

Name _____

Period ____ Date ____/____/____

5 • Gases and Their Properties

MOLAR VOLUME OF HYDROGEN

Purpose: The purpose of this lab is to experimentally determine the molar volume of a gas at STP.

Apparatus:

gas collection tube	rubber stopper	wood splint	400-mL beaker
3M HCl	1-2 cm of Mg ribbon	copper wire	graduated cylinder
ruler	electronic balance	distilled water	tap water

Procedure:

1. As a class, determine the mass of 10 centimeters of Mg ribbon. Put on goggles.
2. Obtain a piece of ribbon between 1.0 and 2.0 cm long. Record its length (± 0.01 cm).
3. Fold Mg ribbon in half and wrap with copper wire as shown in class. Leave a wire "handle."
4. Place copper wire through the rubber stopper so that the magnesium strip is on the narrow side of the rubber stopper.
5. Place about 6 mL of 3M HCl in eudiometer tube. SLOWLY fill the tube to the top with water.
6. Fill 400-mL beaker about 2/3 full of tap water.
7. Place the wire/stopper apparatus over the top and give a gentle twist to ensure a seal.
8. Place finger over stopper hole and invert eudiometer tube in the beaker. Observe.
9. When reaction has stopped, tap tube to release any bubbles clinging to the side of the tube. Equalize the inside and outside pressure by moving the tube so that the water level is equal on the inside and outside of the tube. Record volume of gas inside the tube.
10. Obtain matches and wood splint. Test gas to verify that it acts like hydrogen. Keep wood splint for others. Place WAIT until the instructor has approved your set-up before you do this step.
11. Clean apparatus and station.

Data:

mass of 10 cm Mg = _____ g
length of Mg ribbon = _____ cm (read to 2 decimal places)
room pressure = _____ mmHg
room temperature = _____ °C
volume of H₂ = _____ mL (read this in the grad. cylinder with liquid levels equalized)
equilibrium vapor pressure of water at today's temperature = _____ mmHg (from "CRC")

Questions and Calculations (SHOW ALL WORK!):

1. Write a balanced chemical equation for the reaction between Mg ribbon and hydrochloric acid.
2. Calculate the number moles of H₂(g) formed beginning with the length of magnesium ribbon used.
3. Show your calculation of the partial pressure of hydrogen gas inside the tube. This is the pressure you should use for the room pressure of the hydrogen gas. [Note that another definition of partial pressure is the pressure the hydrogen gas would exert if it were alone in the tube. This is also called the pressure of dry hydrogen.]

