

Changes in Nature

5th Grade

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References:

Dunbar, Kelley. It's Elementary Dear Watson

Benchmarks:

SLC 8: Propose and/or evaluate an investigation of simple physical and/or chemical changes.

CPS Benchmark: A) Students will identify physical and chemical changes and compare their properties.

Objectives:

Students should identify the chemical and physical changes in the water cycle, carbon cycle and weathering. Students should be able to recognize a chemical change or physical change based on a chemical formula.

Materials:

- It's Elementary Dear Watson, by Kelley Dunbar (not attached)
- Students' notes on water and carbon cycle
- 2 piece of limestone
- 2 small beakers or jars.
- two pieces of string (6-8 inches long)
- water
- vinegar

Preparation: The day before the lesson set up the weathering station. Fill one jar with water and the other with vinegar. Set the jars at the edge of a shelf or a stack of books. Place the two stones below the jars. Immerse one string in each liquid. Once the strings are completely saturated, allow one end of the string to remain in the liquid while the other dangles over the edge of the jar. (The end should be near or below the base of the jar) This will allow the liquid to drip out slowly. Make sure the rocks are arranged so that the drops of one liquid fall on each rock. You may want to place newspaper or a tray below the rocks.

Initial Demonstration:

Present the Periodic table to students as in Kelley's lesson. Students should understand that the letters on the periodic table represent different elements, and these elements are the ingredients in all things. Students can gain practice matching the names of elements with their atomic numbers and symbols on the activity sheet.

Write the formula for water on the board (H_2O). Ask students if they know what this is. Tell them this is a "chemical formula". Every chemical substance has its own chemical formula. How do they think the formula would change when water freezes?

Target Observations:

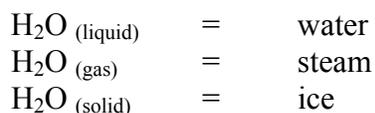
- Students may state that when the state of matter changes, the chemical formula does or does not change.

Target Model:

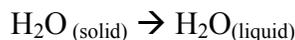
- When the state of matter changes, a new substance is formed **or**
- When the state of matter changes, no new substances are formed.

Procedure:

Show them that the formula is the same regardless of the state of matter. We show the state of matter with a subscript.



Ask the students if ice melting is a physical change only, or if it is also a chemical change. They should explain their answer. Students may remember from previous lessons that all phase changes are physical changes. They may also state that the change is reversible (water can easily be frozen). Point out that if we write the reaction, no new substance is formed, which is our key marker for chemical change:



Target Revised Model:

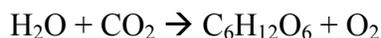
- When the state of matter changes, no new substances are formed.
- Ice melting is a physical change because no new substances are formed. We can see this because the chemical formula is the same.

Procedure 2:

Have students modify their water cycle diagram to include the chemical formula for water in the various states of matter. (liquid in rain, rivers and oceans, solid in ice or snow, gas in the air).

Have students turn to their carbon cycle diagram. If they do not have them, draw a leaf on the board. On one side put the things that the plant needs (CO_2 , H_2O), and on the other put the things that the plant produces (O_2 , $\text{C}_6\text{H}_{12}\text{O}_6$). They may not remember what these things are, so identify them (carbon dioxide, water, oxygen, and glucose). For oxygen you may have a student look on the periodic table to see if they can determine what it is. For glucose, the name isn't as important as them knowing it is "food" or "sugar."

Write the chemical formula on the board:



Ask the students if photosynthesis, the process the plant is doing, is a chemical change or a physical change. Students should be able to tell by the chemical formulae that new substances have been formed. Ask them how they know these substances have different properties. Food tastes different than water. Carbon dioxide is not so good for us to breathe, but we need oxygen to live.

Target Revised Model:

- In a chemical reaction, a new substance is formed
- We can tell from a chemical formula that a new substance was formed because there will be a different chemical formula
- The "ingredients" or elements didn't change, just the way they were put together.

Procedure 3:

Have students examine the two rocks that have been exposed to water and to vinegar. The one under the water may not have changed noticeably. The one under the vinegar should have a noticeable divot where the acid eroded it. Additionally, they may notice bubbles or a foamy substance around the limestone under the vinegar.

What are the physical changes that they notice from the weathering. Is the acid causing a physical change or a chemical change? Did they notice the new (foam or bubbles) substance being formed? To review, ask students to identify several physical changes in nature (most of the water cycle, weathering by wind or water). Then ask them to identify chemical changes in nature (chemical weathering, as from acid rain, and photosynthesis, also the nitrogen cycle if they remember it).

Target Revised Model:

- Acid reacting with rock is a chemical reaction- a new substance is formed
- Water erosion is a physical change

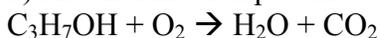
Summary:

Changes in nature can be both physical and chemical changes. In a physical change, no new substance is formed, though the shape, size, or state of matter of a substance might change. In a chemical change, a brand new substance is created, something that was not there before. We can see this easily by looking at a chemical formula.

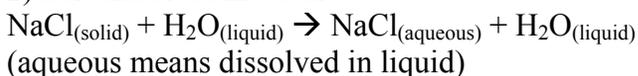
For added practice try these:

Chemical or Physical Change?

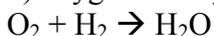
1) Alcohol in a lamp burns:



2) Salt dissolves in water:



3) Oxygen and hydrogen combine to form water



4) A gold necklace is melted

