**STATION LAB: Physical & Chemical Changes**

Block:\_\_\_\_\_\_\_\_\_\_

Names:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_

**Purpose:**

* **To observe and record physical and chemical changes when different materials are combined.**
* **To distinguish between physical vs chemical changes by referring to observations before and after combining different materials.**
* **To explain the difference between reactants and products in a chemical reaction and which substances produce the changes observed (such as bubbling or solid formation).**

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| --- | --- | --- | --- | --- | --- |
|  | Beginning | Developing | Satisfactory | Competent | Exceeding |
| **Observations****/5** | * Data is not represented or is not accurate
* Observations are often incorrect and are missing important evidence of chemical or physical change.
 | * Data lacks precision
* Many details missing in observations
* Evidence of chemical or physical change is rarely described or inaccurate.
 | * Good representation of the data
* Observations are acceptable but could be improved
* Some evidence of chemical or physical change is described in the observations.
 | * Accurate representation of the data
* Observations are have some detail and are generally accurate
* Most evidence of chemical or physical change is described in the observations.
 | * Accurate representation of the data
* Detailed and accurate observations given
* All evidence of chemical or physical change is described in the observations.
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| **Analysis****/10** | * Several questions are not answered
* Analysis is not relevant or many questions not answered correctly
* Understanding of the role of reactants and products not demonstrated.
 | * Answers to questions are incomplete
* Analysis is inconsistent
* There are several significant errors
* Difficulty understanding which product results in changes witnessed
 | * Most questions are answered
* Analysis is general
* There may be some errors in responses
* Some understanding of which product results in changes witnessed
 | * Most questions are answered in complete sentences
* Analysis is thoughtful and only a few minor errors were made
* Able to correctly identify which product produces changes witnessed most of the time.
 | * All questions are answered thoroughly and in complete sentences
* Analysis is insightful and responses are always correct
* Able to correctly identify which product produces changes witnessed.
 |
| **Total: /15** |  |

**Equipment/Materials:**

* Lab sheets/pre-lab
* Pencil/pen
* safety goggles

**Procedure:**

**\*Be careful not to over fill eye-droppers. Move containers closer when transferring and father away when not in use. Wipe up spills immediately with paper towel and water.**

1. In your group you will complete each station.
2. You will have six minutes at each station.
3. Complete stations in order. If you start at Station 3 move to station 4 etc.
4. Do not move to next station until directed to move.
5. Clean up your station when you finish the activity. Dispose of chemicals as directed.
6. The station should be left as you found it so the next group can easily complete the activity.
7. Complete station observations and questions on the lab sheet provided.
8. SAFETY GOGGLES SHOULD BE WORN AT ***ALL*** TIMES DURING THIS LAB.

**Part I: Chemical Changes:** The following stations will demonstrate chemical changes in matter. Follow steps as outlined. Be careful not to spill or splash chemicals. Wear safety goggles.

**STATION #1: Calcium Chloride and Sodium Carbonate**

At this station you will combine the reactants **calcium chloride and sodium carbonate** to produce **calcium carbonate (chalk) and dissolved sodium chloride (salt)**. The chemical reaction is listed below.

1. Correctly label the **“products”** and “**reactants”** below for the given chemical equation

CaCl2(liquid) + Na2CO3 (liquid)🡪 CaCO3 (solid powder) + 2NaCl(aq-in solution)

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Use an eyedropper and put 1-2 cm of the contents of each beaker into the corresponding labeled test tube (CaCl2 or Na2CO3). Put the eyedroppers back in the same beaker they came from.
2. Pour the test tube with Na2CO3 into the CaCl2 test tube.
3. Make detailed observations below and answer the following questions.
4. Rinse the test tubes into the sink and place them back in the test tube holder.

 **Observations:**

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1. What did you observe that shows that a chemical change has occurred resulting in a new product being produced?

**Check the only the boxes that apply.**

|  |  |  |  |
| --- | --- | --- | --- |
| Heat change | Colour change | Gas formed | Solid formed |

b. What **product** is responsible for the white cloudy material seen in the test tube following the reaction? Is it **calcium carbonate (chalk) or sodium chloride (table salt)**? How do you know?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**STATION #2: Acetic acid (vinegar) + NaHCO3 (baking soda)**

  **CH3COOH (liquid)**  + **NaHCO3 (solid) 🡪 CO2 (gas) + H2O (liquid) + Na+(aq- in solution) + CH3COO-(aq)**

 Put a small amount of vinegar into a test tube.

1. Take a small scoop of baking soda and mix it with the acid.
2. Make detailed observations below and answer the following questions.
3. Rinse out the test tubes into the sink. Place them back in the test tube holder.

**Observations: (Acetic acid (vinegar) + NaHCO3 (baking soda))**

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a. How do you know that a chemical change is occurring? Explain using your observations.

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b. What **product** is causing the bubbles to form (refer to chemical equation)?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**STATION #3:** **Zinc Metal in Hydrochloric Acid Solution**

**Reactants Products**

**2HCl (aq-acid solution) + 2Zn (solid) 🡪 ZnCl2 (solid) + H2 (gas)**

*Take care! HCl (hydrochloric acid) is an acid that will burn on contact! Wear safety goggles and take extra care when transferring chemicals to test tubes and rinsing glassware.*

1. Use the tweezers to pick up **one** piece of zinc metal from the beaker.
2. Carefully drop the zinc into the empty HCl test tube.
3. Use the eye dropper to transfer approximately 2 mL of the HCl into the test tube in the test tube rack that contains the zinc metal. (fill to the line drawn on the test tube)
4. Watch not to splash!
5. Observe changes in the test tube **over the next couple of minutes**. Record all observations below.. **Look for black flakes floating in the HCl after a few minutes!!**
6. Carefully pour the used HCl into the waste beaker (labeled liquid waste). Use the tweezers to place the used zinc into the solid waste beaker (labeled solid waste).
7. Rinse out the test tube with lots of water and place it back in the test tube rack.

**Observations:**

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What evidence shows that a chemical change has occurred resulting in a new product being produced?

**Check only the boxes that apply**.

|  |  |  |  |
| --- | --- | --- | --- |
| Heat change | Colour change | Gas formed | Solid formed |

1. **Name the product** which creates the bubbles that are produced during the chemical reaction? *Refer to the chemical equation.* **Which product forms the bubbles**?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. **Which product looks like floating black flakes** and causes the zinc metal to look black?

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**STATION #4: Aluminum foil + Copper (II) Chloride**

**Reactants Products**3CuCl2 ∙ 2H2O (aq)+ 2 Al 🡪 2 AlCl3 (aq)+ 3 Cu (solid) + 6 H2O (l)

**CuCl2 cannot be poured down the sink! Please dispose in labeled beaker!**

1. Measure and record the temperature of the CuCl2 in the test tube \_\_\_\_\_\_\_\_\_\_°C
2. Take a piece of rolled aluminum foil and drop it carefully into the CuCl2 in a test tube.
3. Watch what is happening to the foil over the next few minutes.
4. Again measure and record the temperature of the CuCl2 and aluminum foil. \_\_\_\_\_\_\_\_\_\_°C
5. Is this reaction absorbing heat i.e. getting cold (endothermic) or giving off heat i.e. getting warm (exothermic)?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. Which **product** creates the “red” rusty material the forms during the reaction?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. What other changes occur that are evidence that a chemical change has happened and that a new
substance has been created in the reaction?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
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8. DISPOSE THE MATERIAL IN THE TEST TUBE by pouring it into the labeled waste beaker before rinsing the test tube.

**Part II: Physical Changes:** The following stations will demonstrate physical changes. Please follow procedures at each station. Wear safety goggles when handling chemicals!

**STATION #5: Ice Tea Crystals + Water**

1. Use a spatula to put one scoop of ice tea crystals into a half-filled beaker of water.
2. Stir the mixture until the crystals disappear using the stir stick provided.
3. Record observations:

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a. What is happening to the ice tea crystals once added to the water \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b. This is a physical change. How do you know this? Explain.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. DISPOSE THE MATERIAL IN THE BEAKER by rinsing it in the sink!

**STATION #6: Ooblek Magic**

Ooblek – a non-Newtonian fluid (Newton described how “normal” fluids should behave)

The properties of some materials change with changes in ***temperature***. These are state changes like with water from liquid to solid. Some materials such as Ooblek (a mixture of corn starch and water in a 2:1 ratio) change properties with changes in ***pressure***. This is what we call a non-Newtonian fluid. Other examples of such fluids are quicksand, ketchup, and Silly Putty.

1. Wash your hands before and after touching the Ooblek!
2. Gently drag your fingers through the Ooblek – describe how this feels:

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1. Using only your fingertips, jab them hard into the Ooblek – describe how this feels:

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1. What is different about the physical state of the material when you change how much pressure you put on it?

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1. How do you know the changes seen in this station are physical and not chemical?

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**STATION #7: Food Colouring and Water**

1. Use the tap to put equal amounts of water into two beakers.
2. Take the eye dropper and put **one drop** of **red** food colouring into one beaker with water.
3. Do not swirl the beaker just watch the colour spread in the water.
4. Repeat steps 2-3 using the other beaker but using one drop of blue food colouring instead
5. Describe what you see:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. Pour the contents of each beaker into the larger third beaker. Describe what you see?\_\_\_\_\_\_\_\_\_\_\_\_
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7. When the food colouring and water react is anything lost or gained?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. How do you know a chemical reaction did ***not*** take place?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. Dump the contents of each beaker into the sink and rinse. Then return them to the bin for the next group.

**Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Block:\_\_\_\_\_\_\_\_\_**

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| --- | --- | --- | --- | --- | --- |
|  | Beginning | Developing | Satisfactory | Competent | Exceeding |
| **Conclusion****/10 marks** | Conclusion shows little effort and reflection on the lab. An understanding of chemical vs physical changes has not been demonstrated. | The summary of the results is incomplete with little reflection on the lab. An understanding of chemical vs physical changes is developing but still not clear. | A short summary of the results of the lab indicates a satisfactory understanding of physical vs chemical changes. More detail needed. | Accurate summary of the results of the lab indicates a good understanding of chemical vs physical changes. Some observations from the lab were used in the conclusion. | Accurate summary of the results of the lab indicates an excellent understanding of chemical vs physical changes. Specific observations and examples from the lab were used throughout the conclusion. |

**Conclusion: Write in short paragraphs and use observations and examples demonstrated in the lab to show your understanding of chemical change compared to physical change. Be sure to answer the following questions as you write your conclusion.**

How can you tell that a chemical change is occurring (use specific examples from this lab)? How is a physical change different than a chemical change? What are examples of physical change that you saw in this lab? What are examples of chemical changes seen in this lab? Discuss specific examples seen in the lab and use your observations to explain why the changes are either physical or chemical. What is the difference between products and reactants in a chemical reaction? How do you know which product is responsible for the changes seen? *Each person must complete their own conclusion written independently. This can be typed or written below. Conclusions are due next class! Please staple any typed conclusions to this sheet before submitting.*