

Physical and Chemical Changes

4th or 5th Grade

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Benchmarks:

(4th) SLC 11: A.) Students will identify a chemical change as the formation of a new substance and describe signs that a chemical change is occurring. (e.g., burning, rotting fruit, digestion, etc.) B.) Students will distinguish between physical change, and chemical change, and changes that are chemical as well as physical.

(5th) SLC 8: Students will identify physical and chemical changes and compare their properties.

Objectives:

To have students acquire an awareness of the physical changes that can take place between the three states of matter, and also to develop common sense and intuition in distinguishing between chemical and physical changes.

Materials:

Day 1:

- Ice water
- Liquid water
- 100mL graduated cylinder
- 100mL ether

Day 2:

- A glass container for every group
- Crushed dry ice
- A bowl for every group
- Water

Day 3:

- Concentrated aqueous nitric acid
- A penny

Day 1:

Initial Observations:

Show the class a graduated cylinder filled with Ether and record how many milliliters there is. Leave the cylinder somewhere where no one will touch it until the next day of the lesson.

Show the class some ice and liquid water. What is different between the two?

Ask if anyone knows what is different between a humid day and a non-humid day. Why do you feel “wet” or “sticky” during a humid day?

Target Observations:

- There were 50 mL of Ether in the cylinder
- The ice has a definite shape and a definite volume

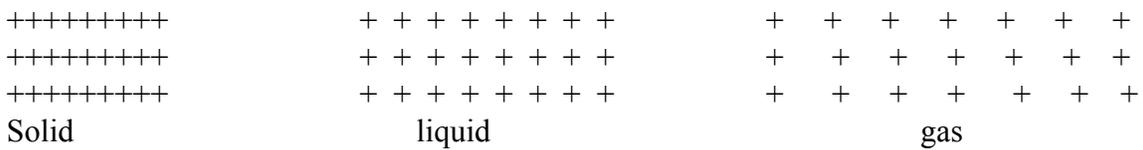
- The water had a definite volume, but no definite shape
- A humid day has more water in the air than a non-humid day.

Target Model:

-Substances come in 3 types, called States of Matter: Solid, Liquid, and Gas.

Procedure:

So what is the difference between the three states? Suppose we have an object made of little pieces that look like plus signs. In a solid, these little pieces are pushed together really close and are connected to each other. In a liquid, the pieces are further apart, but still somewhat connected to each other. In a gas, the little pieces are no longer connected to each other and are spread far apart and do their own thing.



Target Model:

*-Substances come in 3 types, called States of Matter: Solid, Liquid, and Gas.
-In a solid the little pieces that make up things are close together and connected, in a liquid they are further apart, and in a gas they are far apart and no longer connected.*

Demonstration:

By this time some of the ice you brought in should have melted. Ask the class to tell you the change they observe regarding it. Is it the same stuff still? The appearance changed but it's still the same stuff. This is called a physical change.

Some other examples of a physical change: Crumpling a piece of paper into a ball, shattering glass on the floor, ripping apart two pieces of clay, etc...

Target Observations:

- Some of the ice has melted into liquid water
- The water stayed the same, it just changed states

Target Model:

*-Substances come in 3 types, called States of Matter: Solid, Liquid, and Gas.
-In a solid the little pieces that make up things are close together and connected, in a liquid they are further apart, and in a gas they are far apart and no longer connected.
-A physical change is when something changes from one State of Matter to another without changing the stuff that it is made of.*

Demonstration:

Draw the following diagrams on the board. Ask students to identify the one that is not a physical change. How do you know? What types of physical changes could the other diagrams be?

Give each table a glass container filled with water and ice. Ask the students to observe what is happening on the outside of the container. Where are the water droplets coming from? What type of a change is this – physical or chemical? Why do you think so?

Target Observations:

- The outside of the container is covered with water droplets
- The water droplets cannot be coming from the water in the glass container – it isn't leaking
- The water droplets are probably coming from the air
- The formation of water droplets is probably a physical change of gas to liquid, called Condensation

Procedure:

Give each table a bunch of Lego's and ask one table to portray evaporation, one condensation, one melting, and one freezing. Be sure to ask each table what states their change is between. Give at least two types of Lego's to each table to tempt them to use more than one type. Using more than one type is indicating a change in substance, which is a chemical change.

Day 3

Procedure:

Tell students the following characteristics of a chemical change:

- 1) A chemical change involves a change in the identity of the material. Break the class up into groups and have them demonstrate this by using different types of Lego's.
- 2) Fire, or the production of heat, indicates a chemical change.
- 3) The appearance of odor, or a change in odor, is always a sign of a chemical change taking place. An example you can give is rotting garbage.
- 4) Creation of a gas (unless it's the steam of something boiling) is also a great indicator that a chemical change is taking place.
- 5) Color change can also be an indicator of a chemical change.

Target Model:

-Substances come in 3 types, called States of Matter: Solid, Liquid, and Gas.

-In a solid the little pieces that make up things are close together and connected, in a liquid they are further apart, and in a gas they are far apart and no longer connected.

-A physical change is when something changes from one State of Matter to another, or changes its appearance without changing the stuff that it is made of.

-A chemical change is when the stuff that a material is made of changes, *heat is released, an odor is produced, a gas is created, or the color changes.*

Procedure:

Distort the shape of a penny with a hammer. What do we observe? Is this a chemical or physical change?

Now throw the penny in concentrated nitric acid solution and ask the students to observe. A blue-green color should develop and a reddish-brown gas should evolve. What happened? What type of change is this?

Target Observations:

- The penny was bent.
- The bent penny didn't have any of the characteristics of a chemical change, so it was probably a physical change.
- The penny in the acid turned blue-green
- A reddish-brown gas was created
- The penny in the acid was probably a chemical change, because it had two of the characteristics of a chemical change