ENVIRONMENTAL CHEMISTRY

CONTENT CARD SET

Environmental Monitoring

Chemicals In The Environment

All living things are made of chemicals and depend on chemicals to survive. Without CO_2 and water, green plants could not produce sugar for food. Without oxygen, plants and animals could not carry out cellular respiration. Forest fires and volcanoes release large quantities of carbon dioxide, sulfur dioxide and ash, which can be harmful to living things. Some chemicals that we use can cause harm. Some chemicals are also used as medicine. Willow bark contains salicylic acid. As early as 400B.C Hippocrates - the 'Father of Medicine' - recommended willow bark be used to treat pain and fever. First Nations people used willow bark tea as a medicinal drink. A synthetic version of salicylic acid - acetylsalicylic acid - was developed by the Bayer company in 1898 and Aspirin was born. Another medicine derived from plants found in the environment is Echinacea Purposa - extract from the purple cornflower to help stimulate the immune system.

The Nitrogen Cycle

Nitrogen (N_2) occurs naturally in the atmosphere as a gas. In order for living organisms to be able to use this nitrogen, the two atoms must be separated **(fixed**), so they can easily combine with other elements to form usable compounds.

Nitrogen Fixation is the process by which nitrogen gas is fixed in the atmosphere by lightning and fixed in the soil by certain types of bacteria (found in root nodules of beans, clover and alfalfa). After nitrogen fixation has occurred, plants can use the nitrogen-containing compounds, animals then eat the plants and make larger compounds called proteins, which decomposers can then break down into simpler compounds, to be used over again. Eventually nitrogen is released back into the atmosphere to begin the cycle all over. The concentration of nitrogen is not the same everywhere, and if nitrogen is needed in the soil, nitrogen-fixing plants (like alfalfa) and fertilizer can help to replenish the supply.

Issues

An issue is a matter about which people have different opinions or viewpoints.

- cause of the problem
- seriousness of the problem
- how to solve it

An issue is stated in a statement that can be supported or opposed and is science-related when science can provide relevant information on the issue.

Viewpoints

Health-related – physical/mental well-being
Recreational - useable for leisure activities
Political - affects a govt. party or politician
Scientific - knowledge gained by observation & experimentation
Technological - problem solving/application
Ecological - concern for protection of ecosystems
Economic - concerned with money & jobs
Educational - acquiring & sharing knowledge
Egocentric - concern for self
Ethical/Moral - right or wrong

Processes Affecting Chemicals

Chemicals in the air and food, used by living organisms, are changed by the processes of cellular respiration and metabolism. Human activities can cause pollution (any change in the environment that produces a condition that is harmful to living organisms) too much of a harmless substance toxic materials not occurring naturally. **Phosphates**: nutrients that enhance growth of plants (excess phosphates stimulate the growth of algae and weeds). **Dioxins**: chemicals found in certain pesticides and industrial wastes can cause severe illness and possibly birth defects. **Noise Pollution**: can cause hearing loss and other damage to living organisms. **Thermal Pollution**: can eliminate species unable to tolerate the increase in temperature.

Many chemicals are released into the air, water and soil every day by agriculture, sanitation, water and waste treatment, industrial processes, manufacturing, transportation can change the concentration of different chemicals causing an imbalance.

Agricultural Activities - to produce crops that will give a good yield farmers must have an understanding of chemistry (fertilizers pesticides, herbicides).

Fuel Combustion - burning hydrocarbons (fossil fuels - including coal, oil and natural gas) produces large amounts of carbon dioxide and water vapor, sulfur dioxides and nitrogen oxides, traces of mercury and lead.

Industrial Processes - Electrical generation, mineral processing and fertilizer production releases harmful chemicals (sulfur dioxides and nitrogen oxides) into the air. Natural gas contains compounds such as methane, ethane, propane, and butane. If natural gas contains hydrogen sulfide it is called **'sour gas'.** If it doesn't it is called **'sweet'**. When hydrogen sulfide is removed, sulfur dioxide is produced. Laws try to reduce these emissions, and the recovery of the sulfur has enabled the natural gas processing plants to manufacture sulfuric acid, which is used in making fertilizers, steel, synthetic fibers and paint.

Solid Wastes

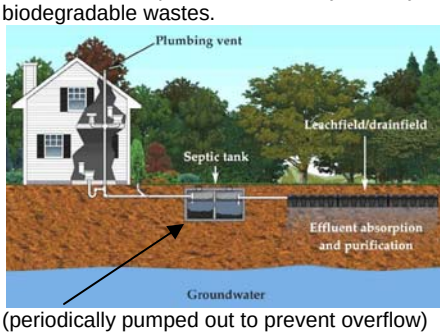
Solid waste includes garbage from households, industries, commercial retailers, institutions and construction or demolition sites. Some of this waste can be recycled or reused, but most of it is placed in landfills.

A small amount is incinerated (burned). Hazards that occur when solid waste, are not properly disposed of include:

- air pollution (controlled emissions - scrubbers)
- leaching (prevented by plastic liners and compacted clay foundation at the landfill site)
- contamination (bacteria removes dissolved nitrates, phosphates and undissolved solids from effluent – which also includes: dissolved and undissolved materials from your kitchen, bathroom and laundry)

Septic Sewage System (rural areas)

A **septic tank** is a large underground container that traps grease and large solids. The liquid waste is distributed through pipes with holes; the pipes lead into a drainage area containing gravel. Bacteria and other micro-organisms in the grave! and soil break down the organic waste and use it as a source of food energy. This system mimics the way in which decomposers normally recycle biodegradable wastes.



(periodically pumped out to prevent overflow)

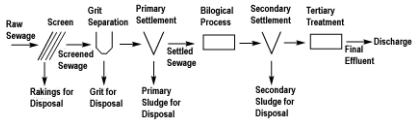
Sewage Treatment Plant (urban areas)

A sewage treatment plant is a facility treating sewage in three levels or steps.

Primary - Physical filtering, sieving and settling - waste water can be further treated with chlorine and returned to the environment as effluent. Waste material, called sludge, can be recycled as fertilizer or landfill.

Secondary - Biological - bacteria and micro-organisms decompose most of the remaining biodegradable waste.

Tertiary – Chemical



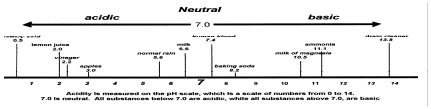
Diagrammatic representation of the process of sewage treatment

Acids & Bases

pH is a measure of the concentration of ***hydrogen ions*** in a solution.

Acids taste sour, are soluble in water and undergo similar chemical reactions and have a pH of less than 7.

Bases taste bitter, are soluble in water, feel slippery, react with acids and have a pH of more than 7'



Substances that are neither acidic nor basic, such as water are **neutral** with a pH of close to 7.

To identify a substance as an acid, a base, or neutral, an indicator is used. It changes color according to the type of substance it is put into. Indicators can be solids, such as **litmus paper**, or **universal indicator** (which change color over a wide pH range can identify many different substances and is more precise), or they can be liquids, such as **phenol red**.

Neutralization

Acids and bases react together when they are mixed. This type of reaction is called neutralization. When the acid and the base are used up, **sal**t and **water** are produced. Acid in your stomach has a normal pH of 2. This acid helps in the digestion of food and kills off bacteria. If you eat too quickly, or are under stress, your stomach produces an excess amount of gastric acid (giving you heartburn).

To neutralize the excess acid, a mild base, an **antacid** tablet, is chewed and swallowed.

(eg. Tums, Rolaids, Pepto Bismal)

$HCl + NaOH \text{ --» } NaCl + H_2O$

Hydrochloric Acid + Sodium Hydroxide ---» Salt + Water

Neutralizing Acid Rain

Rainwater is naturally slightly acidic. When this water combines with chemicals in the atmosphere such as sulfur dioxide or nitrogen dioxide, the effect results in Acid Rain (with a pH as low as 3 - in some parts of Canada).

To neutralize this acid rain, **lime** (calcium hydroxide - which is a base) is added to lakes.

$Ca(OH)_2 + H_2SO_4$ ----» $CaSO_4 + H_2O$

Calcium Hydroxide + Sulfuric Acid ----» Calcium Sulfate + Water

This is not necessary in certain parts of the Rockies because the mountains contain rich deposits of **limestone**, making the water naturally basic. When the acid rain falls, it is neutralized almost immediately.

Essential Elements

Humans need about 25 different chemicals for normal growth. The complex organization of these chemicals produces **organic compounds** which contain Carbon, as well as mostly Oxygen and Hydrogen. Substances that do not contain Carbon are called **inorganic compounds**.

Macronutrients - Nutrients, which are made up of elements and compounds, help living organisms survive. Plants obtain carbon, oxygen and hydrogen from the air, and nitrogen, phosphorus, potassium, magnesium, calcium and sulfur from the soil. These nine elements are called macronutrients (because they are in needed in large quantities) are essential for plants to grow.

Micronutrients - Other elements that are also needed, but not in large quantities. These elements are called micronutrients.

Macronutrient Elements

Nutrient	Importance in Plants
Nitrogen (N)	- proteins & chlorophyll - leaf and stem growth
Phosphorus (P)	- root and flower growth - cellular respiration & photosynthesis
Potassium (K)	- stimulates early growth - starch and protein production - disease resistance - chlorophyll production & tuber formation
Magnesium (Mg)	- chlorophyll structure - photosynthesis
Calcium (Ca)	- cell wall structure - cell division
Sulfur (S)	- production of fruits and grains

Macronutrient Elements

Nutrient	Importance in Humans
Nitrogen (N)	- composition of proteins & nucleic acids - growth and repair of tissue
Phosphorus (P)	- composition of bones, teeth & DNA - metabolic reactions
Potassium (K)	- muscle contraction & nerve impulses
Magnesium (Mg)	- composition of bones & teeth - absorption of calcium & potassium
Calcium (Ca)	- composition of bones & teeth - blood clotting - muscle & nerve function
Sulfur (S)	- protein synthesis - enzyme activation - detoxification

Organisms Take In Substances

Plants take in inorganic compounds to make organic compounds. Consumers use the organic compounds made by plants for their energy, growth and repair. **Diffusion -** Nutrients enter the roots by diffusion - the movement of molecules from an area of high concentration to an area of low concentration. This action continues until the areas are equal concentrations. **Osmosis -** Water moves through plants by a special type of diffusion, called osmosis. In this process, water moves through the walls of the plant's roots from an area where there are more water molecules to an area where there are fewer water molecules. As the plant uses the water it draws more up from its roots. **Active Transport -** Plants need high concentrations of some nutrients in their roots. These nutrients may have higher concentrations in the roots than in the surrounding soil. To maintain these high concentrations, plants move more nutrients into their roots from areas of lower concentration by a process called active transfer. This process requires energy.

Organic Molecules

Class	Description	Example
Carbohydrate	- made of atoms of carbon, hydrogen, and oxygen	sugar, starch, cellulose, glucose
Lipid	- compounds composed of many carbon, hydrogen, and oxygen atoms	fats, oils and waxes
Protein & Amino Acid	- protiens are made up of amino acids - functions include growth and repair, as well as a source of energy	enzymes
Nucleic Acid	- large complicated molecules that play a major role in heredity and in controlling the cell's activities	DNA (deoxyribo-nucleic acid) RNA (ribonucleic acid)

Ingestion and Absorption - The process of taking in the nutrients (elements and compounds) we need is called **ingestion**. These compounds are broken down chemically in the digestive system by a process called **hydrolysis**. Substances broken down by hydrolysis have been hydrolyzed.

(example) Maltose + Water ------ » Glucose

$C_{12}H_{22}O_{11} + H_2O$ ------ » $2C_6H_{12}O_6$

Nutrients such as glucose and amino acids are absorbed through cell membranes and into the bloodstream, which carries them to where they will be used or stored.

Taking In Nutrients - Where organisms live affects how and when they can obtain the nutrients they need. Some organisms get the nutrients they need often by restricting other organisms from getting the same nutrients (reducing the competition).

Substrate - A substrate is a material on which an organism moves or lives. Some organisms attach themselves to the substrate, others obtain their nutrients from their substrate.

Categories of Water Use:

human drinking water
recreation
livestock drinking water
irrigation
protection of aquatic life

Monitoring Water Quality

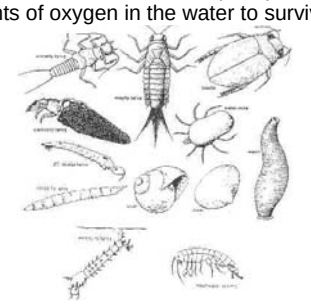
Clarity may be one indicator, but clear water does not indicate what chemicals are present. Water Quality is determined using biological and chemical indicators according to what the water is going to be used for.

Microbiological Indicators

Microscopic organisms (bacteria) can cause serious health problems if they are present in sufficient numbers. Samples are taken to identify their presence to avoid contamination of the water supply.

Biological Indicators

Species of aquatic organisms (invertebrates – animals without a backbone) require certain amounts of oxygen in the water to survive.



Aquatic Environments - The place where aquatic organisms live varies, depending on the pH level and the amount of dissolved oxygen present … likely no fish in water that has a pH below 5.0... worms and midge larva thrive in polluted water, as they require only small amounts of dissolved oxygen for survival

Chemicals Affect Aquatic Organisms

Chemical indicators of water quality: dissolved oxygen, acidity, heavy metals, nitrogen, phosphorus, pesticides, salts – such as sodium chloride and magnesium sulfate.

Dissolved Oxygen

Abiotic factors - water temperature, rate of flow (turbulence), obstacles in the water, wind, amount of photosynthesis by water plants,
Biotic factors - number of organisms using oxygen
Most organisms need 5 milligrams per Litre (5 ppm) of dissolved oxygen to survive. The diversity of species often gives us a relative idea of the amount of dissolved oxygen present. A large number of different species means a high level (likely 8 ppm or more) of dissolved oxygen, whereas a few species indicates a low level (below 5 ppm) of dissolved oxygen.

Measuring Chemicals in ppm

The concentrations of chemical indicators is usually measured in parts per million. One part per million means that one unit of an element or chemical can be found in one million units of solution …

parts per million (ppm),

$$ppm = \frac{\text{grams of solute}}{\text{grams of solution}} \times 10^6$$

or in milligrams per Litre (mg/L).

$$ppm = \frac{\text{mg of solute}}{\text{L solution}}$$

pH Testing

Acidity is measured on the pH scale with 7.0 being neutral and anything below 7 is acidic.

Phosphorus and Nitrogen

Phosphates and Nitrates often enter the water supply by sewage and runoff – They increase the growth of algae and weeds in the water. This then increases the food supply for bacteria, which decompose the plants, as they die. The presence of more and more bacteria uses up the available supply of dissolved oxygen and many of the aquatic organisms die as a result.

Acid Rain & Acid Shock

Sulfur and nitrogen oxides emitted from industries (such as smelters) combine with water vapor in the air to produce sulfuric and nitric acid that fall to the ground as acid rain
... causing chemical changes in the soil
…reducing soil fertility
... retarding tree growth
... killing organisms in lakes & streams
... corroding exposed metal surfaces
... breaking down stone and limestone
... leaching toxic chemicals from the soil
A decrease of one unit indicates the acidity has been **multiplied by a factor of 10**. Periods of extreme acidity (like in the spring when the acid snow melts and the acidic water enters the waterways) are called **acid shock**.
Pesticides - When pesticide chemicals remain in the environment, a toxin is created. Several pesticides mixed together can have a cumulative effect and become very toxic. A toxic substance is poisonous. Dioxins are chemicals found in certain pesticides and industrial wastes can cause severe illness and possibly birth defects.

Measuring Toxicity

Toxins or poisons are substances that produce serious health problems, or death when introduced into an organism. Scientists measure toxins in **LD50** amounts. LD stands for **'Lethal Dose"** and 50 represents 50% of the subject group that will die if they are given the specified dose, all at once.
Noise Pollution: can cause hearing loss and other damage to living organisms. Thermal Pollution: can eliminate species unable to tolerate the increase in temperature
Heavy Metals - have a density of 5g/cm^3 or more. Examples: mercury, copper, lead, zinc, cadmium and nickel. These metals occur naturally and are also processed into a wide variety of products. Heavy metals can be toxic to a wide range of organisms, so concentrations are constantly monitored. Heavy metals can enter the water supply by the action of acid rain and improper solid waste disposal. Heavy metals are especially toxic to children causing abnormal development, brain damage or even death.

Suspended Solids

- turbidity
- unpleasant appearance
- blocks sunlight
- decreases oxygen production

Testing: Use the filtration method to separate the sample into **residue** and **filtrate**

Mobile Air Monitoring Laboratory - Air quality can be measured in two ways: by measuring the levels of pollutants in the air and by estimating the amount of emissions from pollution sources.

Sulfur Dioxide ($SO_{2(g)}$) is a major air pollutant produced through industrial processes (forming smog and acid rain). It can affect your respiratory system and irritate your eyes. **Scrubbers** are used to reduce sulfur dioxide emissions by up to 99%. They use limestone to convert it to a useful product – gypsum.

Nitrogen Oxides

$NO_{x(g)}$ are mixtures of NO and NO_2 and are major contributors to smog and acid rain as well. Vehicle emissions and the burning of fossil fuels are the main contributors of Nitrogen Oxides.

Carbon Monoxide

CO is called the **'silent killer'** because it is a colorless, odorless gas. It is caused by the burning of fossil fuels and not enough oxygen to produce carbon dioxide (CO_2). Motor vehicles are the main producers of CO, but other sources include the burning of wood (forest fires produce large quantities) in fireplaces and stoves, natural gas, industrial processes, airplanes and cigarettes. If inhaled, CO reduces the amount of oxygen in the blood and can cause headaches, sleepiness, chest pains, brain damage and death. **Catalytic converters** are used to convert CO into CO_2

Ground-Level Ozone

Ozone ($O_{3(g)}$) is an odorless, colorless gas that has 3 oxygen atoms. It protects us from harmful ultraviolet rays from space, but at ground-level it can be harmful, because it can affect the respiratory system, deteriorates plastics and can have serious effects on crops. Ground-level ozone forms from reactions between oxygen, nitrogen oxides and compounds that are volatile organic compounds (VOC's), in the presence of sunlight and heat. Fuel combustion is the major source.

Monitoring The Atmosphere

Chemicals in the air can cause mild to serious effects in local areas, but chemicals in the atmosphere can have serious global effects. Ozone depletion and climate change are the primary concerns internationally.

CO_2 As A Greenhouse Gas - occurs naturally in the environment, but increasing amounts that are being produced by various human activities is creating a concern globally.

The Greenhouse Effect - is a naturally occurring event, the result of greenhouse gases (water vapor, carbon dioxide, and other gases) trapping some of the outgoing energy - retaining heat in a way somewhat similar to the glass panels of a greenhouse – helping to maintain the Earth's average surface temperature of 15°C.

The Enhanced Greenhouse Effect - is causing temperatures to increase around the world. Human activities – essentially, the burning of fossils fuels is the primary reason. The enhanced greenhouse effect is depleting the ozone layer.

The Ozone Layer

Ground-level ozone can have dangerous effects. Atmospheric ozone is the chemical that occurs high in a natural formation 15 to 50 kilometers above us in the atmosphere where it maintains a shield around the Earth protecting everyone from harmful UV radiation from the Sun that is becoming thinner and has 'holes' , resulting in more UV radiation getting through to the surface of the Earth and increasing the likelihood of more organisms getting skin cancer and cataracts. It is also affecting the plankton population – which is an important food supply for many animals.

Chlorofluorocarbons (CFC's)

The thinning of the atmosphere is caused by our use of chlorofluorocarbons. They get into the upper atmosphere where they are broken down into elements like chlorine – which destroys ozone. (1 chlorine atom can destroy 100, 000 ozone molecules.

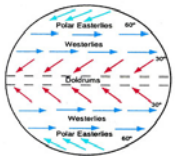
Environmental Transport

There are three stages of transport of substances in the environment:

- **Release** of chemicals at the source
- **Dispersion** of the chemical into the atmosphere
- **Deposition** of the chemical in soil or water

Transport In Air - The direction and distance that airborne chemicals travel are determined by various factors, including:

- The properties of the chemical pollutant
- The wind speed
- The direction of the prevailing winds
- The distribution of particles may also be limited by lack of wind or precipitation.



Groundwater Transport

Water soaking into the soil is collected in a zone called the groundwater zone. The top of the groundwater zone in the soil is called the water table. Groundwater moves sideways, up or down and can move very slowly (1 meter per year) or very quickly (1 meter per day). Some contaminants remain collected in the groundwater for long periods of time (because they are heavy metals), posing problems if the groundwater is used for drinking, agricultural purposes or industrial use. One factor that affects the movement of contaminants in groundwater includes the number and connection of pores (tiny spaces between soil grains) in the soil. When the pores are packed together very tightly and are not connected, the soil is considered impermeable. If the pores are connected the soil is permeable and water can move through easily.

Surface Water Transport - Hazardous chemicals can enter surface water from the air, the groundwater, runoff from agricultural fields and industrial sites and outflow from storm sewers and sewage treatment plants.

Soil Transport - Water is moved in one of four ways: evaporation, absorption by plants, runoff (into surface water) and soaking into soil dissolving substances (leachate). **Packed clay** is impermeable (so fluids won't pass through it). **Organic material** can absorb fluids and slow their movement through the soil. Hazardous chemicals can be changed by what other chemicals are present in the soil. (acids can be neutralized by naturally occurring bases – like limestone)

Hydrocarbons In Soil

The daily use of hydrocarbons in vehicles and industry contaminates the soil. Hydrocarbons are toxic to plants and animals.

Changing Concentration of Harmful Chemicals

Dispersion is the scattering of a substance away from its source.
Dilution reduces the concentration of a pollutant by mixing it with large quantities of air or water.

Bacteria

Some bacteria grow and reproduce only when oxygen is present. They use the oxygen for the process of **aerobic** biodegradation. When oxygen is not present – in an **anaerobic** environment (like deep in landfill sites) - some bacteria remove chlorine from harmful chlorine-containing compounds, such as **PCB's** (polychlorinated biphenyls - human made oils used in electrical equipment), by replacing them with hydrogen atoms – which can then be used as food for the bacteria.

Biodegradation

Biodegradation occurs in the environment because living things (earthworms, bacteria and fungi) are actively breaking down organic substances, including many pollutants. The existing organic molecules provide carbon atoms, which are used to build biological compounds, such as carbohydrates and proteins. This is a multi-step process - large organic molecules are broken down (hydrolyzed) either inside or outside bacteria.

Factors Affecting Biodegradation

- temperature
- soil moisture
- pH
- oxygen supply
- nutrient availability

Bioreactors speed up the rate of biodegradation by adding water to organic waste in a sanitary landfill site. Planting vegetation also encourages faster biodegradation because populations of bacteria and fungi are larger around plant roots meaning more microbial activity.

Phytoremediation

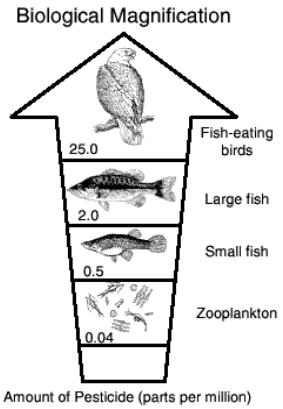
Phytoremediation is a technique that can be used to reduce the concentration of harmful chemicals in the soil or groundwater. Plants are used to clean up metals, hydrocarbons, solvents, pesticides, radioactive materials, explosives, and landfill leachate. The plants absorb and accumulate large amounts of these chemicals. When the plants have matured, they are harvested, then burned or composted. In some cases, the metal can be recycled. When most of the harmful chemicals are removed by phytoremediation from the soil, other plants can be planted.

Photolysis

Photolysis is the breakdown of compounds by sunlight. The formation of ozone and photodegradable plastic are examples of this process. These substances react when exposed to sunlight. It becomes a fine substance that is much easier to dispose of.

Biomagnification (or bioaccumulation)

This process is the increase in the concentration of a chemical or element as it moves up the food chain.



Hazardous Household Chemicals

Chemicals used in the home and garden can be hazardous to your health.

HOUSEHOLD PRODUCTS DATABASE

http://householdproducts.nlm.nih.gov/products.htm

Common Household Hazardous Waste Categories

Household cleaners	Personal hygiene products	Pet-care products
Paint and paint products	Pesticides and fertilizers	Automotive fluids

Improper storage, transport and disposal of these products can contribute to burns, heart problems, kidney failure, lung (respiratory) ailments, cancer and even death.

Government Regulations

Regulations are designed to protect consumers and reduce the risk of hazardous chemicals. The regulations reflect current scientific research done on the products and how they might interact with other products.

Labels

WHMIS

Workplace Hazardous Materials Information System

MSDS Material Safety Data Sheets

An MSDS information sheet for the product gives a detailed description of the product – its composition, physical appearance, and chemical characteristics. It also describes the precautions that should be taken when handling, transporting and disposing of the product, as well as health effects, first aid treatment and what to do in case of a spill.

Eco-Label - "Environmental Choice"

Eco-Logo program helps consumers identify products and services that are less harmful to the environment.

Different labels have different purposes:

Transporting Hazardous Materials

Supplier label

Workplace Label

controlled products transferred at the workplace to other containers, need to apply a workplace label to the new container providing the following information: product identification; information for safe handling and a statement indicating that the MSDS is available.

Disposal label

New Product Regulations

When new products are produced, the supplier must apply for approval to make it available to the consumer. The information about the product must include:

- Intended use
- physical and chemical properties
- active ingredient(s)
- Instructions for use
- safety precautions
- Health effects
- environmental effects
- toxicity to humans
- first aid instructions in case of poisoning

Storage of Hazardous Chemicals in the Home

- Leave original label on the product
- Keep out of reach of children (locked up)
- Containers should be in good condition and secure
- Store in a cool, dry, well-ventilated place
- Never store flammables or gas in glass containers
- Store different classifications of chemicals on separate shelves in separate locations
- Keep oxidizers away from flammables
- Keep upright
- Store chemical in proper place when not in use
- Discard old products
- Place rusted or leaking containers inside a second container – dispose of both

Transportation Of Consumer Goods

When it is purchased and when it is disposed of present transportation issues for consumers. Care should be taken to ensure that passengers are not at risk – from spills, leaks, fumes or accidental handling (by children or pets). Place the product upright and secure in the trunk (car) or box (truck). When disposing of many products, never mix them into one container – try to keep them in their original containers with their original labels.

Disposal Of Hazardous Chemicals

Never pour hazardous chemicals down the drain, or into the soil. Don't throw them into the garbage. The hazardous products may not be treated by the sewage treatment system or septic system and as a result could be released into the soil or enter the surface water system and harm living organisms downstream.

Hazardous Waste Collection Sites

Materials that cannot be recycled or stored safely in the ground to biodegrade are packaged into larger containers and are then transported to high temperature incinerators like one in Swan Hills, Alberta.

Swan Hills Special Hazardous Waste Treatment Facility

Solid Waste Garbage

Follow your local GARBAGE DISPOSAL guidelines that have been created to avoid toxic or hazardous products being placed in a sanitary landfill, where they might burn, explode or escape as a leachate into the groundwater and eventually come back to haunt us.

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