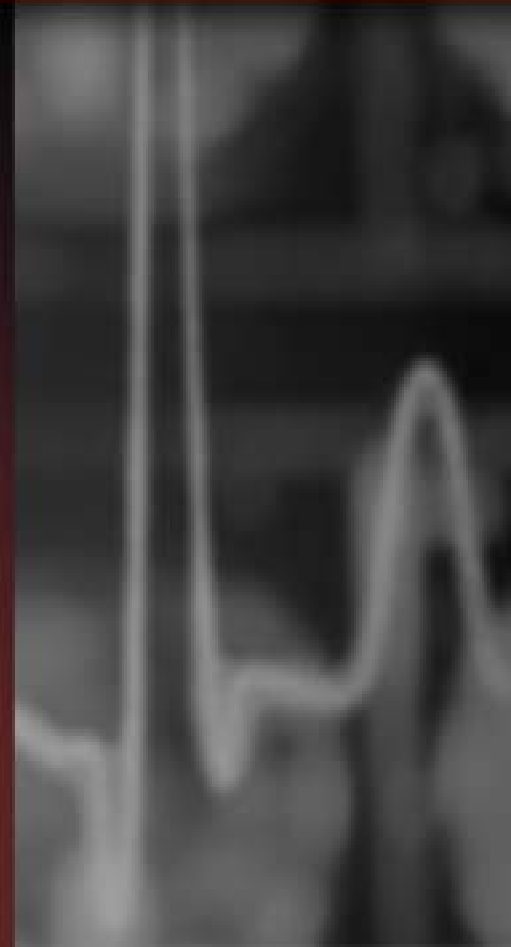


Workplace Hazardous Materials

Information System
(WHMIS)



WHMIS Training Outline

- Introduction
- Labels (Types, Content, Design)
- Material Safety Data Sheets (MSDS)
- Responsibilities of workers and supervisors
- WHMIS Test



Why is WHMIS important?

- **Requirement of OSHA Act**
- **Awareness of risk and hazards in Workplace**
- **“Due Diligence”**

Due Diligence

- The law requires that we act with due diligence, which means that we must demonstrate that we took all reasonable care in carrying out our activities, e.g., in laboratories



Responsibilities

- **To fulfill their individual responsibilities, workers (employees, professors, contract personnel) must:**
- **know what these responsibilities are**
- **have sufficient authority to carry them out (organizational issue)**
- **have the required ability and competence (training or certification required)**

- **Note: While not technically “workers”, students and volunteers are considered as “equivalent to”**

Worker's Responsibilities

- **Responsibilities of workers include:**
- **using personal protection and safety equipment as required by the employer**
- **following safe work procedures**
- **knowing and complying with all regulations**
- **reporting any injury or illness immediately**
- **reporting unsafe acts and unsafe conditions**

Worker's Rights

- **right to refuse unsafe work**
- **right to know, or the right to be informed about, actual and potential dangers in the workplace**

Supervisor's Responsibilities

- **instructing workers to follow safe work practices**
- **enforcing health and safety regulations**
- **correcting unsafe acts and unsafe conditions**
- **ensuring that only authorized, adequately trained workers operate equipment**
- **reporting and investigating all accidents/incidents**
- **inspecting own area and taking remedial action to minimize or eliminate hazards**
- **ensuring equipment is properly maintained**
- **promoting safety awareness in workers**

Workplace Hazardous Materials Information System

- **To provide information on hazardous materials used in the workplace**
- **To facilitate the process of hazard identification**
- **To ensure consistency of hazard information.**

Key Elements of WHMIS

- Labels (Identification):
 - Supplier
 - Workplace
- Material Safety Data Sheets or MSDSs (Information)
- Training

What is a Hazardous Material?



- A: Compressed Gases
- B: Flammable and Combustible
- D1: Immediate effects
- D2: Other toxic effects
- E: Corrosives
- D3: Biohazardous agents
- C: Oxidizers
- F: Dangerously reactive

Compressed Gas Definition

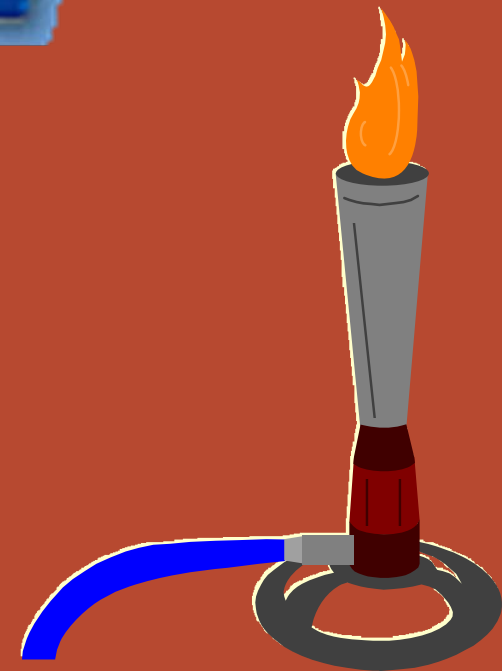
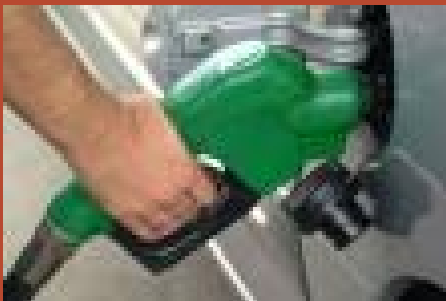


- Compressed gases
- Dissolved gases
- Gas at room temperature
- Gases liquefied by compression
- Refrigerated gases

Flammable and Combustible



- 1: Flammable Gas
- 2: Flammable liquids
- 3: Combustible liquids
- 4: Flammable solids
- 5: Flammable aerosols
- 6: Reactive flammable materials



Flammable and Combustible Flammable Liquids

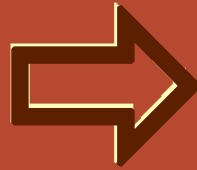
- Flashpoint
- $\leq 37.8\text{ }^{\circ}\text{C}$
- Ethanol
- THF
- Toluene
- Acetone
- Methanol
- Hexane



Oxidizing Materials Oxidizers

- Causes or contributes to the combustion of another material by yielding oxygen or any other oxidizing substance
- Nitrates (ammonium nitrate), nitrites
- Bromates, chlorates
- Perchlorates, permanganates
- Nitric acid





Poisonous and Infectious

- 3 Divisions
- Materials causing immediate and serious toxic effects (two sub divisions)
- Materials causing other toxic effects (Two sub divisions)
- Biohazardous infectious material
- LD50 is lethal dose for 50% of test animal population
- LC50 is lethal concentration for 50% of test animal population (airborne)

Lethal Dose LD50/LC50

LD/LC = 0



LD/LC = 50 %



Materials causing Immediate and Serious Toxic Effects

- *“What is it that is not poison? All things are poison and nothing*
- *is without poison. It is the dose only that make a thing not a poison”* Theophrastus Paracelsus (1493 - 1541)
- Immediate symptoms, e.g., nausea, headache, vomit
- Sub-division A: Very Toxic (low LD50 and LC 50)
- Benzene, chlorine, phosphine
- Sub-division B: Toxic (higher LD50 and LC50)

Materials Causing Other Toxic Effects

- Longer term effects, e.g., carcinogens, mutagens, sensitizers
- Ethidium Bromide (mutagen)
- Halothane (teratogen)
- Acrylamide (neuro toxic)
- Formaldehyde (suspected carcinogen)



Biohazardous Infectious Material

- Viruses (HIV, flu, Hepatitis)
- Bacteria (E.coli, salmonella, strep)
- Blood
- Animal or human tissue
- Tissue culture cells



Corrosive Materials

- **Substances that corrode steel or destroy human/animal tissue**
- **Acids: Sulphuric acid**
- **Bases: Sodium hydroxide**
- **Gases: Chlorine**



Dangerously Reactive Material

- Reacts violently with water to produce a poisonous gas, e.g., alkali metal cyanides
- Undergoes vigorous polymerization, decomposition, or condensation, e.g., 1,3-butadiene
- Becomes self reactive under conditions of shock, friction or increase pressure or temperature, e.g., metal azides, dry picric acid



WHMIS Labels

- Two types of WHMIS label:
- Supplier
- Workplace
- First line of information
- Identifies hazardous material in container
- Draws attention to MSDS
- Alert to dangers and hazards of product

Supplier Label Required Elements

- Name of product
- Name of supplier, e.g., BDH, Fisher
- Reference to MSDS
- Hazard Symbols
- Risk phrases
- Precautionary measures
- First aid measures

Design Requirements

- Label should be in English
- Should have a distinctive hatched border (some labels excepted)
- Must be legible and displayed so can be seen
- Must be sufficiently durable to remain attached under normal lab conditions

Supplier Label

SULPHURIC ACID, FUMING ACIDE SULFURIQUE

Risk phrases:

HIGHLY IRRITATING TO SKIN, EYES AND NOSE.

Health Hazard Data:

STRONG ACID, VAPOURS HIGHLY TOXIC, BURNS SKIN ON CONTACT.

Precautionary Statements:

EYES: FACESHIELD AND GOGGLES
GLOVES: RUBBER

Personal Protective Equipment:

RUBBER APRON, RUBBER BOOTS.

First Aid Measures:

EYES: FLUSH WITH LARGE QUANTITIES OF WATER. CONSULT PHYSICIAN AT ONCE.
SKIN: FLUSH WITH WATER. CONSULT PHYSICIAN.

Ingestion:

TREAT WITH BAKING SODA, MILK OF MAGNESIA OR LARGE QUANTITIES OF MILK. DO NOT INDUCE VOMITING.



Risque(s) possible(s):

EXTREMEMENT IRRITANT POUR LA PEAU, LES YEUX ET LE NEZ.

Reinseignement sur les dangers pour la santé:
ACIDE FORTE, TRAITER COMME POUR L'ACIDE FORTE.

Surexposition aigue: PEAU ET YEUX.

Measures de precaution:

EQUIPMENT DE PROTECTION SPECIFIQUE:
YEUX: ECRAN FACIAL ET LUNETTES
GANTS: EN CAOUTCHOUC

Autre vêtements et equipment:

TABLIER EN CAOUTCHOUC, BOTTES EN CAOUTCHOUC.

Premiers Soins:

YEUX: BIEN RINCER A GRANDE EAU PENDANT 15 MINUTES. CONSULTER UN MEDECIN.

Peau: RINSER A L'EAU. CONSULTER UN MEDECIN.

Ingestion: TRAITER COMME POUR L'ACIDE FORTE. CONSULTER UN MEDECIN.

**REFER TO MATERIAL DATA SHEET FOR FURTHER INFORMATION.
POUR PLUS D'INFORMATION, CONSULTER LA FICHE SIGNALÉTIQUE.**

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Exceptions to Supplier Label

- Containers \leq 100 ml
- Supplies from a stores facility
- Laboratory samples, e.g., samples sent away for analysis
- Labels from a laboratory supply house, e.g., BDH, Fisher, Sigma-Aldrich

Workplace Labels

- Used when no supplier label present
- Usually prepared by the lab or faculty
- Science stores prepares workplace labels upon request
- Medicine stores has blank workplace labels and hazard pictograms to be completed by lab personnel
- Home made labels acceptable

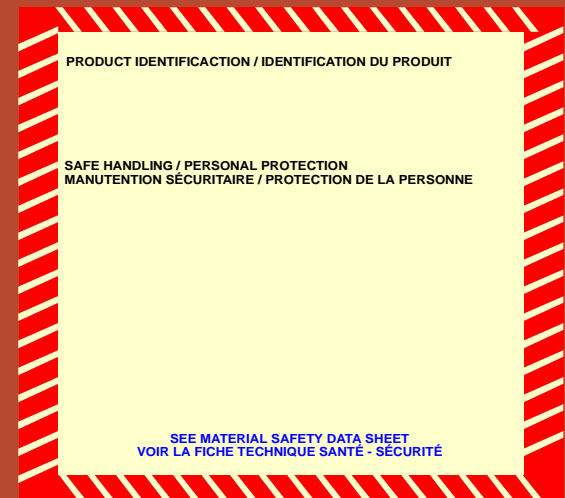
Workplace Labels

Examples of use

- Product purchased prior to WHMIS (1988)
- Original supplier label lost, defaced or illegible
- Experimental sample for use in the lab (NOT reaction intermediates)
- Product decanted from one container to another, e.g., into wash bottles
- Laboratory reagents
- Hazardous waste
- Research samples, chemicals \leq 10 ml

Workplace Labels Design Requirements

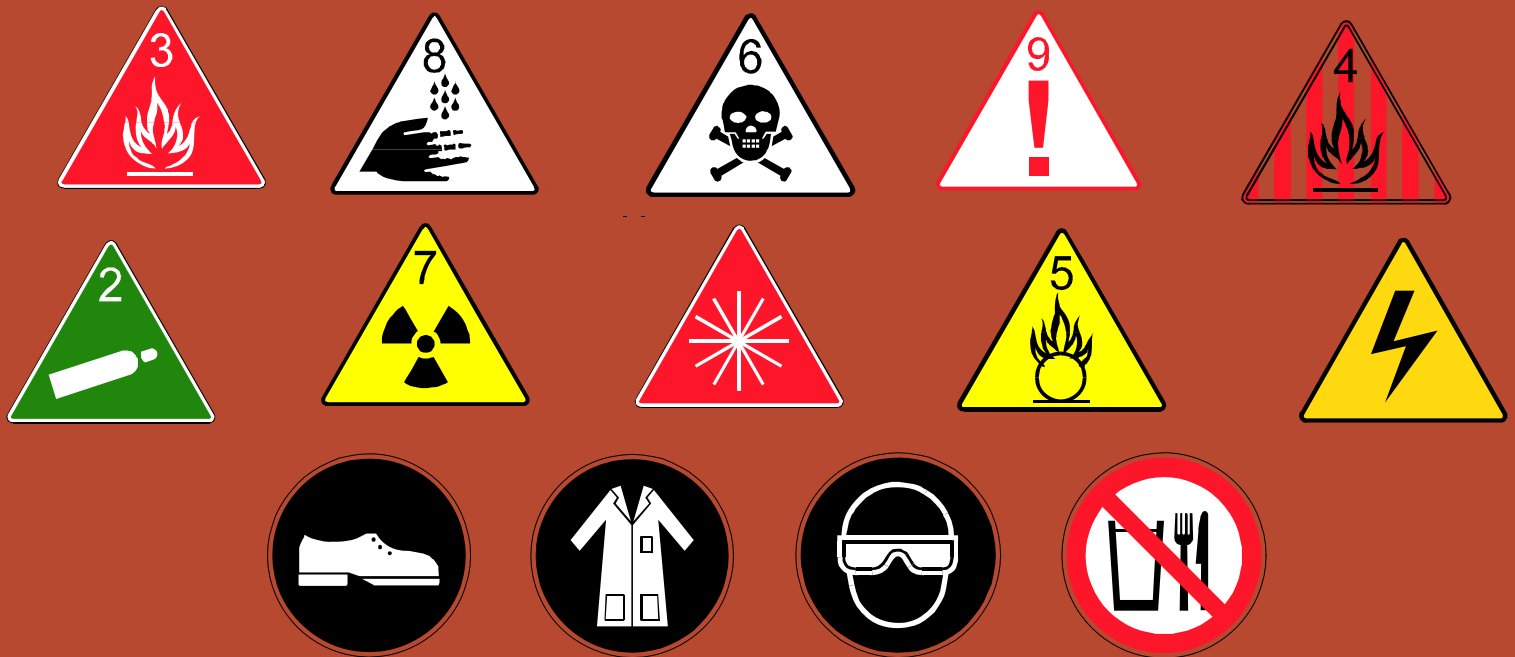
- Name of product
- Safe handling information
- Reference to MSDS
- No design requirements, e.g., no hatched border



Other Labels and Warning Signs

- Lab Doors Signs
- Hazardous waste
- Radioisotope Decay
- Biohazard
- Scintillation Waste
- Radioactive trefoil

Lab Doors Warning Signs



Hazardous Waste

- Chemical wastes
- Sharps containers

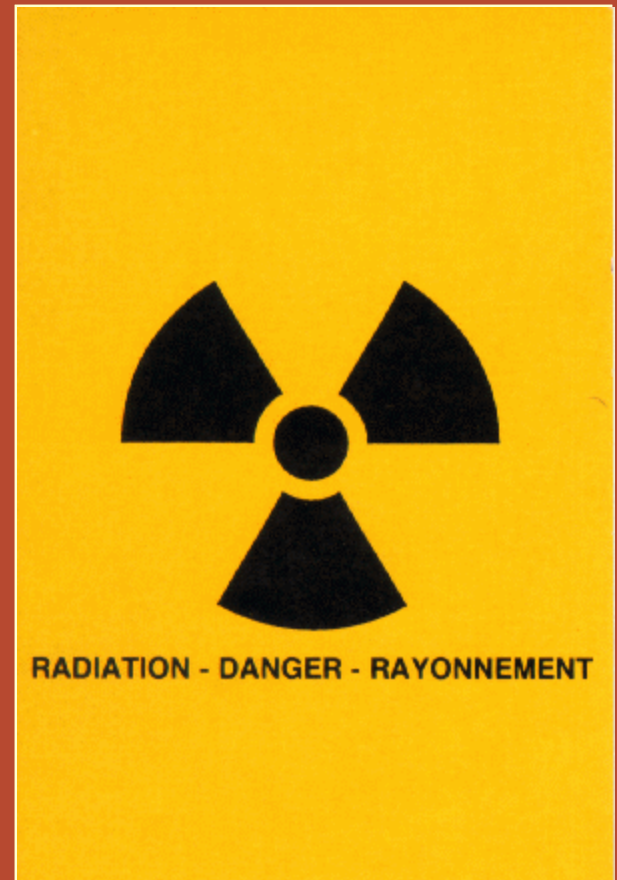
Biohazard

- Sharps container
- Biohazard bags
- Biohazard drum
- Biohazard rooms



Radioactive Trefoil

- Labs with radioactive materials
- Containers with radioactive materials



Material Safety Data Sheets

- Provides more detail than on label
- Describes safe use of product and emergency/spill clean up procedures
- MSDS contains current information
- Updated every three years
- MSDS must be readily available
- Contains minimum nine categories
- MSDS varies in length and detail

Where To find MSDS's

- Must be available in each laboratory (paper or electronic)
- Must be provided by the Supplier
- Internet is largest resource
 - <http://www.ilpi.com/msds/>
 - <http://www.mmc.edu/page.asp?SID=2&Page=1331>
 - http://www.state.nj.us/health/eoh/odisweb/ca_hsfs.htm

MSDS Categories

- Preparation Date and who prepared
- Product Information
- Hazardous Ingredients
- Physical Data
- Fire and Explosion Hazard
- Reactivity Data
- Toxicological Properties
- Preventative Measures
- First Aid Measures

MATERIAL SAFETY DATA SHEET					
SECTION I - MATERIAL IDENTIFICATION AND USE					
Material Name		BCD			
Manufacturer's Name		EKLUMEN 2482 Yonge St., Unit #77, Toronto, Ontario M4P 2H5			
Emergency Telephone Number:		call your local police control			
Chemical Name	Chemical Family	Trade Name and Synonyms		Chemical Formula	
NA	Emulsion	BCD		Proprietary blended mixture	
Molecular Weight				Material ID	
NA				CD Restorer	
SECTION II - HAZARDOUS INGREDIENTS OF MATERIAL					
Hazardous Ingredients	Approximate Concentration %	D.A.S. H.A. or G.A. Numbers	Exposure Limits	LD ₅₀ /TL ₀₁ (mg/kg body wt.)	
Distillates, Petroleum	10.0 - 20.0	64742-48-9	300 mg/m ³	LD ₅₀ 5000 mg/kg rat, oral LD ₅₀ 3000 mg/kg rabbit, skin	
Amino-Alkoxy Dimethyl Siloxane	1.0 - 5.0	71750-80-6	TWA 200 ppm	LD ₅₀ 5600 mg/kg rat, oral LD ₅₀ 64000 ppm, rat, inhalation	
SECTION III - PHYSICAL DATA FOR MATERIAL					
Physical State	Odor and Appearance		Other Threshold (p.p.m.)	Specific Gravity	
Gas <input type="checkbox"/> Liquid <input checked="" type="checkbox"/> Solid <input type="checkbox"/>	Viscous liquid, mild solvent odor		NE	.93	
Vapor Pressure (mm Hg)	Relative Volatility (air=1)	Evaporation Rate	Boiling Point (°C)	Freezing Point (°C)	
NE	NE	NE	100*	0*	
Solubility in Water (mg/l)	% Soluble (by volume)	pH	Coefficient of water of distribution		
Not soluble	84	6.0 - 8.5			
SECTION IV - FIRE AND EXPLOSION HAZARD OF MATERIAL					
Flammability	If yes, under which conditions:		Lower explosion limit (% by volume)		
Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>			NE		
Means of Extinction	CO ₂ , dry chemical, foam				
Special Precautions	Fight like a fuel oil fire. Cool fire exposed containers with water spray. Fire fighter should wear OSHA/NIOSH approved self-contained breathing apparatus.				
Flash Point (°C) and Method	Upper explosion limit (% by volume)	Hazardous Combustion Products		Upper explosion limit (% by volume)	
61°C	NE	Oxides of carbon		NE	
Auto-ignition Temperature (°C)	Rate of Burning		Explosive Power	Sensitivity to Static Discharge	
NE	NE		NE	NE	
SECTION V - REACTIVITY DATA					
Chemical Stability	If yes, under which conditions:				
Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>					
Incompatibility with other substances	If yes, under which conditions: Strong acids, alkalis, oxidizers				
Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>					
Reactivity and under what conditions	Direct contact.				
Hazardous Decomposition Products					
Oxides of carbon					

Physical Data

- Physical state, e.g., solid, liquid
- Odour and appearance
- Vapour pressure
- Vapour density
- Evaporation rate
- Boiling points/ freezing points
- pH

Fire and Explosion Hazard

- Flammability
- Means of extinction
- Flashpoint
- Flammable limits (LFL, UFL)
- Auto-ignition temperature
- Hazardous combustion products
- Explosion data, e.g., sensitivity to shock



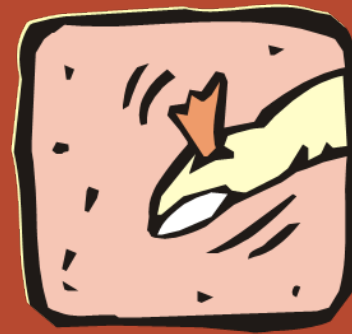
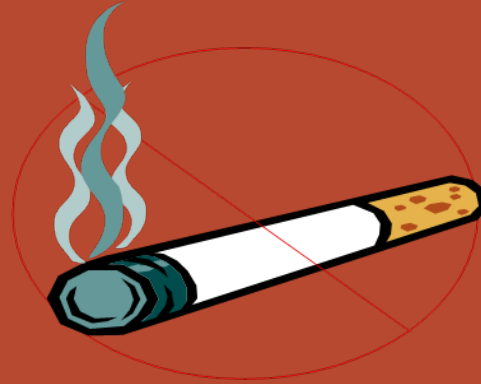
Reactivity Data

- Chemical compatibility
- Incompatibility of chemicals/ products
- Conditions of reactivity
- Hazardous decomposition products



Toxicological Properties

Routes of entry into the body



Toxicological Properties

- Effects of short term acute exposure
- Effects of chronic long term exposure
- Exposure limits
- Time weighted average exposure value
- Short term exposure value
- Exposure ceiling
- Threshold limit value
- LD50 and LC50

Preventive Measures

- Personal protective equipment, e.g., gloves, lab coat, safety goggles
- Storage requirements, e.g, shelf life, control of sources of ignition
- Engineering controls, e.g. ventilation, fume hoods
- Waste disposal: Note follow College guidelines only
- Leak and spill procedures, e.g., clean up small spills. Larger spills contact 6642.

Summary

- Be aware of hazardous materials in your workplace
- Label all your containers
- Know where to find information
- Use safe practices and procedures
 - Engineering controls
 - PPE
- Ask questions before not after.....What happens can have a lasting effect!

