

Name: _____

Period: _____ Subject: _____

Date: _____

States of Matter/Gas Laws

Gas Filled Balloons Lab

Objectives:

- observe chemical reaction (or lack of reaction) when various gases are exposed to a flame
- understand why some gases react and some don't and how this can be used in technology
- predict the amount of product produced in one of these reactions using gas stoichiometry

Equipment:

Note: This is an incomplete list. Make sure you take note of all the equipment used in this lab in order to include a proper list in the "Materials" section for the writeup of this lab in your notebook.

- 12" helium quality balloons
- gases: helium, hydrogen, carbon dioxide, argon, oxygen

Procedure:

1. Fill a number of balloons with helium, hydrogen, carbon dioxide, argon, or oxygen.
2. Tie strings to all the balloons. Record whether the various balloons are floating or sinking.
3. Apply a lit candle at the end of a long stick to each balloon and observe and record what occurs as the balloon pops.
4. Using what you observed watching the balloons with "known" gases, predict which gas was in each of the "unknown" balloons using data such as whether the balloon rose or sank, the sound the balloon made when it popped, and the reaction of the gas with the open flame.

Data:

GAS BALLOONS DATA SHEET				
	Color/#	Predicted observations	Actual Observations	Which gas
Ar				
CO₂				
H₂				
He				
O₂				
Unk. #1				
Unk. #2				
Unk. #3				
Unk. #4				
Unk. #5				
Unk. #6				

(Observations: balloon rise or sink? When popped, loud or muffled? What happens to candle?)

Analysis/Results:

1. Before the balloons even reacted (or didn't), you may have noticed that some balloons rose and others sank. Why? (Be sure to use the word "density"!) Give an example with actual numbers to make your point. Figure out what the density of the gas would be at STP (units: grams per liter).
2. Which gases reacted and which didn't? For the gases that showed a reaction, what was the reaction? Write out the actual chemical equations which represent the reactions which did occur.
3. Hydrogen was one of the gases that showed a reaction. Was it exothermic or endothermic? How could this reaction be used in technology?
4. For the gases that did *not* react, how could this *also* be used for some purpose in technology? (Name at least one specific use for each of the gases that didn't react and describe why it is useful for that particular gas to be non-reactive when used for that particular purpose.)
5. Assuming a 12" balloon contained approximately 5.5 L of gas, how much water (in grams) would have been produced when a hydrogen balloon reacted with excess oxygen in the air? (For the purposes of this calculation, assume STP conditions)
6. The enthalpy of formation of water is -286 kJ/mol. How much energy (in joules) was released in the reaction from the previous question? The enthalpy of vaporization (converting a liquid to a gas) of water is 40.7 kJ/mol. Use this information to help explain why we didn't find any water on the floor after the reaction from the previous question.

Conclusion:

Briefly sum up which gases reacted and which didn't and why those reactions or lack thereof could be useful in the real world.