

AP Chemistry Lab

Molar Volume of a Gas

Pre-Lab Questions

- 1) Write the balanced equation for the reaction between magnesium and hydrochloric acid.
- 2) What is the meaning of the term STP?
- 3) Why is a gas that is collected over water considered to be “wet”?
- 4) What is the meaning of the term vapor pressure of water?
- 5) What factor(s) determine the vapor pressure of water?

Procedure

- 1) Cut a 3 cm piece of magnesium ribbon from the roll.
- 2) Rub the piece of ribbon with sandpaper until it is shiny. Find its mass on the analytic balance. Roll it into a loose coil and wind a piece of copper wire around it until it is trapped in a loose “cage” of copper. See the diagram for an example of how to do this.
- 3) Pour 5 mL of 6 M hydrochloric acid into the bottom of the gas collecting tube. Fill the rest entirely to the top with water.
- 4) Fill a 1 L beaker within an inch of the top with water and have it close to the gas collecting tube. Place the cage in the tube and while covering the mouth with your finger, turn the tube over, immerse the mouth below the water level of the beaker and release it. Clamp the gas collecting tube to a ring stand with a burette clamp and observe. See the diagram for an example of how to do this.
- 5) While the reaction continues, record the temperature of the water in the beaker and the atmospheric pressure of the room.
- 6) When the reaction stops, tap excess bubbles to release them from the cage and sides. Cover the mouth of the tube with your gloved finger again and remove the tube from the beaker, taking care to prevent water or gas from escaping.
- 7) Carry the tube over to a station with a 1 L graduated cylinder. Carefully place the mouth of the tube below the water surface in the tube until the water level inside the tube and in the graduate are equal. See the diagram for an example of how to do this. Measure the volume of the gas now. This equalizes the pressure between the gas in the tube and the atmosphere outside it. See the diagram for an example of how to do this.
- 8) Repeat until you have 3 good trials.

Sample Data Table

	Trial 1	Trial 2	Trial 3
Mass of Magnesium			
Volume of Hydrogen gas formed			
Temperature of water in large beaker			
Barometric Pressure			

Post Lab Questions

The following quantities should be calculated and expressed in a table format.

- 1) Mass of magnesium ribbon used.
- 2) Moles of magnesium ribbon used.
- 3) Volume in liters of H_2 gas formed (measured at room pressure).
- 4) Barometric pressure.
- 5) Vapor pressure of water at correct temperature.
- 6) Pressure of dry H_2 gas collected.
- 7) Volume in liters of hydrogen gas corrected to STP.
- 8) Moles of hydrogen gas produced.
- 9) Molar volume of H_2 at STP.
- 10) The value of the gas constant R according to your data.

