Chemistry Mini-Unit

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Major Concepts: Classifying Matter
Changes in Matter
Chemical Reactions

Core Content Categories:

Assessment at Grade 7

Physical Science:

I. Properties and Changes of Properties of Matter

SC-M-1.1.1: A substance has characteristic properties.

SC-M-1.1.2: Substances react chemically.

SC-M-1.1.3: Chemical elements do not break down under normal laboratory reactions. Elements combine to form compounds.

Scientific Inquiry:

The students will refine and refocus questions that can be answered through scientific investigation combined with scientific information.

The students will use appropriate equipment, tools, techniques, technology, and mathematics to gather, analyze, and interpret scientific data.

Skills: Measuring Inferring Collecting data
Recognizing Patterns Using tools and models
Communicating Results

Challenge:

Matter can be described in different ways. Different kinds of matter that are similar in some ways may show very different characteristics even though they are similar in appearance. In this investigation we will examine various substances and begin to see how they may be very different than they appear.

Matter doesn't always stay the same. Some changes in matter do not change the matter from one kind to another. Other changes can form a different kind of matter. So, have you got what you started with or have you got a new substance? This will be discovered in this unit.

Teacher Notes:

To teach this unit I begin by defining what a property is. We do some demonstrations to determine similar and different properties among substances. As a introductory activity, my class does the lab called "Distinguishing Among Substances" (See Task 1). Whenever the students have discovered how to look at things we talk about how scientists classify matter according to phase. To aid in my discussion, we do the handout on "Solids, Liquids and Gases". Bill Nye also has a good video on solids, liquids and gases that I use. To further define what matter is we discuss the difference between an element, compound, and mixture.

It's now time to really get into the chemistry of the unit. We begin our section on changes in matter by discussing physical changes. We discuss volume changes. I do some quick demonstrations using a hand boiler (love meter) and compound bar to drive this idea home. Next we move to phase changes. To help them understand this we do handout called "How does matter change from one state to another?" Unfortunately, phase changes can be pretty dull. To liven it up a bit, we do a lab on sublimation (See Task 2). This brings us to the more razzle dazzle part...chemical change. We discuss how we know if a chemical change has occurred. (bubbles, cloudiness, heat release, rusting, burning) To review, we do the handout called "What is the difference between a physical change and a chemical change?" Now it's time to put into action what we have studied. We do a quick, easy lab called "Gas Attack" (See Task 3). Alittle razzle-dazzle on a budget. To further their understanding, we do the "Foam Lab" (See Task 4). This is the lab that the kids remember when you ask them what did you like the best. Have fun.

Chemistry Mini-Unit

Pre-Assessment

1) Explain the difference between physical change and chemical change.

2) Determine what kind of change is taking place: chemical or physical.

a) evaporation of water _____

b) cutting a marshmallow _____

c) toasting a marshmallow _____

d) demolishing a car _____

e) the rusting of iron _____

f) melting of sugar _____

g) baking a cake _____

3) Name at least 2 things that may occur to let you know a chemical change is taking place.

4) You have 2 powders that are very similar. What are some of the methods you can use to determine the different properties of these powders?

Task 1: Distinguishing Among Substances

Each group or student will need:

5 clear containers labeled "W", "X", "Y", "Z" and "M"
5 sheets of colored paper labeled as above
Handlens or magnifying glass
5 stirring rods
Warm water (enough to fill the 5 containers with 100mL each)
Graduated cylinder
Lab Sheet

Teacher will provide:

5 vials containing similar white powders

This is the ones I use:

"W" : baking soda
"X" : Sweet 'n Low
"Y" : White garlic powder
"Z" : Baking powder
"M" : Sodium Polyacrulate (Stuff found in diapers)
(The "M" vial is the razzle-dazzle. When the powder is placed in the container, it will absorb the water and turn into a gel. The kids aren't expecting this because nothing real exciting has happened with any of the others.)
P.S. To dispose of this gel, place containers in a bucket of salt water and let set over night. Now it's safe to pour down the drain and wash up containers.

Teacher note: I usually do the first few substances together with the class. I put up an overhead of the data table and as we make our observations, we decide as a class what to put on the chart. This allows the students to see that each substance is different and learn how to described their differences. Once they have their examining skills down I let them go. I try to keep them at about the same point in the lab so that everyone can experience the "M" powder together.

Purpose: To determine the differences among substances that look very much alike.

Procedure:

Safety Note: Wear safety goggles and apron when conducting this activity.

1) Pour a small amount of the substance from the vial marked "W" onto the sheet of colored paper labeled "W".

2) Examine the substance with a handlens. Note the size and shape of the particles. Record observations on data table.

3) Rub a small amount of the substance between your fingers. Observe the texture and record observation.

Safety Note: Do not taste any of the substances. Unknown substances may be poisonous.

4) Pour the substance from your colored paper into the "W" container which has 100 mL of warm water in it. Stir with a clean stirring rod.

5) Carefully note the color, odor, and clarity of the liquid.

Safety Note: Remind your students to place container away from their noses and wave the smell toward their noses rather than taking a whiff.

6) After you have finished your observations of powder "W" and recorded your observations, continue the same procedures for the other 4 substances.

7) Upon completing all your observations on the 5 powders, answer the questions on your activity record sheet.

istinguishing Among Substances (page 52)

you conduct this activity, record your observations in the table provided below.

Substance	Dry			In Hot Water		
	Size	Shape	Texture	Color	Odor	Clarity
W						
X						
Y						
Z						
M						

Task 2

Dry Ice Lab (Sublimation) Name _____

Materials Needed:

2 600 mL beakers	stirring rod
Food coloring	rubber glove
Water (Hot and Cold)	twist tie
Thermometers (2)	rubberband
watch glass	test tube with cork stopper
Stopwatch	

Activity 1: Place a piece of dry ice (CO_2) in one watch glass.
Place a piece of regular ice (H_2O) in the other watch glass.
Observe.

Questions:

1) What phase change will regular ice go through as the temperature increases?

2) What phase of matter does dry ice NOT go through when the temperature increases?

3) What is the phase change that dry ice goes through when it goes from a solid to a gas?

Activity 2:

Step 1: Fill one beaker with regular ice and water. Add 2 drops of blue food coloring to this beaker and stir.

Step 2: Fill the other beaker with hot water. Add 2 drops of red food coloring to this beaker.

Step 3: Place a thermometer in the cold water. Let stand for 1 minute. Record temperature in Data Table 1.

Step 4 Place a thermometer in the hot water. Let stand for 1 minute. Record temperature in Data Table 1.

Make a hypothesis:

The beaker containing _____ water will cause the dry ice to sublimate more quickly.

Make a hypothesis:

When dry ice is added to the beakers of water the temperature of the water in each beaker will _____.

Step 5: Place equal amounts of dry ice to each beaker. Observe for 2 minutes.

Step 6: Place the thermometer in the cold beaker for 1 minute. Record your temperature in Data Table 1.

Step 7: Place the thermometer in the hot beaker for 1 minute. Record your temperature in Data Table 1.

Data Table 1	Before dry ice	After dry ice
Cold Water Temp		
Hot Water Temp		

Questions:

1) If you wanted a "neat" effect by adding dry ice to water, would you put your dry ice in hot or cold water?

2) Using your data, what was the temperature difference in the hot water from the first measurement to the second? (subtract)

3) What was the temperature difference in the cold water from the first measurement to the second?

4) Which kind of water had the most drastic change in temperature, hot or cold?

Activity 3: Place a small amount of dry ice into a rubber glove. Using a twist tie, secure the end of the glove tightly. Observe.

Questions:

1) what happens to the glove as the dry ice sublimates?

2) What gas is filling the glove?

Activity 4: Place dry ice into your test tube. Place the cork stopper on the end of the test tube. Face the top of the tube away from you and others. Observe.

***** Your cork has a letter on it. Keep up with your stopper because its the only one you will get. You have 10 minutes to do this part of the experiment.

Questions:

1) What caused the cork to pop out of the test tube?

2) Is sublimation a physical change or chemical change?

Task 4: Foam Lab

Materials Needed:

Polyurethane foam system (Part A and Part B) bought from Flinn
2 disposable cups (clear plastic works best)
paper towels
well ventilated area (I open my door and turn on 2 fans.)
chemical resistant gloves (I do all the pouring so I just have my students wear latex gloves.)
2 graduated cylinders
wooden stirring rods
acetone (in case of spills)
goggles and aprons
food coloring (just to make it look cooler)

Procedure:

In a well ventilated area, place 20 mL of liquid Part A in a disposable cup. Add a few drops of food coloring, if desired, and stir. Place 20 mL of liquid Part B in a second disposable cup. Spread the paper towel flat on the table top and place one of the cups in the center of the paper towel. Pour the contents from the second cup into the cup on the paper towel and stir vigorously. When you start to see a reaction, stop stirring and remove the stirring rod and observe.

During the next few minutes, observe the foam as it expands to about 30 times its orginal volume. The cup will get warm indicating an exothermic reaction. Do not touch the foam until it is completely hardened. If any unreacted chemicals should come into contact with the skin it could cause skin irritations or allergic reactions. Notice the pores in the foam caused by carbon dioxide gas.

For a fun alternative, use approximately 35 mL of each liquid, mix in a paper cup, and then pour into a clear, plastic glove. Make sure some of the mixture is in each finger of the glove. Now watch the foam expand and fill the glove. When completely hardened the glove can be removed, if desired.

Safety Precautions: Wear chemical resistant goggles and aprons. Avoid contact with skin. Work in a well ventilated area. Avoid breathing any of the vapors. Do not ingest any of the materials and use them only in the manner for which they are intended. Wash hands thoroughly when finished.

Clean Up and Disposal: Cups can be thrown in trash. Cylinders can be cleaned with acetone.

Lab Questions Name _____

"Gas Attack" Lab

1) What were the 3 chemicals used in this lab?

2) What was the purpose of the phenol red?

3) Why was it best to mix these chemicals together in a ziplock bag?

4) Was this an examine of a physical change or a chemical change? Defend your answer with things you observe that led you to this conclusion.

5) Name at least 3 changes you observed when these chemicals were mixed.

"Foam" Lab

1) What safety precautions were taken in this lab?

2) Was this lab an example of a physical change or chemical change? Defend your answer.

3) Name 3 changes you observed when the 2 liquids were mixed.

4) Explain why you feel it was necessary to stir these liquids vigorously.

5) When the lab was completed, your new product was much different from the substances we started with. Explain the properties of your original substances and your final product.

6) Explain why the volume of your substance changed but its mass didn't.

7) Compare the Gas Attack Lab and the Foam Lab. Explain what the two labs had in common when it came to the changes you observed.

Chemistry Mini-Unit Open Response

Part A

You are conducting an experiment in which you are asked to place 10 grams of a white powder into a beaker of 100ml of water. You notice as you stir the substance seems to disappear. There is no clouding, bubbling, or heat release. Explain in detail why this was a physical change. Defend your answer with at least 3 reasons.

Part B

You are then asked to place 10 grams of another white powder into a beaker of 100ml of water. This time you immediate notice a bubbling and the beaker has become somewhat warmer. Explain in detail what would lead you to believe this was a chemical reaction. Defend you answer with at least 3 reasons.