

Activity 3: Why Balance a Chemical Reaction?

This lab is adapted from a lab found in: Microchemistry Laboratory Manual from Addison-Wesley by Alan Slater and Geoff Rayner-Canham. I highly recommend this book and microchemistry.

Background: Students may have balanced chemical equations in Grade 10 but will need a refresher and practice. This lab relates the actual chemical reaction to the balanced chemical equation. Most students will see that a ratio of 4:2 (or 2:1) $\text{H}_2:\text{O}_2$ will give the loudest "bang" when ignited in the bunsen burner. They are measuring a volume ratio but since the gases are at the same conditions this is also their mole ratio - although the students are not at this stage yet.

In this experiment I give them the reactants but they must come up with the products and then balance the reactions.

The beauty of performing these reactions at the microchemistry scale is that it allows the students to easily repeat any of the gas mixtures if they want to confirm their results. I encouraged all of them to "try it again and confirm".

Chemical Reaction Equations

The Production and Reaction of Hydrogen and Oxygen Gases

Purpose:

1. To produce hydrogen and oxygen gas and identify the types of reactions involved.
2. To determine the mixture of hydrogen and oxygen gas that produces the loudest sound.

Observations:

Amount of Hydrogen Gas	Amount of Oxygen Gas	Loudness of Reaction
5 Parts	1 Part	
4 Parts		
3 Parts		
2 Parts		
1 Parts		

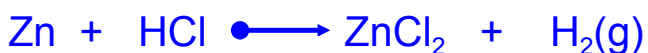
Fuel to Oxygen Ratio Lab

Producing Hydrogen Gas Fuel:

Word equation:

Zinc + Hydrochloric Acid $\bullet \longrightarrow$

Balanced Chemical Reaction Equation:

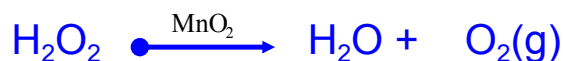


Producing Oxygen Gas:

Word equation:

Hydrogen Peroxide $\bullet \xrightarrow{\text{MnO}_2}$

Balanced Chemical Reaction Equation:



The Combustion Reaction:

Fuel + Oxygen $\bullet \longrightarrow$

Discussion:

1. What role does the MnO_2 play in the production of oxygen gas?
2. What ratio of hydrogen to oxygen gas did you find produced the loudest sound?
3. What ratio of hydrogen to oxygen gas ***should*** have been the best ratio and how do you know it should be this?
4. If your answer to #2 and #3 were not the same suggest reasons why this might have happened.

Step 1: Fill all 5 bulbs completely with water.

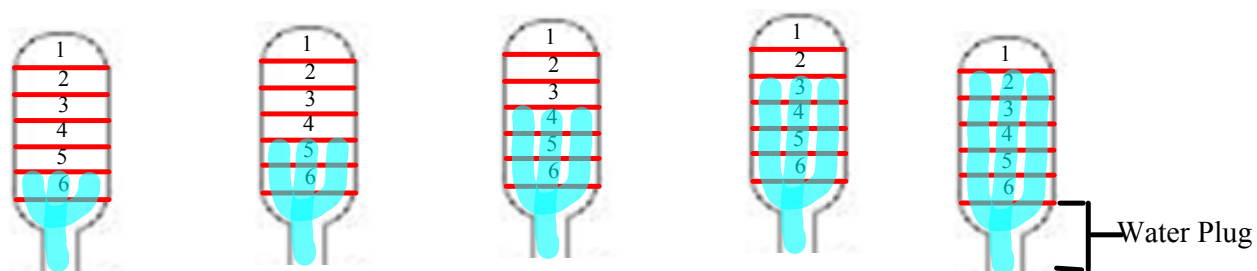
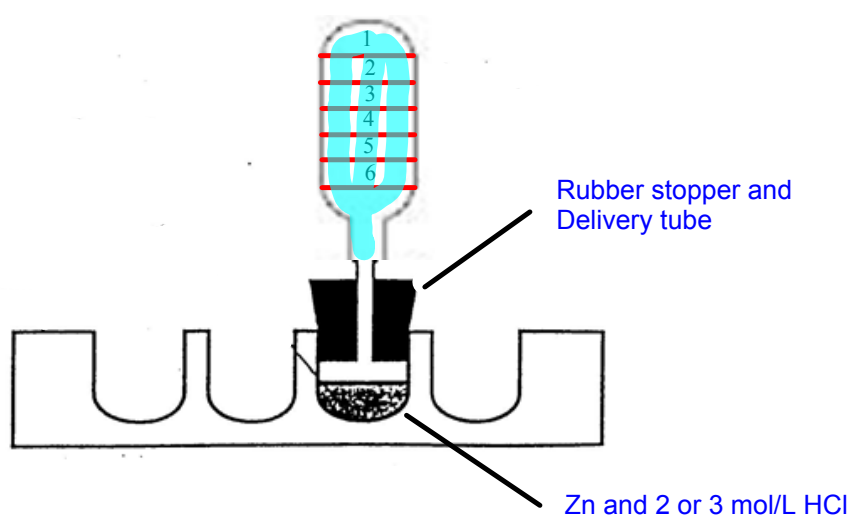


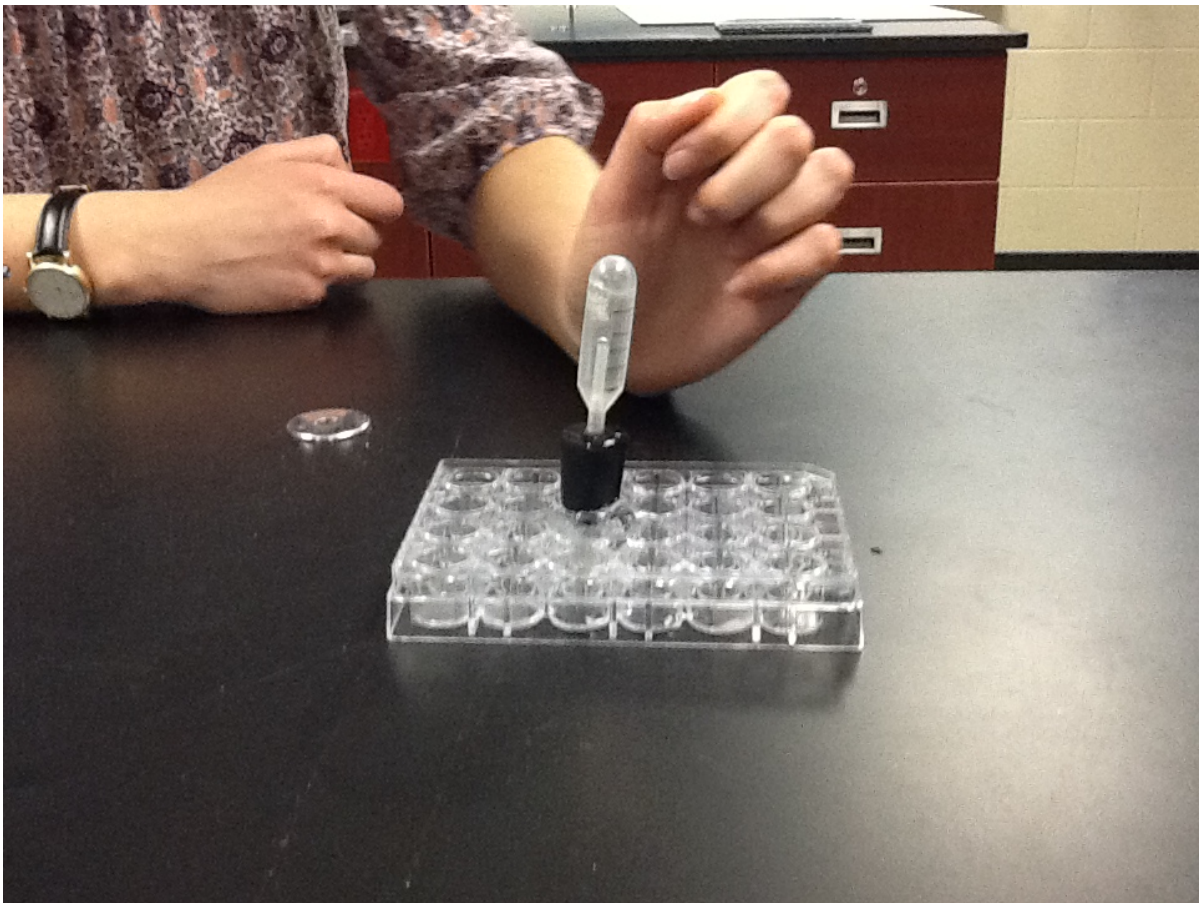
Place them in order in your test tray.



Step 2: Collect Hydrogen gas.

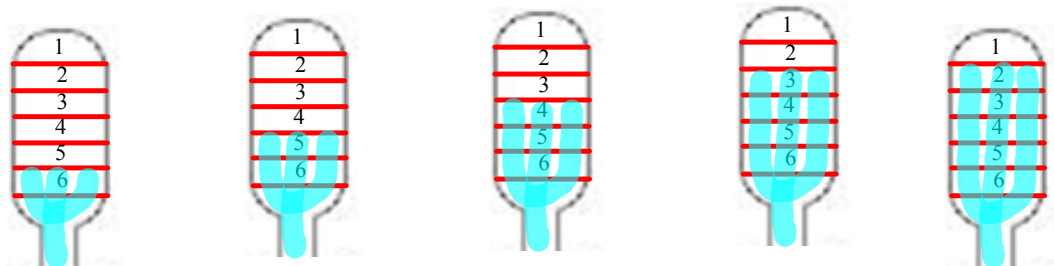
You will need Zn and HCl.





Step 3: Collecting the Oxygen Gas

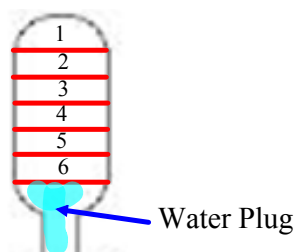
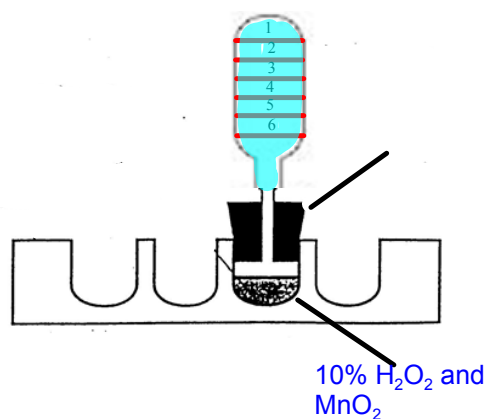
You now have a set of gas bulbs with H₂ gas that look like this:



You will fill the remaining space in each bulb with O₂ gas.

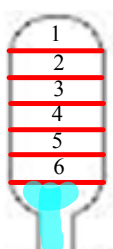
You will need Hydrogen Peroxide and a piece of MnO₂.

All your bulbs should look like this when you are finished. Make sure you keep them in order and don't let all the water out or you will lose the gas too!



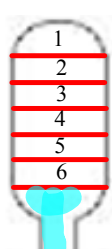
Step 4: Igniting the Gas Mixture:

1



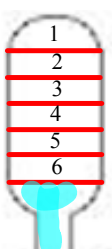
5 part H_2
1 part O_2

2



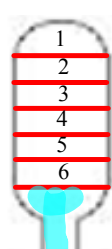
4 part H_2
2 part O_2

3



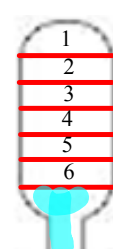
3 part H_2
3 part O_2

4



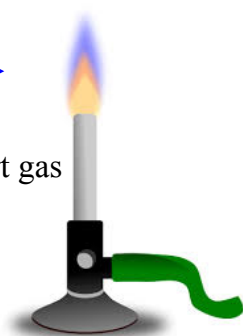
2 part H_2
4 part O_2

5



1 part H_2
5 part O_2

Squeeze Gas bulb to squirt gas into the flame.



Amount of Hydrogen Gas	Amount of Oxygen Gas	Loudness of Reaction
5 Parts	1 Part	
4 Parts		
3 Parts		
2 Parts		
1 Parts		

Record your results in your table. The loudest gets a ranking of 1, next loudest a 2, and so... The quietest will get a rank 5 Parts

Not sure of your results? If you have time, repeat those mixtures that you are not sure of.

Complete your observations table and answer the discussion questions.

