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

1) Analyze and interpret data from observations and measurements of the physical properties of matter to explain phase changes between a solid, liquid, or gas.

2) Analyze and interpret data to show that the amount of matter is conserved even when it changes form, including transitions where matter seems to vanish.

3) Design a process to measure how different variables (temperature, particle size, stirring) affect the rate of dissolving solids into liquids.

4) Evaluate the results of an experiment to determine whether the mixing of two or more substances result in a change of properties.

**5.ETS1: Engineering Design**

1) Research, test, re-test, and communicate a design to solve a problem.

2) Plan and carry out tests on one or more elements of a prototype in which variables are controlled and failure points are considered to identify which elements need to be improved. Apply the results of tests to redesign the prototype.

3) Describe how failure provides valuable information toward finding a solution.

**5.ETS2: Links Among Engineering, Technology, Science, and Society**

1) Use appropriate measuring tools, simple hand tools, and fasteners to construct a prototype of a new or improved technology.

2) Describe how human beings have made tools and machines (X-ray cameras, microscopes, satellites, computers) to observe and do things that they could not otherwise sense or do at all, or as quickly or efficiently.

3) Identify how scientific discoveries lead to new and improved technologies

**Review particle nature of matter:**

*Building blocks of matter:*

1. Materials

6 building blocks

1. Build something using the pieces.
2. Describe your object.

|  |  |
| --- | --- |
| Parts |  |
| Size |  |
| Mass |  |
| Shape |  |
| Texture |  |
| Flexibility |  |

1. Rearrange the parts to build something new. Describe.

|  |  |
| --- | --- |
| Parts |  |
| Size |  |
| Mass |  |
| Shape |  |
| Texture |  |
| Flexibility |  |

1. What properties were the same? What were different? What evidence do you have?
2. 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**  

**Questions:**

* 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?