

The volume of 1 mole of hydrogen gas

Topic

Molar volume.

Timing

40 min.

Description

Students react magnesium quantitatively with hydrochloric acid. They collect the hydrogen and calculate the molar volume.

Apparatus and equipment (per group)

- Burette
- Burette stand
- Water bath.

Chemicals (per group)

- Hydrochloric acid 2 mol dm⁻³ **Low Hazard**
- Magnesium ribbon 0.02–0.04 g (~3.5mm standard ribbon) (**Water reactive**)

Teaching tips

You should demonstrate the procedure beforehand. The inversion is not difficult. Rest the end of the burette on the lip of the beaker and swing the tap end round and upward to a vertical position. It is important that the liquid level starts on the graduated scale of the burette. If the liquid level is not on the scale, opening the tap momentarily allows the liquid to drop onto the scale.

Background theory

Volume of one mole of gas at standard temperature and pressure, stp, (0 °C, 101,500 N m⁻²) is 22.4 dm³.

At room temperature and average pressure, rtp, the students can expect an answer of approximately 24 dm³.

Students that are more able may be able to use the equation $P_1 V_1/T_1 = P_2 V_2/T_2$ to find the volume at stp. The temperature and pressure in the laboratory need to be measured.

Safety

There is no need for any special precautions but eye protection will prevent uncomfortable, though not damaging, splashes to the eyes.

Answers

1. Expect rtp molar volume to be approximately 24 dm³.



Credits

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