed your guess?

Divide students into four groups. Allow the groups to rotate through the stations, using their science notebooks to record their observations. (Please note, station 4 will require dumping and rinsing materials for each group rotation.)

EXPLAIN

After all groups have completed all four stations, gather all the students and facilitate a discussion about the properties of matter and how they can be used to identify mystery substances. Discuss that Station 1 required observing the hardness of solid matter and Station 2 required observing response to magnetic forces as evidence of type of solid matter. Station 3 provided examples of three types of matter—solid, liquid, and gas (students may not recognize air/gas as matter). Discuss common uses of ice, water, and water vapor. Discuss that matter takes up space and has weight. Station 4 uses solubility as a property to differentiate two types of matter.

AS A CLASS, WATCH THE GENERATION GENIUS PROPERTIES OF MATTER VIDEO.
Then facilitate a conversation using the Discussion Questions.

ELABORATE

Students can use the DIY Activity to make slime like Zoe and Charlotte from the video. They should be able to describe properties of the ingredients as well as properties of the finished slime. They can also experiment with adding different ingredients and seeing how the properties of the resulting material compare to the original slime.

EVALUATE

Return to the discussion about the diamond from the Engage portion of the activity. Students have learned a lot about how to identify materials based on their properties. Ask students which properties might be able to be used to determine whether a diamond is real or not (hardness is an identifying property of diamonds as they are one of the hardest minerals). Diamonds scratch almost all other minerals, but other minerals are not hard enough to scratch diamonds.

Create one or more scenarios involving mystery substances and have students write in their science notebooks about how they might use properties of matter to identify them.