Unit 9 Gas Laws
Mini Lab Investigation

Group Names: _____
Block _____

MINI-LAB: INVESTIGATING GAS LAWS [1]

Purpose: To understand the relationship of temperature, pressure and volume in gas molecules.

Materials: Erlenmeyer flask, graduated cylinder, hot plate, tongs (or heat resistant gloves), balloon, water, marshmallows, empty 2-liter bottle, "Fizz Keeper" pressure pump, metal soda can, ice bath

Procedure #1: Add about 10mL of water to an Erlenmeyer flask. Place a balloon over the opening of the flask, and place the flask on the hot plate until the water boils. Observe the behavior of the balloon. Remove the flask from the hot plate and allow to cool. Record any changes in the balloon.

a. What happened to the balloon? the balloon expanded (volume increased)
b. Circle the variables that were involved: temperature pressure volume
c. Which variable was held constant? pressure
d. What variable changed when temperature increased? Volume (also increased)
e. Circle the relationship between these variables: directly or inversely proportional

Procedure #2: Transfer a few marshmallows into a 500 ml bottle. Attach a "Fizz Keeper" pump to the top of the bottle. Observe the behavior of the marshmallows, while pumping air into the bottle.

a. What happened to the marshmallows? The marshmallows shrank in size
b. Circle the variables that were involved: temperature pressure volume
c. Which variable was held constant? temperature
d. What variable changed when pressure increased? Volume (decreased)
e. Circle the relationship between these variables: directly or inversely proportional

Procedure #3: Transfer 10 ml of water to the metal soda can. Place the can on the hot plate and allow water to boil. Using tongs (or heat resistant gloves), carefully remove the soda can from the hot plate and flip it upside down into an ice bath. Observe the behavior of the can.

a. What happened to the soda can? The walls of the can collapsed inward
b. Circle the variables that were involved: temperature pressure volume
c. Which variable was held constant? volume
d. What variable changed when temperature decreased? Pressure (decreased)
e. Circle the relationship between these variables: directly or inversely proportional

Clean up each station, and turn off the hot plates. Then answer the post lab questions on next page.

Post Lab Activity: Use the internet to research Gas Laws and answer the questions below:

[1] Adapted from Tania Lauby, South St. Paul High School, South St. Paul, MN https://serc.carleton.edu/sp/mnstep/activities/35031.html

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Post Lab Questions

1. Which gas law was demonstrated in Procedure #1? Charles' Law
2. Write the relationship for this law. Volume and temperature are directly proprotional
3. Write the equation for this law: $\frac{V_1}{T_1} = \frac{V_2}{T_2}$
4. Explain how this law relates to Procedure #1. When the temperature of the water vapor increased, the volume of the balloon increased because the gas molecules spread out more

5. Which gas law was demonstrated in Procedure #2? Boyle's Law
6. Write the relationship for this law. Pressure and volume are inversely proportional
7. Write the equation for this law: $P_1V_1 = P_2V_2$
8. Explain how this law relates to Procedure #2. When the pressure increases from air being added to the bottle, the volume of the marshmallows decrease because there is less room in the bottle.

9. Which gas law was demonstrated in Procedure #3? Guy Lussac's Law
10. Write the relationship for this law. Pressure and temperature are directly proportional
11. Write the equation for this law: $\frac{P_1}{T_1} = \frac{P_2}{T_2}$
12. Explain how this law relates to Procedure #3. When the temperature of the gas particles inside the can decrease, the gas particles take up less room reducing the pressure and the walls of the can collapse.