Chemistry **Summative Activity: Unit 1: Stoichiometry, Gases**

**Heat of Formation of MgCl2**

**Purpose:**

1. Determine the heat of formation for MgCl2 experimentally
2. Determine the %yield for H2 production

**Safety:**

1. Use caution handling HCl acid. Avoid contact with skin and do not inhale. Notify teacher of any contact.
2. Relieve the pressure slowly by gently removing the stopper. Hold stopper securely.

**Procedure:**

**Part 1: Heat for Mg and HCl**

1. Measure out approximately 50 mL of 3.0 M HCl in a graduated cylinder and record exact amount. Assume that its density and specific heat are essentially equivalent to that of water.

Pour the acid into a 250 ml plastic bottle with gas pressure sensor and thermometer attached.

2. Mass approximately 0.1 g of cleaned magnesium and record exact amount.

3. Add the magnesium to the acid and immediately seal the flask. Hold stopper securely onto flask.

4. Record the highest temperature and the highest pressure.

5. Repeat for 3 trials. If the trials differ by more than 10%, repeat for a fourth trial. Record the average of these values.

7. Determine the volume of the gas in the flask by filling the entire bottle with water and then

transfer that amount to a graduated cylinder. Calculate the volume of the gas by subtracting the volume of the HCl solution from the total volume of the flask.

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**Balanced Chemical Reaction:**

## DATA TABLE :

|  |  |  |  |
| --- | --- | --- | --- |
| Trial # | **1** | **2** | **3** |
| Mass of Mg |  |  |  |
| Mass of HCl |  |  |  |
| Moles of Mg |  |  |  |
| **Ti** |  |  |  |
| **Tf** |  |  |  |
| **ΔT** |  |  |  |
| Heat released |  |  |  |
| **ΔHrxn/mole Mg** |  |  |  |
| **Pressure kPa initial** |  |  |  |
| **Pressure kPa final** |  |  |  |
| **Δ Pressure KPa** |  |  |  |
| **Volume of entire flask** |  |  |  |
| **Volume of HCl** |  |  |  |
| **Volume of gas in flask** |  |  |  |
| **Moles of gas (PV=nRT)** |  |  |  |

**Calculations:**

1. Calculation of moles of Mg for a trial ­­­­\_\_\_\_\_\_(indicate which trial)
2. Calculation of the Heat for the same trial
3. Calculation of the Heat(kJ)/mole for same trial
4. Calculate the theoretical moles of H2 produces from the amount of Mg reacted using stoichiometry.

5. Calculate the actual moles of H2 from the P, T, V data.

6. Calculate the percent yield for moles H2 produced.

**Error Analysis:**

Be very specific and don’t not use human errors but experimental errors.

1. One error for heat of formation of MgCl2:

2. One error for the moles of H2 gas produced: