

2 Explore

Name _____

Date _____

Activity 1.

During this activity, you and your group will devise and implement a logical system for organizing matter, using materials provided by your teacher.

1. Send two people from your group to collect the listed materials in the correct amounts. Arrange the materials at your group's workstation. **Note:** Label or otherwise identify the water, saltwater, sugar, and salt to avoid getting them mixed up.
2. Review the *Properties of Matter Study Cards* as a group to familiarize yourselves with the collected materials.
3. Once your group has a good understanding of the makeup of the materials, brainstorm together and devise a logical system of organizing the materials. Use the information on the study cards, the physical characteristics of the materials, and any other means you can think of to group the materials. In the space provided, briefly describe your methodology.

MATERIALS

set of *Properties of Matter Study Cards*

half-scoop of copper shot in an evaporating dish

half-scoop of iron filings in an evaporating dish

scoop of sand/salt mixture in an evaporating dish

250-mL beaker of water

250-mL beaker of saltwater

scoop of sugar in an evaporating dish

scoop of salt in an evaporating dish

granite chip(s)

brass washer

steel bolt

piece of aluminum foil

"empty" beaker

2

Explore

Name _____

Date _____

Activity 1. (continued)

4. When you have finished brainstorming, use the table below to display your organizational system. Work so that someone outside your group can follow your system of organization. Give each group a descriptive name, and explain on the table your logic for categorizing the materials as you did.

Group	Materials in this group	Criteria for this group

5. When you have completed your system of organization, have your teacher review your work. If any changes are necessary, complete them before you start the next activity.

2 Explore

Name _____

Date _____

Activity 2.

During this activity, you will use five materials from Activity 1 to explore eight properties of matter. Your teacher has set up measurement tools and other materials to be used in this activity around the classroom. Take a moment to familiarize yourself with the location of these materials.

Always use appropriate personal protective equipment when working with chemicals, and adhere to all laboratory safety rules. When you have finished, dispose of chemicals according to your teacher's instructions.

1. As a group, choose five items from the Activity 1 materials list that you wish to investigate further. List the five materials that you will study.

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

2. Using the five items you selected, test or measure each with respect to the eight properties being explored:

- mass
- volume
- density
- magnetism
- appearance (color, texture, features, etc.)
- reactivity with acid
- state at room temperature
- conductivity

Record your observations and results in your Properties of Matter Data Table.

MATERIALS

selected materials
from Activity 1

measurement tools
and materials at
stations

2 Explore

Name _____

Date _____

Activity 2. (continued)

3. Identify each item being tested or measured in the first column, "Material."
4. In each corresponding column, record your observations and findings for each particular property. If the column requires a description, be specific and give details of what occurs during the test or measurement process. Otherwise, simply provide the measurement or yes/no response. **Note:** The last two rows of the table should remain blank for now.
5. When you finish the activity, have your teacher check your work. Keep your table in a safe place. You will need it for an upcoming activity.
6. Clean up all materials as directed by your teacher.

2 Explore

Name _____

Date _____

Properties of Matter Data Table

Material	Mass (g)	Volume (mL)	Density (g/mL)	Magnetism (yes or no)	Appearance (color, texture, features)	Reactivity with Acid (yes or no)	State at Room Temperature (solid, liquid, or gas)	Conductivity (yes or no)
Item 1								
Item 2								
Item 3								
Item 4								
Item 5								

2 Explore

Name _____

Date _____

Activity 3.

During this activity, you will conduct eight different experiments and document some of the ways that matter can interact.

1. Some materials must be shared by all groups. These materials have been arranged around the room by your teacher. Familiarize yourself with the location of these materials.
2. Follow the experiment instructions provided. As you conduct each experiment, record the results as well as your first-hand observations. Briefly explain what you did during each experiment, and provide a detailed description of what happened as a result. **Note:** The last column will not be used during this activity.

Remember that "observation" is not only visual. Use a variety of observation techniques and senses when evaluating the result of the changes taking place. Keep the following questions in mind when observing the experiments:

- (a) Did the temperature of the material or its container change? If so, how?
 - (b) Was there a color change?
 - (c) How long did the change take?
 - (d) Can the change be reversed?
 - (e) Was an odor emitted during the change? If so, describe it.
 - (f) Was any sound created by the change? If so, what do you think caused the sound?
3. As your group completes each experiment, clean up your workspace as directed by your teacher.

EXPERIMENT INSTRUCTIONS

1. Yeast and Hydrogen Peroxide

- a. Pour the dry yeast into a test tube.
- b. Take the test tube containing the yeast to the hydrogen peroxide station.

MATERIALS

half-scoop of yeast
in evaporating
dish

black marker

sheet of filter
paper

2 250-mL beakers,
each filled with
150 mL of water

5 copper shot in a
test tube

scoop of sugar in
evaporating dish

stirring rod

half-scoop of
sodium
bicarbonate in
evaporating dish

1 or 2 pieces of
mossy zinc

piece of chalk

half-scoop of iron
filings in a
test tube

(continued)

2 Explore

Name _____

Date _____

Activity 3. (continued)

- c. Pipet 5 drops of hydrogen peroxide into the test tube.
- d. Observe and record the result.

2. Filter Paper and Marker

- a. Using a marker, make a black line about 3 cm from the bottom of the filter paper.
- b. Fold the filter paper so that it will fit into a 250-mL beaker. Keep the black line visible.
- c. Place the filter paper into a beaker containing 150 mL of water. Make sure the black line is above the water line; adjust the water level if necessary.
- d. When the water reaches approximately 1 centimeter from the top, remove the filter paper, and allow it to air dry. Observe and record the result.

3. Silver Nitrate and Copper

- a. Put the copper into a test tube.
- b. Go to the silver nitrate station.
- c. Add 1 milliliter of silver nitrate to the copper in the test tube.
- d. Observe and record the result.

4. Sugar and Water Solution

- a. Note the properties of the sugar and the water separately.
- b. Pour the sugar into the water.
- c. Stir the solution.
- d. Observe and record the result.

5. Sodium Bicarbonate and Acetic Acid

- a. Pour the sodium bicarbonate into a test tube.
- b. Take the test tube to the acetic acid station.

MATERIALS (continued)

large beaker or test tube holder (to hold test tubes upright)

5 test tubes

mortar and pestle (may be shared)

ruler

2 Explore

Name _____

Date _____

Activity 3. (continued)

- c. Pipet 5 drops of acetic acid into the beaker.
- d. Observe and record the result.

6. Zinc and Hydrochloric Acid

- a. Put the zinc into a test tube.
- b. Take the test tube to the hydrochloric acid station.
- c. Drip 5 drops of hydrochloric acid onto the zinc in the test tube.
- d. Observe and record the result.

7. Chalk

- a. Place the chalk into the mortar.
- b. Using the pestle, grind the chalk thoroughly.
- c. Observe and record the result.

8. Iron and Copper Sulfate

- a. Put the iron filings into a test tube.
- b. Go to the copper sulfate station.
- c. Add 1 milliliter of copper sulfate to the iron filings in the test tube.
- d. Wait 3 to 5 minutes. (Use this time to document the results of your other experiments.)
- e. Observe and record the result.

2 Explore

Name _____

Date _____

Experiment Data Table

Experiment	What did you do?	What happened?	Type of change
1			
2			
3			
4			
5			
6			
7			
8			

3

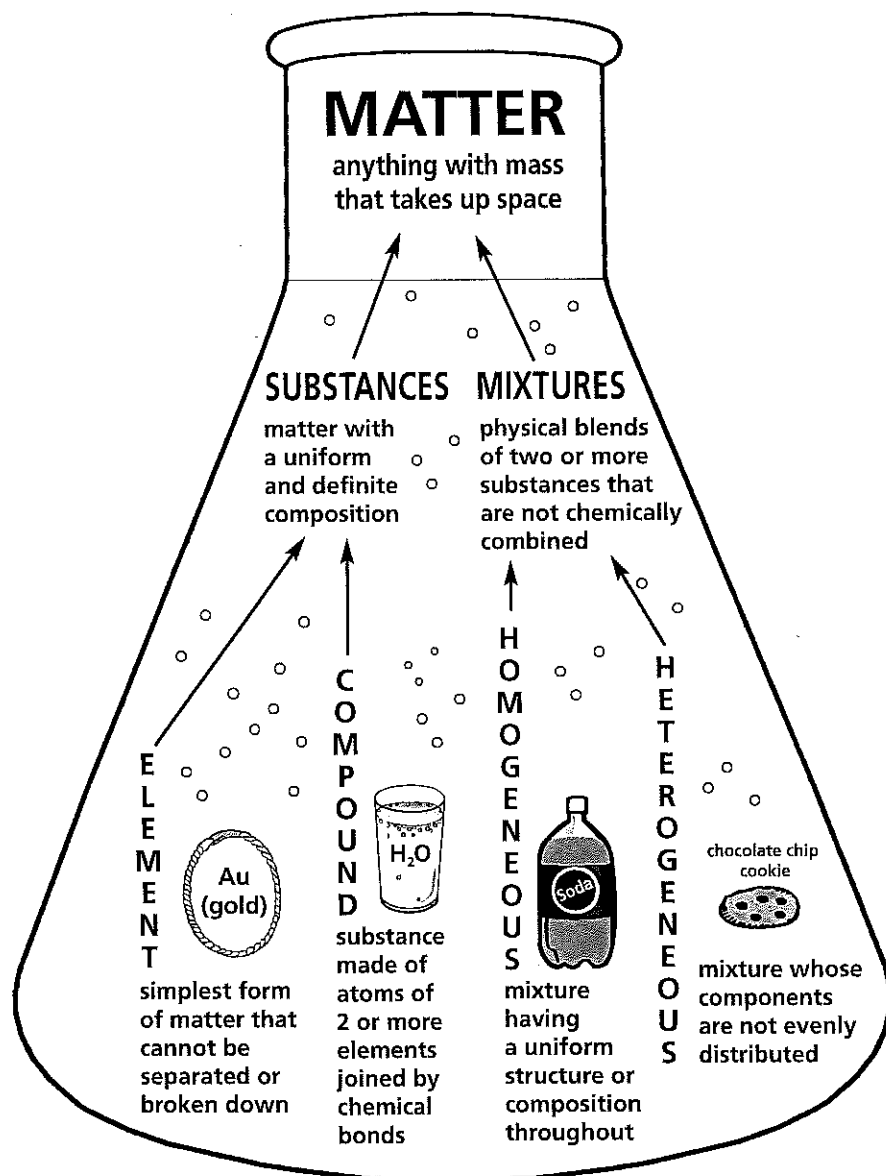
Explain

Name _____

Date _____

Classifying Matter

The following "pyramid" outlines the way in which matter traditionally is classified. After studying the pyramid, review the chart describing your own system of classifying matter from Activity 1. Compare your system with the pyramid system, and then answer the questions that follow.



3 Explain

Name _____

Date _____

Answer the following questions.

1. How does your classification system differ from the one on the pyramid?
2. How is your classification system similar to the one on the pyramid?
3. In the space provided, classify the materials provided in Activity 1 using the guidelines presented on the pyramid.

3 Explain

Name _____

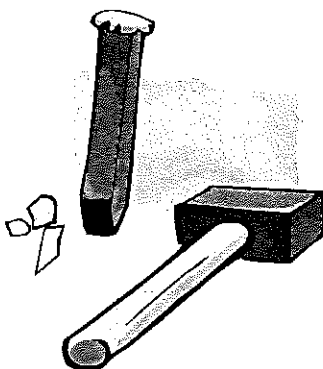
Date _____

Properties of Matter

Properties of matter can be described as either **physical** or **chemical**.

A PHYSICAL PROPERTY

- is characteristic of a substance that does not involve a chemical change.
- can be measured without changing the composition of a substance.
- e.g., Malleability—No matter how much you hammer iron, it still keeps all of the characteristics of iron.



A CHEMICAL PROPERTY

- relates to the ability of a substance to undergo chemical change.
- can only be measured when a substance goes through a chemical reaction.
- e.g., Oxidation—When iron reacts with oxygen, it changes from shiny, silver iron to dull, brown-red iron oxide, or rust, a different substance with different properties.



Properties of matter can also be described as either **intensive** or **extensive**.

AN EXTENSIVE PROPERTY

- is based on the **amount** of matter in a sample.
- e.g., Length—The length of a piece of aluminum foil will change depending on the size of the sample.

AN INTENSIVE PROPERTY

- is based on the **type** of matter in a sample.
- e.g., Color—The color of aluminum foil will remain shiny silver no matter how big or small the sample.

3 Explain

Name _____

Date _____

Retrieve the Properties of Matter Data Table you filled out during Activity 2. Label the last two rows "Physical or Chemical Property?" and "Extensive or Intensive Property?" respectively, and then complete the table. Review the measurements and observations you performed, and identify each property studied (mass, volume, density, etc.) as either physical or chemical, and either extensive or intensive.

Changes of Matter

Physical Change: a change of matter from one form to another without a change in chemical properties.

- When matter goes through a physical change, the type of matter does not change.

Chemical Change: a change that occurs when one or more substances change into entirely new substances with different properties.

- A chemical change is often, but not always, associated with a color change, or the creation of gas, light, or heat.
- When matter goes through a chemical change, the type of matter changes.

Now, retrieve the Experiment Data Table you filled out during Activity 3. Complete the chart. Identify the type of change that occurred at each experiment station, and complete the chart by writing either "physical" or "chemical" in each of the corresponding cells.