



36. Gas volume

Time

1–2 h.

Curriculum links

Reactions of metals with acids. Moles.

Group size

2– 4.

Materials and equipment

General

- ▼ a range of laboratory glassware including measuring cylinders, burettes and beakers
- ▼ access to two decimal place balance.
- ▼ items from the junk list (pXX).

Materials per group

- ▼ bottle of vinegar
- ▼ magnesium ribbon cut into 0.04g pieces.

Safety

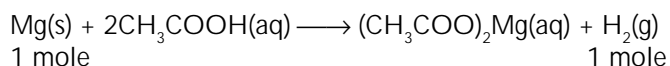
Eye protection must be worn.

Risk assessment

A risk assessment must be carried out for this activity.

Commentary

There are many approaches to this problem but they all share a common aim to measure the volume of hydrogen evolved from a known mass of magnesium. Most approaches collect the gas over water in a graduated device such as a measuring cylinder or burette. Students need to consider the accuracy of the method that they choose. The volume of gas is noted and adjusted for atmospheric pressure. It is then simple to calculate the volume of 1 mole of the gas.

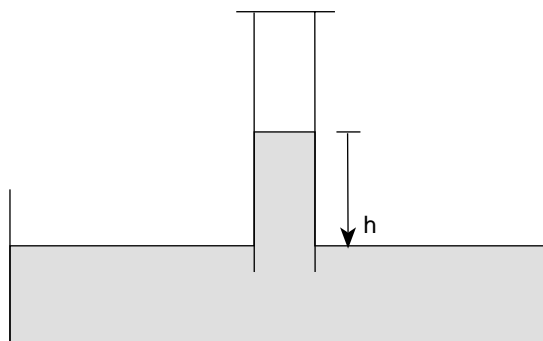


Evaluation of solution

This problem has been used as a competition. The best solution is the one that is nearest the theoretical value but credit should also be given for elegance. During trialling many students forgot to adjust the volume of gas collected to atmospheric pressure and room temperature – *ie*



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Pressure of gas + ρgh + SVP
= atmospheric pressure

SVP = Saturated vapour
pressure of water
 ρ = density of water
 h = height of water

The corrections are very small. The difference between theoretical and experimental answers is usually very small.



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- ▼ Construct apparatus to measure the molar volume of hydrogen produced from the reaction of magnesium with vinegar.