RISK ASSESSMENT **Ecosolve High School Students**

Properties of carbon dioxide

Written by: Bill Wilkins, Mary Newt, Christina Lee **Commenced on:** 21 Jul 2024 **Expires:** 21 Oct 2025

Classes for which experiment is required

Teacher: Phillip Crisp **Year Group:** 10 Chemistry

Room	Period	Date
611	3	Wed 31/7/24

Items to be prepared by laboratory technician

10 g marble chips
100 mL 5M HCl
large test tube
100 mL beaker
wooden splints
100 mL limewater
matches

Procedure or reference, including variations

S&B p67
In addition, pour carbon dioxide from test tube into beaker to extinguish burning splint.

Equipment to be used

glass beaker, 200 mL or less

Potential hazards
Breakage of beaker. Cuts from chipped rims.

Standard handling procedures
Inspect and discard any chipped or cracked beakers, no matter how small the damage. Sweep up broken glass with brush and dustpan; do not use fingers.

large borosilicate glass test tube, ~150 mm x 25 mm (Pyrex test tube, ~150 mm x 25 mm)

Potential hazards
Breakage of test tubes. Cuts from chipped test-tube rims. More fragile than smaller test tubes. Large test tubes are preferred for exothermic reactions and for boiling, since material less likely to be ejected.

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.

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

calcium carbonate (calcite, chalk (rock), lime (limestone), limestone, marble chips) **$CaCO_3$**
CAS: 471-34-1

Class: nc PG: none Users: K-12 Training: 1-6

GHS data: Not classified as a hazardous chemical.

Potential hazards
Not toxic.

Standard handling procedures
Solubility ~0.6 mg/L at 20°C.

Disposal
May be placed in the garbage.

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.

Chemicals to be produced

carbon dioxide, gas generated during experiment **CO_2**

CAS: 124-38-9

Class: 2.2 PG: none Users: K-12 Training: 1-6

GHS data: Not classified as a hazardous chemical.

Potential hazards
Harmless, in quantities generated during experiments. Toxic at high concentrations in air due to absorption through lungs into blood, lowering the pH.

Standard handling procedures
DO NOT GENERATE CARBON DIOXIDE IN A CLOSED CONTAINER SINCE THE CONTAINER MAY EXPLODE. Magnesium burns in carbon dioxide to form magnesium oxide and carbon.

Disposal
Gas may be released to the atmosphere, provided it is not in an enclosed space.

Knowledge

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

Agreement by student(s)

I/we, Bill Wilkins, Mary Newt, Christina Lee, agree to conduct this experiment safely in accordance with school rules and teacher instructions.

Risk assessment

I/we 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

Assessment by Student(s)

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

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

Control measures:

Always point test tube away from any person.
Add hydrochloric acid slowly and carefully to avoid vigorous reaction and projection of material from test tube.
Dip matches and tapers in water to ensure extinguished before disposal.
Additional measures: safety glasses, gloves

With the specified control measures in place, I/we 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.

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 confirm that the risk level and control measures entered by student(s) above are correct and appropriate.

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.