SUBJECT: SCIENCE **FORM: 5**

PRESERVATION AND CONSERVATION OF THE ENVIRONMENT

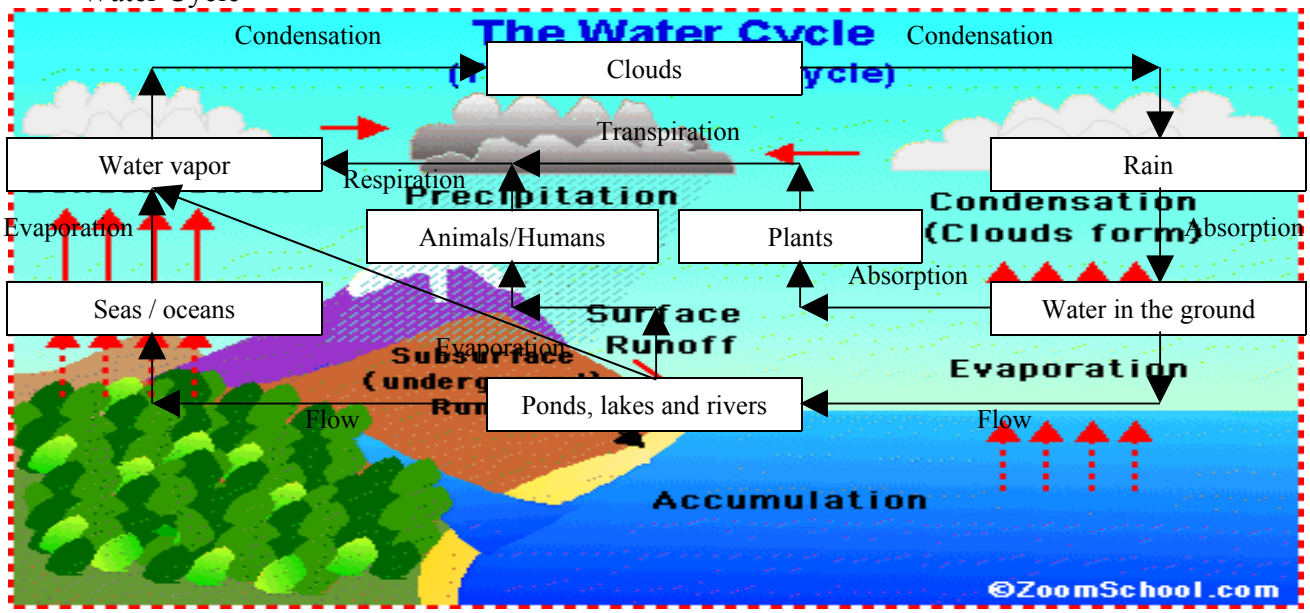
3.1 Balance in Nature

What is the meaning of balance in nature?

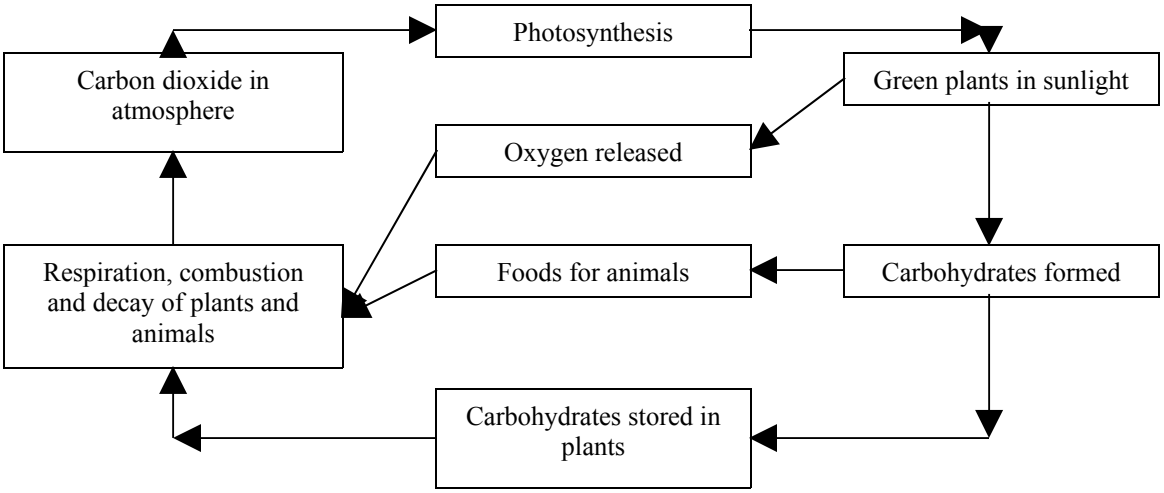
Refer to the **situation where living things and non living things depend on each other for their existence in natural way**. That means they are balance on one another so that their ecosystems continue to exist in natural state.

Natural Cycle Helps to Maintain Balance in Nature:

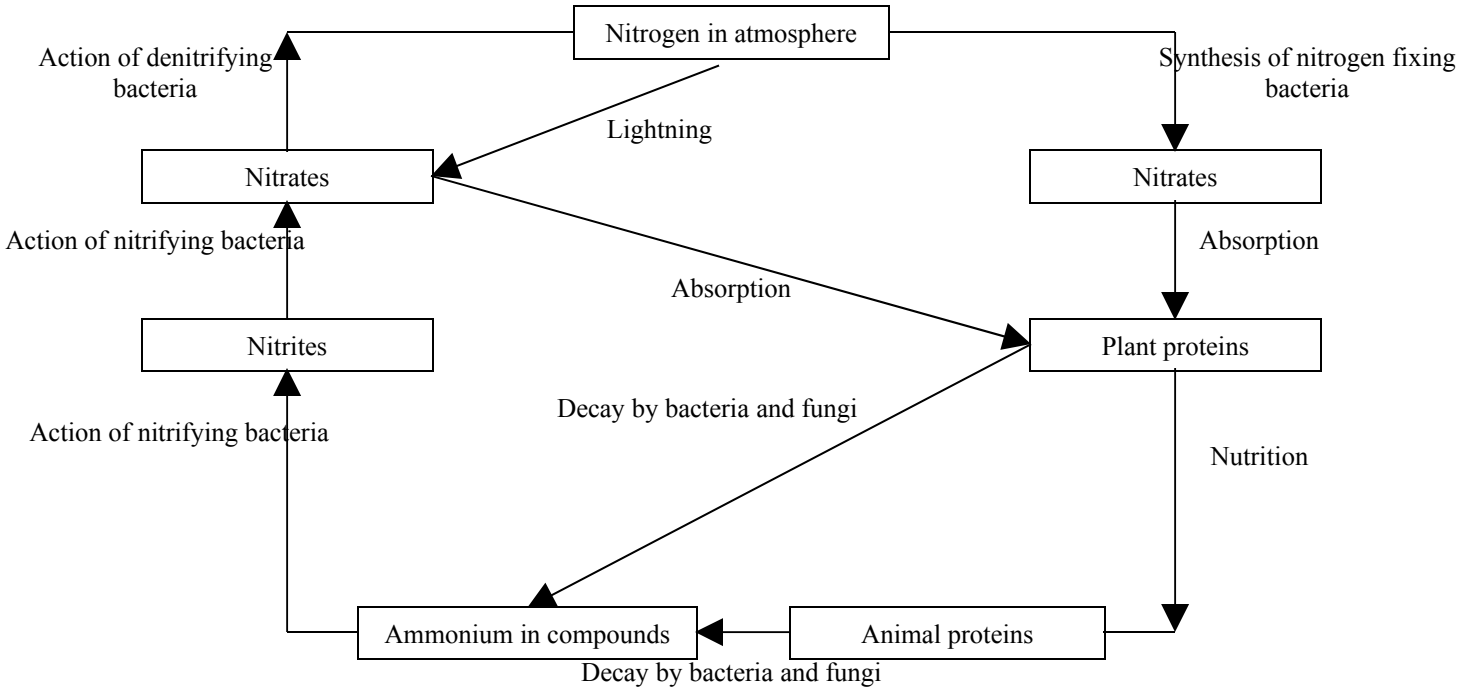
- Water Cycle

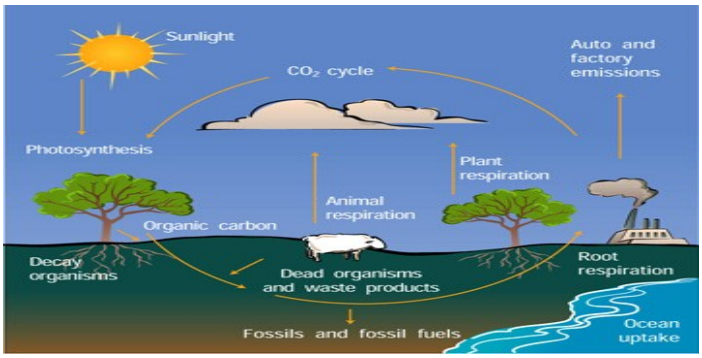


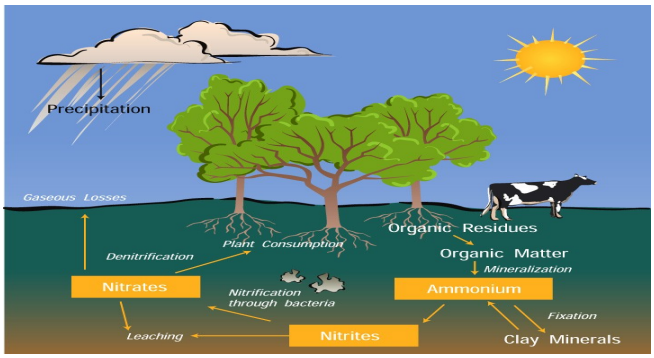
- Carbon Cycle



- Nitrogen Cycle



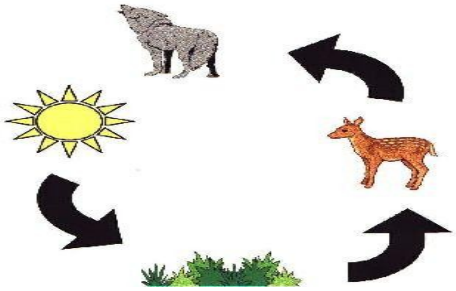




Food Webs Helps to Maintain Balance in Nature:

a) Food chains

Food relationship among organisms forms food chains. That means **green plants make their own food by photosynthesis**, and **some animals get their food from eating this green plant**, and **some other animals get their food by eating herbivores** (animals that feed only green plants)



Examples of food chains are given below:

a) Grass ➔ Rabbits ➔ Eagles
b) Green plants ➔ Goats ➔ Human Beings
c) Paddy plants ➔ Rats ➔ Snakes ➔ Eagles

Energy is transferred from organism to organism in food chain. **Some of energy is wasted during transfer**. It is because of **waste (faeces) product by organism** and **heat lost to surrounding.**

No energy is destroyed or created in food chains.

Original source of energy in food chains is the Sun. Why? Because **the sun supplies energy to green plants** so that they can make their own food by photosynthesis

b) Food webs

Food chains don't exist alone on their own in nature. In fact, they are inter-related. This inter-relationship among food chains forms food web.

Example of food web is given below:

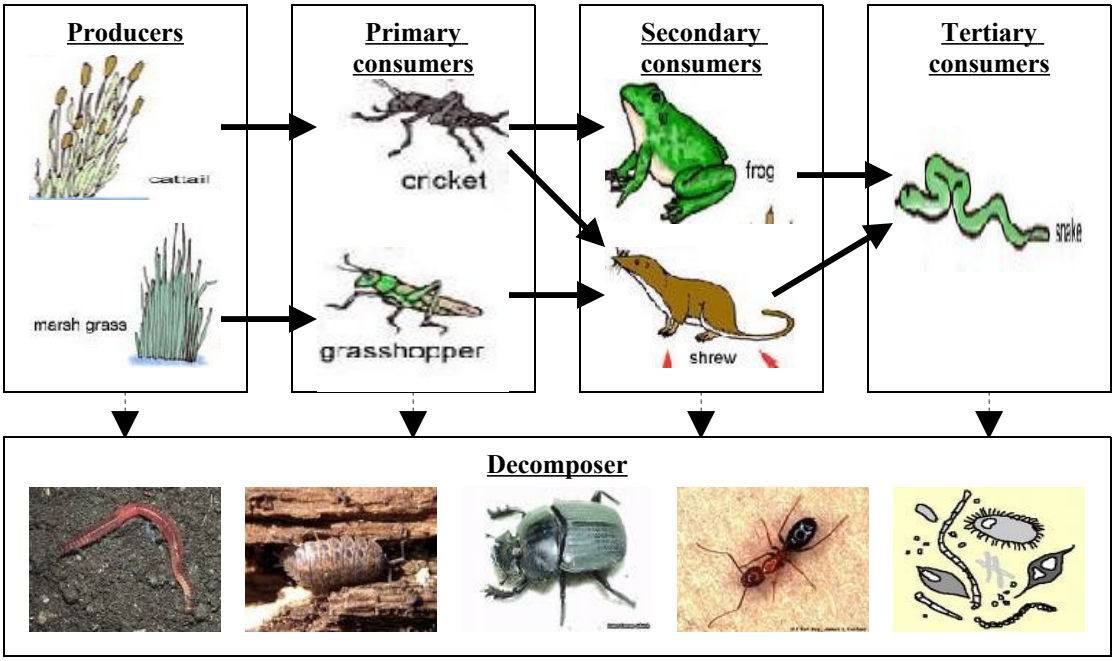


Diagram 3.1

Producers **:** All producers are green plants, because they make their own food under sunlight via photosynthesis

Primary consumer **:** Animals which eats plants, either herbivores or omnivores

Secondary consumer: Animals which eats primary consumers

Tertiary consumer **:** Animals which eats secondary consumers

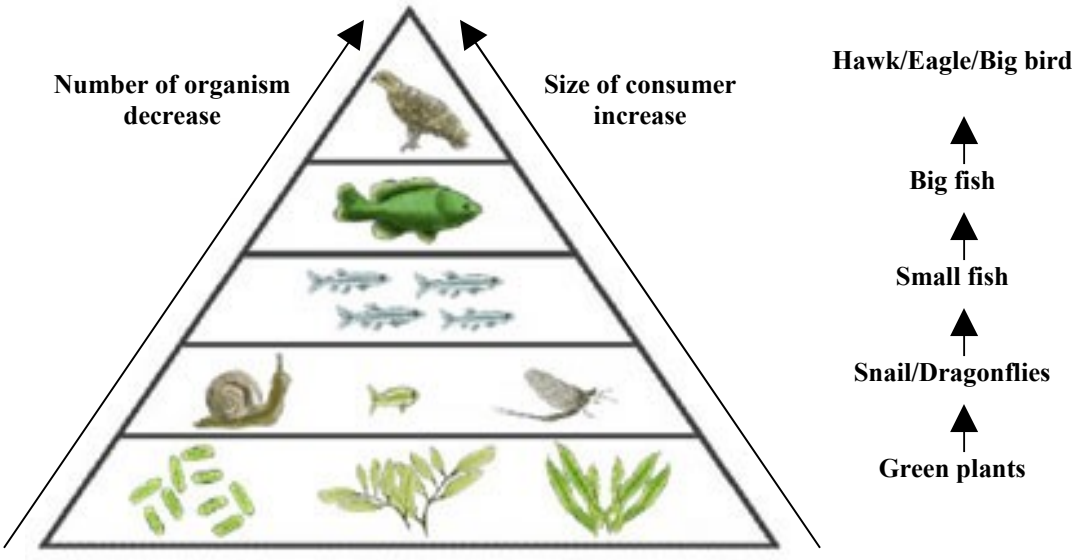
Decomposer : They are bacteria of decay, fungi and other organisms which break up dead plants and animals into minerals. These minerals will be absorbed again by plants.

Refer to Diagram 3.1, food web is much simple compare to the real one. Actually, real food web is much more complicate that that.

Stable food web maintains the balance in nature. The balance of ecosystem will be upset if members are taken out or new members are put in.

c) Pyramid of Numbers

It shows the relative number of organisms in a particular food chain



As we move up from the base to the apex of the pyramid,

a) the number of organisms decrease
b) the organisms become stronger and maybe bigger
c) the energy transferred decrease (Only 10% of energy is transferred from one organism to another)

The relative number of organisms at each stage of the number of pyramid is naturally controlled. Otherwise, food supply will be disrupted.

Effects of Natural Disasters on the Balance in Nature:

a) Forest fires

It can destroys large timber trees and large variety of plants and animals

After a forest fire, the balance of nature in that area is completely destroyed. The plants grow again, but slowly before animals will return

Forest fire produces plenty of smoke and dust. These substance form thick haze, and result in poor vision and healthy problem for human beings such as cough, asthma, and bronchitis

b) Drought

Refer to long period of dry weather.

Plants and animals don't get enough water supplies. Plants are the first to wither and die, followed by the animals.

In severe drought, the **complete habitat can be turned into a desert-like region**. It is followed by a **famine**. **People** who live in that drought area **will be starved to death** unless they receive aid from outside the affected region

c) Flood

It is caused by heavy rainfall such as monsoons

Large variety of plants is destroyed, and many animals are drowned. Those survived animals have to find new habitats to find food.

Floods are likely to **wash away the topsoil and all its nutrients. The surviving plants will lack of nutrients.**

Floods also cause **the water pollution, and as a result, a lot of water-borne diseases such as dysentery and cholera are emerged.**

d) Typhoons

It is great thunderstorms which bring torrential rains and winds of very high speed

It can sweep across a whole region very fast, inflicting wide spread and catastrophic destruction to property and causing loss of lives (animals, plants and human beings).

It also causes landslide and flooding.

e) Earthquake

It happens because of movement of molten roc st

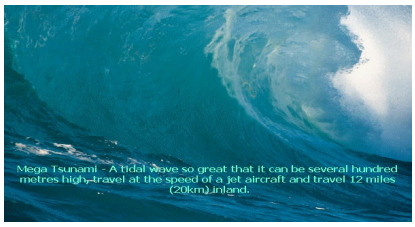
Normally lasts at most for 1 minute

Can cause catastrophic destruction, loss of lives and upset the balance of nature

Example: Kobe's Earthquake on 1994

However, scientists can predict where the big earthquake will occurs fairly and accurately, and so that people who live in earthquake-prone area will take proper precautions.

If an earthquake takes place on sea floor, tsunami (mighty sea wave as tall as coconut tree and moving at 700-800 km per hour) may be produced.



Example: Tsunami on 26th December 2004

f) Volcanic eruption

It throws out molten materials, dust and gases such as carbon monoxide (CO), sulphur dioxide (SO_2) and hydrogen sulphide (HS)

The dust and acidic gases pollute the air and dissolve in the rain to form **acid rain**

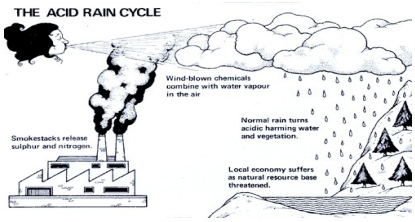
The molten materials, called **lava,** can flow and spread out over large areas. It will destroy habitats and kills organisms which are in its way.

Example: Krakatoa's volcanic eruption in 1883

Ways for Maintaining the Balance in Nature:

1) Prevent air and water pollution
2) Prevent forest fires
3) Keep our ponds, rivers and lakes clean
4) Maintain the fertility of the soil
5) Prevent the erosion of the topsoil
6) Replant after logging
7) Do not destroy plants and animals indiscriminately.
8) Set up the warning system if there will be high possibility for natural disaster to occur

3.2 Environmental Pollution and Its Effects



Source of Environmental Pollution:

- Uncontrolled use of fossil fuels (e.g: diesel and coal)

As a result, they **produce a lot of** carbon dioxide (CO_2), carbon monoxide (CO), sulphur dioxide (SO_2) and nitrogen dioxide (NO_2). All of them are **acidic gases**.

These gases **dissolve in rain, to form acid rain**, which is **very corrosive**.

- Uncontrolled use of pesticides, fungicides, and fertilizers in agriculture

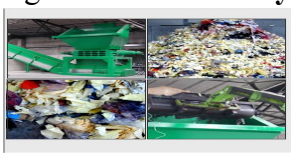
Some of pesticides and fungicides sprayed onto the crops **escape into the air incidentally and pollute it**.

Excess pesticides, fungicides and fertilizers **which dissolve in water below the ground finally flow into the natural water resource nearby** like pond, lake or river. As result, the **water will be polluted.**

- Emission of toxic gases, smoke and noise from motor vehicles

Toxic gases such carbon monoxide (CO) and sulphur dioxide (SO_2), **and smoke** comes from motor vehicles **will pollute the air in big cities**.

Besides, the **continuous noise** comes from motor vehicles in the big cities **can be very irritating.**



- Improper disposal of industrial waste

Industrial wastes such as acids, alkalis, mercury and lead are **indiscriminately disposed into the environment.** Even the **radioactive wastes** are not being disposed in a safe and proper way.

- Improper disposal of rubbish

Some of plastics are **non-biodegradable**. That means, **it cannot be decomposed by bacteria**. As a result, they stays in the environment for hundred of years.

Food swills and human sewage which are not properly managed can pollute the water and land.

- Extensive use of CFC (chlorofluorocarbon)

CFC is the **main pollutant which destroys the ozone in the atmosphere**. It is **extensively used** as a cooling agent **in refrigerators and air conditioners**.

Effects of Environmental Pollution:

- Harmful Effect on Human Health

Pollutant	Harmful Effects
Lead (Pb)	Cause high blood pressure and nervous disorders
Mercury (Hg)	Destroys the nervous system Cause deformity in fetus Leading to Minamata diseases
Chromium (Cr)	Cause adverse effects if it accumulate too much in kidneys, brain, liver and bones.
Carbon monoxide (CO)	Depriving oxygen from our body
Sulphur dioxide (SO_2)	Irritate and corrode human's respiratory system Cause coughs, asthma and bronchitis
Nitrogen dioxide (NO_2)	"
Smoke	Cause lung cancer
Sewage	Cause water borne disease such as typhoid, cholera and dysentery
Radioactive waste	Cause sterility Cause deformity in fetus Cause cancer, even worse death
Noise	Lead to the total deafness and nervous disorders

- Destruction of Habitats

Pollutant	Harmful Effects
Acid rain	Corrodes the mineral in the soil, making the soil is unsuitable habitat for plants. Cause the roots of plants to be unable to absorb water.
Oil spills	Pollute the natural water resources like sea, river and lake When oil spills is washed to the shore, it makes the coast line as uninhabitable place for marine organisms

Clearing of forests for housing, heavy industries and etc deprive plants, animals and indigenous people from their habitat.

- Extinction of Species

This issue comes from many causes, like:

1. Destruction of their habitats by :- a) mining
   b) logging
   c) Clearing of forests for housing, heavy industries

2. Pollution of natural water resources by :- a) Oil spills
   b) Toxic substance spills

3. Illegal hunting

- Loss of Economic Resources

This matter comes from many reasons, like:

1. Destruction of forests by :- a) acid rain
   b) natural disasters (e.g: forest fires, typhoon, earth quake)

2. Pollution of soil by :- a) improper disposal of industrial waste
   b) extensive use of pesticides, fungicides and fertilizers

3. Soot/smoke settling (comes from thick haze) on the leaves of the green plants prevent them to receive sunlight for photosynthesis process.

4. Pollution of natural water resources by :- a) Oil spills
   b) Toxic substance spills

Global Warming:

Refer to phenomena where the Earth's temperature increases due to several factors such as:

- Clearing of large area of forests
- Burning of fossil fuels in factories and motor vehicles

} Quantity of CO_2 keeps increasing bcoz of both factors

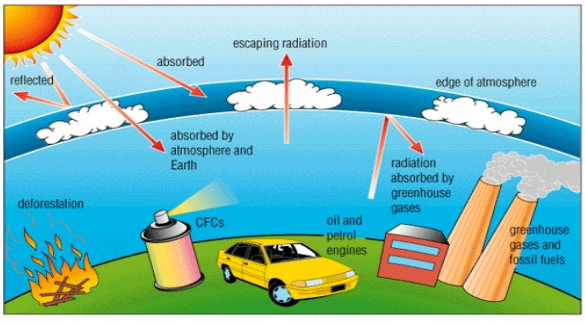
Since quantity of **CO_2 increases gradually** in atmosphere and it **denser than air**, it will **forms a layer in atmosphere surrounding the Earth**

Heat from the **Sun can pass through** the **layer of CO_2** to the Earth. **But heat and infrared reflected from the Earth cannot pass through** the **layer of CO_2** into outer space.

Heat and infra red trapped between the layer of CO_2 and the Earth makes the Earth's temperature increases.

Global warming is similar to the **greenhouse effect.**

Besides CO_2 gas, there are **other gases** that can **cause global warming** like **CFC**, **methane** and **nitrogen dioxide (NO_2).**



Thinning of Ozone Layers:

Refer to phenomena where the **ozone's layer becomes thin** due to **usage of CFC in refrigerator, air conditioner and aerosol spray**

Basically, ozone is **made up with the combination of three oxygen atoms (O_3)**. It **formed and decomposed at the same rate** so that there is **no change in the thickness of ozone's layer.** The usage of ozone is **to protect the Earth from excess of ultraviolet (UV) light from the Sun**

However, the usage of CFC increases the rate of ozone's decomposition. If **it is not treated immediately**,

- High intensity UV light can **cause cancer**
- " **kill the cytoplasm of cells**
- " **damage plant tissue**
- " **reduce immuniy to fight disease**
- " **increase the temperature of the Earth**

3.3 Conservation of the Environment

- **How to control environmental pollution?**

1. **Controls** the **usage of fossils fuel**
   1. Use unleaded petrol
   2. Use alternative sources (hybrid, solar, electric and etc)

2. " **disposal of industrial waste**
   1. Build very high chimney and use electrostatic filter inside it
   2. Radioactive waste should be stored in lead and concrete container before it is disposed on the sea floor or desert.

3. " **usage of chemical pesticides and fertillizers**
   1. Practice biological control
   2. Practice rotation of crops
   3. Use organic fertilizer such as compost

4. " **emission of pollutants from motor vehicles**
   1. Use unleaded petrol
   2. Use catalytic converter
   3. Install a silencer at exhaust system
   4. Use public transport

5. " **disposal of rubbish**
   1. Reuse materials
   2. Recycle glass, plastics and paper
   3. Set up rubbish traps along a river

6. " **usage of CFC**
   1. Reduce the usage of CFC
   2. Replace CFC with HFC