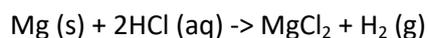


# Determination of the Universal Gas Constant

by Vinutha Ramakrishna

## Experiment Overview

One of the most important laws about the behaviour of matter is the ideal gas law, which relates the pressure, volume, temperature and the number of moles of a gas. In this experiment a known number of moles of hydrogen is collected, at known conditions of temperature and pressure by a simple chemical reaction. The hydrogen is produced by reacting the metal magnesium with an acid according to the equation:



The liberated hydrogen is trapped by displacing water from a measuring cylinder, hence the gas is saturated with water vapour. The total pressure in the system is therefore, the sum of the pressure exerted by the hydrogen gas and the pressure exerted by the water.

This is an application of Dalton's **law of partial pressures**:

$$P_{\text{Total}} = P_{\text{Hydrogen}} + P_{\text{Water}}$$

where  $P_{\text{Total}}$  is the total pressure of gas in the system.

he numerical value of the Universal gas constant, R is calculated and compared to the theoretical value.

## Level of Experiment

First year undergraduate

## Keyword Descriptions of the Experiment

### Domain

general chemistry

### Specific Descriptors

kinetic theory of gases, gas laws

## Course Context and Prerequisite Knowledge and Skills

This is a first year general chemistry experiment, which is conducted by students pursuing their studies in sciences, pharmacy, engineering etc. It gives the students an understanding of methods of collection of gases, consolidates on theoretical aspects of kinetic theory of gases dealt in lectures and helps them to recognise the different units in which the properties of matter can be expressed and also emphasises on their mathematical skills to interconvert units.

## Time Required to Complete

**Prior to Lab:** 30 min to 1 h reading

**In Laboratory:** 2-2.5 h

**After Laboratory:** 1 h (calculations, analysing results, and report writing)

## Experiment History

The origin of this experiment is unknown, it has been adopted in the first year chemistry unit, SCH101, apparently since the conception of this unit.

## References

"*Chemistry A- SCH101, Laboratory Manual*", Faculty of Education Health and Science, Charles Darwin University, **2006**.