

EXPERIMENT 6: HYDROGEN-PREPARATION AND PROPERTIES

Equipment: 3 bottles, thistle tube, hydrogen generator, splints, glass plates, pneumatic trough, ring stand, universal clamp, GOGGLES MUST BE WORN

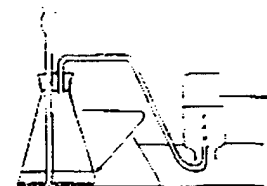
Materials: Zinc (mossy, metal), dilute HCl (3N)

In this experiment you will learn about the most abundant element in the universe.



Generating Hydrogen

- A. Set up the hydrogen generator and arrange the apparatus to collect 3 bottles of hydrogen by water displacement. Put enough Zn into a generator to fill the bottom fifth (1/5); add enough dilute HCl (3N) to cover the bottom of the thistle tube. Collect one bottle of gas immediately. Cover with glass plate and store it mouth down. Collect two more bottles of gas.



Pour (decant) the acid from the generator into the sink. Rinse twice with water. Keep the Zinc in the generator bottle for the next class.

NO ZINC IN THE SINK!!

DO NOT LIGHT FLAMES UNTIL ALL GENERATORS ARE STOPPED AND RINSED!

Testing Hydrogen

- B. **WHEN IT IS SAFE TO DO SO**, light a bunsen burner. Use the burner to light a splint. Hold the **SECOND** bottle of hydrogen you collected mouth downward and put the splint halfway into the bottle and hold it there for 30 seconds. **DO NOT JERK YOUR HAND AWAY.**

1. Describe what happens to the splint

(a) inside the bottle _____

(b) at the mouth _____

2. Does hydrogen burn? _____ What is the evidence? _____

Write the equation for the reaction. _____

3. Does hydrogen support burning (can you burn things in hydrogen)? _____

What is the evidence? _____

- C. Hold the **FIRST** bottle of hydrogen you collected mouth downward and insert a burning splint.

4. Compare this reaction with the one in Part B. _____

5. Explain. _____

- D. Rinse an empty bottle (#1 or #2 from above). Stand it mouth up. Place the **THIRD** bottle of hydrogen you collected mouth down on top. Remove the glass plate. Let stand two minutes.

Bring each bottle, separately, mouth downward, to a Bunsen flame.

6. Describe what happens. (bottle 3) _____

(bottle 1 or 2) _____

7. If H₂ gas is less dense ('lighter') than air, how could hydrogen gas get from the top bottle into the bottom bottle? _____

SUMMARY QUESTIONS.

8. What property of hydrogen enables collection by water displacement? _____

9. Why do mixtures of hydrogen and air burn faster than pure hydrogen? _____

10. Complete and balance the equation:



11. For the reaction: $2H_2 + O_2 = 2H_2O$, what is the sign of ΔH ? _____

How does the chemical potential energy in water (product) compare to the chemical potential energy in a mixture of hydrogen gas and oxygen gas (reactants)?

12. Draw and completely label a potential energy diagram for burning hydrogen in oxygen.

