**Exploring Properties of Matter Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Physical Science - Matter**

***Preparing to Investigate***

In this investigation you will predict and observe properties and changes of several materials (most of which will already be familiar to you). Focus on making careful observations; even if you have not practiced this skill in the laboratory before, you have already developed a sense for properties of some materials and have encountered hundreds of chemical reactions in your daily life. You will refer back to the observations you make within this investigation as you develop your understanding of chemistry ideas throughout this unit.

***Making Predictions***

Predict what you think will happen in each of the activities (before you actually do them) and write down your predictions in the data table.

***Procedure***

Before you begin, put on your goggles, and wear them properly throughout the investigation.

Six stations, A through F, have been set up around the laboratory. At each station, you will complete the investigations indicated for that station. The stations can be completed in any order; that is, work at Station D can be completed before Station B activities, and so on. When working at a particular station, you must complete the investigations at that station in order. Follow these general instructions:

* Take note of what the station looks like and how it is set up. You will be expected to reset it after you are finished.
* Read the procedure and safety reminders.
* Record your predictions.
* Complete the investigation.
  + Record your complete data and observations. **Quantitative data** may include masses or volumes measured using tools such as a balance or graduated cylinder. **Observations** refer to data you can collect using your senses. Therefore, record what you see, hear, feel, or smell. (***Caution:*** *Never taste anything in the laboratory).*
* Restore the station to its original condition.

When you have completed your work at all six stations, answer the questions that follow the data table.

**Station A: Paper**

*Investigation 1*

1. Tear a small piece of paper into smaller pieces and place the pieces on a watch glass.
2. Record your observations in your data table.

*Investigation 2*

1. Place the watch glass and pieces of paper on a heat-resistant pad.
2. Light the pieces of paper with a match and allow them to burn completely.
3. Record your observations in your data table.
4. Discard the paper as directed by your teacher, clean the watch glass, and reset the station.

**Station B: Solutions**

*Investigation 3*

1. Place two clean, dry test tubes into a test tube rack.
2. Dispense one drop of Universal Indicator into one of the test tubes.
3. Add 10 drops of ammonia solution to the test tube containing the Universal Indicator.
4. Record your observations. Keep the test tube and its contents for Investigation 4.
5. Dispense one drop of Universal Indicator into the second test tube.
6. Add 10 drops of vinegar to the second test tube.
7. Record your observations. Keep the test tube and its contents for Investigation 4.

*Investigation 4*

1. Carefully pour the contents of the test tube containing the ammonia solution from Investigation 3 into the test tube containing vinegar from Investigation 3.
2. Touch the outside of the test tube at the level of the combined solutions.
3. Record your complete observations in your data table.
4. Discard the test tube contents as directed by your teacher, clean both test tubes, and reset the station.

**Station C: Blue Crystals**

*Investigation 5*

1. Use a spatula to place a blue crystal in the mortar.
2. Use the pestle to grind the blue crystal.
3. Record your observations in your data table.
4. Put the powder into a crucible to use for Investigation 6.
5. Clean and reset the station.

*Investigation 6*

1. Turn on the hot plate to a setting of “high”. (***Caution:******Do not touch the hot plate surface. It may already be hot)***
2. Measure and record the mass of the crucible and blue powder from Investigation 5. Record in your data table.
3. Place the crucible on the hot plate and heat for 3 minutes, stirring gently with the glass stirring rod. Use tongs to hold the crucible as you stir.
4. Use tongs to remove the crucible from the hot plate and allow it to cool for several minutes.
5. Using tongs, place the crucible on the balance to measure the mass. Record in your data table.
6. Put the powder into a waste container as directed by your teacher.
7. Turn off the hot plate and reset the station.

**Station D: Tea Lights**

*Investigation 7*

1. Turn on the hot plate to a setting of “high”. ***(Caution: Do not touch the hot plate surface – it may already be hot!)***
2. Use tongs to place the tea light (in the metal holder) on the hot plate.
3. Observe for two – three minutes.
4. Use tongs to carefully remove the tea light.
5. Turn off the hot plate.
6. Record your observations in your data table.

*Investigation 8*

1. Light the wick on a second tea light with a match.
2. Observe for two – three minutes.
3. Carefully extinguish the flame.
4. Record your observations in your data table.
5. Reset the station.

**Station E: Baking Soda**

*Investigation 9*

1. Place a small amount of solid baking soda into a clean well of a spot plate.
2. Add 5 drops of vinegar to the baking soda in the well.
3. Make careful observations and record your results in your data table.

*Investigation 10*

1. Dispense 10 drops of baking soda solution from a dropper bottle or pipet into a clean well.
2. Add 5 drops of vinegar to the baking soda solution in the well.
3. Make careful observations and record your results.

*Investigation 11*

1. Dispense 10 drops of baking soda solution from a dropper bottle or pipet into a clean well.
2. Add 1 drop of silver nitrate solution to the baking soda solution in the well. ***Caution: Silver nitrate solution can stain your skin or clothing. Handle with care)***
3. Make careful observations and record your results in your data table.
4. Discard the spot plate contents as directed by your teacher, clean the spot plate and reset the station.

**Station F: Metals**

*Investigation 12*

1. Count and use 10 post-1982 pennies to make the measurements that follow.
2. Make sure the 10 pennies are completely dry. Then measure and record the mass of the 10 pennies.
3. Our about 50 mL of water into a 100-mL graduated cylinder. Accurately measure and record the volume of water in the cylinder.
4. Carefully place your 10 pennies into the graduated cylinder. Accurately measure and record the volume of the water and pennies.

*Investigation 13*

1. Fill a clean test tube to a height of 2 to 3 cm (1 – 1 ½ inch) with blue solution.
2. Use forceps to carefully place an iron nail into the test tube so that it is partially, but not totally, immersed in the blue solution.
3. Record your observations in the date table over several minutes.
4. Remove the nail from the solution and record any additional observations you have in your data table.
5. Dispose of the solution and the nail as directed by your teacher, clean the test tube, and reset the station.

**DATA TABLE**

|  |  |  |
| --- | --- | --- |
| **Exploring Properties of Matter** | | |
| **Investigation**  **Number** | **Prediction** | **Observations** |
| **1** |  |  |
| **2** |  |  |
| **3** |  |  |
| **4** |  |  |
| **5** |  |  |
| **6** |  |  |
| **7** |  |  |
| **8** |  |  |
| **9** |  |  |
| **10** |  |  |
| **11** |  |  |
| **12** |  |  |
| **13** |  |  |

**Investigation 6 Data:**

Mass of crucible/blue powder: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_g

Mass after heating: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_g

**Investigation 12 Data:**

Mass of 10 pennies: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_g

Volume of Water: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_mL

Volume of Water and Pennies: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_mL

Volume of Pennies: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_mL

***Analyzing Evidence***

1. In which investigations did you collect ***quantitative*** data? (Look back to page 1 if you are confused about what quantitative data is.
2. ***Density*** is defined as the mass of a substance within a given volume. To calculate density you would need to divide the mass by the volume. ***Density = mass/volume or D = m/v***. The units are often grams/cubic centimeters or ***g/cm3***. One cm3 is equal to one mL. In Investigation 12 you measured the mass and volume of pennies and another object.
   1. ***Using the information above, calculate the density of the post-1982 pennies. Show your work!***

***Density = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

***Interpreting Evidence and Making Claims***

1. Did either treatment of the paper at Station A create a new material? How do your observations support your thinking?
2. When you added the ammonia and vinegar solutions together in Investigation 4 did you form a new substance. How do you know?
3. Did either treatment of the blue crystals at Station C create a new material? Why do you think that?
4. Was the burning tea light different from the melting tea light at Station D? Describe the observations that led to your conclusion.
5. Did any of the investigations of baking soda at Station E create a new material? How do your observations support your thinking?
6. Identify one investigation in which your observations closely matched your predictions. Why do you think your prediction was so accurate?
7. Identify one investigation in which your observations were different from your predictions. Why do you think your prediction was so inaccurate?
8. Based on what you experienced in this investigation, describe what you think is the difference between a physical change and a chemical change?