



All About Matter: Chemical vs Physical Changes

Chemical Sciences

- ▶ Natural and processed materials have a range of physical properties. These properties can influence their use (ACSSU074)

Use and influence of science

- ▶ Science knowledge helps people to understand the effect of their actions (ACSHE062)

Lesson Outcomes

Students will be able to differentiate between physical and chemical changes. Students will be able to differentiate between physical and chemical properties of matter

Background information

Show your class how combining two objects can create a new object in this hands-on science lesson. Students will learn why breaking apart an object doesn't change its mass.

Preparation for the lesson

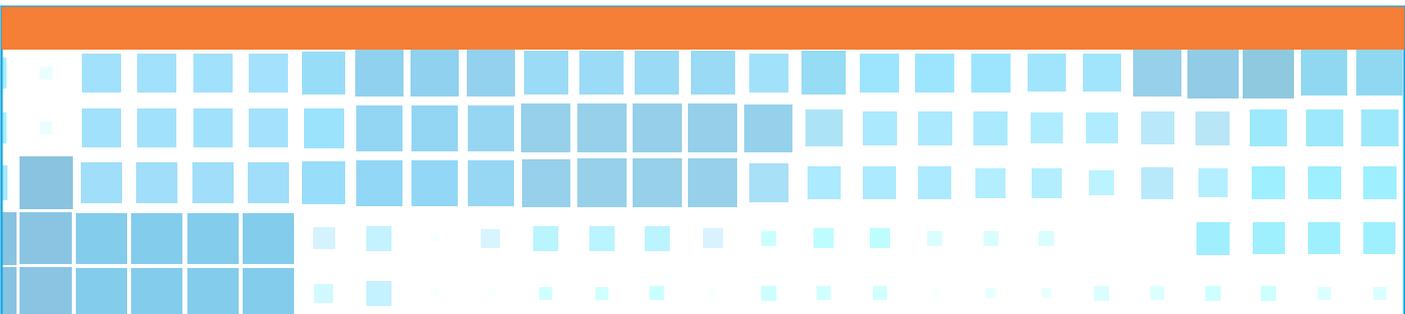
- ▶ Student worksheets "What's the Matter?"
- ▶ One quarter of a cup of baking soda
- ▶ One quarter of a cup of vinegar
- ▶ One balloon
- ▶ One funnel
- ▶ One empty water bottle
- ▶ Computers
- ▶ White Board Markers
- ▶ Notebook paper

Introduction (5 minutes)

1. Begin the lesson by asking your students what physical and chemical changes they have seen in the environment.
2. Tell your students that they will be learning about the physical and chemical changes and properties of matter.

Explicit Instruction/Teacher Modelling (30 minutes)

1. Pass out the What's the Matter workbooks to your students.
2. Go over the changes and properties with your students.
3. Explain each change and property to your students with an example
4. An example of a physical change would be shape. You can explain that shape is a physical property. For example, a rectangle can be broken down into triangles, but it would still contain the same amount of mass.
5. Go over and explain the physical and chemical changes to your students on page 2 in the What's the Matter packet.



Guided Practice/Interactive Modelling (40 minutes)

1. Conduct the experiment on the third page of the What's the Matter workbooks.
2. Ask your students to answer the questions about the experiment with a partner
3. Go over the questions as a class

Independent Working Time (10 minutes)

- ▶ Ask your students to write the definition of each word on page 3 of the packet.

Differentiation

Enrichment

- ▶ Ask your students to write a paragraph explaining why the metabolism of food is a chemical change. Have them research the metabolism of food before writing the paragraph.

Support

- ▶ Show your students one example of a physical change and one example of a chemical change through a drawing. An example could be fireworks for a chemical change and cutting a paper for a physical change.

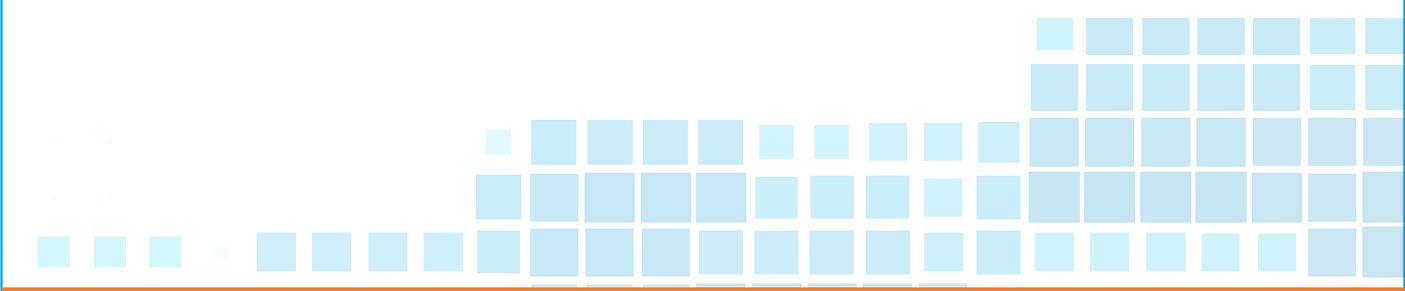
Assessment (10 minutes)

- ▶ Ask students to complete the Chemical vs. Physical Properties worksheet.

Review and Closing (20 minutes)

- ▶ Ask students to pick an object. Have them think of a physical change or chemical change that the object could go through. Instruct your students to write two properties that would change as a result of the change. Ask your students to share what they wrote with the class.

This lesson plan is provided by Education.com



WHAT'S THE MATTER?



Matter is anything that takes up space and has mass. Mass is the stuff that matter is made of, or the amount of particles in a substance or object. Matter has physical and chemical properties and can undergo physical and chemical changes.

What are some examples of matter? Well, just look around you and everything you see, touch, smell, and breathe are examples of matter.

What is a property?

A property describes how an object looks, feels, or acts. Properties can be physical or chemical. Properties can also be quantitative or qualitative. A qualitative property of matter is observed and generally can't be measured with a numerical result. A quantitative property of matter is one that can be measured numerically, such as height, length, or weight.

WHAT ARE EXAMPLES OF PHYSICAL PROPERTIES?

Physical properties can be observed. Examples of physical properties can be colour, weight, volume, size, shape, density, boiling point, or freezing point.

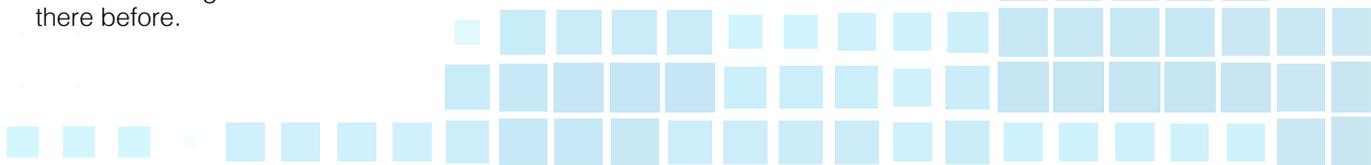
WHAT ARE EXAMPLES OF CHEMICAL PROPERTIES?

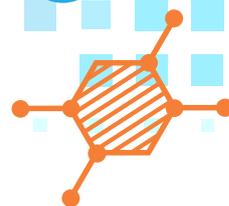
A chemical property is usually one that can only be seen when a substance undergoes a chemical change. These properties cannot be observed by touching or looking. Chemical properties become apparent when the structure of the substance is altered chemically.

An example of this would be adding baking soda and vinegar and watching it bubble and give off a gas. The bubbling is an indicator that the properties of the two initial ingredients have recombined to form a new substance or substances.

WHAT IS A CHEMICAL CHANGE?

A chemical change is a change that results in a new substance (or substances) being formed. The important word to remember is new. A chemical change involves the making or breaking of bonds between atoms. A chemical change makes a new substance that wasn't there before.





WHAT ARE EXAMPLES OF CHEMICAL CHANGES?

Some examples of chemical changes are nails rusting over time, batter turning into a cake in the oven, wood or paper burning to ashes, the digestion of food, and the baking soda and vinegar example above.

WHAT IS A PHYSICAL CHANGE?

A physical change is a change in a state of matter. For example, when ice melts, the H₂O molecule is going from a solid (ice) state to a liquid (water) state of matter. The actual molecule or the arrangement of the atoms has not changed— just its state of matter. A physical change can also be a change in appearance of matter. For example, a piece of paper is made of paper molecules, and when you tear the piece of paper in half, both halves are still made of paper molecules. The atoms and molecules that make up the substance are not physically changed.



PHYSICAL OR CHEMICAL CHANGE?

Tick the following whether you think the item is a physical change or a chemical change.

	PHYSICAL CHANGE	CHEMICAL CHANGE
Ice Melting		
Cutting a pineapple into pieces		
Adding vinegar to baking soda		
A piece of rusting metal		
A campfire		
Crumbling a piece of paper		
Sour milk		
Shattering a drinking glass		
Dissolving sugar in water		
Burning paper		
Boiling water		
Burning a match		

TRY THIS EXPERIMENT

How do you know that a gas is produced as a result of mixing baking soda and vinegar?

Materials

- ▶ ¼ cup of baking soda
- ▶ ¼ cup of vinegar
- ▶ 1 small, empty water bottle
- ▶ 1 balloon
- ▶ 1 funnel



Procedure

1. Stretch the balloon out before using it.
2. Using the funnel, fill the balloon with the baking soda.
3. Pour the vinegar into the empty water bottle.
4. Attach the opening of the balloon to the mouth of the water bottle – be careful not to get any baking soda into the bottle.
5. Count to three and lift up the part of the balloon that contains the baking soda so that the baking soda falls into the bottle.

QUESTIONS

1. What are the physical properties of baking soda?
2. What are the physical properties of the vinegar?
3. What happened inside the water bottle when you added the baking soda to the vinegar? What did you see in the bottle?
4. Did anything happen to the balloon? If so, what do you think caused it?
5. What type of change occurred inside the bottle when you added the baking soda to the vinegar?
6. Fill in the definitions in the vocabulary box below:

VOCABULARY	
Matter	
Mass	
Property	
Qualitative	
Quantitative	
Physical change	
Chemical change	

ANSWER SHEET

	PHYSICAL CHANGE	CHEMICAL CHANGE	EXPLANATION
Ice Melting			This is a physical change because H ₂ O is changing from a solid state to a liquid state. The H ₂ O molecule remains the same, just in a different state of matter.
Cutting a pineapple into pieces			This is a physical change. The molecules that make up the pineapple are not being changed – just their size is being changed.
Adding vinegar to baking soda			This is a chemical change because a new substance is being produced – the carbon dioxide gas and atoms are being rearranged.
A piece of rusting metal			This is a chemical change because the iron in the nail is being changed into a new substance: rust
A campfire			This is an example of chemical change because the burning wood is being changed into new substances: smoke and ash.
Crumpling a piece of paper			This is an example of physical change because the paper molecules are the same. The appearance of the paper is the only thing changing.
Sour milk			This is an example of a chemical change because the atoms of the milk have been rearranged to form a new substance: sour milk. You cannot do anything to the milk to get rid of the sour part.
Shattering a drinking glass			This is an example of physical change because the actual pieces of glass are not being changed. They are just being broken into smaller pieces.
Dissolving sugar in water			This is a physical change because is NO new substance being formed. When you mix sugar with water, you simply get sugar water.
Burning paper			This is an example of a chemical change because two new substances are formed: smoke and ash.
Boiling water			This is an example of a physical change because the H ₂ O is changing to another state of matter (liquid to gas). No new substance is formed. The molecules of water are just spaced out more.
Burning a match			This is an example of a chemical change. The match head changes into ash and smoke and you cannot use the match again.

ANSWERS

- What are the physical properties of the baking soda?** White, odourless, solid, crystalline solid.
- What are the physical properties of the vinegar?** Clear liquid, characteristic smell, acidic taste.
- What happened inside the water bottle when you added the baking soda to the vinegar? What did you see in the bottle?** – Foam and bubbles began to appear. The bubbles indicate that a gas is being formed.
- Did anything happen to the balloon? If so, what do you think caused it?** – As the gas formed, it had nowhere to go so it went up and into the balloon, making it inflate.
- What type of change occurred inside the bottle when you added the baking soda to vinegar?** – A chemical change
- Fill in the definitions in the vocabulary box below:**

VOCABULARY	
Matter	Anything that takes up space and has mass
Mass	The amount of stuff in a substance
Property	How an object looks, feels, or acts
Qualitative	A property of matter that can be observed and generally cannot be measured with a numerical result
Quantitative	A property of matter that can be measured numerically
Physical change	A physical change is a change in a state of matter or appearance
Chemical change	A chemical change is a change that results in a new substance(s) being formed