Name_____

Microscale Experiment with Hydrogen & Oxygen Combustion

Introduction: Hydrogen gas (H_2) is considered a valuable fuel. When hydrogen is exposed to a flame and oxygen (O_2), the two gasses react with one another to form water (H_2O). In this lab you will experiment with different combinations of hydrogen and oxygen to find the ideal combustion ratio.

Engineering Inquiry: Does the amount of Hydrogen and Oxygen affect the explosion?

Pre-Lab Questions:

1. Balance the following equation describing the reaction of Hydrogen (H_2) with Oxygen (O_2)

$$H_2 + O_2 \rightarrow H_20$$

2. Write a sentence describing the reaction above.

Hypothesis 1: If I increase the amount of hydrogen the explosion will be greater because element ratio of 2 H_2 molecules react together with 1 O_2 molecule is the same as H_2O.

Hypothesis 2: A mixture of 2/3 hydrogen and 1/3 oxygen will have the loudest explosion because the balanced chemical reaction shows a 2:1 ratio of Hydrogen to Oxygen.

Equipment/Materials:

3 Pipette Bulbs
1 Hydrogen Generator
1 Oxygen Generator
2x 250 mL Beaker
Matches
1 Candle

Safety:

- Goggles must be worn at all times in the lab.
- Be very careful when handling fire.

Procedure:

1. Fill pipette bulb completely full with water and place it inverted on the Hydrogen generator. Allow hydrogen gas to completely fill bulb.

2. Light the candle with the matches and when bulb is filled with gas remove it from the hydrogen generator and squeeze it out into the flame of the candle.

3. Write a complete sentence in the space provided (**Table 1**) that answers the two posed questions of your observations when the hydrogen was exposed to the flame. *How loud was the explosion*? and *How much kick (recoil) was provided by the explosion*?

4. Fill pipette bulb with water again and place it inverted on the hydrogen generator. This time only fill the bulb 2/3 of the way with hydrogen.

5. Transfer the bulb from the hydrogen generator to the oxygen generator and fill the last 1/3 of the bulb with oxygen.

6 Repeat, this time filling 1/3 with hydrogen and 2/3 with oxygen.

7. Repeat, this time filling all the way with oxygen.

Table 1: Results

Gas Mixtures	**How loud was the explosion? Scale: 0 to 4** (no explosion to loud explosion)	**How much kick (recoil) was provided by the explosion? Scale: 0 to 4** (felt nothing to firm kick)
All H_2 gas		
2/3H_2 gas & 1/3 O_2 gas		
1/3 H_2 gas & 2/3 O_2 gas		
All O_2 gas		

Post- Lab Questions:

1. Were there any surprises (this you didn't expect) in the data above? Explain.

2. Which gas mixture gave the loudest explosion?

3. Which gas mixture gave the biggest kick?

4. Were there any situations that did not give an explosion? Which ones?

5. Why do you see *No Smoking* or *No Open Flame* signs in the hospital?

6. Did your candle ever go out due to the explosion? Which ones?

7. What could be the cause of the candle going out?

8. You have two Hypotheses. Write a conclusion for each Hypothesis.

Hypothesis 1

Hypothesis 2