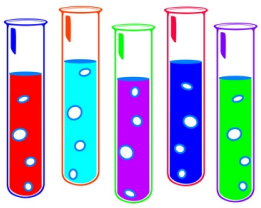
Name _____ Date _____ Changes Activity



Background Information: Chemistry is the study of matter and the changes it undergoes. These changes can be broken down into two categories: physical and chemical changes. A physical change will not change the element or compound's chemical composition. A chemical change will change the substance into a new chemical.

Guiding Questions: What are the observations that will indicate the difference between physical and chemical changes? Will all observations decipher between the two types of changes?

Materials**:** Balance, Ziploc bag, pipette, Sodium Bicarbonate ($NaHCO_3$), Calcium Chloride ($CaCl_2$) and Phenol Red

Pre-Lab Question: Complete the scientific claim based on your knowledge of science. Then, write a scientific explanation defending your claim.

Prediction: Physical changes (always/sometimes/never) look the same as a chemical change in the lab.

Reasoning: _____

_____

Procedure:

1. Observe the sodium bicarbonate ($NaHCO_3$) in the closed vial. Record some properties about this substance below in the table. Then pour the sodium carbonate into your Ziploc bag.
2. Observe the calcium chloride ($CaCl_2$) in the closed vial. Record some properties about this substance below in the data table. Add the calcium chloride to bag.
3. Observe the pipette pre-filled with phenol red. Record some properties about this substance below in the table.
4. With a partner, *carefully* place the pipette into the bag without squeezing the liquid out. It's easiest if one person stabilizes the bag while the other guides the pipette into the ziploc bag.
5. Holding the dropper bottle stable, push as much air out of the Ziploc bag as possible and then *carefully and completely* seal the bag, still without letting the phenol red mix with either of the dry chemicals.
6. Using a balance, mass the Ziploc bag without having the contents of the pipette mix with the other two substances.
7. While still in the sealed Ziploc bag, carefully squeeze the pipette with the phenol red and thoroughly mix all chemicals. Record observations of the changes below in the table.
8. Mass the Ziploc bag again, still with all substances inside the sealed bag.
9. Carefully open the Ziploc bag, and then dispose of all substances in the trash.

Observations:

	Observations		**Observations**
Sodium bicarbonate		Mixing Sodium bicarbonate + Calcium chloride Phenol Red	
Calcium chloride			
Phenol Red			

Data:

Mass before (step 6):	Mass After (step 9):

Discussion

Questions:

1. Provide three physical properties recorded in the table during this activity.

2. Provide three chemical changes that were seen during this activity.

3. Was mixing the calcium carbonate and sodium bicarbonate in the Ziploc bag a physical or a chemical change? What is the evidence?

4. Was mixing the calcium carbonate, sodium bicarbonate AND phenol red a physical or a chemical change? What is the evidence?

5. What type of matter is:

    a. Calcium chloride _____

    b. Sodium Bicarbonate _____

    c. Phenol Red _____

6. a) What is the Law of Conservation of Matter?

    b) Was the Law of Conservation of Matter followed? Why or why not? Provide evidence or discuss any sources of error.

Name _____ Changes of Matter

____1. Which statement describes a chemical property of iron?
1. iron can be flattened into sheets
2. iron conducts electricity and heat
3. iron combines with oxygen to form rust
4. iron can be drawn into a wire

____2. Which statement describes a chemical property that can be used to distinguish between compound A and compound B?
1. A is a blue solid and B is a white solid
2. A has a high melting point and B has a low melting point
3. A dissolves in water and B does not dissolve in water
4. A does not burn in air and B does burn in air

____3. An example of a physical property of an element is the element's ability to:
1. react with an acid
2. react with oxygen
3. form a compound with chlorine
4. form an aqueous solution

____4. Which statement describes a chemical property of oxygen?
1. Oxygen has a melting point of 55 K
2. Oxygen can react with a metal
3. Oxygen gas is slightly soluble in water
4. Oxygen gas can be compressed

____5. Which statement describes a chemical property of hydrogen gas
1. hydrogen gas burns in air.
2. hydrogen gas is colorless
3. hydrogen gas has a density of 0.000 09g/cm^3 at STP
4. hydrogen gas has a boiling point of 20.K at standard pressure

____6. A large sample of solid calcium sulfate is crushed into smaller pieces for testing. Which two physical properties are the same for both the large sample and the smaller pieces?
1. mass and density
2. mass and volume
3. solubility rate and density
4. solubility and volume

____7. Which process represents a chemical change?
1. melting of ice
2. corrosion of copper
3. evaporation of water
4. crystallization of sugar

____8. Which substance can NOT be broken down by a chemical change?
1. ammonia (NH_3) 2. argon (Ar) 3. methane (CH_4) 4. water (H_2O)

____9. Which substance can be broken down by chemical means?
1. CO 2. Ce 3. Ca 4. Cu

____10. Which set of procedures and observations indicates a chemical change?
1. Ethanol is added to an empty beaker and the ethanol eventually disappears.
2. A solid is gently heated in a crucible and the solid slowly turns to liquid.
3. Large crystals are crushed with a mortar and pestle and become powder.
4. A cool, shiny metal is added to water in a beaker and rapid bubbling occurs.

Teachers' Notes:
This is great as an intro lab as it does not require precise measurement on the part of the students and does not pose a significant safety risk. I often use this as a first day kind of lab where I can evaluate the students' attention to detail, ability to follow instructions, etc. All materials can be obtained locally and disposal is simple.

Hints:

- Store the calcium chloride in an airtight container. It will pick up moisture from the air and become less effective over time (and harder to clean!)
- To prevent contamination during multiple set ups, label the plastic spoons with a sharpie.
- If the bag looks like it's about to pop, tell students to open the bag and release some of the pressure.

Evidence of a chemical change:
Energy (heat transfer), color change, and new materials being produced (gas)

Why did the bag get hot?
Chemical bonds hold the molecules together and store the energy of the molecule. When chemical reactions occur, bonds break and some energy can be lost as heat

Why did the color change?
Indicators are chemicals that change color when chemicals react. In this experiment, when the calcium chloride and baking soda dissolve in liquid, they react to form an acid. Phenol red is an indicator that turns yellow in the presence of an acid.

Why did the bag inflate?
A gas, carbon dioxide (CO_2) is also produced by the reaction. The gas creates the bubbles you see and inflates the plastic bag.

Types of indicators

Phenol red indicator: pH 6.8 yellow - 8.4 red
Universal indicator: pH 4.0 red - 10.0 blue
Bromthymol blue indicator: pH 6.0 yellow - 7.6 blue

Image http://i.ehow.com/images/a06/28/in/science-projects-involving-chemical-reactions-1.1-800x800.jpg