**Test for Hydrogen Gas**

**Purpose:** determine the density of hydrogen gas relative to air using the water displacement technique to collect hydrogen gas.

**SAFETY:**

1) Calcium metal is corrosive and is a skin and eye irritant. Avoid skin/eye contact, ingestion, and inhalation. DO NOT GET ONTO CLOTHES. Use tweezers or gloves to handle. Goggles on!

2) Calcium hydroxide is produced when Calcium reacts with water. Calcium hydroxide is corrosive and is a skin and eye irritant. Avoid skin/eye contact, ingestion, and inhalation.

After cleaning up, WASH HANDS WELL WITH SOAP AND WATER!

**Materials:**

**-** 2 test tubes and stoppers

- Test tube rack

- Water basin/trough

- Pieces of Ca metal in a beaker

- Tweezers

- Goggles

- Aluminium foil

- Pencil

**Procedure:**

Density test for hydrogen gas:

1) Fill your water basin/trough and your 2 test tubes with water.

2) Using tweezers, wrap 2 Ca metal pieces in a small pieces of aluminium foil (wrap an extra just in case).

3) With your pencil and your tweezer, poke a few holes in your aluminium foil coating your Ca metal.

4) Invert one of your test tubes filled with water into the water basin/trough. Try not to lose any water. The water should stay in your test tube when in contact with water.

*These next few steps need to be done promptly, so it's a good idea to read a few steps ahead.*

5) Carefully, tweeze the Ca metal wrapped in your aluminium foil and place it on the water while holding the inverted test tube.

*The reaction happening is:*

$$Ca (metal) + H\_{2}O \rightarrow Ca(OH)\_{2 }+ H\_{2}$$

6) While holding the Ca metal with your tweezer, move the inverted test tube so that the mouth covers the reacting Ca metal. The gas produced should be displacing the water inside your test tube.

7) Once the water in your tube is completely displaced, move the Ca metal away from the mouth. Quickly cap the test tube with a stopper after taking it out of the water. Place this back on your test tube rack.

8) Repeats steps 4-7 for a second test tube.

9) Once you have both your test tubes. Bring your test tube rack with your test tubes to the front of the class.

10) You will hold one tube upside down and the other upside up. After removing both their stoppers at the same time, time for 1 minute.

11) Your teacher will light a splint over the mouths of both tubes. Record your results below.

12) Return to your groups, discuss your findings, and answer the questions below.

**Data collection:**

|  |  |
| --- | --- |
| Mouth up | Mouth down |
|  |  |

**Data Analysis:**

*Complete this write up on a separate piece of paper (written or typed) as a group.*

1) Based on your findings, which gas is denser (hydrogen or air)?

2) What would your results be if hydrogen gas were denser than air? How come?

3) Using the data on the board, calculate the density of hydrogen gas in g/mL.

4) When hydrogen gas was lit, was that a physical or chemical change? Why?

5) Google "Hydrogen fuel". Was lighting your hydrogen gas an endothermic or exothermic reaction? What observations support your answer? What findings online support your answer?

6) Describe 2 tests to show the water remaining in your basin/trough is basic.

**Reflection:**

*This is to be completed and handed in individually. The below are guiding questions to help direct your reflection for this lab.*

1) What did you learn in this lab (Science, working with others, manipulating equipment, etc)

2) What were your group dynamics? What could you do next time to improve this dynamic with the same group of people?

3) How could you apply what you learned in this lab experience outside this classroom?

**Group analysis and individual reflection due this Friday March 6th, 2015**