**7.PS1: Matter and Its Interactions**

1) Develop and use models to illustrate the structure of atoms, including the subatomic particles with their relative positions and charge.

2) Compare and contrast elemental molecules and compound molecules.

3) Classify matter as pure substances or mixtures based on composition.

4) Analyze and interpret chemical reactions to determine if the total number of atoms in the reactants and products support the Law of Conservation of Mass.

5) Use the periodic table as a model to analyze and interpret evidence relating to physical and chemical properties to identify a sample of matter.

6) Create and interpret models of substances whose atoms represent the states of matter with respect to temperature and pressure**.**

**Review particle nature of matter:**

1. Review the particle nature of matter using states of matter cups and ping pong ball models.
   1. What is a solid?
   2. What is a liquid?
   3. What is a gas?
   4. What is the evidence for each?
   5. How can they change from one state into another?
   6. Do the pieces change?
   7. Does the matter change?

*Changes in properties/ matter:*

1. Materials:

Gobstoppers

Food coloring

Chocolate kisses

Rubbing alcohol

Sugar packets

Alka-Seltzer tablet

Cotton balls

Empty water bottle

Spoon

Clear plastic cups

1. Fill 2 plastic cups ½ way with water. Place on a stable table.
2. ***Cup #1***- place 5 different colored gobstoppers in the bottom of the cup.
   1. Observe what happened over the next 20 minutes.
   2. What changes do you see?
   3. Can you draw a picture of it?
   4. Can you draw a picture of it using particles?
   5. While waiting, continue to cup #2.
3. ***Cup #2***- drop 1 drop of food coloring in the still water. Observe what happens.
4. ***Chocolate kiss-*** make observations of the kiss in its wrapper

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Cool** | **warm** | **Cooled after warming** |
| Mass |  |  |  |
| Height |  |  |  |
| Shape |  |  |  |
| Texture/ flexibility |  |  |  |

What properties changed when warm? What cooled back down? Did the chocolate change its identity?

1. ***Rubbing alcohol-*** Wet a cotton ball with rubbing alcohol and wipe is across your desk top. What do you observe immediately and after 5 minutes?

|  |  |  |
| --- | --- | --- |
| Immediately |  |  |
| After 5 minutes |  |  |

1. What happened to the alcohol?
2. What evidence do you have?
3. Can you draw a particle picture of what happened?
4. ***Sugar and water***- Fill a cup half way with water. Weigh the cup and 2-packets of sugar. What is the weight?

Open the sugar pack and pour into the cup of water. Swirl to dissolve.

Weigh the mixture and the empty packets.

What happened to the sugar?

* 1. Is the sugar still there?
  2. What evidence do you have?
  3. Can you get the sugar back again? How?

1. *Alka-Seltzer-* break the Alka-Seltzer into half. Obain a square of toilet paper and a length of thread.
2. Break the tablet and tie into a square of toilet tissue with a piece of string, leaving an end dangling.
3. Fill the empty water bottle 1/3 full. Hang the Alka-Seltzer packet above the water without it touching the water and seal the bottle tightly.

1. Measure the mass of the Alka-Seltzer tablet and the plastic bottle containing water with the cap on.  DO not mix!

**Mass of the "system" BEFORE combining. The system is bottle with cap, alka-seltzer and water  = \_\_\_\_\_\_\_\_\_\_ grams** 

1. Shake the bottle to mix the Alka-Seltzer and water. Turn up-side down.

What do you observe?

1. Place the closed bottle back on the balance and measure its mass it AGAIN.

**Mass of the "system" with closed cover (CLOSED system): \_\_\_\_\_\_\_\_\_\_ grams**    
 

1. Wait until the Alka-Seltzer tablet has completely dissolved. Place the bottle in the tub and SLOWLY loosen the cap and leave the bottle uncapped. Wait 30 seconds. DO NOT SPILL!
2. Place the cap and filled bottle back on the balance and find the mass of the "system".

**Mass of the "system" (bottle, cap, alka-seltzer and water) with the cap off (OPEN system): \_\_\_\_\_\_\_\_\_\_\_\_\_\_ grams**  

* Was the mass of the closed bottle system AFTER the reaction the same as the mass of the uncombined system, BEFORE the reaction? \_\_\_\_\_\_

If not, attempt to explain why not.

* Was the mass of the open bottle system AFTER the reaction the same as the mass of the closed system, AFTER the reaction? \_\_\_\_\_\_

If not, attempt to explain why not.

Draw a picture to represent this?

**Modelling atoms and molecules with Legos**

1. Materials

Legos – 3 different colors and sizes. *Lego Bricks must be the same size for each color stored in sandwich sized zip-top bags*

colored pencils

1. Each LEGO® block represents one atom. Remove the LEGOS® from the bag.
2. Sort the LEGOS® by color. Each color is a different element.
3. **Elements-** Using boxes to represent the LEGOS®, draw and color the atoms for each of the 3 elements.

Build 2 molecular elements.

Write the chemical “formula” for each element, using the first letter of the color to represent the symbol.

1. **Compounds-** A compound has to have 2 or more different elements bonded together.

Using the elements, create at least 3 different compounds. Draw and color the compounds. Write their chemical “formulas”

1. **Mixtures-** Mixtures are not chemically bonded, they are just physically mixed together.
   1. Create a mixture of at least two different elements. Draw and color the element mixture. Write the formulas of the species in the mixture.
   2. Create a mixture of 3 different compounds. Draw and color the compounds mixture. Write the formulas of the species in the mixture.
   3. Create a mixture of elements and compounds. Draw and color the element and compound mixture. Write the formulas of the species in the mixture.

|  |  |  |
| --- | --- | --- |
| **Element** | **Compound** | **Mixture** |
| Formula: | Formula: | *Element mixture*  Formula: |
| *Molecular element*  Formula: | Formula: | *Compound mixture*  Formula: |
| *Molecular element*  Formula: | Formula: | *Elements and Compounds mixture*  Formula: |

1. **Reactions-** Balance the following reaction.

N2 + H2 🡪 NH3

Build Lego models of each species and use them to illustrate a balanced reaction.

How can the law of conservation of mass be illustrated using these models?