

APPENDIX U

Note: This information is for reference purposes, it does not replace WHMIS training. The online Orientation to WHMIS training is required by all employees (includes graduate students). The online WHMIS Refresher is required 2 years after the Orientation, as well as every 2 years subsequent to this. The training can be accessed via the UPEI Health and Safety Website: <http://www.kccsoft.com/online/custom/upei.asp>. Contact Human Resources for further access information.

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)

University of Prince Edward Island

Why WHMIS?

The Workplace Hazardous Materials Information System (WHMIS) is the ‘law of the land’—compliance is not optional. WHMIS legislation came into effect on October 31, 1988 and is implemented through a combination of various Provincial and Federal laws. The legal requirements for WHMIS are found in the Occupational Health and Safety Act and Regulations. If found in violation, the employer, the supervisor, and/or the worker might be held liable.

The **institution** must put in place a program in compliance with WHMIS—this involves at the highest level of the University, through Health and

Safety, but the practical adoption of programs to ensure compliance with WHMIS requirements falls upon each Department.

The **employer/supervisor** has an obligation to provide for the safety of workers, making available to them proper information and education.

Workers (*all those working where hazardous materials are present, not just ‘employees’*) **have an obligation** to make use of available information (e.g. know what WHMIS Hazard Symbols mean; know what information is in a Material Safety Data Sheet *and* make use of it), and to comply with safe practices and safety legislation.

A Worker's ‘Right to Know’

WHMIS promotes safety through a worker's ‘right to know’. It has three components: labels; Material Safety Data Sheets (i.e. MSDSs); worker education. It is designed to ensure that employers obtain information to train employees properly about workplace hazardous materials.

For each controlled product (as defined by the federal Hazardous Products Act; see criteria on the ‘WHMIS Hazard Symbols, Classes...’ later in this appendix) suppliers must provide purchasers with hazard information by meeting WHMIS labelling requirements, and by providing detailed information on an MSDS.

Controlled products must be labelled according to WHMIS standards. This may mean replacing lost or damaged supplier labels, making worksite labels for bottles into which controlled products are placed, or updating labels on products manufactured prior to WHMIS implementation.

Our workers, be they staff, students or other researchers, must have ready access to hazard information. This is achieved primarily by ensuring access to MSDSs (see next page).

*If you work in an area where there are ‘hazardous products covered by the legislation’, you must: complete the online WHMIS training and Quiz and attend a site specific safety training session. Supervisors of those working in areas where hazardous materials are found *must also be familiar with WHMIS and departmental safety programs*, and *must ensure provision of the additional site specific safety training for their lab areas and projects*. WHMIS refreshers will be required.*

‘WORKERS’ ARE EXPECTED TO...

- ® **read instructional material** provided (and attend training sessions, as required)
- ® **know where to find and how to use WHMIS information**, such as MSDSs
- ® **follow safe procedures** when handling, using, storing or manufacturing controlled products
- ® **use control measures** (e.g. ventilation, fume hoods) provided at the worksite
- ® **use the right, properly maintained, personal protective equipment** (‘PPE’), e.g. to limit exposure to a controlled substance (eye protection, dust masks, gloves, aprons, etc.)

‘Controlled’ Products and Other Products

There is no detailed list of products which are controlled under WHMIS legislation. The determination is ‘performance based’, i.e. it depends on the behaviour of a material, not simply on its name. For example, sulfuric acid is a controlled product, not because it is ‘on a list’, but because it is corrosive, and corrosives *are* controlled products.

Some products covered by other legislation *may* be exempt from WHMIS legislation (*of course, this does not mean they are hazard-free!*). Such exemptions *may* be included under:

- Explosives Act
- Food and Drug Act
- Pest Control Products Act
- Atomic Energy Control Act
- Restricted Product (HPA)
- Wood & products made of wood
- Manufactured articles
- Tobacco products
- Products under Transportation of Dangerous Goods (*see the TDG section*)
- Hazardous Waste

Information on a Material Safety Data Sheet

An MSDS (*see sample MSDS*) has valuable information you should check before using a controlled product or a mixture which contains controlled products:

- product identification and use (synonyms, supplier’s name/emergency phone number)
- hazardous ingredients
- physical data
- fire and explosion data
- reactivity data
- toxicological properties/health hazard data
- first aid measures
- preventive measures (including handling, storage, waste disposal, spill/leak cleanup)
- preparation information (e.g. revision date)

How Current is an MSDS?

Canadian legislation still requires that an MSDS be created or revised within the past three years. If information about a new hazard becomes available, a supplier must provide an updated MSDS the next time a controlled product is ordered.

Where can You find an MSDS?

Each supervisor must ensure that hard copies of MSDSs are readily accessible to all employees within their immediate workspace.

Note that MSDSs for biohazardous infectious materials (WHMIS category D3) must also be kept.

MSDSs must be dated/revised within the past 3 years.

Electronic copies are now readily available from most supplier web sites and up-dated MSDSs can be obtained from them. Links to a number of university suppliers can be found on the UPEI Health and Safety web site: http://www.upei.ca/humanres/html/health_safety.html

Labelling of Chemicals, Solutions and Mixtures

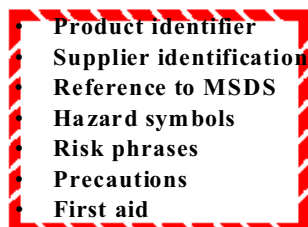
Upon receipt of a new reagent, on the label print the year and month received and your supervisor’s initials or name (e.g. ‘200407 AZ’).

Chemicals purchased since October 31, 1988 should already meet the WHMIS labelling requirements. Most chemicals from before that time are 'laboratory reagents' (see the next column) and will often meet WHMIS laboratory reagent labelling requirements, except for the need for a reference to the MSDS.

Containers of prepared solutions and mixtures (*and waste*) must be properly labelled as to contents and owner. There are two categories of labels under WHMIS legislation: Supplier Labels; Workplace Labels.

Supplier Labels — Required Information

Supplier labels have a distinctive 'hatched' border, in which there must be no extraneous information. The following must be included on the standard supplier label:



For small quantities of a controlled product (<100 mL), the label need only include:

- Product identifier
- Hazard symbols
- Supplier identifier
- Reference to MSDS

'Laboratory reagents' are chemicals which originate from a lab supply house, are packaged in quantities of under 10 kg, and are intended for laboratory use only. Labels for laboratory reagents need not have a hatched border (though they still may have one), but must include:

- Product identifier
- Risk phrases
- Precautionary measures
- First aid
- Reference to MSDS, if available

Workplace Labels — Required Information

There are situations where there will not be a supplier label, so a workplace label must be prepared by the end user. Such a label will be required:

- When the supplier label has been lost or destroyed
- On individual containers which are part of a bulk shipment
- For decanted ('poured out') product
- For controlled products produced and used at the workplace
- On controlled products from before October 31, 1988

The information printed on a workplace label need not be as extensive as that listed on a supplier label. There are 3 requirements on a workplace label:

- Product identifier
- Information for safe handling
(e.g. 'keep away from heat, sparks and flame', 'avoid breathing vapour')
- Reference to the MSDS

There are even more relaxed requirements for workplace 'laboratory labels'. Covered under these provisions are:

- Decanted products (e.g. 6 M HCl)
- Lab intermediates synthesized in and intended for use in a laboratory
- Reaction vessels

These 'laboratory labels' require only:

- Clear product identification (could just be printed on the bottle using a felt marker; please also include the owner's name)
- Product identifier
- Chemical identity or generic identity of ingredients, if sample is sent outside of UPEI
- Supplier identifier
- The statement 'Hazardous Laboratory Sample. For Hazard Information or in an Emergency Call 902-____ (contact telephone #).

Labels on lab samples, if controlled products, sent out for analysis or use elsewhere must meet the requirements above. [Note: Transportation of Dangerous Goods Regulations (TDGR) may also have to be met. You can check with any of personnel on campus who are currently trained and certified in TDG. The list can be found on the UPEI Health and Safety web site: <http://www.upei.ca/humanres/safety/>

EM Science
MATERIAL SAFETY DATA SHEET

Section I. Product Identification and Use

Manufacturer: EM Science P.O. Box 70, 480 Democrat Road, Gibbstown, NJ 08027

Emergency: 416-201-6383 (24 hr; CANUTEC) **Information:** 856-423-6300 (0800-1700 M-F; Tech. Service)

Product Name: Sodium hydroxide

Product Code(s): ACS816,B10252,B30167,B45212,K92768,SX0593,XX0443,006482,-

Chemical/Other Name: Sodium hydroxide; caustic soda; lye; sodium hydrate; natrium hydroxide; soda lye

Chemical Formula: NaOH

Chemical Family: Alkali hydroxide

TDG Shipping Name/UN: Sodium hydroxide, solid UN 1823 **TDG Classification/Packing group:** 8 PG II

Use: Laboratory reagent, industrial processes

Section II Hazardous Ingredients

<u>Chemical name</u>	<u>CAS No.</u>	<u>%</u>
Sodium hydroxide	1310-73-2	100

Section III Physical Data

Physical State: Solid

Appearance and Odour: White hygroscopic, pellets; odourless **Odour Threshold:** Not applicable

Specific Gravity: 2.13 **Vapour Pressure:** 1.0 mmHg at 739°C

Vapour Density: Not applicable **Evaporation Rate:** Not applicable

Boiling Point: 1390°C

Freezing Point: 318°C

pH: 12 (0.05% w/w solution), 13 (0.5% w/w solution), 14 (5.0% solution)

Coefficient of water/oil distribution: Not available

Section IV Fire or Explosion Hazard

Conditions of Flammability: Noncombustible

Extinguishing Media: Use an extinguisher appropriate to the surrounding material that is burning. Sodium hydroxide and its solutions will not burn or support combustion. However, reaction of sodium hydroxide with a number of commonly encountered materials can generate sufficient heat to ignite nearby combustible materials. Water can be used to extinguish a fire in an area where sodium hydroxide is stored as long as the water does not come into contact with the sodium hydroxide.

Flash point / method: None

UEL: Not applicable **LEL:** Not applicable

Autoignition Temperature: Not applicable

Hazardous Combustion Products: Na₂O

Explosion data: - sensitivity to mechanical impact: No - sensitivity to static discharge: No

Section V Reactivity Data

Conditions of instability: Normally stable, rapidly absorbs carbon dioxide from the air

Incompatibilities: Strong acids, metals, organohalogen compounds, nitro, chloro-organic compounds, peroxides, flammable liquids, chloroform/methanol mixtures

Conditions of reactivity: Normally stable

Hazardous decomposition products: Na₂O

Section VI Toxicological Properties / Health Hazard Data

Route of entry:

-**skin contact:** Causes severe burns

-**skin absorption:** No information available

-**eye contact:** Causes severe burns

-**inhalation:** Causes burns

-**ingestion:** Harmful

LC₅₀: Not available

LD₅₀: 500 mg/kg (orl-rat)

Exposure Limits: TLV-TWA: 2 mg/m³

Affects of Acute Exposure: Inhalation of sodium hydroxide will cause burns to the nose, throat and lungs. The onset of these affects may be delayed. Contact with eyes will cause irritation or severe burns depending on the concentration and duration of exposure. In severe cases, ulceration and permanent blindness may occur. Skin contact will cause severe burns, with deep ulceration, and penetration to the deeper layers will occur. Corrosion will continue until sodium hydroxide is removed. Ingestion may cause severe pain, burning of the mouth, throat and esophagus, vomiting, diarrhea, collapse and possible death.

Affects of Chronic Exposure: Prolonged or repeated overexposure to this product causes tissue destruction.

Irritancy: Standard Draize test: skin, rabbit 500 mg/24H - severe; eye, rabbit 50 ug/24H - severe

Sensitization to Product: No information available **Carcinogenicity:** No information available

Reproductive Toxicity: No information available **Teratogenicity:** No information available

Mutagenicity: No information available **Toxicologically Synergistic Products:** None found

Section VII First aid measures

Skin: Flush the contacted area with lukewarm running water for at least 15 minutes. Remove contaminated clothing, taking care not to spread the chemical. If contamination is extensive, remove clothing under running water. Discard or decontaminate clothing before re-use. Unless contact has been slight, seek medical attention. Seek medical attention if irritation persists.

Eye: Flush the contaminated eye(s) for at least 15 minutes with lukewarm running water, holding the eyelids open. Take care not to rinse contaminated water into the non-affected eye. Always seek medical attention for accidents involving the eyes.

Inhalation: Take proper precautions to ensure your own safety before attempting rescue. Remove source of contamination or move victim to fresh air. If breathing has stopped, trained personnel should begin artificial respiration, or if the heart has stopped, cardiopulmonary resuscitation (CPR) immediately. Seek medical attention.

Ingestion: Never give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. Rinse mouth thoroughly with water. Do not induce vomiting. Have victim drink 200-400 mL of water to dilute. If breathing has stopped, trained personnel should begin artificial respiration, or if the heart has stopped, cardiopulmonary resuscitation (CPR) immediately. Seek medical attention.

Section VIII Preventive Measures

Engineering Controls: Engineering control methods to reduce hazardous exposures are preferred. Methods include mechanical ventilation (dilution and local exhaust), process or personnel enclosure, control of process conditions, and process modification. Administrative controls and personal protective equipment may also be required. Use a corrosion resistant ventilation system separate from other exhaust ventilation systems. Exhaust directly to the outside.

Personal Protective Equipment:

-**gloves:** Rubber, neoprene, nitrile, PVC or equivalent

-**respiratory protection:** Approved respirator, fume hood as appropriate

-**eye protection:** Chemical safety goggles or face shield

-**clothing:** Plastic apron, sleeves and boots as appropriate

Storage Requirements: Store in suitable labelled containers. Keep containers tightly closed when not in use and when empty. Protect from damage. Store away from incompatible materials.

Handling Procedures and Equipment: Avoid generating dust. Follow routine safe handling procedures.

Leak or Spill Clean-up: Before dealing with spillages take necessary protective measures, inform others to keep at a safe distance and, for flammable materials, shut off all possible sources of ignition. Transfer carefully into container and arrange removal by disposal company. Wash site of spillage thoroughly with water and detergent.

Disposal: Follow all federal, provincial and local regulations for disposal. Use only licensed disposal and waste hauling companies. Disposal of small amounts of spilled material may be handled as described under "Leak or Spill Cleanup". Large spills must be dealt with separately and must be handled by qualified disposal companies.

Special Shipping Information: Follow all TDG regulations and see classification in Section I.

Section IX Preparation Information

Prepared by: Technical Affairs Department, BDH Inc., Toronto, Ontario (416)255-8521

For questions contact: Regulatory Affairs Dept, EM Science, Gibbstown, NJ (856) 423-6300

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WHMIS Hazard Symbols, Classes, and related Safety Information

Symbol	Class	Description	It means that the material...	And that you should...
	A	Compressed gases	• poses an explosion danger because the gas is held in a cylinder under pressure • may cause its container to explode if heated in a fire • may cause dropped container to explode	• handle with care; do not drop cylinder • keep cylinder away from potential sources of ignition • store the containers securely, in a designated area • keep valve covers on while storing or moving and when cylinders are not in use
	B	Combustible and flammable materials	• is one that will burn and is therefore a potential fire hazard • may burn at relatively low temperatures; flammable materials catch fire at lower temperature than combustible materials • may burst into flame spontaneously in air; or emit flammable gas on contacting water • may cause a fire when exposed to heat, sparks or flames, or via friction	• keep the material away from heat sources and other combustible materials • never smoke when working with or near the material • store the material in a cool, fire-proof area, as designated by your supervisor
	C	Oxidizing materials	• poses a fire/explosion risk in the presence of flammable/combustible material • may cause fire if it comes into contact with combustible materials, e.g. wood • may react violently or cause an explosion if it comes into contact with combustible materials such as fuels • may burn skin and eyes upon contact	• keep the material away from combustible materials, and store in a designated area • keep the material away from sources of ignition • never smoke when working near material • wear the proper protective equipment, including eye, face and hand protection and protective clothing
	D1	Poisonous and infectious materials: Immediate and serious toxic effects	• is a potentially fatal poisonous substance • may be fatal or cause permanent damage if it is inhaled or swallowed, or if it enters the body through skin contact • may burn eyes or skin upon contact	• handle material with extreme caution • avoid contact with the skin or eyes by wearing proper protective equipment, including eye, face and hand protection, and protective clothing • avoid inhaling by working in well-ventilated areas and/or wearing respiratory equipment • wash and shower thoroughly after use • store material in designated areas only

Symbol	Class	Description	It means that the material...	And that you should...
	D2	Poisonous and infectious materials: Other toxic effects	• is a poisonous substance that is not immediately dangerous to health • may cause death or permanent damage as a result of repeated exposures over time • may be a skin or eye irritant • may be a sensitizer which produces a chemical allergy • may cause cancer • may cause birth defects or sterility	• avoid skin and eye contact by wearing all protective equipment necessary, including eye, face and hand protection, and protective clothing • avoid inhaling by working in well-ventilated areas and/or wearing respiratory equipment • store material in designated areas only
	D3	Poisonous and infectious materials: Biohazardous infectious materials	• may cause a serious disease, resulting in illness or death	• take every measure to avoid contamination • handle material only when fully protected by the proper, designated equipment • handle material in designated areas where engineering controls are in place to prevent exposure
	E	Corrosive materials	• causes severe eye and skin irritation upon contact • causes severe tissue damage with prolonged contact • may be harmful if inhaled	• keep containers tightly closed • avoid skin and eye contact by wearing all necessary protective equipment, including eye, face and hand protection, and protective clothing • avoid inhaling by using in well-ventilated areas only and/or wearing the proper respiratory equipment
	F	Dangerously reactive materials	• is very unstable • may react with water to release a toxic or flammable gas • may explode as a result of shock, friction or increase in temperature • may explode if heated in a closed container • may undergo vigorous polymerization	• open containers carefully; do not drop them • store material in a cool, flame-proof area, as designated by your supervisor • keep material away from heat

Transportation of Dangerous Goods (TDG)

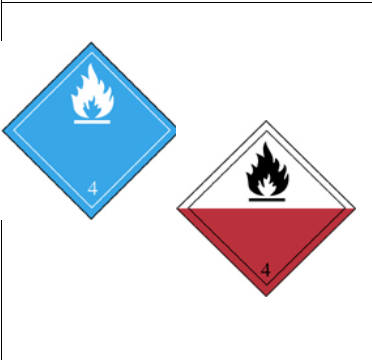
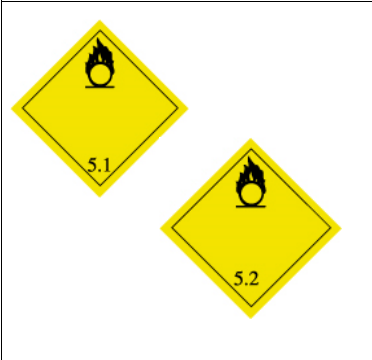
TDG and WHMIS are covered under *separate* legislation. **TDG package labels ('diamonds') should not be confused with the circular WHMIS symbols** (which are on the *two previous* pages). These two pages provide basic knowledge of TDG classes and symbols.

TDG regulations cover shipment of dangerous goods on land, e.g. roadway (including between university buildings), and via airplane. Persons with TDG training should receive and open, or supervise opening of, items covered under the TDG Act, and should be consulted to ensure 'dangerous goods' are shipped properly (see the UPEI Health and Safety web site for a listing of university personnel with current TDG training). When a TDG-labelled package is received, it should be verified that it conforms to TDG specifications. TDG regulations don't apply when moving a package within a building, once it has been properly received. **Note: dangerous goods should not be transported 'on the road' by personal vehicle or by bicycle.**

TDG labels are diamond shaped, are usually numbered to indicate the class, typically include descriptive symbols, and often have a distinctive color. The class number on the label denotes the only (or the primary) hazard for a substance, as defined by TDG regulations. When a substance has two or more different hazards, the class number is omitted on the TDG label corresponding to a 'secondary hazard'. On the package there will also be more specific identification of the hazardous substance(s), e.g. 'UN 1823 Sodium Hydroxide 1 kg'. A package may have a number of TDG labels, e.g. if it contains different substances in at least two different classes. **Note: All TDG warning labels must be removed or defaced immediately upon emptying packages or containers.**

Under TDG there are 9 classes of dangerous goods:

	<u>Class 1—Explosives</u> Orange labels, but with different symbols and division ('sub-class') numbers to indicate the type of explosion hazard. 'EXPLOSIVE' may be printed on some labels.
	<u>Class 2—Gases</u> This class has five labels. A red label with a 'fire symbol' and the number 2 denotes Class 2.1 (flammable gas). A green label and a white compressed gas cylinder symbol is 2.2 (non-flammable, non-poisonous, non-corrosive gas). Class 2.3 (toxic/poisonous gas) is a white label with a 'skull and crossbones' symbol; the words 'Poison gas' may optionally appear on it. Class 2.4 (corrosive gas; recognized for land shipments only) has a white label with a black compressed gas symbol. Finally, oxygen (for land shipments) has a special yellow label with an 'oxidizer symbol'.

	<u>Class 3—Flammable liquids</u> Red label, with a fire symbol and the number ‘3’ (i.e. the class) at the bottom of the diamond. Flammable liquids have ‘a closed-cup flash point not greater than 61°C’.
	<u>Class 4—Flammable solids; Substances liable to spontaneous combustion; Substances that on contact with water emit flammable gases (water-reactive substances).</u> Divisions: 4.1 (‘a solid that under normal conditions of transport is readily combustible...’; label has red vertical stripes on a white background, and a ‘fire symbol’); 4.2 (‘substance liable to spontaneous combustion..., or in contact with air, liable to spontaneous heating to the point where it ignites’; bottom half of label red, fire symbol in the top half); and 4.3 (‘...contact with water emits dangerous quantities of flammable gases...’; blue label, with fire symbol).
	<u>Class 5—Oxidizing Substances & Organic Peroxides</u> Yellow label with fire-oxidizing symbol. If 5.1 is printed on the label, the substance ‘causes or contributes to combustion of other material...’. If 5.2: an ‘organic compound that contains the bivalent -O-O- structure ... strong oxidizing agent and may be liable to explosive decomposition, be sensitive to heat, shock or friction...’
	<u>Class 6—Toxic (Poisonous) & Infectious Substances</u> White label, various symbols, e.g.: ‘skull and crossbones’ (toxic/poisonous), or ‘biohazard symbol’ and ‘INFECTIOUS’ on the label .
	<u>Class 7—Radioactive Materials</u> Labels have the ‘radioactive symbol’ and the word ‘RADIOACTIVE’; may have a yellow top half as background to the radioactive symbol.
	<u>Class8—Corrosives</u> Black and white label. A corrosive substance is defined as one which ‘... causes visible necrosis of skin or corrodes steel or non-clad aluminum’.



Class 9—Miscellaneous Products or Substances

Miscellaneous dangerous goods not covered in any other class, e.g. dry ice. If air transport included, white label, with black vertical lines in the top half. If only via land, red ‘!’, not stripes.