

Making hydrogen

Written by: Phillip Crisp **Commenced on:** 31 Oct 2009 **Expires:** 31 Jan 2011

Classes for which experiment is required

Teacher: Phillip Crisp **Year Group:** 10 **Room:** **Period:** **Date:**
 611 2 1/11/09
 614 4 1/11/09

Items to be prepared by laboratory technician

8 groups of
 2 Magnesium ribbon, 2 cm length
 1 1 M hydrochloric acid, 50 mL

Procedure or reference, including variations

Science World 7, p.52
 Cork to be used to trap hydrogen gas prior to "popping".

Equipment to be used

box of matches

Potential hazards

Box burns violently if ignited.

Standard handling procedures

Keep dry. Used matches should never be returned to the box.
 Count boxes out and in.

cork

test tube rack

test tube, small (~75 x 8 mm), borosilicate ("pyrex")

Potential hazards

Breakage of test tubes. Cuts from chipped test-tube rims. Small test tubes more likely to eject material during exothermic reactions.

Standard handling procedures

Inspect and discard any damaged test tubes. Sweep up broken glass with brush and dustpan; do not use fingers.

wooden splint

Potential hazards

When lit, it acts as ignition source; causes burns.

Standard handling procedures

Extinguish all tapers with water before disposal.

Chemicals to be used and produced

hydrochloric acid solution, 0.2 M to 4 M (1% to 14% wt/wt)

Class: 8 PG: III **7-12** Users: 1,2,5

HCl_(aq)

UN: 1789 CAS: 7647-01-0

Potential hazards

Lung-irritant hydrogen chloride gas is evolved; skin irritant; corrosive; toxic if ingested.

Standard handling procedures

Do not breathe vapour. Avoid splashes in eyes or on skin.

hydrogen gas, generated during experiment

Class: 2.1 PG: none **7-12** Users: 1,2,5

H₂

UN: 1049 CAS: 1333-74-0

Potential hazards

Highly flammable gas. Forms dangerously explosive mixtures with air. Non-toxic, but can act as asphyxiant; hydrogen/air mixture in lungs can explode if ignited. Detonation ("popping") of small volume of hydrogen/air mixture in sturdy test tube by ignition with match or wooden taper is generally safe; breakage of test tube is possible.

Standard handling procedures

Generate hydrogen only in small volumes (<1 mL). Detonate hydrogen/air mixtures only in small undamaged test tubes (<8 cm; <5 mL). Use borosilicate ("pyrex") test tubes; do not use thin-walled soda glass test tubes. Protect against flying broken glass from breakage of test tubes. SAFETY GLASSES!

magnesium (magnesium metal, magnesium ribbon, magnesium turnings)

Class: 4.1 PG: III **7-12** Users: 1,2,5

Mg

UN: 1869 CAS: 7439-95-4

Potential hazards

Burns with white-hot flame; UV radiation emitted from flame may cause eye damage; do not allow students to view flame from close distance; otherwise harmless. Reaction with ethanol may be violent after a long induction period. Reactions of magnesium with dichromate salts, nitrate salts, sulphur, phosphorus or halogenated solvents can be dangerously violent. Reaction of magnesium with silica (sand) to form silicon may be dangerously exothermic if the silica is not completely dry. Do not use magnesium as an alternative to aluminium in the thermite reaction; the reaction is dangerously explosive. Magnesium ribbon can, however, be used as a fuse for the thermite reaction.

Standard handling procedures

Keep containers tightly sealed to prevent corrosion.

Knowledge

I have read and understood the potential hazards and standard handling procedures of all the equipment, chemicals and living organisms.
 I have read and understood the Material Safety Data sheets for all chemicals used and produced.
 I have copies of the Material Data Sheets of all the chemicals available in or near the laboratory.

Risk assessment

I have considered the risks of:

| | | | |
|------------------------|-----------------------|-----------------------------|-------------------------|
| fire | breakage of equipment | electrical shock | radiation |
| explosion | cuts from equipment | escape of pathogens | waste disposal |
| chemicals in eyes | sharp objects | heavy lifting | inappropriate behaviour |
| inhalation of gas/dust | rotating equipment | slipping, tripping, falling | special needs |
| chemicals on skin | vibration and noise | falling objects | other risks |
| runaway reaction | pressure | heat and cold | |

Certification by teacher

I have assessed the risks associated with performing this experiment in the classroom on the basis of likelihood and consequences using the School's risk-level matrix, according to Australian/New Zealand Standard AS/NZS 4360:2004 and its guidelines, HB 436:2004. I have found that all the risks are "low risk". Risks will therefore be managed by "routine procedures" in the classroom.

Name: **Signature:** **Date:**

Certification by laboratory technician

I have assessed the risks associated with preparing the equipment, chemicals and living organisms for this experiment and subsequently cleaning up after the experiment and disposing of wastes, on the basis of likelihood and consequences using the School's risk-level matrix, according to Australian/New Zealand Standard AS/NZS 4360:2004 and its guidelines, HB 436:2004. I have found that all the risks are "low risk". Risks will therefore be managed by "routine procedures" in the laboratory.

Name: **Signature:** **Date:**

Monitoring and review

This risk assessment will be monitored using comments below and will be reviewed within 15 months from the date of certification.

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| <i>Attach further pages as required</i> |
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