DENSITY OF A GAS NAME_____

SC.A.1.3.1.7.1– Uses a variety of measurements to describe the physical properties of matter (EX: volume and mass)
SC.A.1.3.1.8. – Determines the physical properties of matter that can be observed without altering the substance (EX: mass, volume, boiling point, density)
SC.A.1.3.6.8.1– Determines the relationship between mass and volume of an assortment of common substances.

BACKGROUND: Gas, like all matter, has mass and volume; therefore, gas has a density. You will find the density of a gas indirectly by producing it in a chemical reaction.

MATERIALS:
(per student)

- Safety goggles
- Paper towels (5)
- Apron

(per group of 2 students)

- Balance (triple beam or electronic)
- Seltzer tablets (2)
- Thick walled glass bottle with a tight fitting cap (12 oz. or 375 mL glass bottle and cap)
- 1000 mL beaker (1)
- 250 mL beaker (1)
- Pitcher (2 ½ qt/2.4 L)
- Bucket (13 – 15 quarts/13.78 – 15.9 L)
- Tubing (aquarium – 1.5 m)
- Rubber stopper (1 #2 one hole)
- Permanent marker (Sharpie)
- Jar (quart size/32 oz. – 1.06 quarts = 1 L)
- Water

PROCEDURE:

1. Measure 150 mL of water in the 250 mL beaker.
2. Pour the 150 mL of water into the glass bottle. Dry off the outside of the glass bottle. Set the bottle on the table.
3. Take your seltzer package and crush the tablets. (Be careful and don't break the package while you are crushing the tablets.) Now, place the lid on a paper towel. (MAKE SURE THE LID IS DRY.) Open the seltzer package and pour the broken seltzer pieces into the lid.

4. Place the bottle (with the 150 mL of water) on the balance and the lid (with the seltzer tablets) on the balance by the bottle.
5. Record the mass of the bottle (w/water) and lid (w/seltzer tablets) on your DATA CHART.
6. If using a triple beam balance, return the riders to zero and remove the bottle and lid from the balance. Set on the table.
7. Now, place the jar in the bucket of water, making sure it is filled with water and then turning the jar upside down in the bucket. (Note: If there are any air bubbles in the bottom of the jar, once you have turned it over, repeat the process to get rid of air bubbles. After several tries, if you continue to have air bubbles, you may need to put more water in the bucket.)
8. Keeping the jar underwater, place the end of the tubing (that is opposite of the stopper) up into the jar until it reaches the top (actually it is the bottom of the jar, but you have turned it upside down).
9. One member of your group will now place the bottle (w/water) in one hand and the lid (w/seltzer tablets) in the other. Have your partner take hold of the end of the tubing with the stopper. (Make sure the other end of the tubing is still positioned in the jar.)
10. Place the lid next to the mouth of the bottle, pour the tablets into the bottle, and QUICKLY have your partner put the stopper in the mouth of the bottle. (Note: Place the stopper in the mouth of the bottle. Do not force the stopper tightly into the neck of the bottle because the stopper might not come out for you.)
11. When there are no more bubbles forming in the large jar, lift the jar and mark the water level on the jar with the permanent marker. (DO NOT TAKE THE JAR ALL OF THE WAY OUT. THE MOUTH OF THE JAR MUST NOT LEAVE THE WATER LEVEL.)
12. Once you have marked the water level, then you may remove the jar.
13. Turn the jar upright and fill with water to the mark. Pour the water from the jar into your 1000 mL beaker and record on the DATA CHART. (Remember that 1 mL = 1 cm^3 of water.)
14. Take the stopper off of the bottle and place the lid on it.
15. Place the bottle (with lid) on the balance and record the mass on your DATA CHART.
16. Clean up all materials.
17. Complete DATA CHART.

DATA CHART:

Mass 1 (before reaction – procedure #5) _____

Mass 2 (after reaction - procedure #15) - _____

Mass = _____

Volume = _____

Density = _____

NAME_____PERIOD_____DATE_____

MASS, VOLUME, AND DENSITY
K – W – L

SC.A.1.3.1.7.1 – Uses a variety of measurements to describe the physical properties of matter (EX: volume and mass).
SC.A.1.3.1.8.1 – Determines the physical properties of matter that can be observed without altering the substance (EX: mass, volume, boiling point, density).
SC.A.1.3.6.8.1 – Determines the relationship between mass and volume of an assortment of common substances.

K What do you KNOW?	W What do you WANT to know?	L What did you LEARN?
1. What are the four general properties of matter?		
2. Define Mass.		
3. Define Volume.		
4. List the formula for density.		

NAME___**TEACHER COPY**_____PERIOD_____DATE_____

MASS, VOLUME, AND DENSITY
K – W – L

SC.A.1.3.1.7.1 – Uses a variety of measurements to describe the physical properties of matter (EX: volume and mass).
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K What do you KNOW?	W What do you WANT to know?	L What did you LEARN?
1. What are the four general properties of matter?		
Mass, weight, volume, density		
2. Define Mass.		
The amount of material an object contains.		
3. Define Volume.		
The amount of space an object takes up.		
4. List the formula for density.		
Mass divided by volume = density. **M/V = D**		

LABORATORY RUBRICS (Density of a Gas)

Name _____ DATE_____

SC.A.1.3.1.8.1 – Determines the physical properties of matter that can be observed without altering the substance (EX: mass, volume, boiling point, density).
SC.A.1.3.1.8.1 – Determines the physical properties of matter that can be observed without altering the substance (EX: mass, volume, boiling point, density).
SC.H.3.3.1.8.2 – The student uses appropriate procedures for safety in the classroom, home and community.

Category	4	3	2	1
GENERAL PROPERTIES	Identifies the 4 general properties.	Identifies 3 general properties	Identifies 2 general properties	Identifies 1 general property.
DETERMINES MASS, VOLUME, DENSITY OF A GAS	Follows procedures and identifies all 3.		Follows procedures and identifies 2 of the 3.	Follows procedures and identifies 1 of the 3.
USE OF LAB EQUIPMENT	Lab equipment used with little or no direction from teacher.	Lab equipment used effectively with some extra direction from teacher.	Lab equipment used effectively, but with guidance from teacher.	Struggles with directions for using lab equipment.
LAB SAFETY	All safety rules in the lab are followed		.	One or more safety rules not followed.
LAB EQUIPMENT IDENTIFICATION	Proper pieces of equipment used for all sections of all parts of the lab.	One piece of equipment not used properly.	Two pieces of equipment not used properly.	Two or more pieces of equipment not used properly.
GOAL 3: #3	The student accurately uses numeric operations to compete density problems.			The student shows minimal accuracy in the use of numeric operations and is unable to complete density problem.
GOAL 3: #8	The student completes all tasks and works/communicates effectively with other class members.	The student completes most important tasks and works/communicates effectively with other class members.	The student completes some of the important tasks and works/communicates effectively with other class members.	The student shows minimal understanding of the tasks and is unable to work/communicate effectively with other class members.
