

Instructional Procedures

Student Data Sheet

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, adding food coloring to water, 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 is critical. None of the masses should change but you may have slight changes due to errors and/or lack of precise equipment. This is a great discussion to have with students before you begin the lab.

Materials Needed:

Experiment 1	Ice cubes, small ziploc bag, balance, plastic cup
Experiment 2	Small piece of cardboard or cardstock, balance
Experiment 3	Graduated cylinder, 20 ml of water in a small cup, small container of salt (about 1-5 grams), plastic spoon, balance
Experiment 4	Graduated cylinder, 20 ml of water, small ziploc bag,
Other Options	Small candle, lighter, balance Small piece of uncrumpled aluminum foil, balance Graduated cylinder, 10-20 ml vinegar, 5-10 grams baking soda, ziploc baggie, small plastic cup, balance
Experiment 5	Dropper or plastic pipette, wax paper, 3-4 toothpicks, soapy water, petri dish or small clear glass bowl, pepper

Experiment I. Changing the state of water does not affect its mass.

1. 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.
2. 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 students why you are doing this. **You may want to put the baggie in a plastic cup to measure the mass so that all of the mass after the ice melts is on the balance.**

**** 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.

1. Take the square piece of cardboard and find its mass on the balance. Cut the cardboard into at least 10 pieces. Be sure not to lose any pieces. Predict whether or not the mass will change.
2. 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.

1. 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.
2. 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.
3. 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.

1. Find the mass of an Alka-Seltzer tablet and a Ziploc bag filled with 20 ml of water (all at the same time).
2. 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.

3. 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.

Other Options:

- **Burn a candle** - use a small candle like a birthday candle adhered to a notecard or a tea light. Obtain the mass before lighting, have the students predict what the mass will be after lighting and blowing it out. Light the candle. Allow it to burn for a minute or so. Blow it out and reweigh.
- **Aluminum foil** - take the mass of small piece of uncrumpled foil (make sure that all of the foil fits on the balance pan). Let the students make a prediction. Crumple up the foil and reweigh.
- **Baking Soda and Vinegar** - add a small amount of baking soda to a small ziploc baggie. Pour 10-20 ml of vinegar into a small cup that will fit into the baggie without spilling the vinegar. Weigh the baggie, baking soda, and vinegar before they are added together. Let the students make a prediction. If you haven't already put the cup of vinegar into the baggie with the baking soda, set the cup of vinegar into the baggie without spilling any of it onto the baking soda. Remove as much air from the baggie as possible before zipping it up. Once the baggie is zipped, tip the cup of vinegar over into the baking soda. Reweigh the baggie after the reaction occurs. Allow the students to feel the outside of the baggie. The students should notice that the baggie got cooler.

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

1. 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.
2. 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.
3. 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.

Chemical and Physical Changes Class Demonstrations

4. Use a clean toothpick and touch the water. Notice that nothing happens.
5. 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.