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Observing Chemical & Physical Changes

Target:

Students will learn how to make both qualitative and quantitative observations. They will then use to these observations to determine if a chemical or physical change has occurred.

Background:

In Chemistry, you should be watching for changes when you do lab experiments. Some changes will be obvious, such as a dramatic color changes. Some will be almost undetectable, as in the slow reaction of oxygen with iron to form rust. Sometimes there will be no change at all, but this observation of "no change" is as important as observations of change.

It is important that the observation you make in the lab be as specific and informative as possible. For example, suppose you have observed a gas being given off as a result of a chemical reaction. You should write your observation at "gas formed" rather than "it fizzed". Whenever possible, try to quantify (measure) the changes you observe. If you think the mass has decreased, use the available equipment to find out how much the mass decreased. If you observe, "material became hotter," use the thermometer to determine how much the temperature changed.

All matter is solid, liquid, or gas. If two liquids are mixed and a gas is produced, a chemical reaction has occurred. Likewise, if two liquids are mixed and a solid is produced, a chemical reaction occurred. If a color change is observed or a change in temperature occurs without adding or removing heat, these are chemical changes as well. However, if a solid simply changes into a liquid as when ice melts, this is a change in the phase of matter. It is a physical change, not a chemical reaction.

Materials

Safety goggles
Barium nitrate
Lab apron
Potassium sulfate
250 mL beakers (2)
HCl (3.0 *M*)
100 mL beakers (3)
Magnesium ribbon
Graduated cylinder
Food coloring
Bunsen burner
Water
Matches
Ring stand and ring
Wire gauze
Spatula
Sponge
Well plate (6 wells)
Tongs

Safety

1. The 3.0 *M* HCl is corrosive. Handle it with extreme care.
2. If you come in contact with any solution, wash the contacted area thoroughly.
3. You are working with a flame in this lab. Tie back hair and loose clothing.
4. Do not drop matches into the sink. Dispose of burned matches in the trash can after they are cool.
5. Safety goggles and a lab apron must be worn at all times in the laboratory.

Procedure

In this experiment, you will be asked to make observations. While you are making observations, think about how some of them might be quantified. Be careful to note the phase of the matter you are asked to use. Create a data table that allows you to record the necessary data, both qualitative and quantitative.

Station 1

1. Add about 100 mL of water to a 250 mL beaker.
2. Add a few drops of food coloring to a beaker of water.
3. Make and record observations for several minutes.

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Station 2

1. Dissolve a spatula tip amount of barium nitrate in a small amount of water (about 10 mL) in a 100 mL beaker.
2. Dissolve a spatula tip amount of potassium sulfate in a small amount of water (about 10 mL) in a 100 mL beaker.
3. Pour the solutions from Step 1 and 2 together into an empty 100 mL beaker. Make and record careful observations.

Station 3

1. Add about 100 mL of water to a 250 mL beaker.
2. Arrange the beaker and ring stand as shown in **Figure 1**.

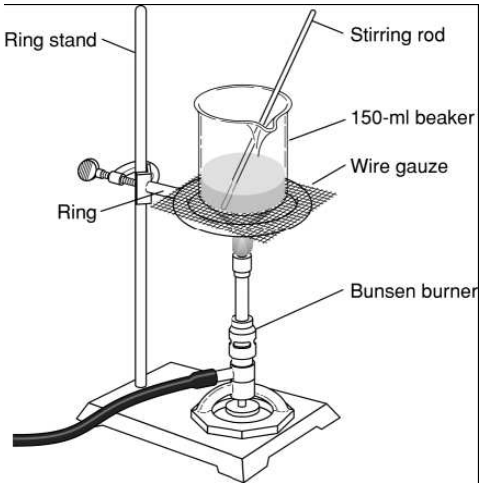

Figure 1
Apparatus to boil water

3. Light the Bunsen burner and place it under the beaker. Adjust the burner so the hottest part of the flame touches the bottom of the beaker.
4. Bring the water to a boil. Make and record careful observations.
5. Use the tongs to hold the sponge over the beaker for a couple of minutes as the water boils.
6. Place the sponge on the lab bench and let it cool.
7. Squeeze the sponge. Record your observations.

Station 4

1. Place a few drops of 3.0 *M* HCl in one of the wells.
2. Add a small piece of magnesium ribbon to the acid. Make and record careful observations.

Analysis / Questions

1. For each of the four parts of this experiment, list the clues that a chemical change occurred, and tell whether each change is physical or chemical. Justify each choice.
2. Do any of the procedures give a clue that a chemical change occurred, but are not chemical changes? Which ones?
3. What was the purpose of the sponge in Part 3? How did it help you decide if the process was a physical or chemical change?
4. Make microscopic drawings of each of the four processes. Discuss how these explain your observations.
5. Develop definitions of chemical change and physical change using atoms and molecules in your definitions.