RISK ASSESSMENT **EcoSolve High School**

Making hydrogen

Written by: Phillip Crisp **Commenced on:** 25 Jun 2025 **Expires:** 25 Sep 2026

Classes for which experiment is required

Teacher: Phillip Crisp (training code 1) **Year Group:** 10

Room	Period	Date
611	3	Mon 30/6/25

Items to be prepared by laboratory technician (training code 2)

8 groups of:
2 x magnesium ribbon, 2 cm
1 x 2M hydrochloric acid, bottle, 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. A used match should never be returned to a box of matches, in case it is hot enough to ignite matches in box. Count boxes out and in.

small borosilicate glass test tube, ~75 mm x 8 mm (Pyrex test tube, ~75 mm x 8 mm)

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. Do not insert finger in test tube, since it may become stuck and swell. Borosilicate test tubes are generally recommended if the contents are to be heated. Rimless borosilicate test tubes are known as "ignition tubes", but offer no advantage over tubes with rims for heating solids over a Bunsen flame.

cork stopper

Potential hazards
Flammable. Take care fitting corks into glass containers, since the container may break if the stopper is too large or too much force is applied. Take extreme care inserting glass tubing into holes in corks; ensure hole is correct size for tube and tube is lubricated with glycerine or oil.

Standard handling procedures
Do not place in flame.

wooden splint (splinter, taper)

Potential hazards
When lit, it acts as an ignition source; may cause burns. Possibility of splinters, especially if damaged.

Standard handling procedures
Extinguish wooden splint with water before disposal.

Chemicals to be used

hydrochloric acid 3-8 M (10-25% wt/wt) **$HCl_{(aq)}$**
CAS: 7647-01-0

Class: nc PG: none Users: 7-12 Training: 1-5

GHS data:

WARNING

Causes serious eye irritation
Causes skin irritation
May cause respiratory irritation

Potential hazards
Irritates eyes, lungs and skin.

Standard handling procedures
Avoid inhalation of vapour or skin contact.

Disposal
Retain for collection by a waste service or <20 mL/day may be poured, with stirring, into 50 times the volume of

water, then poured down the drain. Residues should be placed in an Acid waste container.

magnesium, ribbon **Mg**

Class: 4.1 PG: III Users: 7-12 Training: 1-5 UN: 1869 CAS: 7439-95-4

GHS data:

DANGER  In contact with water releases flammable gases which may ignite spontaneously

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. Reaction with ethanol may be violent after a long induction period. Reactions of magnesium with dichromate salts, nitrate salts, sulfur, 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.

Disposal
Retain for collection by a waste service or <100 g/day may be dissolved in dilute hydrochloric acid and poured down the drain. Do not place in the garbage, due to the possibility of ignition.

Chemicals to be produced

hydrogen, gas generated during experiment **H_2**

Class: 2.1 PG: none Users: 7-12 Training: 1,2,5 CAS: 1333-74-0

GHS data:

DANGER  Extremely flammable gas

Potential hazards
EXTREMELY FLAMMABLE GAS. Forms dangerously explosive mixtures with air. Not 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. Do not ignite or detonate balloons filled with hydrogen gas.

Standard handling procedures
DO NOT GENERATE HYDROGEN IN A CLOSED CONTAINER SINCE THE CONTAINER MAY EXPLODE. 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.

Disposal
<10 L/day may be released to the atmosphere, provided no ignition source is present.

Knowledge

I have read and understood the potential hazards and standard handling procedures of all the equipment, chemicals and biological items, including living organisms.
I have read and understood the Safety Data Sheets for all hazardous chemicals used in the experiment.
I have copies of the Safety Data Sheets of all the hazardous chemicals available in or near the laboratory.

Risk assessment

I have considered the risks of:

fire or explosion	injuries from equipment	biohazards	waste disposal
chemicals in eyes	rotating equipment	injuries from animals	improper labelling/storage
inhalation of gas/dust	electrical shock	environmental impact	inappropriate behaviour
chemicals on skin	vibration or noise	intense light/lasers	communication issues
ingestion of chemicals	sharp objects	UV, IR, nuclear radiation	allergies
runaway reaction	falling or flying objects	pressure inside equipment	special needs
heat or cold	contamination of area	heavy lifting	ethical issues
breakage of equipment	exposure to pathogens	slipping, tripping, falling	other risks

For **outdoor activities**, consider wind, temperature, rain/hail/snow, UV, air quality, fire danger, pollen, bites/stings etc

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 matrix, according to International Organization for Standardization Standard ISO 31000:2018.

I consider the inherent level of risk (risk level without control measures) to be:

Low risk **Medium risk** High risk Extreme risk

Control measures:

Hold test tube away from body when popping.
Explain possibility of test tube breakage and importance of safety glasses.
Ensure students check test tubes for signs of damage before popping.
Additional measures: safety glasses

With the specified control measures in place, I have found that all the risks are "low risk". Risks will therefore be managed by routine procedures in the classroom, in combination with the specified control measures.

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

Certification by Laboratory Technician

I have assessed the risks associated with preparing the equipment, chemicals and and biological items, including 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 matrix, according to International Organization for Standardization Standard ISO 31000:2018.

I consider the inherent level of risk (risk level without control measures) to be:

Low risk Medium risk High risk Extreme 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 electronic review notes or hand-written notes on a printout. It will be reviewed within 15 months as part of the regular review process.