

## CHAPTER 15

# Our Environment

# Acknowledgment

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- Some images and video clips have been modified according to the syllabus.

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Exercise (MCQ)

**(Activity 15.1) Collect waste material from your homes. This could include all the waste generated during a day, like kitchen waste (spoilt food, vegetable peels, used tea leaves, milk packets and empty cartons), waste paper, empty medicine bottles/strips/bubble packs, old and torn clothes and broken footwear. Bury this material in a pit in the school garden or if there is no space available, you can collect the material in an old bucket/ flower pot and cover with at least 15 cm of soil. Keep this material moist and observe at 15-day intervals.**

**What are the materials that remain unchanged over long periods of time?**

Materials like plastics, bubble packs, milk packets, empty cartons, etc., remain unchanged over long periods of time.

**What are the materials which change their form and structure over time?**

Materials like vegetable peels, spoilt food, used tea leaves, waste paper change their form and structure over time.

**Of these materials that are changed, which ones change the fastest?**

Materials such as cotton rags, vegetable peels, used tea leaves, waste paper changed the fastest.

# Why are many man-made materials like plastics not broken down?

Specific enzymes are needed to break-down of particular substance. Bacteria and saprophytes do not have enzymes to broken down materials like plastic etc.

# Biodegradable substances

Substances that are broken down by biological processes are said to be biodegradable.

Ex: Paper, vegetable waste, cotton material, etc.



# Non-Biodegradable substances

Substances that are not broken down by biological processes are said to be non-biodegradable substances.

Ex: Rubber, plastic, glass etc.



# Non-biodegradable wastes generated daily in kitchen which can be recycled.

Broken plastic containers, polythene bags, tin foils, wrappers





# Distinguish between biodegradable and non-biodegradable substances.

Biodegradable	Non-biodegradable
1. They can be broken into simplest form by biological processes.	1. They cannot be broken by biological processes.
2. They do not produce more pollution.	2. They produce more pollution.
3. They remain for less time in environment.	3. They remain for a long time in the environment.

# How biodegradable substances affects the environment

- (i) Biodegradable substances act as a medium to return back the nutrients to the environment.
- (ii) Their degradation may release certain gases in the atmosphere thereby polluting the environment.

# How non-biodegradable substances affects the environment.

- (i) They make the environment poisonous and unfit for survival.
- (ii) They block the transfer of energy and minerals in the ecosystem

# HOW LONG DOES IT TAKE?

POLYMERIC MATERIAL	DEGRADATION TIME
Cotton rags	1-5 months
Paper	2-5 months
Rope	3-14 months
Orange peels	6 months
Wool socks	1 to 5 years
Cigarette butts	1 to 12 years
Plastic coated paper milk cartons	5 years
Plastic bags	10 to 20 years
Nylon fabric	30 to 40 years
Aluminum cans	80 to 100 years
Plastic 6-pack holder rings	450 years
Glass bottles	1 million years
<b>Plastic bottles</b>	<b>May be never</b>

# Advantages of paper bags over plastic bags during shopping.

- a) Paper of paper bags can be recycled. During recycling it does not produce poisonous gases like plastic bags.
- b) Paper bags are biodegradable and do not pollute the environment like non-biodegradable plastic bags.



# Why is the government stressing upon the use of jute/cloth carrying bags?

- a) Jute/cloth bags are biodegradable and do not produce harmful gases on recycling.
- b) They do not pollute environment on disposal.



# Harmful effects of using plastic bags on the environment

a) Polythene bags when buried, soil becomes barren and leads to soil pollution.



# Harmful effects of using plastic bags on the environment

b) Plastic bags often block drains leading to overflow of drain causing foul smell and source of spread of diseases.





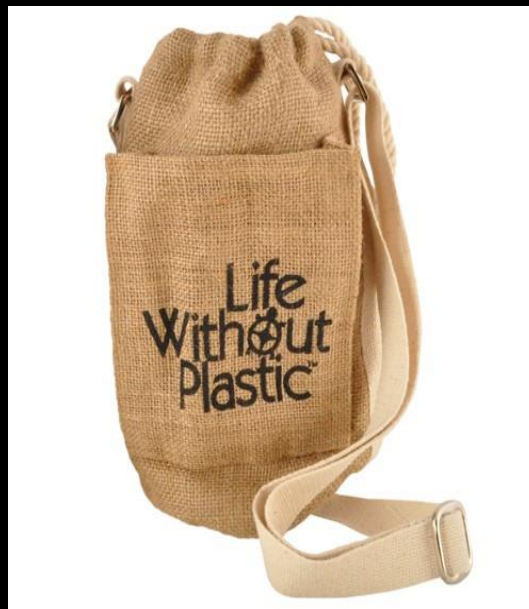
# Harmful effects of using plastic bags on the environment

c) On burning, they release toxic gases that cause pollution.



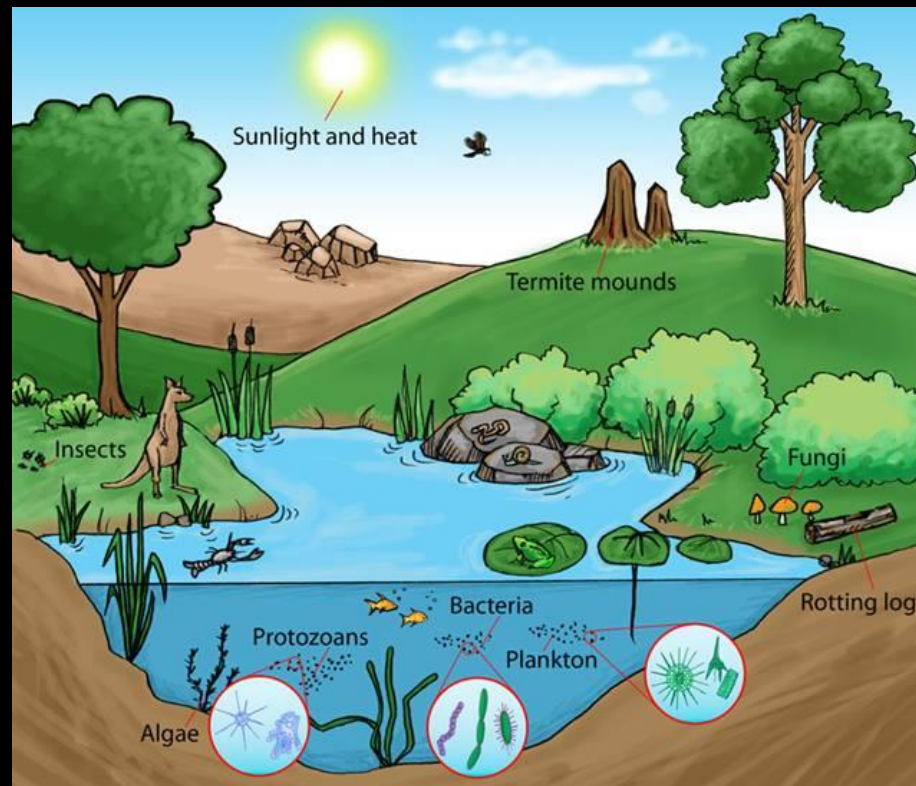
# Harmful effects of using plastic bags on the environment

Alternatives to plastic bags are cloth bag, jute bags and paper bags to carry purchased items.



# Ecosystem

All the interacting organisms in an area together with the non-living constituents of the environment form an ecosystem



# Components of Ecosystem

The two components of ecosystem are

- a) biotic component - Living organisms like plants, animals and microorganisms.
  
- b) abiotic components - Physical factors like temperature, rainfall, wind, soil and minerals.

## Garden as an Ecosystem

A garden has different plants, such as grasses, trees; flower bearing plants like rose, jasmine, sunflower; and animals like frogs, insects and birds. All these living organisms interact with each other and their growth, reproduction and other activities are affected by the abiotic components of ecosystem.

## **Natural ecosystem**

Forests, ponds and lakes.

## **Artificial ecosystem**

Gardens and crop-fields are human made (artificial) ecosystems.

## Aquarium as ecosystem

The aquatic plants would make the food from the available light. The food can be used by fishes. A food chain is formed.



## Why should we clean an Aquarium?

An aquarium does not have adequate number of decomposers for wastes to decompose and so it has to be cleaned once in a while. Increase in nutrients due to decomposition causes algae growth which cause limited water of aquarium cloudy or opaque and growth of bacteria. This harms the fish population in the aquarium.



# Why should we clean an Aquarium?

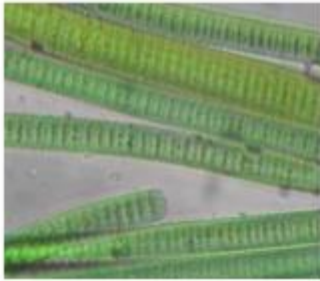


## Should we clean ponds and lakes also?

Ponds and lakes have enough varieties of decomposers which can decompose waste organic material and complete the biochemical cycles.

# Producers

All green plants and certain blue green algae which can produce food by photosynthesis are called the producers.



Photosynthetic Bacteria



Grasses



Shrubs



Trees

# Consumers

The organisms which consume the food produced, either directly from producers or indirectly by feeding on other organisms are called consumers.

## □ Herbivores

- Only eat plants



## □ Omnivores

- Eats both plants & animals



## □ Carnivores

- Only eats animals



## □ Scavengers

- Eat bodies of dead organisms



# Decomposers

The microorganisms that break-down the complex organic substances into simple inorganic substances are called decomposers.



# **What will happen to the garbage and dead animals and plants in the absence of decomposers?**

There will be no recycling of nutrients such as nitrogen, phosphorous, sulphur etc. All biodegradable wastes (garbage, dead animals and plants) will accumulate and cause environmental pollution. In the absence of decomposers, the earth would be piled up with the dead remains of plants and animals.

## Role of decomposers in the ecosystem

Decomposers help in the breakdown of organic matter or biomass from the body of dead plants and animals into simple inorganic raw materials such as  $\text{CO}_2$ ,  $\text{H}_2\text{O}$ , and some nutrients.

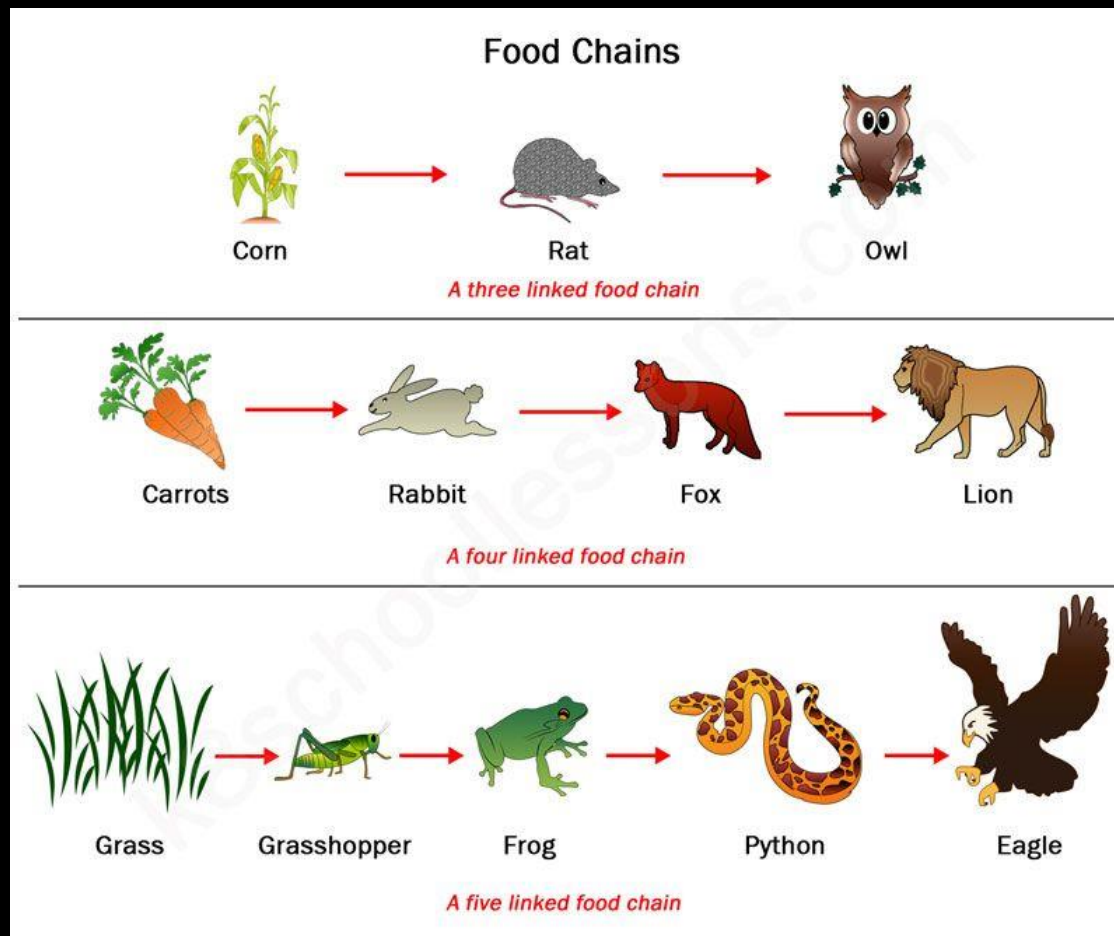
**(Activity 15.4) Write the aquatic organisms in order of who eats whom and form a chain of at least three steps.**





# Food chain

The series of organisms taking part at various biotic levels form a food chain.



## **Food chain in a forest**

Grass → Deer → Tiger

## **Food chain in a grassland**

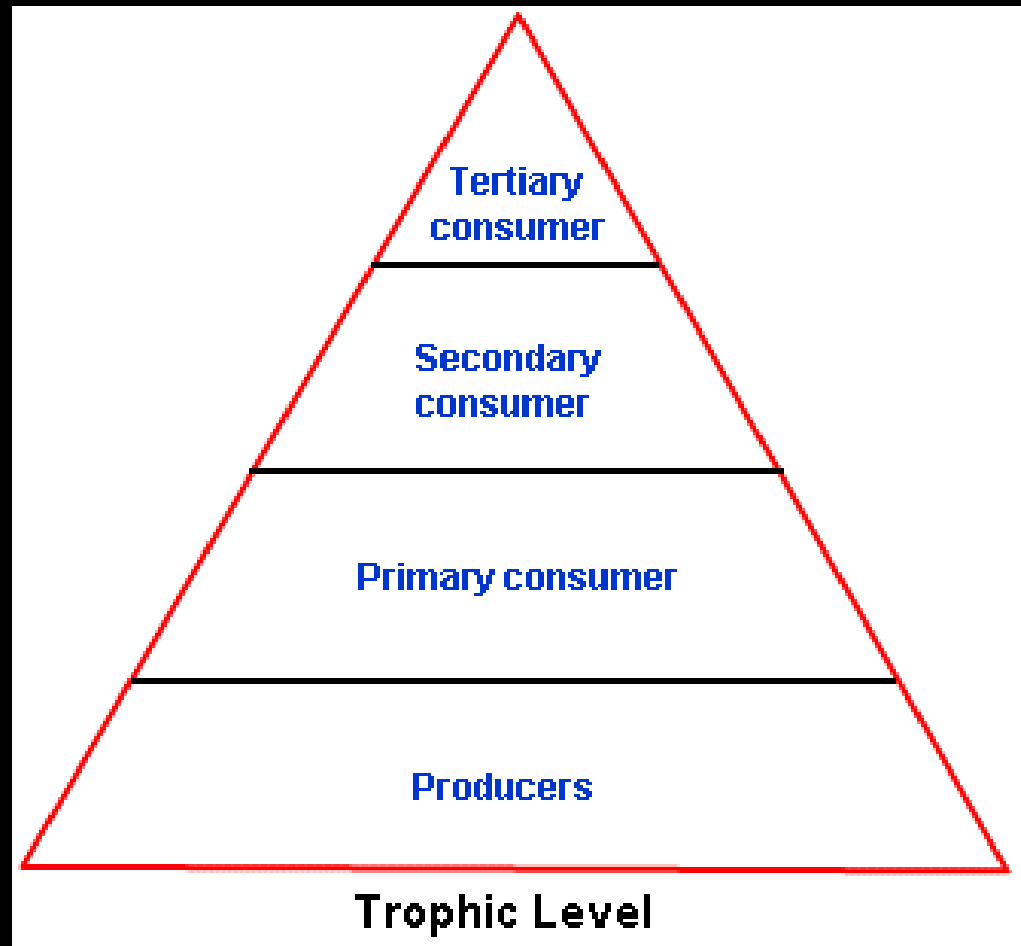
Grass → Grasshopper → Frog → Snake → Eagle

## **Food chain in a pond**

Phytoplankton → Scorpion → fish → crane

# Trophic levels

Each step or level of the food chain forms a trophic level.



## Loss of energy in trophic levels

When green plants are eaten by primary consumers, some amount goes into digestion and in doing work and the rest goes towards growth and reproduction.

# **Average value of organic matter that is present at each trophic level**

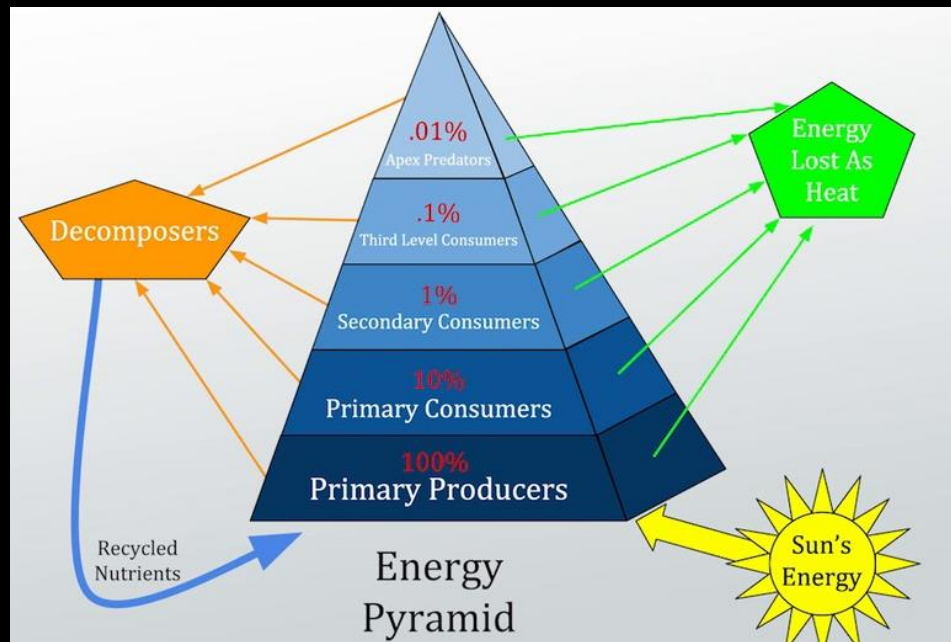
10% is the average amount of organic matter that is present at each step and reaches the next level of consumers.

## Why do food chains consists of only three or four steps?

Since only 10% of energy is available for the next level of consumers, food chains generally consist of only three or four steps. The loss of energy at each step is so much that very little usable energy remains after four trophic levels.

# 10% Law

The plants trap 1% of solar energy and only 10% of the available energy is transferred from one trophic level to the next trophic level. This is called 10% law.



**In the following food chain, grass provides 4000J of energy to the grass hopper. How much energy will be available to snake and frogs?**

Grass → grasshopper → frogs → snake

As per 10% law of transfer of energy through trophic level. Frogs will get 400J and snake will get 40J of energy.

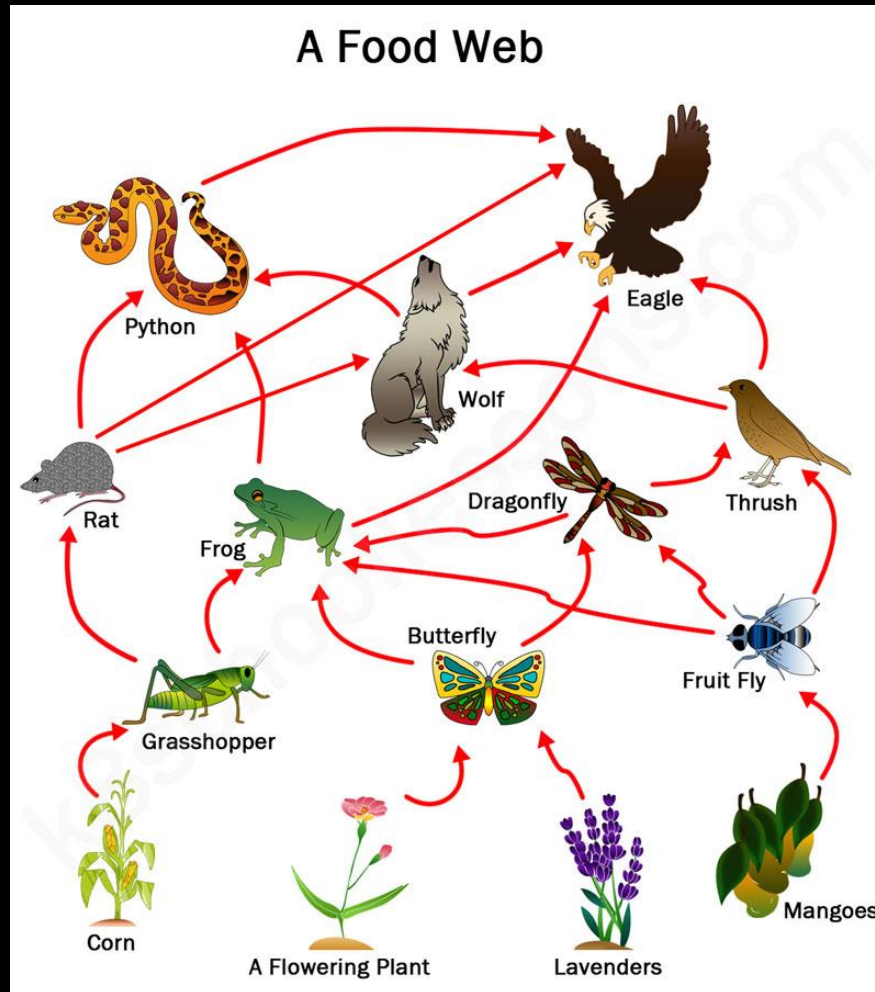


## What will happen if we kill all the organisms in one trophic level?

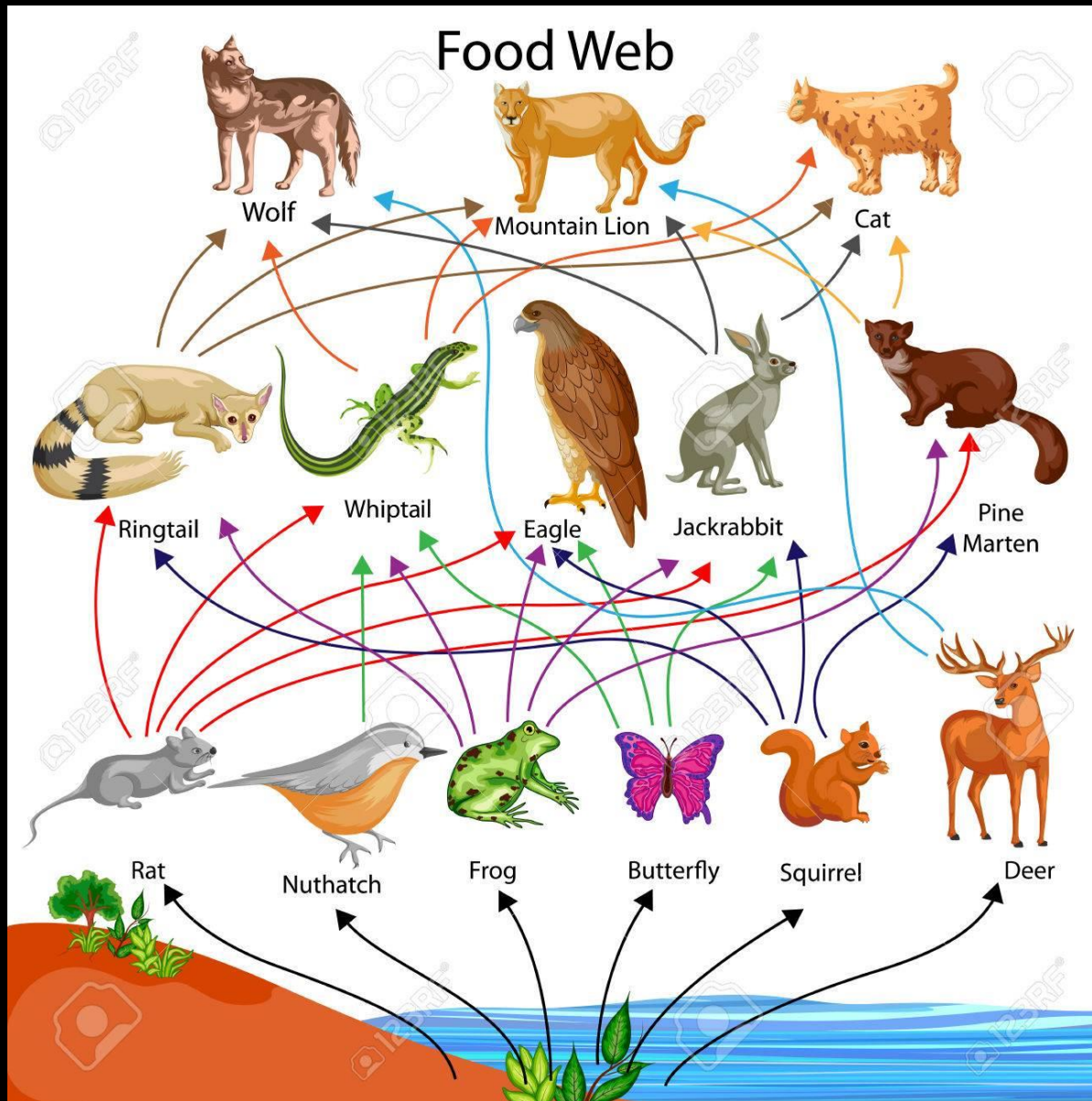
If we kill all the organisms in one trophic level, the lower trophic level will grow more in number and the higher trophic level will not survive and flow of energy from one trophic level to other will not take place.

# Food web

A series of branching lines which shows the relationship in food chains is called a food web.



# Food web



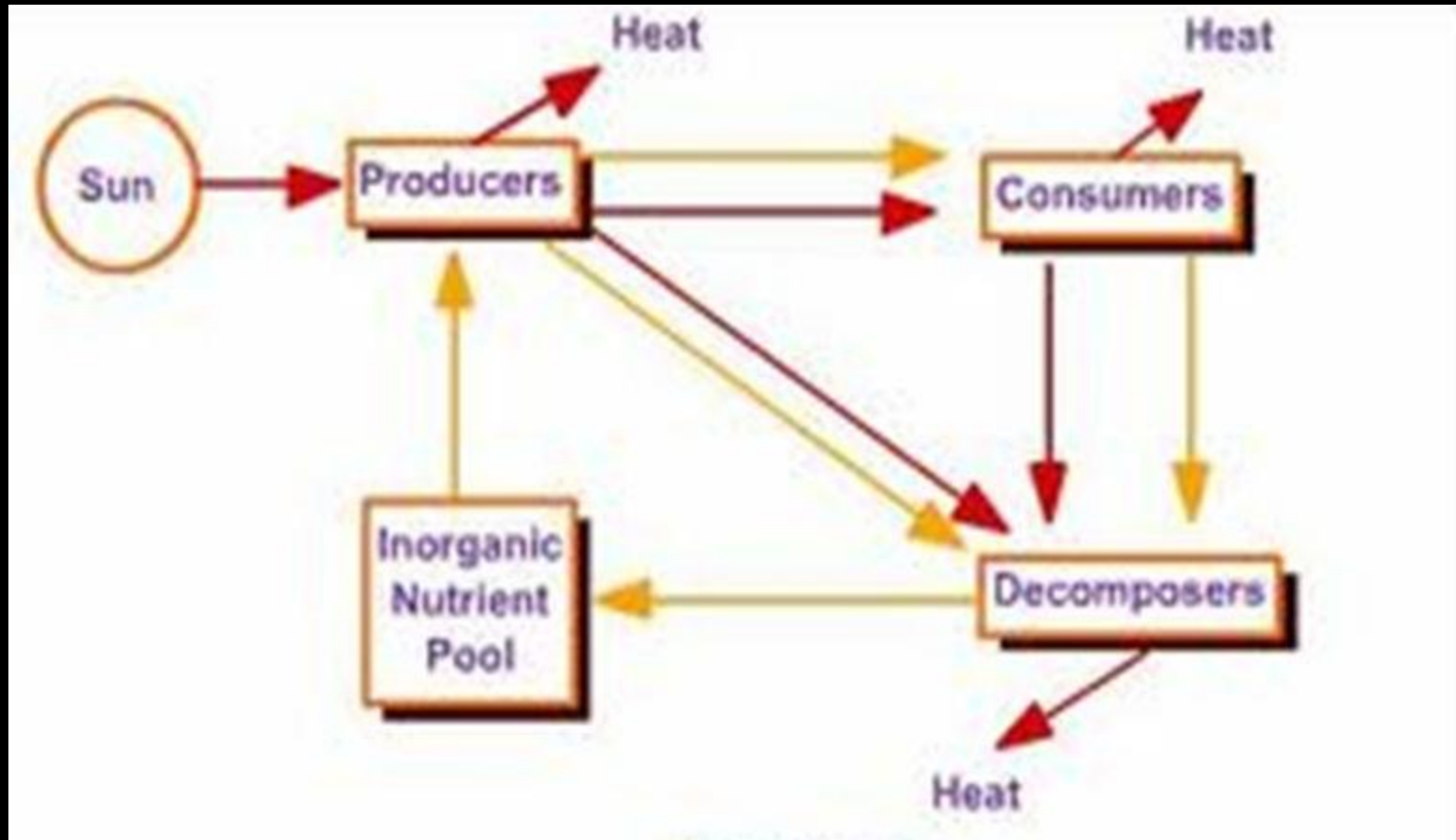
# Difference between Food chain & Food web

Food chain	Food web
1. The sequence of one organism consuming the other is known as food chain.	1. A network of food chain with intercrosses and linkages is called food web.
2. Trophic level of each organism is fixed. Each organism at a trophic level receives food from one group of organisms	2. Each organism in one trophic level receives its food from more than one group of organism.

## **Why is the flow of energy unidirectional?**

The energy that is captured by the autotrophs does not revert back to the solar input and the energy which passes to the herbivores does not come back to autotrophs. So the flow of energy is unidirectional.

# Why is the flow of energy unidirectional?

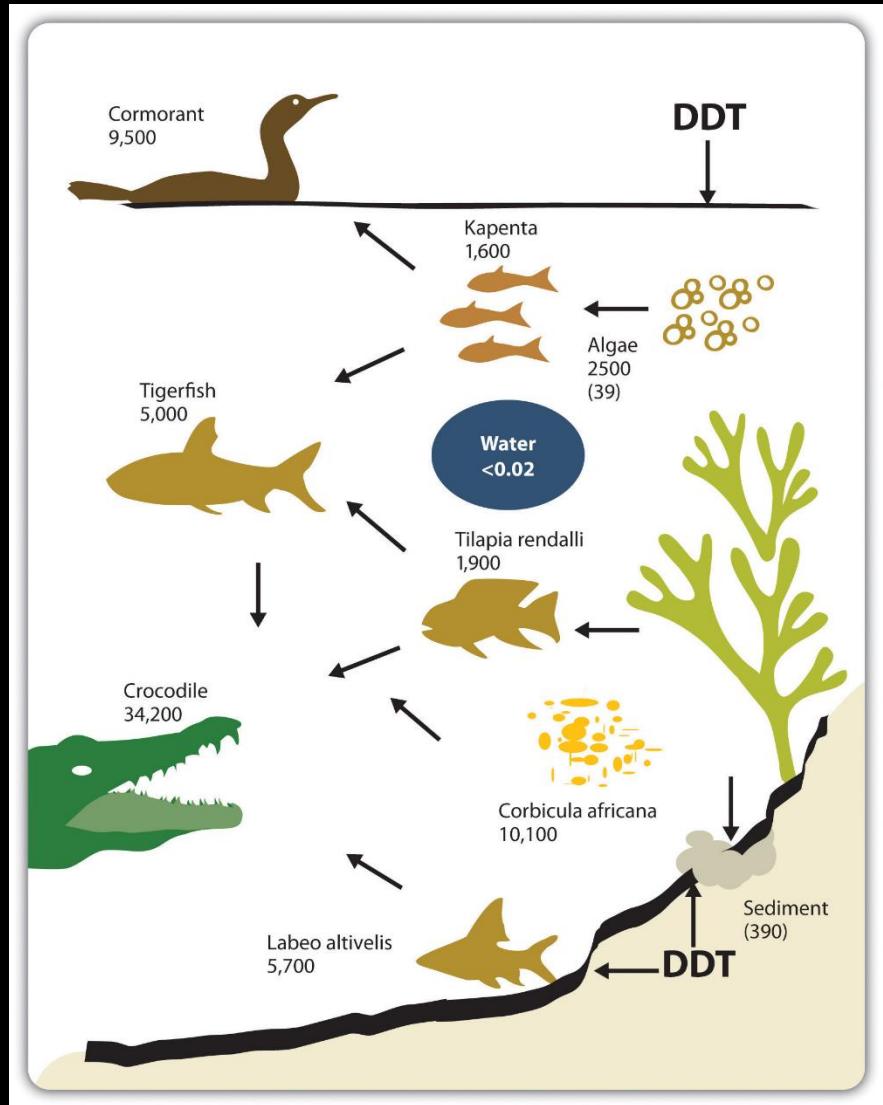


## How do pesticides and other chemicals enter the food chain?

Pesticides and other chemicals are either washed down into the soil or into the water bodies. From the soil, these are absorbed by the plants along with water and minerals, and from the water bodies these are taken up by aquatic plants and animals.

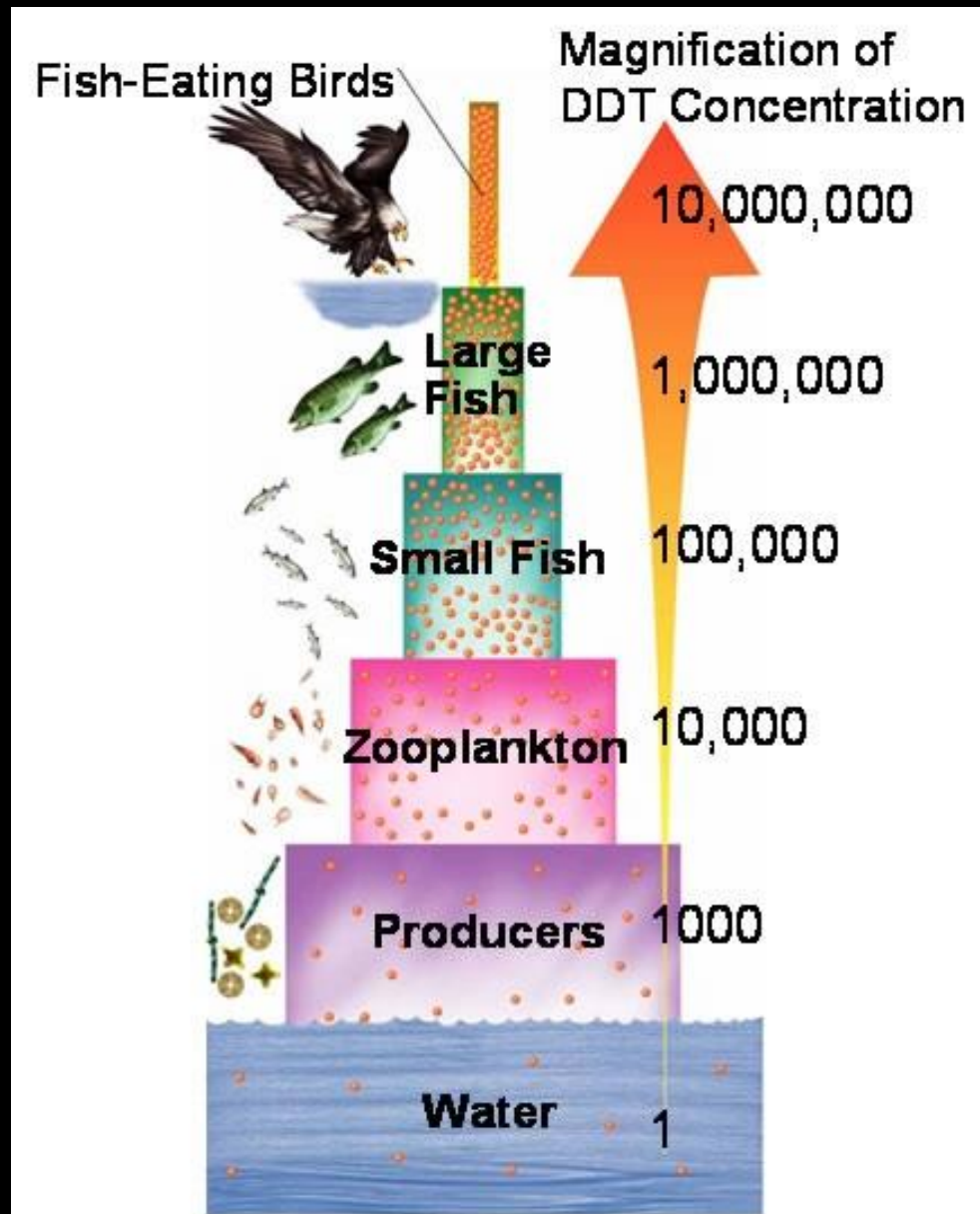
# Bio-magnification

The accumulation of chemicals in the individuals of higher trophic level is called biological magnification.





# Bio-magnification



**(Activity 15.5) What do you think would be the source of pesticides in these food items?**

Pesticides are used in crop fields to protect the crops from pests. These pesticides are absorbed by the soil. Plants absorb these chemicals from the soil through water and prepare food. When these green plants are eaten by humans, they get absorbed by the human body.

## **Discuss what methods could be applied to reduce our intake of pesticides.**

- a) All fruits and vegetables must be washed thoroughly under running water which helps to remove traces of chemicals and bacteria from the surface.
- b) Fruits and vegetables should be peeled if possible.
- c) Outer leaves of leafy vegetables can be removed.

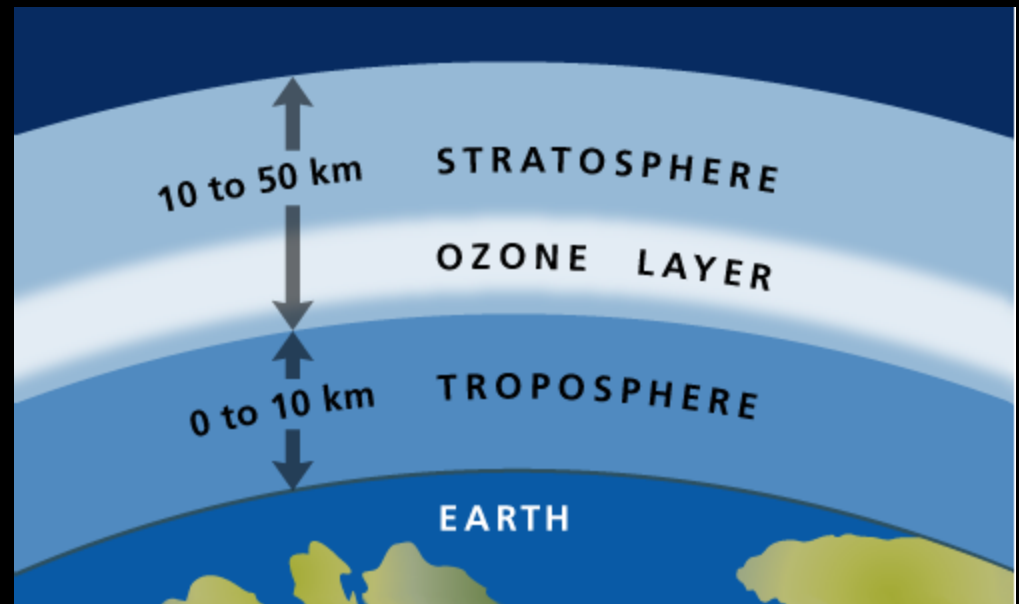
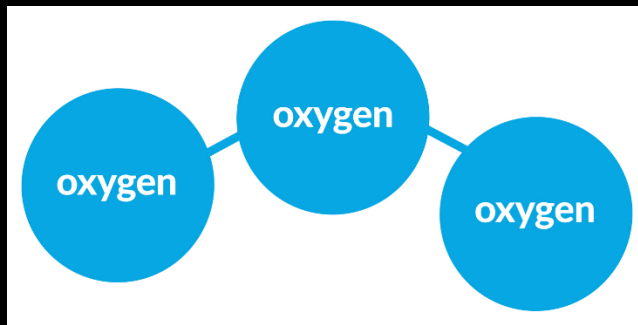
**Discuss what methods could be applied to reduce our intake of pesticides.**

d) In case of meat, fat should be trimmed because some pesticides residues collect in fat.

e) We can eat organic food or food grown using biological methods of pest management.

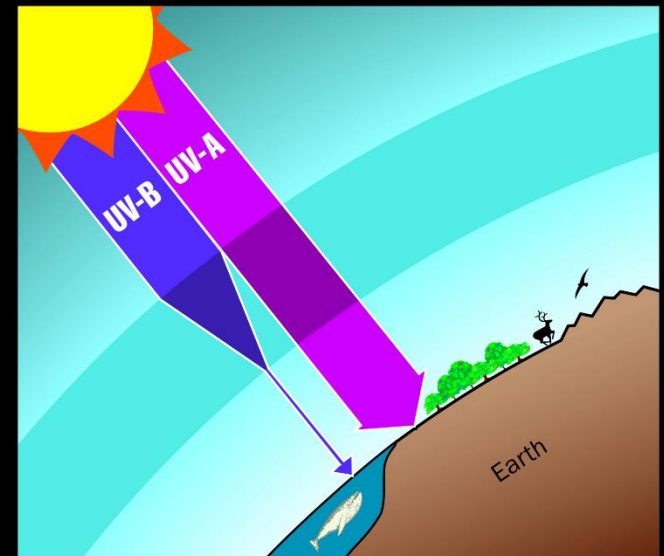
# Ozone

Ozone ( $O_3$ ) is a molecule formed by three atoms of oxygen.



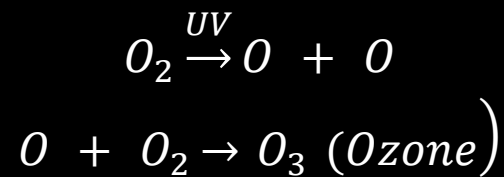
## Role of ozone in atmosphere

Ozone at higher levels of the atmosphere shields the surface of the earth from ultraviolet (UV) radiation from the Sun. This radiation is highly damaging to organisms, for example, it is known to cause skin cancer in human beings.



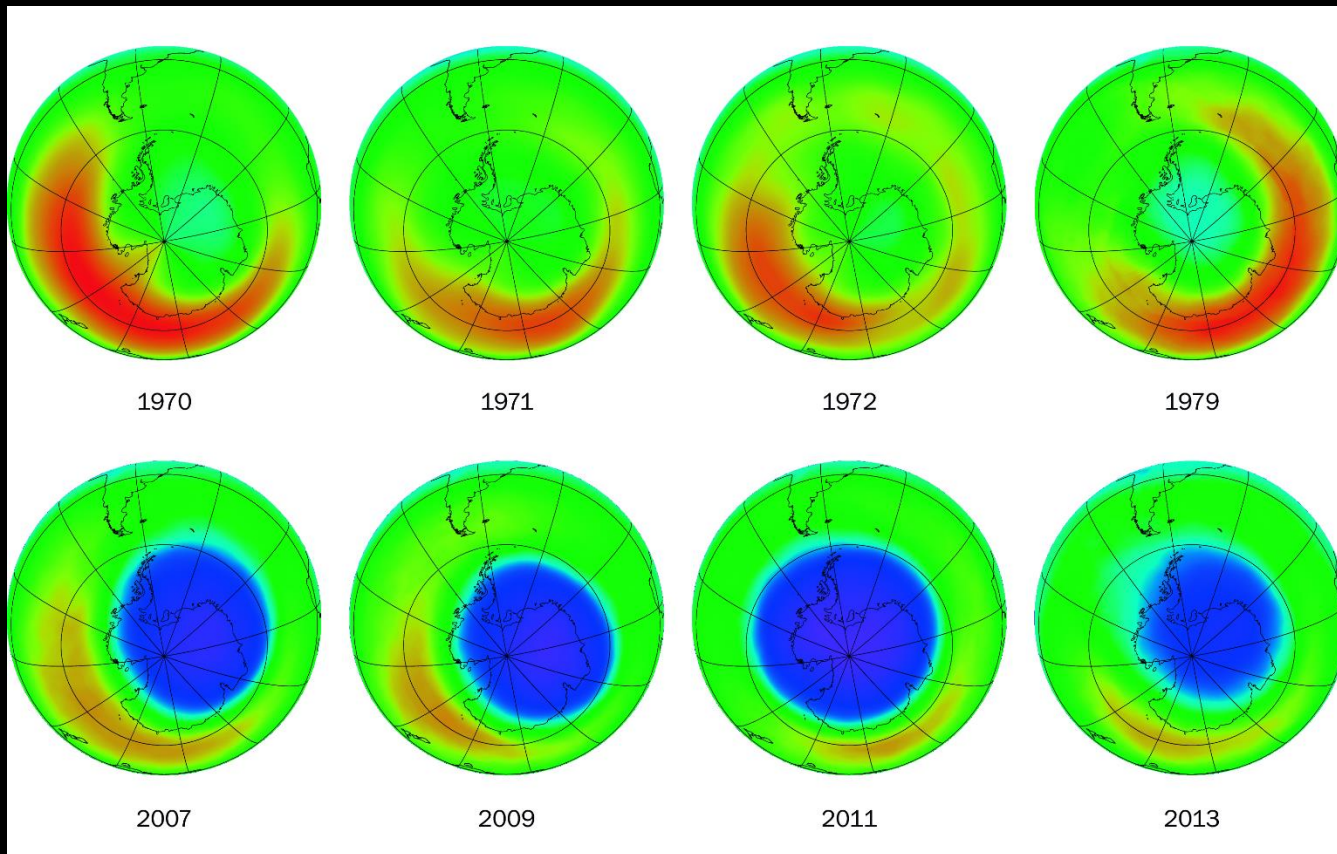
## Formation of ozone

Ozone at the higher levels of the atmosphere is formed by UV radiation acting on oxygen ( $O_2$ ) molecule. The higher energy UV radiations split apart some molecular oxygen ( $O_2$ ) into free oxygen (O) atoms. These atoms then combine with the molecular oxygen to form ozone.



# Ozone Depletion

The decrease in the amount of ozone in the atmosphere is called ozone depletion.





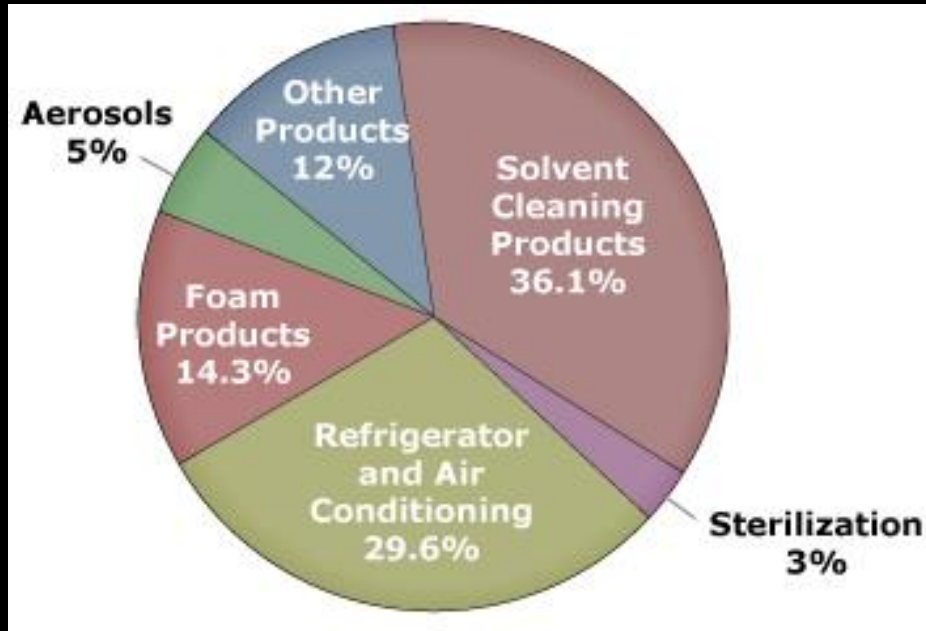
## **Reason for Ozone Depletion**

The decrease in ozone layer is due to synthetic chemical like chlorofluorocarbons (CFC) which are used as refrigerants and in fire extinguishers.

# (Activity 15.6) Which chemicals are responsible for the depletion of the ozone layer?

## the depletion of the ozone layer?

Chlorofluorocarbons (CFC), nitrogen oxides, hydrocarbons.



**(Activity 15.7) Find out what happens to the waste generated at home. Is there a system in place to collect this waste?**

The waste generated at home is separated into recyclable and non-recyclable or wet and dry. This is collected by the municipal authority and taken to a garbage dump where it is dumped separately into recyclable and non-recyclable parts.

**(Activity 15.7) Find out what happens to the waste generated at home. Is there a system in place to collect this waste?**



**(Activity 15.8) Calculate how much waste is generated at home in a day.**

Generally 2 – 3 kg waste is generated in a home per day.

**How much of this waste is biodegradable?**

Vegetable and fruit peels, leftover food, waste paper, used tea leaves, etc. amount to 1 – 2 kg per day.

**Calculate how much waste is generated in the classroom in a day. a**

Classroom waste includes mostly paper, leftover food, wrappers, dust etc. which amounts to about 750g to 1kg per day.

**How much of this waste is biodegradable?**

Most of the classroom waste is biodegradable which is less than 500g.

## **Suggest ways of dealing with this waste.**

The biodegradable wastes like paper, leftover food items, and fallen leaves should be dumped into compost pits, made in safe corner of the school, to prepare compost. The compost can be used in the school garden as manure.

**(Activity 15.9) Find out how the sewage in your locality is treated. Are there mechanisms in place to ensure that local water bodies are not polluted by untreated sewage?**

Sewage is collected in drains and sent to a Sewage Treatment Plant (STP) where it is filtered and treated with microbes and chemicals to get rid of waste material. There are sewage treatment plants which treat water before it is released into the river. Industries are required to treat wastes before allowing them to enter the rivers.



**(Activity 15.9) Find out how the sewage in your locality is treated. Are there mechanisms in place to ensure that local water bodies are not polluted by untreated sewage?**



## **Find out how the local industries in your locality treat their wastes.**

Different industries use different methods to eliminate pollutants depending upon the nature of wastes.

- Waste water is kept in tanks to remove suspended impurities.
- Waste water is treated with different chemicals to remove waste and harmful chemicals.
- Waste water is treated with disinfectants like chlorine before allowing it into rivers.

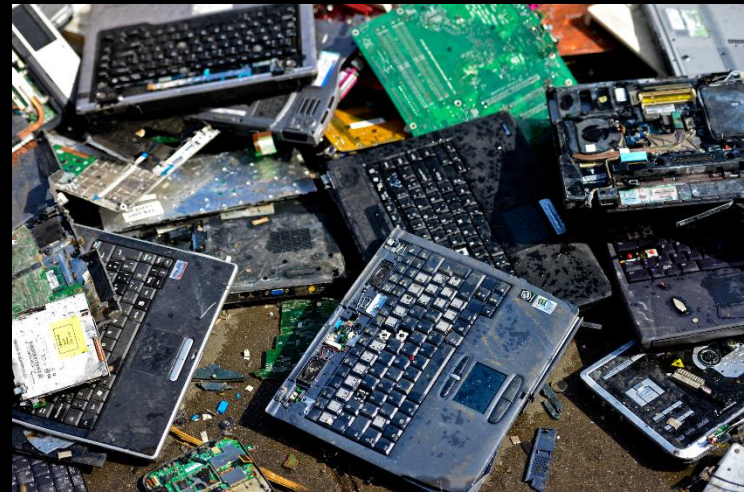
# Are there mechanisms in place to ensure that the soil and water are not polluted by this waste?

Biodegradable waste is sent for preparation of compost, bio-gas and manure;  
non-biodegradable is used for land refill.



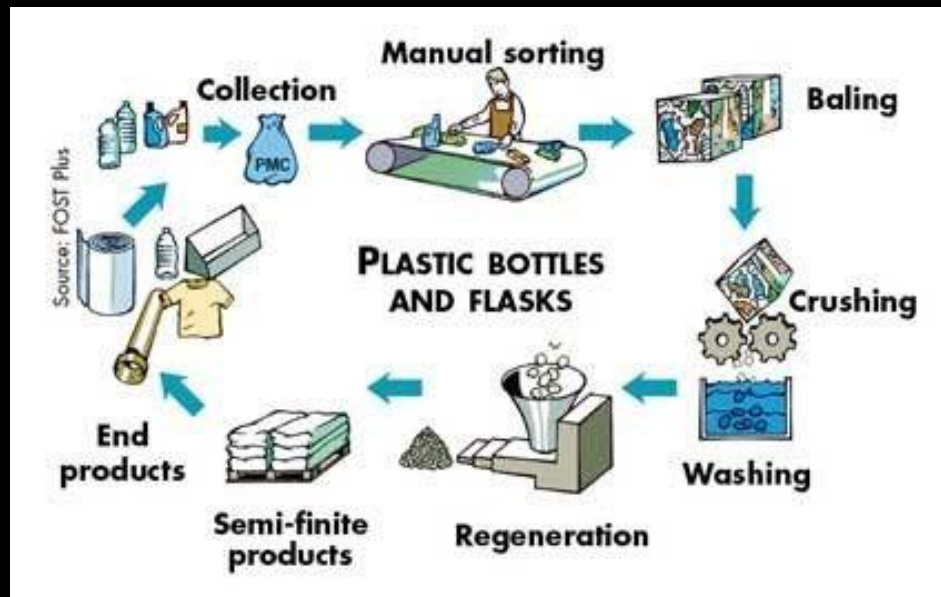
**(Activity 15.10) Search the internet or library to find out what hazardous materials have to be dealt with while disposing of electronic items. How would these materials affect the environment?**

Disposed electronic items contain cadmium, lead, silicon, plastics, etc. These items cause land pollution which can affect our health and also other organisms.



# Find out how plastics are recycled.

Plastics can be melted and recycled for making plastic bags, mugs, bucket, etc. Molten plastic waste mixed with asphalt can be used for making road.



## **Does the recycling process have any impact on the environment?**

During recycling of plastic fumes of plastic and other chemicals cause air pollution which may cause breathing problems like asthma.

# Exercise (MCQ)

**1. Which of the following groups contain only biodegradable items?**

- (a) Grass, flowers and leather
- (b) Grass, wood and plastic
- (c) Fruit-peels, cake and lime-juice
- (d) Cake, wood and grass



## 2. Which of the following constitute a food-chain?

- (a) Grass, wheat and mango
- (b) Grass, goat and human
- (c) Goat, cow and elephant
- (d) Grass, fish and goat

### **3. Which of the following are environment-friendly practices?**

- (a) Carrying cloth-bags to put purchases in while shopping
- (b) Switching off unnecessary lights and fans
- (c) Walking to school instead of getting your mother to drop you on her scooter
- (d) All of the above

END