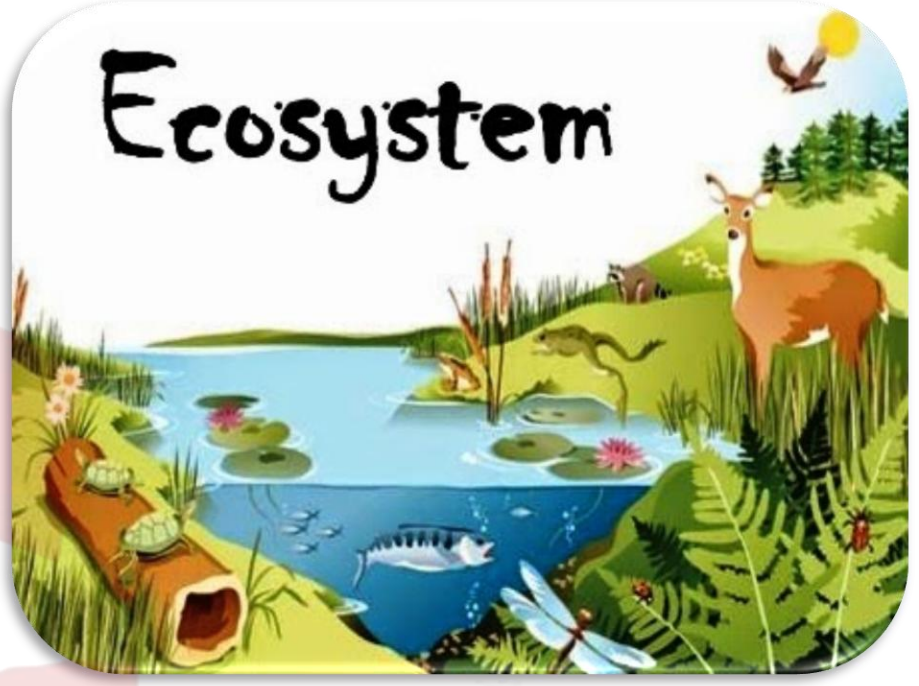
Class 10

Class 10: Our Environment

Introduction

- Everything that surrounds us is environment. It includes both living (biotic) and non-living (abiotic) components.
- Interaction between these biotic and abiotic components form an ecosystem.



- In an ecosystem living components depend on each other for their food which give rise to food chains and food webs in nature.

- Human activities lead to environmental problems such as depletion of ozone layer and production of huge amount of garbage.

ECO-SYSTEM – WHAT ARE ITS COMPONENTS?

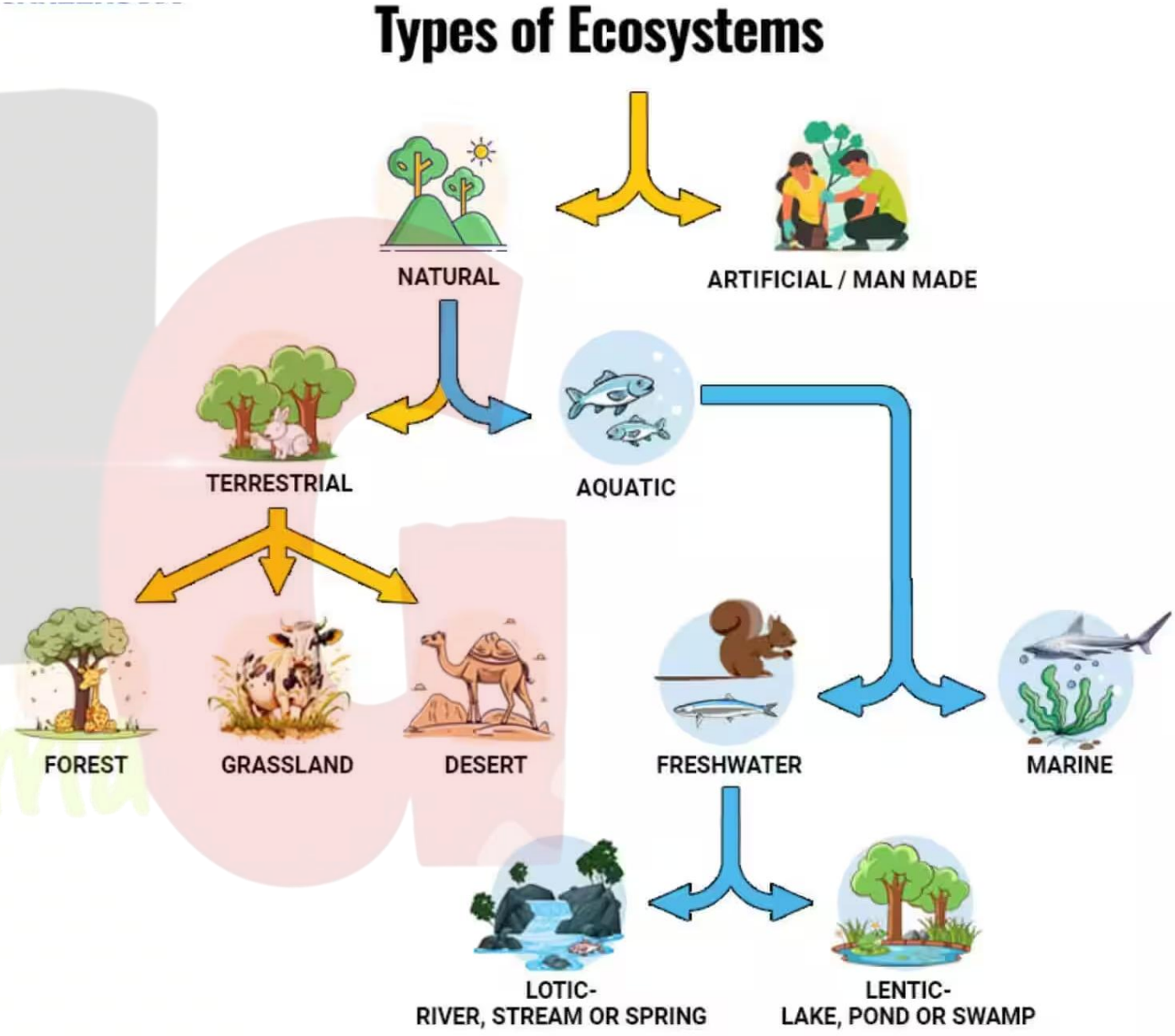
An **ecosystem** is a self-sustained system where living organisms interact with each other and with the physical environment.

Examples

- Pond ecosystem
- Forest ecosystem
- Desert ecosystem
- Aquatic (freshwater/marine)

Component of ecosystem :-

- Biotic (Living component)
- Abiotic (non living component)



ECO-SYSTEM – WHAT ARE ITS COMPONENTS?

Types of ecosystem

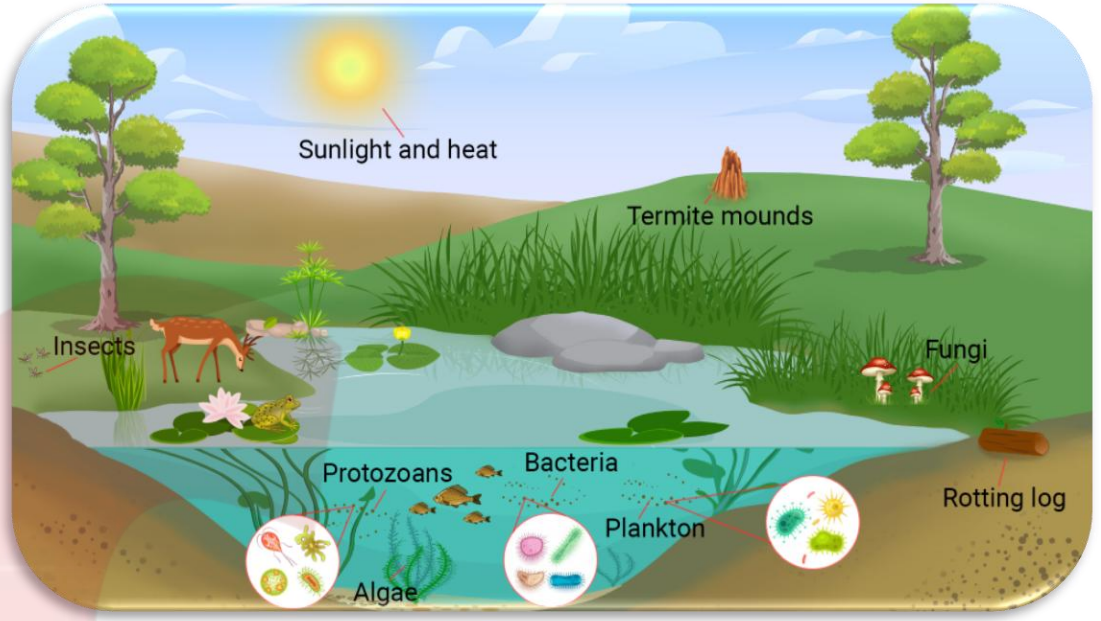
It is of two types

(i) Natural ecosystem: The ecosystem which exist in nature on its own.

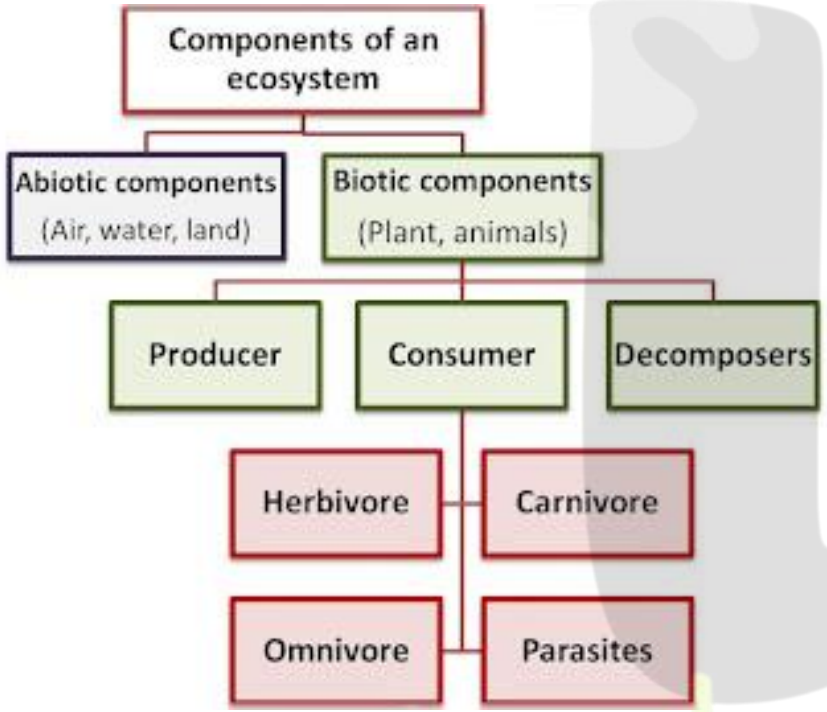
Example: forest, lake, Aquatic.

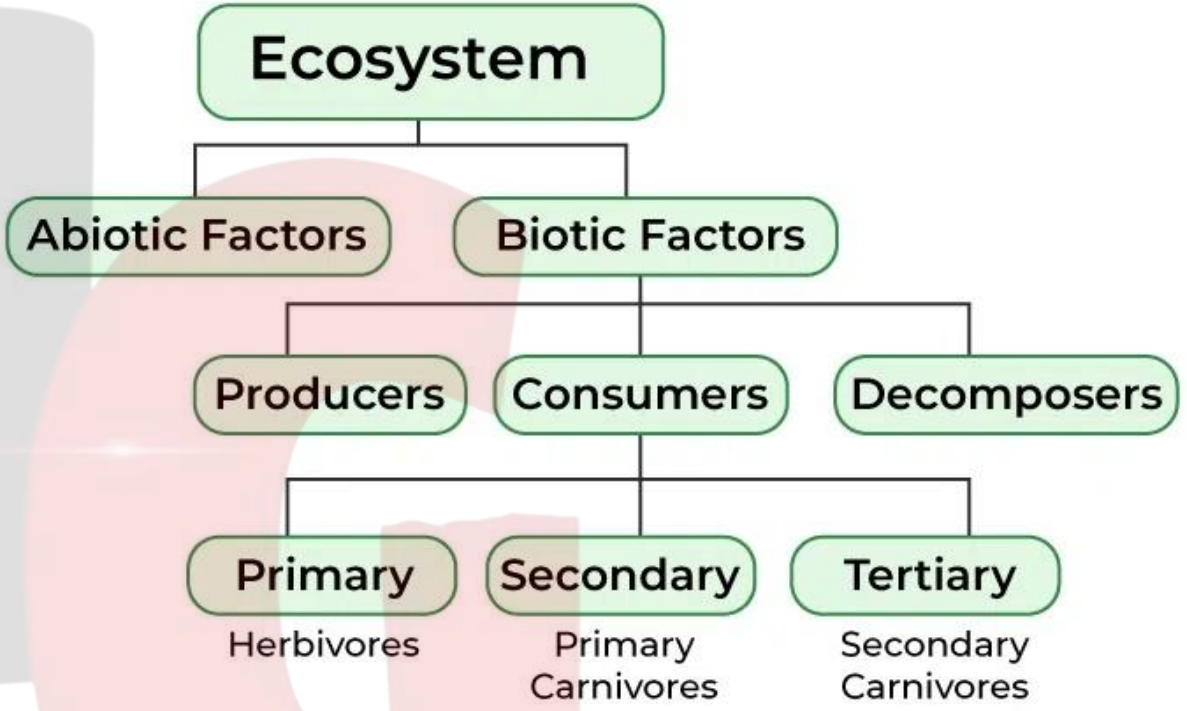
(ii) Artifical ecosystem: Man-made ecosystems are called artificial ecosystem.

Example: crop field, aquarium, garden.



ECO-SYSTEM – WHAT ARE ITS COMPONENTS?





i) Abiotic Components: All the non-living components such as air, water, land, light, temperature etc. form the abiotic components.

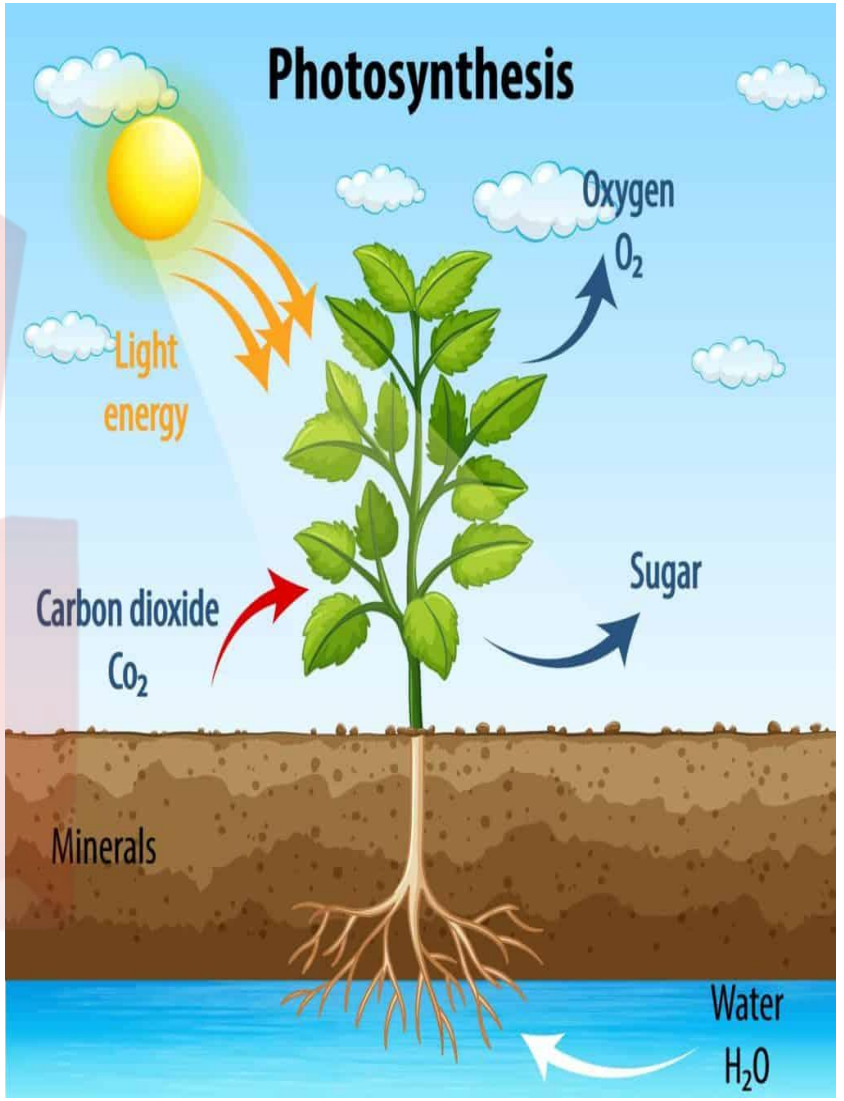
(ii) Biotic Components: All the living components such as plants, animals, bacteria, fungi etc. form the biotic components.

ECO-SYSTEM – WHAT ARE ITS COMPONENTS?

Producer

Producers: All green plants and blue-green algae can produce their own food using abiotic components (photosynthesis), hence called producers.

*Photosynthesis is the process used by plants, algae, and some bacteria to convert **light energy into chemical energy**, using sunlight, water, and carbon dioxide to create **glucose (sugar)** and oxygen.*



ECO-SYSTEM – WHAT ARE ITS COMPONENTS?

Consumers

Include all animals which depend on producers directly or indirectly for their food.

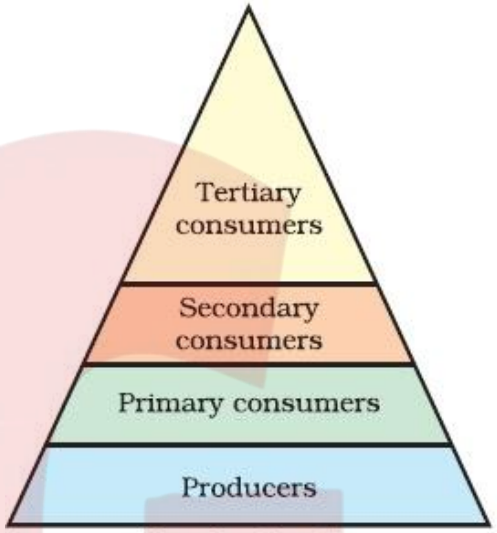
Division of Consumers

(i) **Herbivores:** Plant eaters. Example: goat, deer.

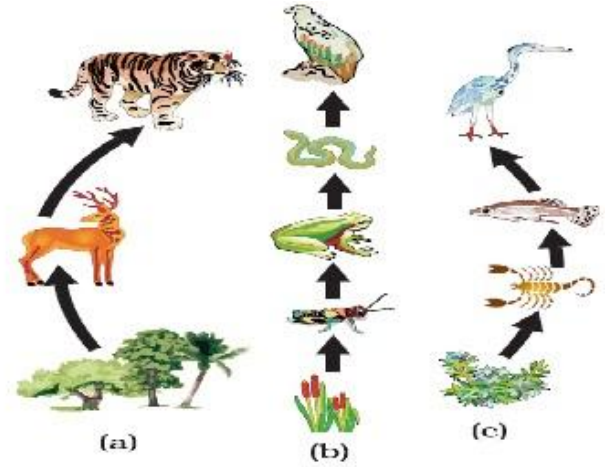
(ii) **Carnivores:** Flash eaters. Example: tiger, crocodile.

(iii) **Omnivores:** Eats both plants and animals. Example: human.

(iv) **Parasites:** Live on the body of host and take food from it. Example: lice, cascuta.



Trophic levels

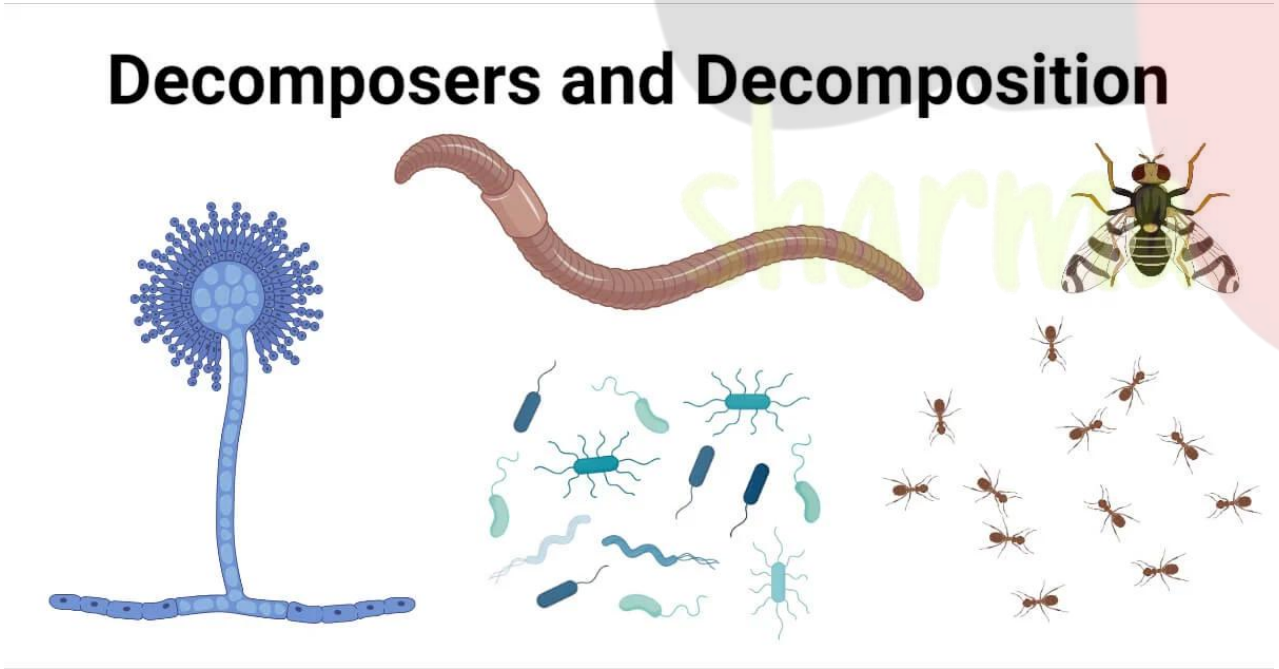


Food chain in nature (a) in forest, (b) in grassland and (c) in a pond

ECO-SYSTEM – WHAT ARE ITS COMPONENTS?

Decomposers

Include organisms which decompose the dead plants and animals.
Example: bacteria, fungi. These help in the replenishment of natural resources.



Decomposer animals are nature's recyclers. They are the organisms responsible for breaking down and decomposing dead plants, animals, and other organic matter. These unsung heroes include insects like beetles and worms, as well as larger scavengers like vultures and crabs.


Beetles

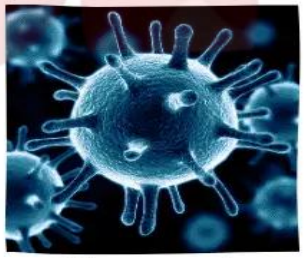

Fly Larvae


Fungi


Sow bugs


Termites


Worms


Microscopic organisms


Millipedes


Slugs

FOOD CHAIN

Definition

Food chain is a series of organisms in which one organism eats another organism as food.

Or,

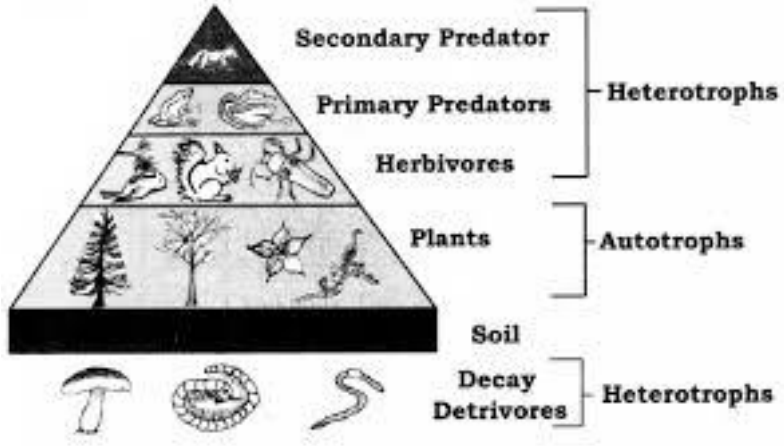
A **food chain** is a linear sequence showing **who eats whom** in an ecosystem.

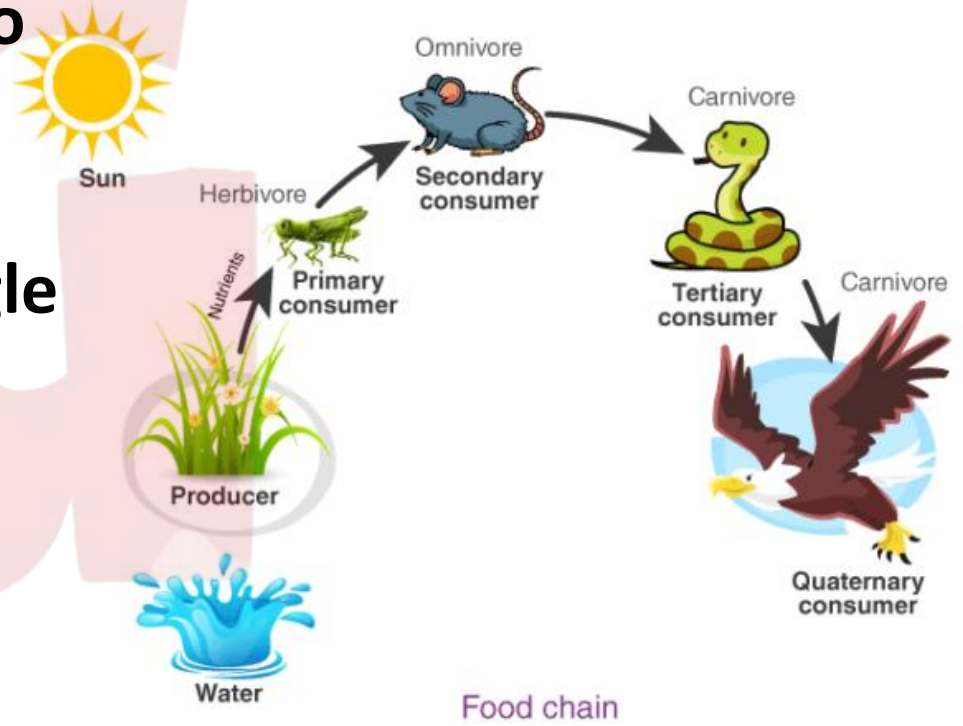
Example

Grass → Grasshopper → Frog → Snake → Eagle

Features

- Always **starts with producers**
- Ends with **top carnivores**
- Shows one-way flow of energy



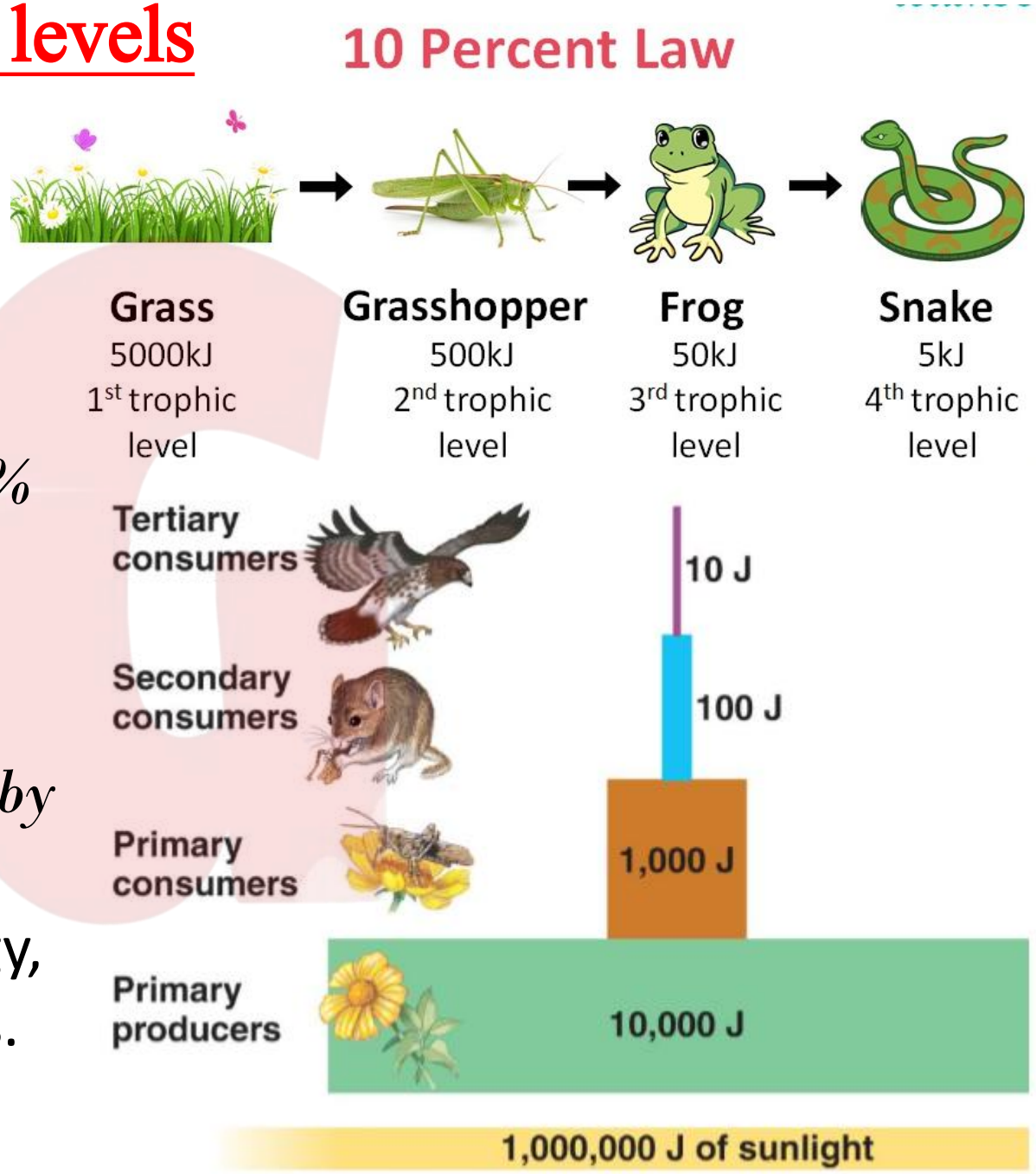


Food chain

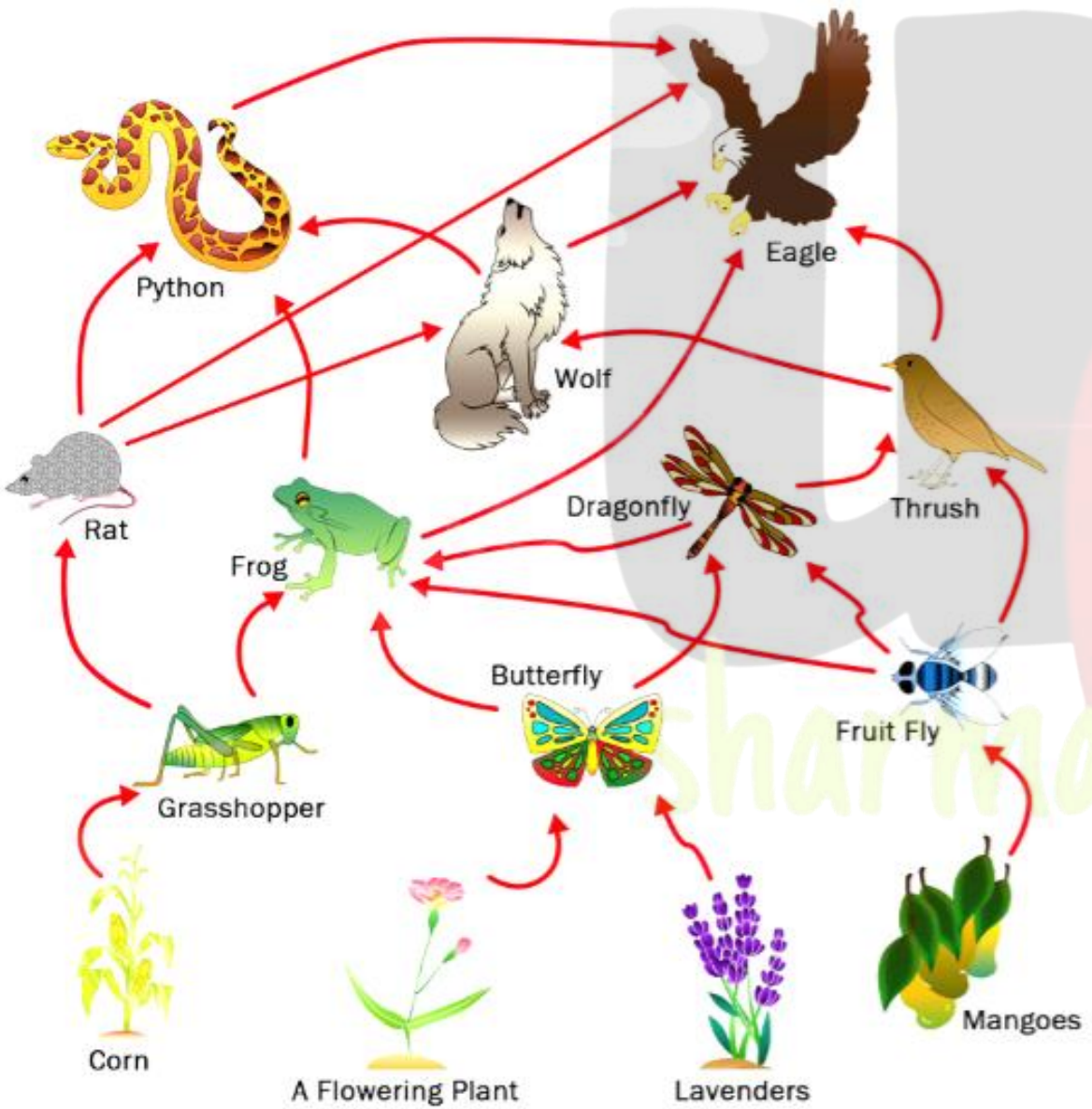
In a food chain various steps where transfer of energy takes place is called a **trophic level**.

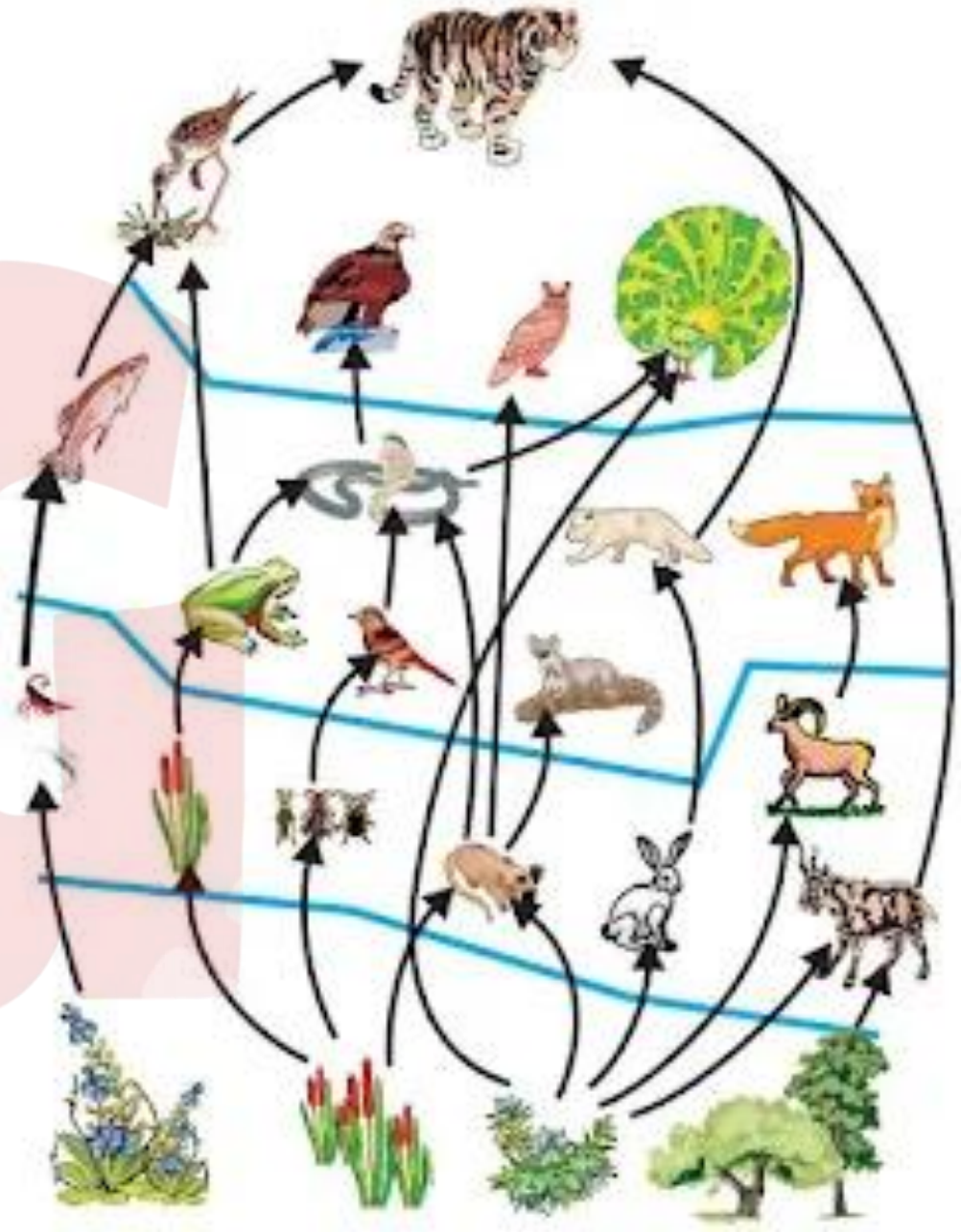
Flow of energy between trophic levels

- Flow of energy in a food chain is unidirectional.
- Green plants capture 1% of sunlight and convert it into food energy.
- **10 percent law(Lindeman) :** *Only 10% of energy is transferred to the next trophic level. The remaining 90% energy is used in life processes (digestion, growth, reproduction etc.) by present trophic level.*
- Due to this gradual decrease in energy, food chains contain 3-4 trophic levels.



FOOD WEB


Python
Eagle
Wolf
Rat
Frog
Dragonfly
Thrush
Butterfly
Fruit Fly
Grasshopper
Corn
A Flowering Plant
Lavenders
Mangoes



FOOD WEB

Definition

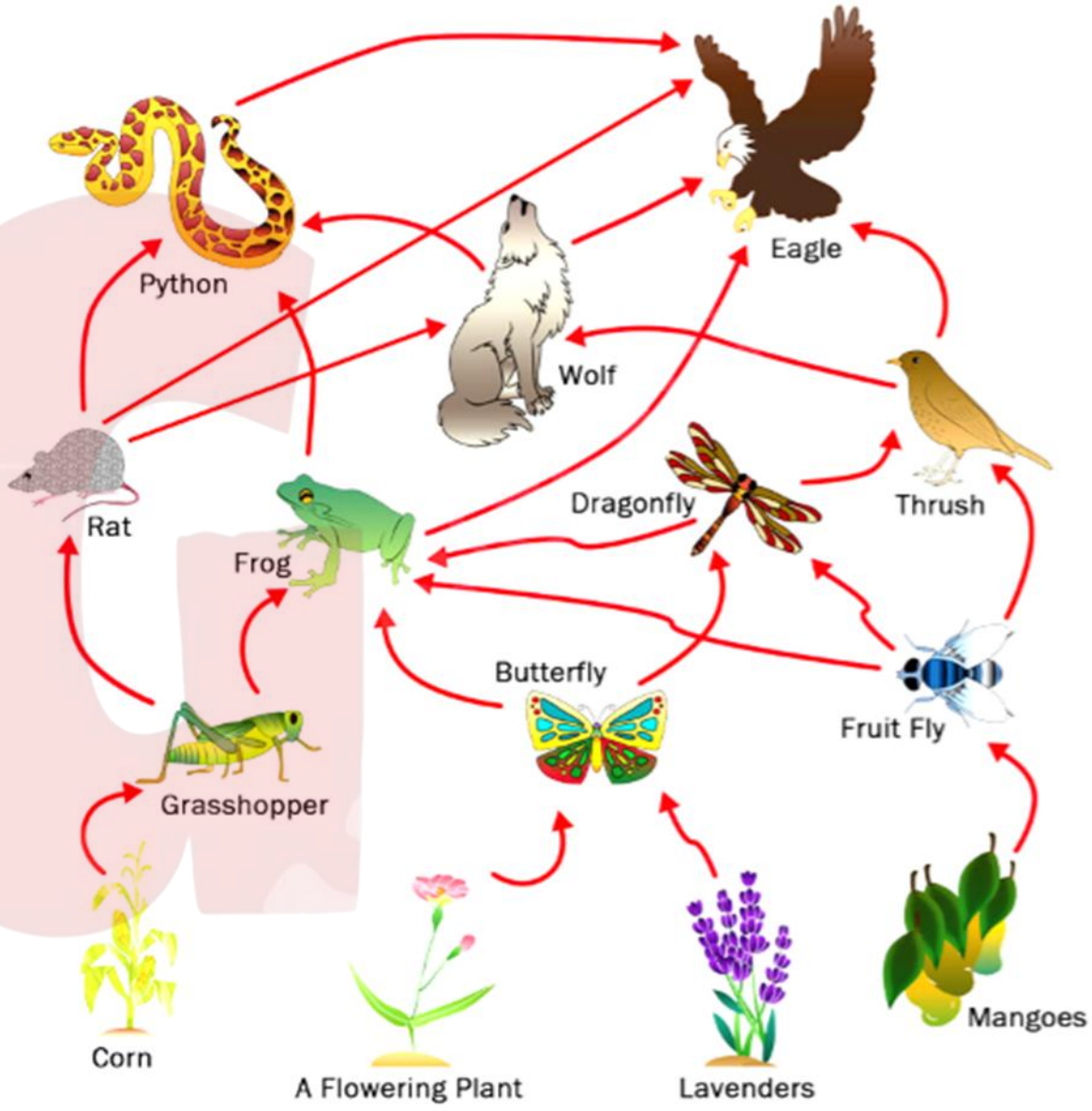
In nature large numbers of food chains are interconnected forming a food web.

Or,

*A **food web** is a network of interconnected food chains.*

Importance

- Makes the ecosystem stable
- Provides alternative food sources



Food Chains and Webs

Features of Energy flow diagram

1. Energy flow is **unidirectional.** It does not revert back from autotroph to the Sun or consumer to autotroph.
2. **Energy** available at each trophic level **gets diminished** progressively due to loss of energy at each level.

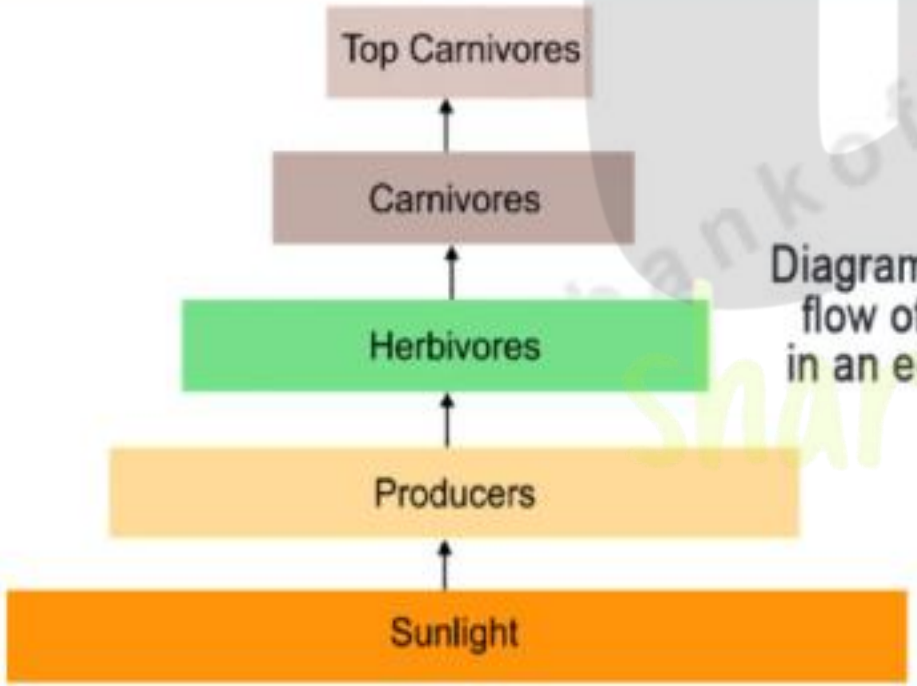
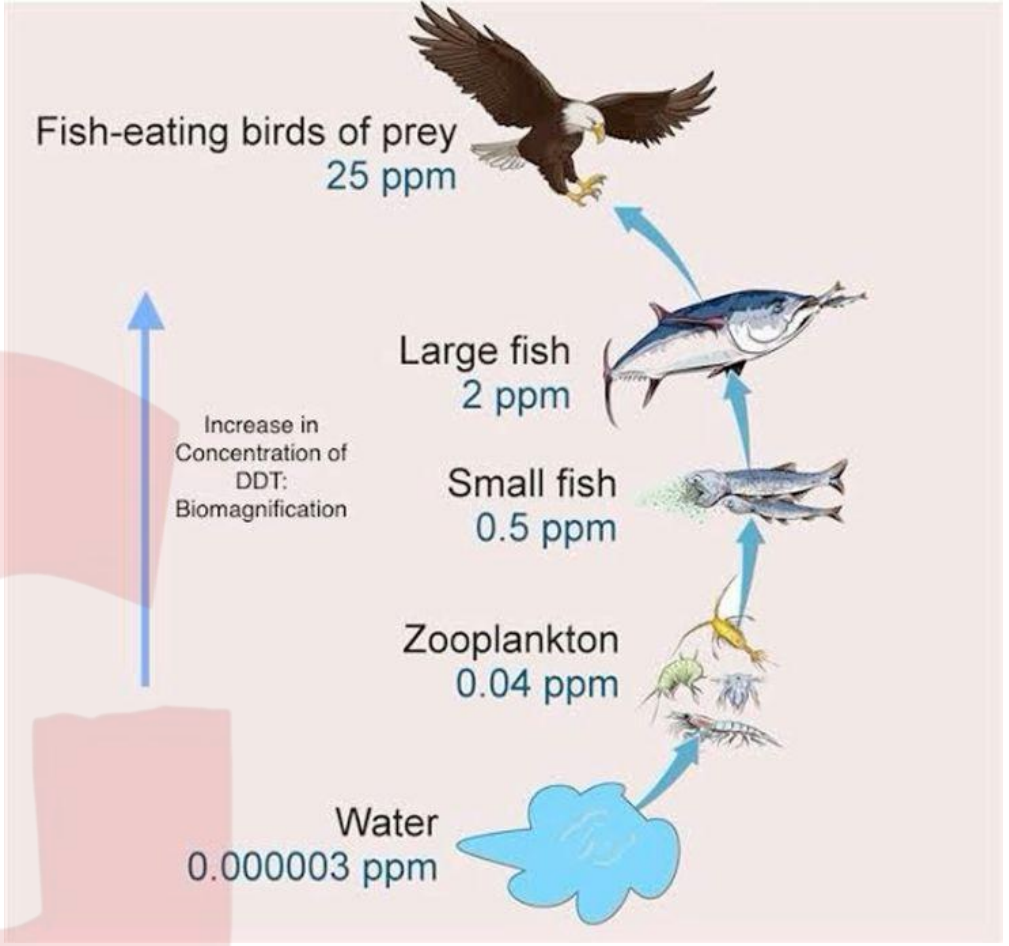


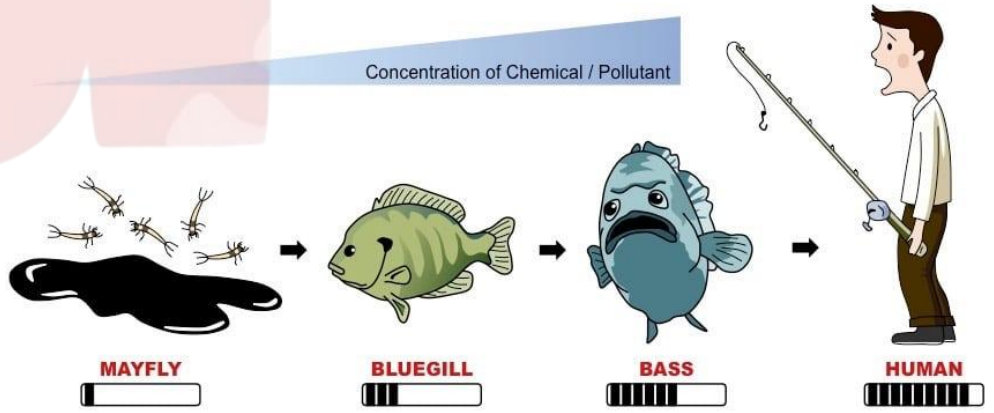
Diagram showing flow of energy in an ecosystem

Biological magnification

The concentration of harmful chemicals increases with every next trophic level in a food chain. This is called biological magnification.

- Maximum concentration of such chemicals get accumulated in human bodies as human occupy the top level in any food chain.





Methods to reduce intake of pesticides

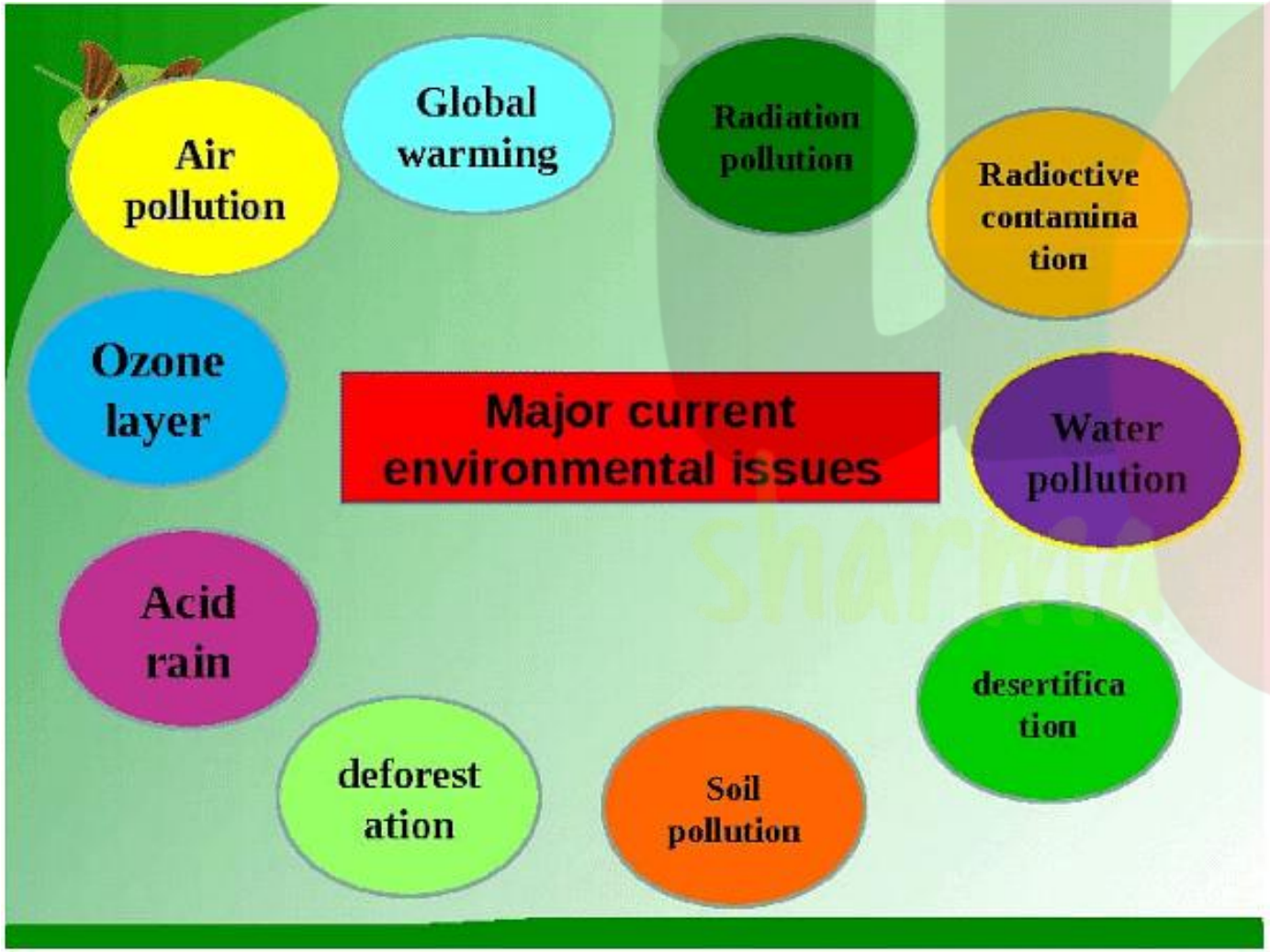
- ✓ Minimise the use of chemical pesticides.
- ✓ Wash fruits & vegetables thoroughly before use.
- ✓ Use organic fruits and vegetables.

QUESTIONS

1. What are trophic levels? Give an example of a food chain and state the different trophic levels in it.
2. What is the role of decomposers in the ecosystem?

Environmental problems

Changes in the environment affect us and our activities change the environment around us. Human activities leads to pollution, deforestation etc.



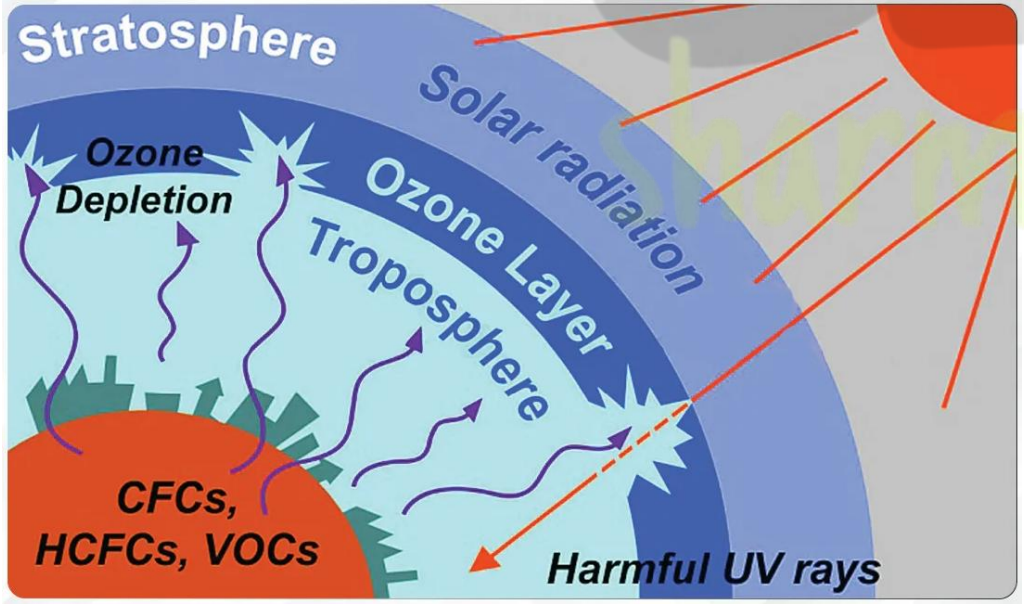
OZONE LAYER AND ITS DEPLETION

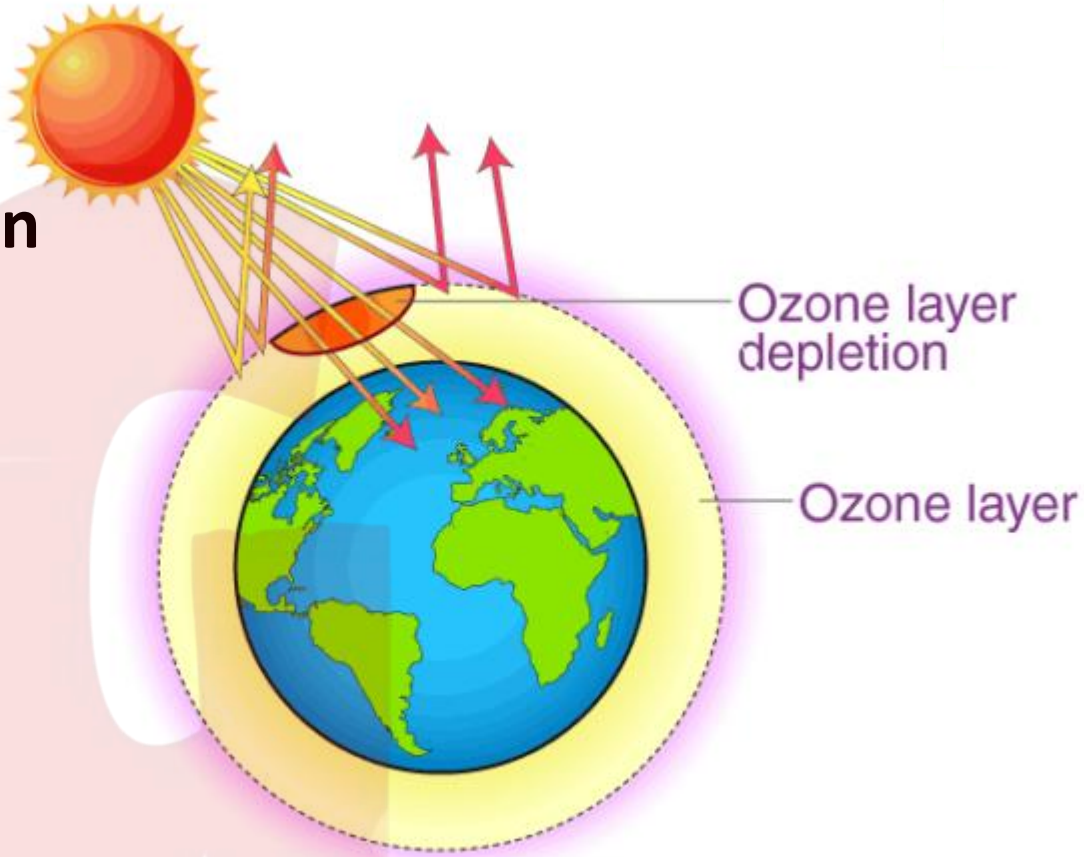
Ozone Layer

- Located in **stratosphere**
- Protects Earth from **harmful UV radiation**

Effects

- Skin cancer
- Eye cataracts
- Reduced crop productivity





OZONE LAYER AND ITS DEPLETION

Formation of ozone molecule

How is Ozone formed

(i) The high energy UV radiations break down the O_2 molecules into free oxygen (O) atoms.

$O \rightarrow (UV)\ O + O$ (atoms)

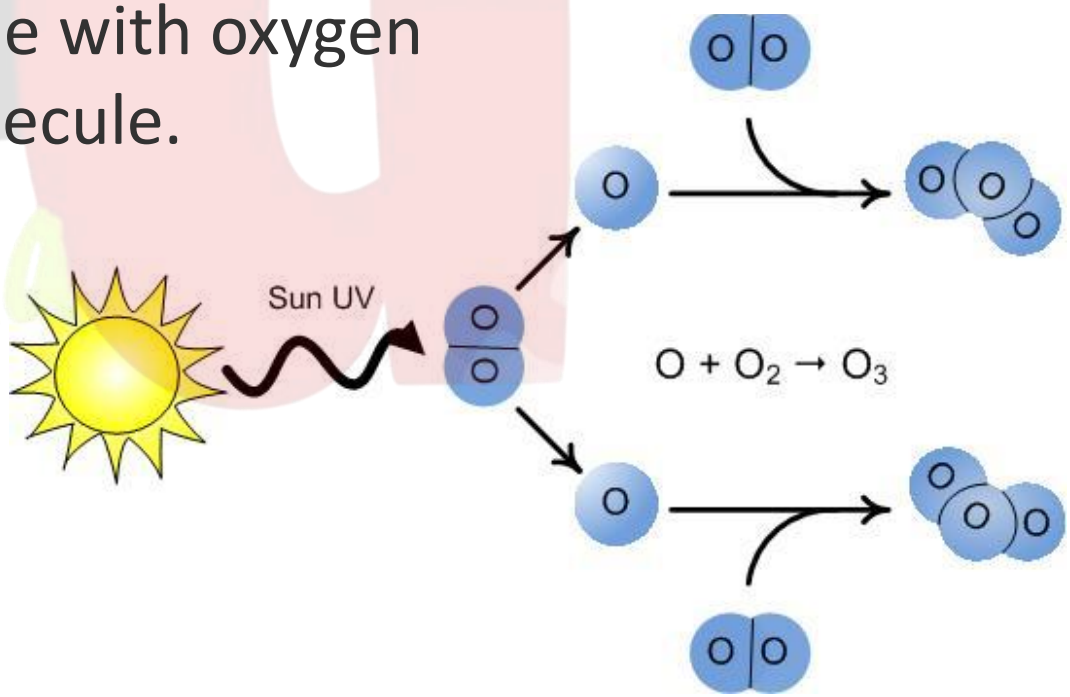
$$O_2 \xrightarrow{UV} O + O$$

(ii) These oxygen atoms then combine with oxygen (O_2) molecule to form the ozone molecule.

$O_2 + O \rightarrow O_3$ (ozone)

$$O + O_2 \rightarrow O_3$$

(Ozone)

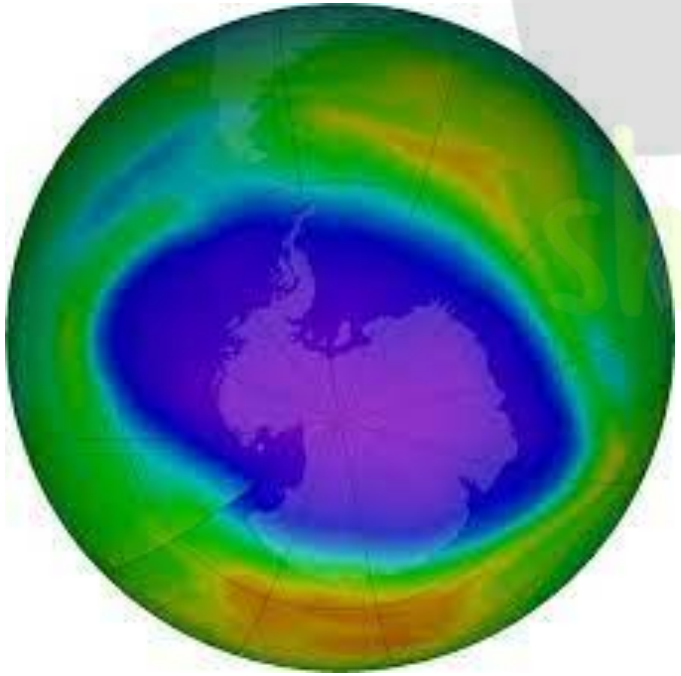


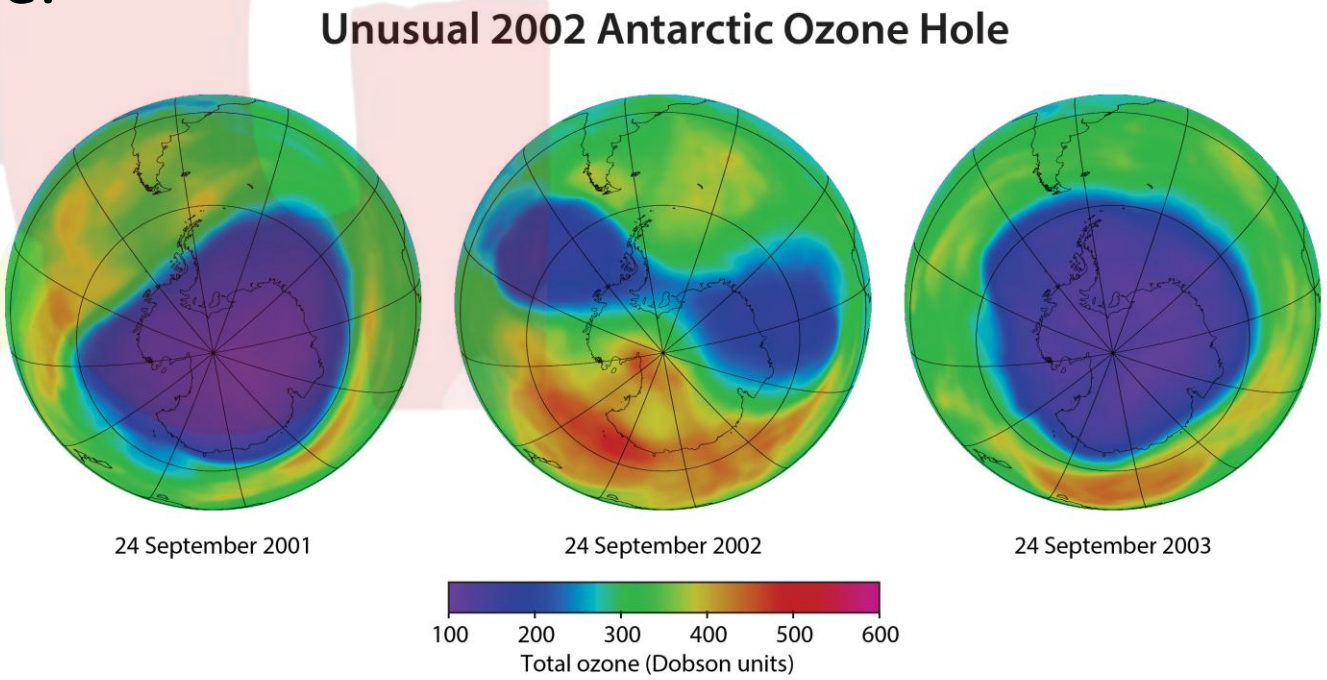
OZONE LAYER AND ITS DEPLETION

Ozone Depletion

Caused by:

- **CFCs** (Chlorofluorocarbons) from refrigerators, ACs, aerosol sprays
- Halons, methyl bromide
- The decrease in the thickness of ozone layer over Antarctica was first observed in 1985 and was termed as ozone hole.

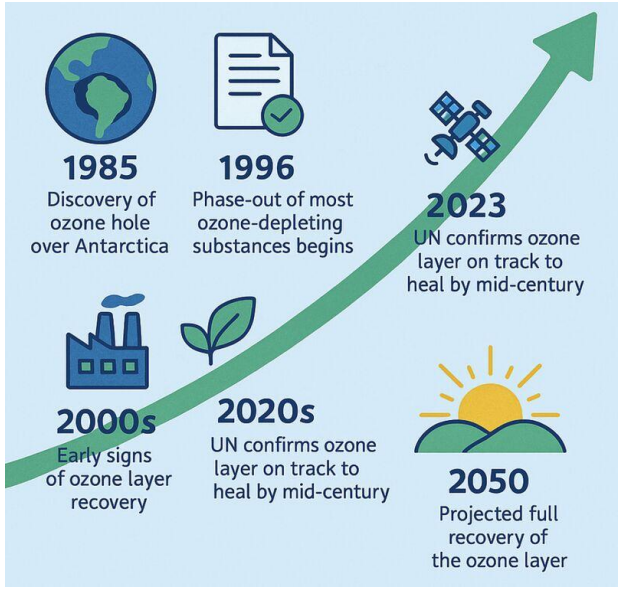




OZONE LAYER AND ITS DEPLETION

Protection – Montreal Protocol (1987)

- Global treaty to reduce CFCs
- United Nations Environment Programme (UNEP) succeeded in forging an agreement to stop CFC production at 1986 levels (KYOTO PROTOCOL) by all countries.



MONTREAL PROTOCOL
CONTRIBUTES TO THE
SUSTAINABLE DEVELOPMENT GOALS

HOW DO OUR ACTIVITIES AFFECT THE ENVIRONMENT?

Managing the Garbage we Produce

- **Garbage** are the unwanted materials that people have thrown away.
- In organisms, specific **enzymes** are needed to break-down a particular substance. So, if we eat coal, we do not get energy. Similarly, bacteria or other saprophytes have no enzymes to break down artificial materials like plastics.

WASTE MANAGEMENT

Types of Waste

Biodegradable	Non-Biodegradable
Can be broken down by microbes	Cannot be decomposed by microbes
Food waste, paper, cloth	Plastic, metals, glass

Micro-organisms release enzymes which decompose the materials but these enzymes are specific in their action that's why enzymes cannot decompose all the materials.

PROBLEMS WITH PLASTIC

- Non-biodegradable
- Clogs drains
- Kills animals
- Releases toxic gases on burning

METHODS OF WASTE DISPOSAL

1. Landfills

Waste buried in low-lying areas.

Landfill

2. Composting

Biodegradable waste → Manure

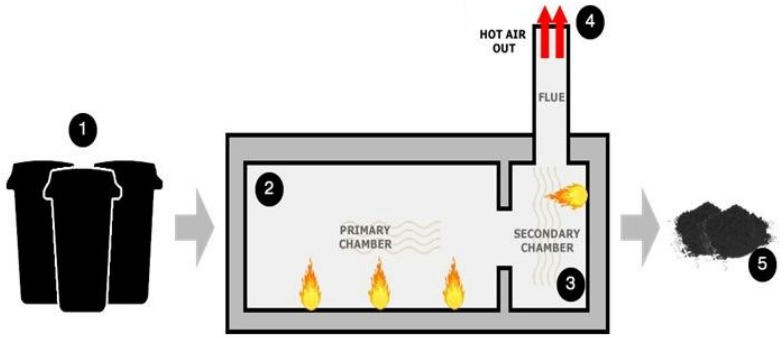
Composting

3. Recycling

Paper, glass, metals, plastics

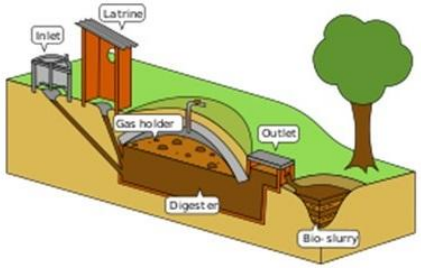
4. Incineration

Burning waste at high temperatures



Incineration

Vermi-Composting



Biogas Generation

5. Sewage Treatment

Removing impurities from wastewater

3Rs – REDUCE, REUSE, RECYCLE

Reduce

Minimize use of resources

Ex: Carry jute bags

Reuse

Use items again

Ex: Reusing plastic bottles

Recycle

Converting waste into new products

Ex: Old newspapers → new paper sheets

WHY NON-BIODEGRADABLE WASTE IS A PROBLEM?

- Accumulates in environment
- Causes soil and water pollution
- Enters food chain (bio-magnification)
- Harms aquatic and land animals

QUESTIONS

1. Why are some substances biodegradable and some non-biodegradable?
2. Give any two ways in which biodegradable substances would affect the environment.
3. Give any two ways in which non-biodegradable substances would affect the environment.

QUESTIONS

1. What is ozone and how does it affect any ecosystem?
2. How can you help in reducing the problem of waste disposal? Give any two methods.

EXERCISES

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

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

5. Will the impact of removing all the organisms in a trophic level be different for different trophic levels? Can the organisms of any trophic level be removed without causing any damage to the ecosystem?

6. What is biological magnification? Will the levels of this magnification be different at different levels of the ecosystem?

7. What are the problems caused by the non-biodegradable wastes that we generate?

8. If all the waste we generate is biodegradable, will this have no impact on the environment?

9. Why is damage to the ozone layer a cause for concern? What steps are being taken to limit this damage?

TOP 10 IMPORTANT QUESTIONS – OUR ENVIRONMENT

1. What is an ecosystem? Explain its biotic and abiotic components with examples.
2. Draw a labelled diagram of a food chain and explain the flow of energy (10% law).
3. What is the difference between biodegradable and non-biodegradable substances? Give two examples of each.
4. Explain the phenomenon of biomagnification with the help of an example.
5. What are decomposers? State their role in the ecosystem.
6. How is the ozone layer formed? What are its functions? Why is it depleting?
7. What are food webs? How are they different from food chains? Why are food webs more stable?
8. Why is the energy transfer between trophic levels highly inefficient? Explain with reference to the 10% law.
9. **Describe the 3R principle: Reduce, Reuse, Recycle. Give examples of each.**
10. What are the environmental problems caused by non-biodegradable waste like plastics? How can they be managed?

Previous Year Questions 2025

Q1: Which of the following groups do not constitute a food chain? (1 Mark)

(i) Wolf, rabbit, grass, lion

(ii) Plankton, man, grasshopper, fish

(iii) Hawk, grass, snake, grasshopper, frog

(iv) Grass, snake, wolf, tiger

(a) (i) and (iv)

(b) (i) and (iii)

(c) (ii) and (iii)

(d) (ii) and (iv)

Ans: (c)

Q2: The percentage of solar energy which is not converted into food energy by the leaves of green plants in a terrestrial ecosystem is about: (1 Mark)

(a) 1%

(b) 10%

(c) 90%

(d) 99%

Ans: (d)

Q3: Two statements are given — one labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below

Assertion (A): The amount of ozone in the atmosphere began to drop sharply in the 1980s.

Reason (R): The oxygen atoms combine with molecular oxygen to form ozone. (1 Mark)

Ans: (b)

(a) Both A and R are true, and R is the correct explanation of A.

(b) Both A and R are true, but R is not the correct explanation of A.

(c) A is true, but R is false.

(d) A is false, but R is true.

Q4: "Excessive use of chemicals and pesticides in agriculture adversely affects the environment." Justify this statement. (2 Marks)

Q5: Identify from the following a group containing all non-biodegradable substances. (1 Mark)

(a) Leather, Glass, Plastic

(b) Cotton, Wood, Nylon

(c) DDT, Polyester, Glass

(d) Leather, Silk, Wool

Ans: (c)

Q6: Two statements are given — one labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below (1 Mark)

Assertion (A): Animals will not get energy if they eat (consume) coal as food.

Reason (R): Specific enzymes are needed for the breakdown of a particular food.

(a) Both A and R are true, and R is the correct explanation of A.

(b) Both A and R are true, but R is not the correct explanation of A.

(c) A is true, but R is false.

(d) A is false, but R is true.

Ans: (a)

Q7: Some harmful chemicals get accumulated in human bodies through the food chain. Name this phenomenon. Explain the reason for the maximum concentration of these chemicals found in our bodies. (3 Marks)

Q8: Other than the abiotic components, which of the given biotic components are not required to make an aquarium with small herbivorous fishes a self-sustaining system? (1 Mark)

(i) Aquatic plants and aquatic animals

(ii) Terrestrial plants and terrestrial animals

(iii) Decomposers as bacteria and fungi

(iv) Consumers as clown fishes and sea urchins

(a) (i) and (iv)

(b) (ii) and (iii)

(c) (i) and (iii)

(d) (ii) and (iv)

Ans: (d)

Q9: Two statements are given — one labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below (1 Mark)

Assertion (A): Use of jute bags for shopping reduces pollution.

Reason (R): Jute is biodegradable and its bag may be reused as and when needed.

Ans: (a)

Q10: In the food chains given below, select the most efficient food chain in terms of energy. (1 Mark)

Ans: (c)

(a) Grass → Grasshopper → Frog → Snake

(b) Plants → Deer → Lion

(c) Plants → Man

(d) Phytoplankton → Zooplankton → Small Fish → Big Fish

Q11: What are decomposers? Give two examples. State how they maintain a balance in an ecosystem. (3 Mark)

Q12: The examples of natural and manmade (artificial) ecosystems are, respectively: (1 Mark)

(a) Forests and ponds

(b) Crop fields and lakes

(c) Lakes and gardens

(d) Crop fields and forests

Ans: (c)

Q13: Human activities that are affecting the environment are: (1 Mark)

(a) Minimising the use of chlorofluorocarbons

(b) Excessive use of disposable cups and plates

(c) Maximising the use of reusable utensils for eating food and drinking fluids

(d) Segregating the wastes into biodegradable and non-biodegradable before disposal

Ans: (b)

Q14: (a) Why are the organisms of first trophic level important in any food chain?

(b) Justify the following statement: 'The flow of energy in an ecosystem is unidirectional.' (2 Marks)

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