5 Experiments of Physical and Chemical Changes

Summary

The Law of Conservation of Mass states that mass is conserved in physical and chemical changes. Students explore this concept by taking initial masses, making predictions, and finding final masses of physical and chemical changes. Students observe water changing from ice to a liquid, a piece of cardboard being cut up, salt dissolving in water, Alka-Seltzer reacting in water, and water's physical property of cohesiveness being disrupted by soap.

Time Frame

1 class periods of 60 minutes each

Group Size

Small Groups

Materials

These are the supplies needed for each group.

- 2 ice cubes
- one balance with gram mass cubes (Gram mass cubes can be ordered from enasco.com TB16755M Set of 500 for $12.50) Balance or scales acceptable.
- 2 Ziploc bags
- 6 x 6 inch square of cardboard
- scissors
- 2 tsp. of salt in a very small container or bag
- 100 ml graduated cylinder
- small cup
- spoon
- 1 Alka-Seltzer tablet
- piece of wax paper
- water squirt bottle or beaker with an eyedropper
- toothpicks
- container of Dawn detergent mixed in water
- one petri dish
- pepper

- Student sheet.pdf

Background for Teachers

Matter is anything that takes up space and has mass. Matter is composed of atoms and molecules and is always changing its form by either physical or chemical changes. The Law of Conservation of Mass states that mass is neither created nor destroyed during any physical or chemical changes.
A physical change occurs when the appearance of a substance changes but its chemistry remains the same. No new substance is formed in a physical change; water moving between states of matter, a Popsicle melting, and a paper crumbled are examples of physical changes.
A chemical change occurs when bonds are broken between atoms and rearranged into new, entirely different substances such as burning a log and frying an egg.

Intended Learning Outcomes

1a. Observe simple objects, patterns, and events and report their observations.

1c. Given the appropriate instrument, measure length, temperature, volume, and mass in metric units as specified.
1d. Compare things, processes, and events.
1h. Predict results of investigations based on prior data.
1i. Use data to construct a reasonable conclusion.
2e. Seed and weigh evidence before drawing conclusions.
3a. Know and explain science information specified for the grade level.
4a. Record data accurately when given the appropriate form.
4c. Use scientific language in oral and written communication.
6c. Science findings are based upon evidence.

Instructional Procedures

Pre-lab discussion:
Define matter, and physical and chemical changes. Demonstrate a physical change for the students. Some ideas are: crumpling paper, using instant snow (Stevespanglerscience.com Item #: WFXS-100, $6.99), or crushing a can. Discuss a chemical change such as burning a log or frying an egg. Explain that since the beginning of our earth, all the matter that was on the earth is simply being changed from one form to another. Whenever these changes take place there is no change in mass by either losing or gaining mass. Mass in our world is conserved. Students will observe this today when they perform several physical and chemical changes.
Instructional procedure: In this lab, precise measuring on the balance and counting of gram cubes is critical. None of the masses should change but you may have change due to errors and lack of precise equipment. This is a great discussion to have with students before you begin the lab.
Experiment I. Changing the state of water does not affect its mass.

Put two ice cubes into a Ziploc bag. Find the mass. Have the students predict if there will be a change in the mass of the bag after the ice melts.

Let the ice cubes melt until the end of the class and then find the mass of the bag with ice/water again. Be sure and wipe off any condensation from the outside of the bag. Ask the kids why you are doing this.

** The mass shouldn't change because mass is conserved in nature, changing the state of water doesn't change its mass.
Experiment II. Physical changes in appearance do not affect mass.

Take the square piece of cardboard and find its mass on the balance. Leave the cubes on the balance and cut the cardboard into at least 10 pieces. Be sure not to lose any pieces. Predict whether or not the mass will change.

Re-mass the cardboard pieces.

** Mass is conserved in nature, changing the arrangement of parts during a physical change does not change its mass.
Experiment III. A physical change as salt is dissolved in water does not affect mass.

Find the mass of the small cup filled with 20 ml of water and the container that holds the salt (all at the same time). Predict whether the mass will change after the salt is mixed into the water.

Add the salt to the water and mix the solution with a spoon. Be sure to not lose any of the salt or water during the mixing.

Find the mass of the cup, salt-water mixture, and the empty salt container.

** The mass should not change because mass is conserved.
Experiment IV. In a chemical change, mass is again conserved.

Find the mass of an Alka-Seltzer tablet and a Ziploc bag filled with 20 ml of water (all at the same time).

Add the Alka-Seltzer tablet to the water and quickly seal the Ziploc bag. Predict whether the

mass will change after the reaction is completed.

When the chemical reaction has completed, mass the bag with all its contents again.

** In this reaction we form a new substance, carbon dioxide gas, which is a chemical change. Mass is also conserved in chemical changes.

** Ask the students if we would have gotten the same mass if we didn't seal the bag. No, because some of our matter would have escaped into the air in the form of carbon dioxide gas.

Experiment V. Observing a physical change in the properties of water.

Place a few drops of water on a piece of wax paper. Notice its rounded appearance. Touch a toothpick to the drop of water. Nothing should happen.

Dip the toothpick in a container of soapy water and touch the drop of water again. Observe what happens.

** The bubble should collapse because soap will interfere with the cohesiveness of water and it breaks down. This is a physical change because the molecule of water didn't change just its behavior did.

Fill a petri dish about half full with water. Sprinkle a thin layer of pepper on the water. The pepper will float on the water because the surface tension of water holds it up.

Use a clean toothpick and touch the water. Notice that nothing happens.

Dip the toothpick in a container of soapy water and then touch the water again. Observe that the pepper instantly spreads to the edges of the dish.

** The soap rode across the top of the water and pushed the pepper to the edges. This is a physical change on the surface of the water that propelled the pepper to the side.

Bibliography

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