

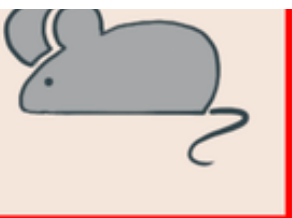
## **Science Fun Facts**

- *There is enough DNA in an average person's body to stretch from the sun to Pluto and back 17 times.*
- *The average human body carries ten times more bacterial cells than human cells.*
- *It can take a photon 40,000 years to travel from the core of the sun to its surface, but only 8 minutes to travel the rest of the way to Earth.*
- *At over 2000 kilometers long, The Great Barrier Reef is the largest living structure on Earth.*
- *There are 8 times as many atoms in a teaspoonful of water as there are teaspoonfuls of water in the Atlantic ocean.*
- *The average person walks the equivalent of five times around the world in a lifetime*
- *When Helium is cooled to almost absolute zero (-460°F or -273°C), the lowest temperature possible, it becomes a liquid with surprising properties: it flows against gravity and will start running up and over the lip of a glass container!*
- *If Betelgeuse would explode transiting from the red super giant stage to supernova then our sky would light continuously for two months. It can happen anytime, within a couple of thousand years, tomorrow or even now.*
- *An individual blood cell takes about 60 seconds to make a complete circuit of the body.*
- *The known universe is made up of 50,000,000,000 galaxies. There are between 100,000,000,000 and 1,000,000,000,000 stars in a normal galaxy. In the Milky Way alone there might be as many 100,000,000 planets.*

GARDEN VALLEY COLLEGIATE  
SCIENCE DEPARTMENT

# LAB

# SAFETY



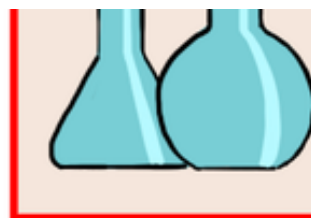
ANIMAL  
HAZARD



SHARP INSTRUMENT  
HAZARD



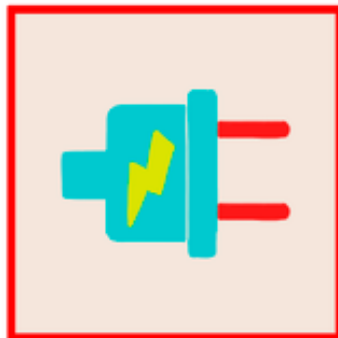
HEAT HAZARD



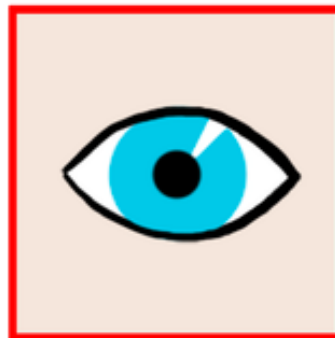
GLASSWARE  
HAZARD



CHEMICAL  
HAZARD



ELECTRICAL  
HAZARD



EYE & FACE  
HAZARD



FIRE  
HAZARD



BIOHAZARD



LASER RADIATION  
HAZARD



RADIOACTIVE  
HAZARD



EXPLOSIVE  
HAZARD

# What is this thing called “WHMIS”?

To benefit from WHMIS, you must know what it is and how the system works.

1. WHMIS stands for Workplace Hazardous Materials Information System.
2. It is an information system implemented in 1988, that is designed to help students know more about safety and health hazards of materials that they use in the workplace.
3. WHMIS gives workers and employers key safety and handling information in the form of special labels, symbols, and Material Safety Data Sheets (MSDS) on potentially dangerous chemicals that are used on the job.
4. You will come across controlled products that fall under the WHMIS legislation at school (for example, the chemicals used in your science and shop class), and at any workplace where chemicals are used.

## WHMIS Labels

All controlled products at school or the workplace must have WHMIS labels.

The purpose of a WHMIS label is to identify the product as controlled and alert workers or handlers to the hazards and safe handling procedures of the product. A WHMIS label is just a first alert, as the amount of information in it is limited by its size. The MSDS provides more detailed information.

It is important that you read the whole label before using a product for the first time. The label will give a brief summary of the most important things to know about the chemical.

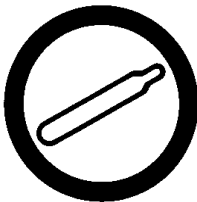

This includes:



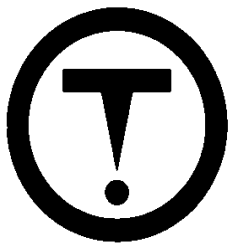
- Name of the chemical: may be the common name, trade name, generic name, brand name, code name.
- The WHMIS hazard symbols: hazard symbols representing the WHMIS hazard classes.
- Risks and precautions: Short phrases describing the hazards to supplement the information provided by the symbols, and precautions to be taken when using, handling or being exposed to the product.
- First Aid instructions: These statements indicate immediate first aid measures that can be taken by the victim or others in case of an accident or emergency.
- Supplier's name and address.
- A reference to the matching MSDS stating that more information is available.

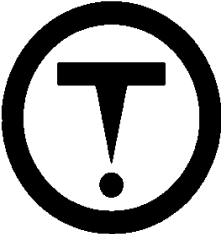





# WHMIS Symbols

The shapes of the symbols used on labels have been chosen to show the nature of the hazard they represent.













<p><b>Class A</b></p>	<p><b>COMPRESSED GAS</b></p> <ul style="list-style-type: none"> <li>• It is a gas kept under pressure.</li> <li>• Heat may cause the container to <u>explode</u>.</li> <li>• A drop or impact may cause the container to explode. E.g. steel cylinders of acetylene, oxygen, hydrogen, helium, chlorine, nitrogen, neon, argon etc. and fire extinguishers.</li> <li>• Compressed gases can be hazardous simply because they are under high pressure, and the gas itself can also be hazardous (like chlorine gas). If the gas itself is hazardous, it will have other appropriate hazard symbols along with the compressed gas symbol.</li> <li>• Handle with care, do not drop.</li> <li>• Keep away from heat or potential sources of ignition. Store in a designated area. Large cylinders must be properly secured with a chain.</li> </ul>	
<p><b>Class B</b></p>	<p><b>FLAMMABLE AND COMBUSTIBLE MATERIALS</b></p> <ul style="list-style-type: none"> <li>• The material is a potential fire hazard. It may burn at relatively low temperature. Sparks, flame or friction could ignite it.</li> <li>• May burst into flame spontaneously in air or release a flammable gas on contact with water.</li> <li>• Keep any of these materials away from heat sources and other combustible materials. Never smoke when working with or near the materials. Store in a cool, fire-proof area.</li> </ul> <p><b>Division 1: Flammable Gases:</b> E.g. hydrogen, methane, propane.</p> <p><b>Division 2: Flammable Liquids</b> Flashpoint less than 37°C. These liquids catch on fire easily and have highly flammable fumes. E.g. gasoline, ethanol, methanol, diethyl ether.</p> <p><b>Division 3: Combustible Liquids:</b> Flashpoint &gt; 37°C E.g. diesel fuel, kerosene. These are less easily ignited than flammable liquids.</p> <p><b>Division 4: Flammable Solids:</b> E.g. magnesium, sodium, beryllium.</p> <p><b>Division 5: Flammable Aerosols:</b> E.g. most aerosol cans contain flammable propellants, also butane, propane in aerosol containers.</p> <p><b>Division 6: Flammable Reactive Materials:</b> Materials that could spontaneously ignite in air (celluloid, lithium aluminum hydride) or in water (sodium).</p>	

<p><b>Class C</b></p>	<p><b>OXIDIZING MATERIALS</b></p> <ul style="list-style-type: none"> <li>• The material is a fire or explosion risk near flammable or combustible material. May <u>burn</u> skin or eyes on contact.</li> <li>• An oxidizing material may or may not burn itself, but will release oxygen or another oxidizing substance, and thereby causes or helps a flammable or combustible material to burn. E.g. sulfuric acid, perchloric acid, hydrogen peroxide, sodium peroxide, benzyl peroxide, permanganates, dichromates, perchlorates, chlorine and bleach.</li> <li>• Keep the material away from combustible materials and store in designated areas. Keep the material away from sources of ignition. Never smoke when working near the material.</li> <li>• Wear proper protective equipment, including eye, face and hand protection and protective clothing.</li> </ul>	
<p><b>Class D</b></p>	<p><b>POISONOUS AND INFECTIOUS MATERIAL</b></p> <ul style="list-style-type: none"> <li>• The material is a potentially fatal poisonous substance. It may be fatal or cause permanent damage if it is inhaled, swallowed or absorbed through skin. May burn skin or eyes on contact.</li> </ul> <p><b>Division 1: Materials Causing Immediate and Serious Toxic Effects.</b></p> <ul style="list-style-type: none"> <li>• These materials are <i>immediately dangerous</i> to life and health. They can kill you fast!</li> <li>• Handle the material with extreme caution. Avoid contact with the skin or eyes, use proper protective clothing.</li> <li>• Avoid inhaling by working in well-ventilated areas. Wear respiratory equipment.</li> <li>• Wash and shower thoroughly after using.</li> <li>• Store in designated areas only.</li> </ul> <p><b>Division 2: Materials Causing Other Toxic Effects</b></p> <ul style="list-style-type: none"> <li>• The material is poisonous but not immediately dangerous to health. It may cause death or permanent damage as a result of repeated exposure over time. Usually the effects result from repeated exposure to the substance in the workplace over a long period of time. E.g. repeated exposure to benzene, asbestos.</li> <li>• Includes materials that can cause immediate irritation (to the eyes, skin, or lungs).</li> </ul>	  

<p><b>Class D Division 2 continued</b></p>	<ul style="list-style-type: none"> <li>• Includes materials that can cause ill health effects that are not immediate; such as allergies, asthma, cancer, organ damage, birth defects, sterility, or other serious illness or disease.</li> <li>• Avoid skin and eye contact by wearing all protective equipment necessary including eye, face and hand protection and protective clothing.</li> <li>• Avoid inhaling by working in well-ventilated areas. Use respiratory equipment.</li> <li>• Store in designated areas.</li> </ul> <p><b>Division 3: Biohazardous Infectious material.</b> This includes organisms (like bacteria and viruses) and the toxins they may produce that are believed to cause disease. E.g. anthrax (in meat handling), salmonella, hepatitis B virus, AIDS virus, certain fungi and moulds, contaminated blood and pathogenic bacteria cultures, etc.</p>	  
<p><b>Class E</b></p>	<p><b>CORROSIVE MATERIAL</b></p> <ul style="list-style-type: none"> <li>• Caustic or acid materials that can eat through the skin or corrode metals like aluminum or steel. E.g. chromic acid, sulfuric acid, nitric acid, sodium hydroxide, hydrofluoric acid, some household cleaners, water treatment chemicals, photographic chemicals, lye.</li> <li>• This class also includes corrosive gases such as ammonia and the acids hydrogen fluoride, hydrogen chloride, hydrogen iodide and hydrogen bromide.</li> </ul>	
<p><b>Class F</b></p>	<p><b>DANGEROUSLY REACTIVE MATERIAL</b></p> <ul style="list-style-type: none"> <li>• Products which undergo dangerous reactions (such as polymerization, decomposition or condensation), when subjected to heat, pressure, shock or contact with water .</li> </ul> <p>Examples:</p> <ul style="list-style-type: none"> <li>• Plastic monomers such as butadiene undergo hazardous self-polymerization unless inhibitors are added,</li> <li>• Copper and mercury acydes, acetylides, ether, peroxides,benzyl peroxide, picric acid and isopropyl nitrates can be explosive under shock.</li> <li>• Calcium carbide reacts with water to release acetylene gas.</li> </ul>	

# International Hazard Symbols

- Not all products are controlled by the WHMIS legislation, and so they may not have WHMIS labels or use the exact same symbols as WHMIS. You'll see these other symbols on products you commonly find around the house and garden, including cosmetics (like hairsprays), pesticides, and some consumer and household products (like oven cleaners). These products use the International Hazard Symbols you see below.
- For your safety, you should be able to recognize these symbols and understand what hazards they represent.
- The following warning symbols used on labels are not controlled by WHMIS legislation:

	<b>DANGER</b>	<b>WARNING</b>	<b>CAUTION</b>
<b>Poison</b>			
<b>Flammable</b>			
<b>Explosive</b>			
<b>Corrosive</b>			

Note: The border that surrounds each symbol signifies the danger level of the hazard.

- An octagon (same shape as a stop sign) indicates “DANGER” and represents the most dangerous hazard.
- A four-sided diamond, indicates “WARNING” and represents a moderate or medium hazard level. A warning diamond does not pose as extreme a risk as the danger octagon.
- The upside-down triangle indicates “CAUTION” and represents the slightest or least hazard of the three borders. This does not make it hazardless! Use these products with caution.

# Material Safety Data Sheets (MSDS)

An MSDS is a sheet that gives more detailed technical information about the product. It is broken up into nine sections

- Product information - description of the chemical
- Hazardous ingredients in the product
- Physical data (chemical properties of the ingredients)
- Fire and explosive hazard - how easily it catches on fire or explodes.
- Reactivity data - describes how it reacts with other chemicals
- Toxicological properties - describes how it affects human health
- Preventive measures to be taken
- First aid measures to be taken if exposed
- When it was made and for more information who to contact for more information

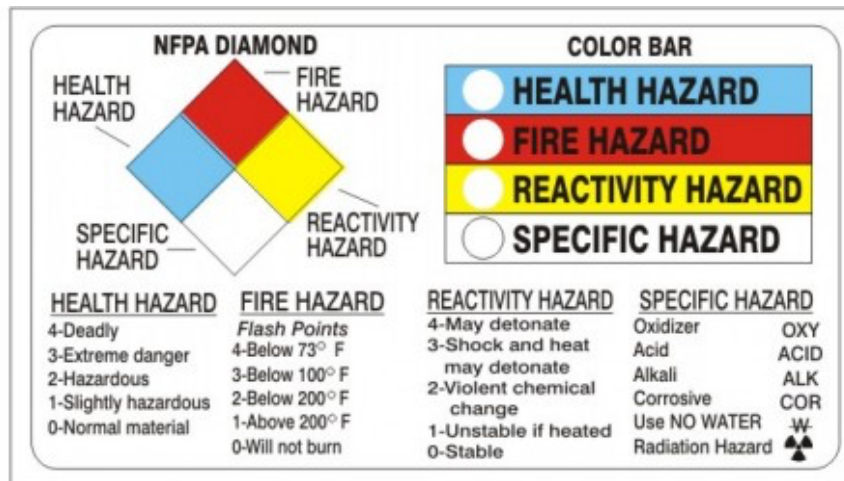
The image shows a sample Material Safety Data Sheet (MSDS) form. The form is titled "MATERIAL SAFETY DATA SHEET" and is divided into five sections. A large "SAMPLE" watermark is overlaid on the form. The sections are: Section 1 - Product Identification and Use, Section 2 - Hazardous Ingredients, Section 3 - Physical Data, Section 4 - Fire and Explosion Data, and Section 5 - Reactivity Data. Each section contains various fields for chemical and safety information.

Employers must keep the MSDS up to date (no older than three years) and on file at the worksite, and must allow employees to read them and make copies of them.

The employer must educate workers about important information on the sheet for each chemical.

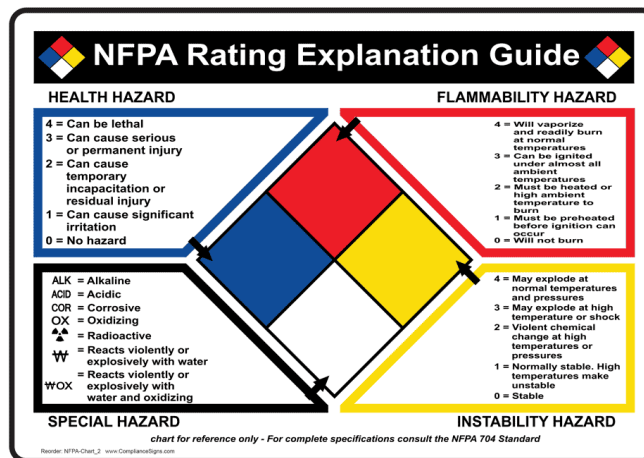


# National Fire Protection Agency (NFPA) "Fire Diamond"



**RATING EXPLANATION GUIDE**

HEALTH	FLAMMABLE	REACTIVE
Recommended Protection	Susceptibility to Burning	Susceptibility to Energy Release
<b>4</b> Special full protective suit and breathing apparatus must be worn	<b>4</b> Very flammable	<b>4</b> May detonate under normal conditions
<b>3</b> Full protective suit and breathing apparatus should be worn	<b>3</b> Ignites under normal temperature conditions	<b>3</b> May detonate with shock or heat
<b>2</b> Breathing apparatus with full face mask should be worn	<b>2</b> Ignites with moderate heating	<b>2</b> Violent chemical change but does not detonate
<b>1</b> Breathing apparatus may be worn	<b>1</b> Ignites when preheated	<b>1</b> Not stable if heated use precautions
<b>0</b> No precautions necessary	<b>0</b> Will not ignite	<b>0</b> Normally stable



## Safety Items in the Science Classroom

Note the locations and know the proper use of each of the following safety items in the Science lab.



FIRE EXTINGUISHER



FIRE BLANKET



EYE WASH STATION



LAB SHOWER

## Safety in the Science Classroom Page 1

1. Never begin an experiment or lab without your teacher's permission.
2. Read and study the procedure from start to finish before beginning any experiment. If you have any questions, ask your teacher. Make sure you understand any safety symbols on materials you will be using, and the hazards they represent. Follow the procedure exactly as specified.
3. Always wear safety goggles throughout a lab that requires chemicals. Keep the goggles on for as long as there are any chemicals being used by anyone in the lab. Do not take your goggles off or move them from your eyes (for example, to write down observations) at any time during the lab. Wear other safety equipment, such as aprons, gloves, lab coats, as required.
4. Never eat or drink anything in the lab. Do not chew gum during labs.
5. Never inhale chemicals. Use the "wafting" technique if you need to smell a chemical. Do not taste any substances or draw any material into a tube with your mouth.
6. If you are taking chemicals from one container and putting them into smaller containers, make sure you label all the containers.
7. When pouring liquids hold the containers away from your face. Put test tubes in a test tube rack before pouring liquids into them.
8. Use only Pyrex or Kimax glass containers when heating. Never use chipped or cracked glassware. Never allow a container to boil dry.
9. Report all chemical spills to your teacher. All chemical spills must be cleaned up completely and immediately. Wipe up any splashes or spills of water immediately.
10. Use test tube holder and always slant test tubes away from yourself and others when heating them. Keep materials away from flames. Follow all instructions for using Bunsen burners carefully.
11. Take caution with hotplates -- you can't tell by looking if they are hot, but they can remain hot for up to one hour after being turned off. To see if one is still hot, don't touch it! Instead, carefully put a drop of water on its surface. If the water bubbles or boils, the hot plate is too hot to touch!

12. Make sure your hands are dry when using electrical equipment. Unplug electrical cords by pulling on the plug, not the cord. Don't use equipment with frayed wires or cords. Report any defective equipment or outlets to your teacher.
  13. When cutting materials, follow the following guidelines:
    - Do not cut anything with a scalpel or razor blade by holding it in one hand while cutting it with the other. Always put the item down (for example, into a dissecting tray) on a flat surface. Hold it down with pins or clamps, not your fingers.
    - Always cut away from yourself and away from others when using a scalpel.
    - When walking with or handling over a scalpel or sharp or pointed object, keep the sharp or pointed surface facing the floor away from others when using a scalpel.
  14. Tie back long hair and loose clothing.
  15. When holding a bottle from which you are going to pour chemicals, keep the label against the palm of your hand. If everyone does this, any drips will only touch the opposite side of the bottle, and not get on your hand.
  16. When diluting acid, always add small amounts of acid to large amounts of water.
  17. Know the location and proper use of the fire extinguisher, safety shower, fire blanket, first aid kit, and fire alarm.
  18. If your clothing catches on fire, smother it with the fire blanket or a coat. "*Stop, Drop, and Roll*" NEVER RUN.
  19. Report any accident or injury, *no matter how small*, to your teacher.
  20. When cleaning up, be sure to:
    - Turn off gas if it was used.
    - Disconnect electrical apparatus.
    - Return all materials to their proper places.
    - Do not return unused chemicals to the original containers. Your teacher will tell you what to do with the unused chemicals and how to dispose of any other materials. Never pour unused chemicals down the drain without permission from your teacher.
    - Place any broken glass in the container(s) reserved for broken glass. Do not put broken glass in the regular garbage.
    - Clean and dry your work area. Do not leave water on the counter or floor
    - The last thing you should do after a lab is wash your hands with soap and water.
-