NAME _____ PREF ____ SECTION SC_____ DATE _____

EXPERIMENT 13: WEIGHING WITHOUT A BALANCE

Equipment: 8" test tube, 1000mL beaker, rubber stopper
Materials: a strip of Mg, HCl, paper strip or rubber band, water at room temperature

In this experiment you will see how careful measurements, the mole method, and a balanced equation can be used to find the weight (mass) of a sample of magnesium metal.

A. Place a strip of Mg in an 8" test tube. Fill the test tube with water (at room temp.) to within 1" of its mouth. Place 400 mL of water (also at room temp.) in a 1000 mL beaker. Add enough HCl solution to the test tube to fill it. Cover the test tube with the LARGE end of a rubber stopper and, while holding the stopper in place with your finger, quickly invert the test tube into the beaker of water. With the mouth of the test tube well below the surface of the water in the beaker, remove the stopper carefully so that the Mg does not fall out. Let the mouth of the test tube rest on the bottom of the beaker. Observe the reaction. [Rinse your hand with tap water.]

1. Describe the reaction: _____

2. Write a balanced equation for the reaction. _____

B. When all the Mg has reacted, add (room temperature) water to almost fill the beaker. Raise the test tube so that the liquid level in the beaker is even with the liquid level in the test tube. Put a strip of wet paper on the test tube to mark the level. Remove and drain the test tube. Add water to the level marked by the paper, and then empty the contents of the test tube into a graduated cylinder. Record the volume.

3. VOLUME: _____ mL. 4. What is the reason for equalizing the water levels? _____

_____

C. Obtain the following information: 5. ROOM TEMPERATURE: ____ C = ____ K

6. VAPOR PRESSURE OF WATER AT ABOVE TEMPERATURE: _____ TORR. (Table O)

7. TODAY'S ATMOSPHERIC PRESSURE: _____ in Hg = _____ mmHg = _____ TORR.

D. The hydrogen gas collected in the test tube was actually a mixture of water vapor and H_2 gas.

8. Considering your answers to #4 and #7, what is the pressure inside the test tube after the water levels have been equalized?
P (inside) = P (due to $H_2(g)$) + P (water vapor) = _____ TORR.

9. What is the partial pressure of hydrogen only? _____ TORR.

E. We now know the pressure and the volume of the hydrogen gas at room temperature. We need to know what the volume WOULD be at S.T.P. Use the Combined Gas Law ($P_1xV_1/T_1 = P_2xV_2/T_2$) to determine this.

10. VOLUME OF HYDROGEN GAS AT STP: _____ mL

F. Since one mole of an ideal gas takes up 22.414 L of space at S.T.P., how many moles of hydrogen gas are represented by the volume you calculated in #10?

11. MOLES OF HYDROGEN GAS: _____

G. Use the balanced equation (#1) to determine how many moles of Mg must have reacted to produce that many moles of hydrogen (11). Then use the Gram Atomic Weight of Mg to find the weight of that many moles of Mg. Compare that with the known weight (see your teacher) and calculate your per-cent error.

12. MOLES OF Mg USED: _____ moles

13. WEIGHT OF Mg USED: _____ grams

14. ACTUAL WEIGHT: _____ grams (from teacher)

15. $$\text{PERCENT ERROR} = \frac{\text{Accepted value - Measured value}}{\text{Accepted value}} \times 100$$

Percent Error = _____ %