

CHIP: OUR ENVIRONMENT

KEY FEATURES

- Complex topics made easier.
- Topic wise questions that help you clear your concepts.
- Read less, grasp more.
- Important questions related to exam.
- Previous year questions.

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15.1 Eco-System — What are its components?

Ecosystem: It is the physical surrounding in which living and non-living things interact with each other to maintain a balance.

Components of ecosystem.

Biotic

It consists of all the living organisms.

Example: Plants, Animals

Abiotic

It consists of all the non-living components.

Example: Water, soil.

Types of ecosystem.

The type of ecosystem depends on the biotic and abiotic components present in it.

Example: Garden as an ecosystem might consist of flowers, insects, birds etc.

Example of other ecosystem.

- Aquatic ecosystem (ponds, lakes, rivers)
- Terrestrial ecosystem (Desert, grassland)
- Aerial ecosystem. (Birds living on trees)

→ All are natural ecosystem.

Garden, Crop Fields - artificial ecosystem.

Types of organisms

- Producers: Organisms that can produce / make their own food

Examples:- Plants and Some bacteria
(eg: cyanobacteria)

- Consumers: Organisms that depend on producers directly or indirectly to obtain food.

→ Herbivores: Organisms that eat grass and other plants (Eg: Cow, goat, buffalo).

→ Carnivores: Organisms that eat meat.
(Eg: Lion, tiger)

→ Omnivores: Organisms that eat both i.e plants and animals.
(Eg: Humans, bear).

→ Decomposers: organisms that obtain nutrients by decomposing dead and decaying matter.
(Eg: Fungi)

→ Scavengers: organisms that feed on dead organisms.
(Eg: Eagle, Vulture)

□ Bonus points

Decomposers help in recycling of the nutrients.

Decomposers also help in cleaning the environment and making fossil fuels (Petroil)

☐ Think Over it.....

Q- Why are consumers not able to prepare their own food?

Q- How do carnivores help in creating a balance in the environment?

Q- Name a few organisms that can make their own food apart from plants.

☐ Topics related questions.

Q- What is ecosystem? Name the different types of ecosystem.

Q- Decomposers are a crucial part of the environment. Justify your statement.

☐ Important questions.

Q- Why are crop fields known as artificial ecosystem?

Q- Write the common food chains of the pond ecosystem?

Food web : A complex series / chain of organisms in which multiple organisms are interdependent on each other for their survival.

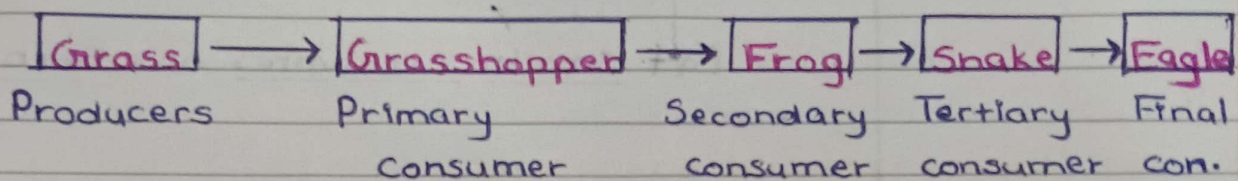
By: Karan Pawar

15.1.1 Food Chains and Webs

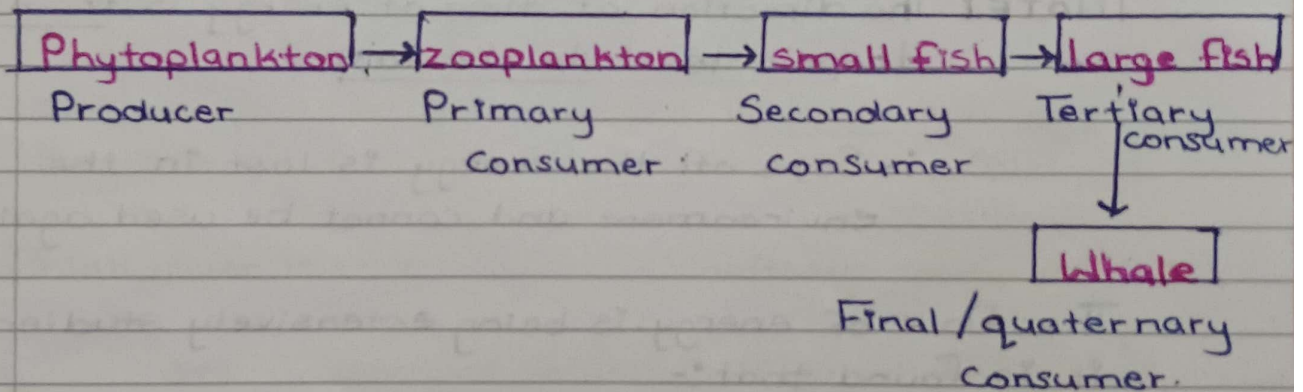
Food Chain: a series of organisms in which one organism is dependent on the other for their food.

Examples of different food chains.

▣ Terrestrial food chain.



▣ Aquatic food chain.



Trophic level: It is the step or level of the food chain.

Autotrophs / producers

Form the first trophic level.

They fix up solar energy and make it available for consumers / heterotrophs.

Herbivores / primary consumers

Eat plants

Form the second trophic level.

Small carnivores / Secondary consumers.

Eat herbivores and obtain their food.

• Forms the third trophic level.

Larger carnivores / Tertiary consumers.

Eat smaller carnivores and herbivores.

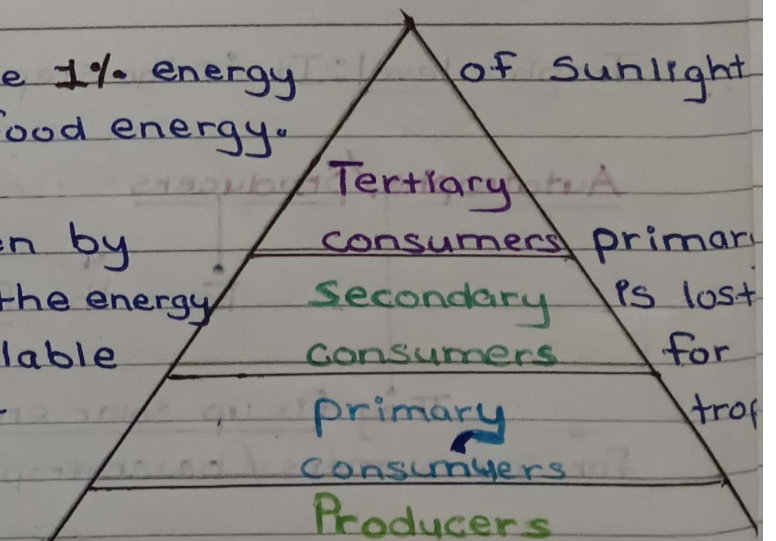
Forms the fourth trophic level

NOTE: The direction of flow of energy is from first trophic level to the last

:- Some of the energy is lost in the environment and cannot be used again.

The flow of energy is being extensively studied and it is found that:-

- Green plants capture 1% energy of Sunlight and convert it into Food energy.
- Green plants are eaten by Consumers, most of the energy is lost and only 10% is available for transfer to the next level.
- Only 10% can be taken as average value of organic matter (energy) that can be transferred to the next trophic level. Therefore very less energy is available for the transfer to next trophic level. This is known as 10% law.



□ From the energy flow diagram, two things are clear...

- Energy flow through various trophic levels is always unidirectional.
- The energy available at each trophic level gets diminished progressively due to loss of energy at each level.

□ Biomagnification

! It is the accumulation of various toxic / harmful chemicals (which are non-degradable) in the organisms at various trophic levels in food chain.

! The highest concentration of chemicals is found to get accumulated in human beings as they are present at the last trophic level.

□ Think over it

Q-Are scavengers actually different from decomposers? If yes, how?

Q-Are food chains really helpful to us? Do they help us to study the interaction between different organisms?

□ Topics related to questions.

Q-What is food chain? Give one example of a terrestrial and an aquatic food chain. Which food chain is better according to you?

Q-What is a trophic level? Which are the different types of organisms ^{are} present at different trophic levels?

Q How can you say that tertiary consumers are left with the least amount of energy?

Q Define 10% law.

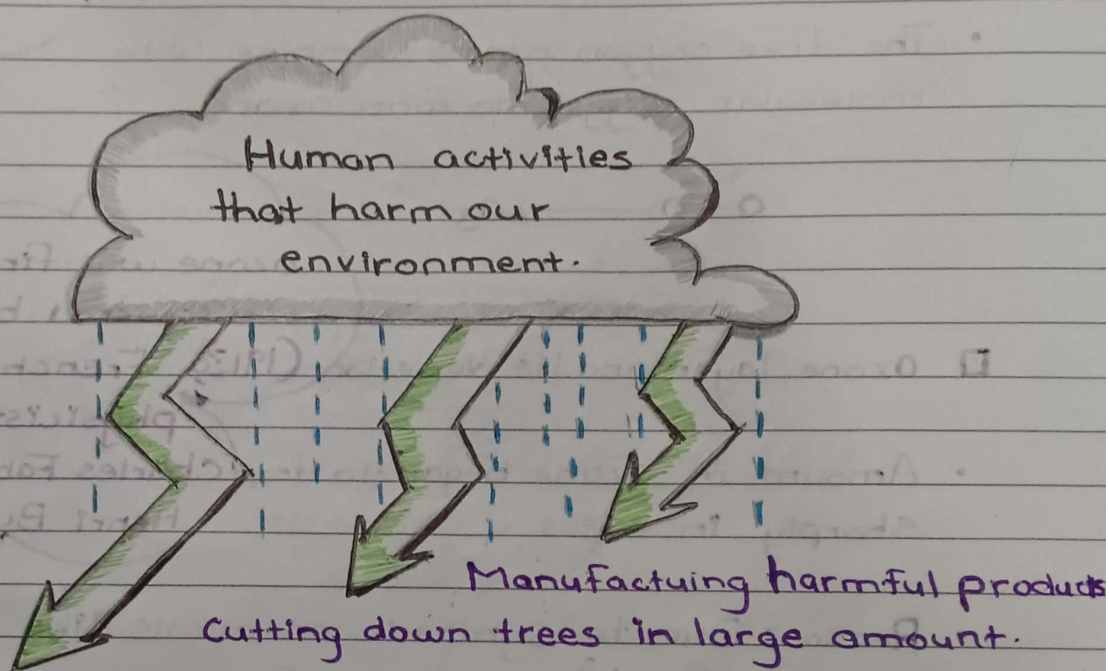
Q Solve the following.

^{4th} Leopard $\rightarrow$ ^{3rd} Deer $\rightarrow$ ^{2nd} Grass $\rightarrow$ ^{1st} Sunlight
50J

- Find the amount of energy available for Grass and leopard.
- If the amount of energy available decreases by 20% from 1st trophic level to the 2nd and so on till the 4th trophic level, how much energy will be available for leopard?

15.3 How do our activities affect our environment?

- Our environment is being regularly polluted due various kinds of human activities.
- Environmental pollution leads to various kinds of disease such as



Burning of fossil fuels.
(eg: Coal, Petroleum)

5.3.1 Ozone layer and how it is getting depleted.

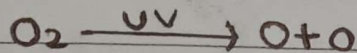
□ ozone: A poisonous gas present at higher levels in $[O_3]$ our atmosphere.

: Formed by combination of 3 atoms of oxygen.

: At higher levels in atmosphere it shields our earth from the harmful UV rays of the sun.

▣ Formation of ozone layer.

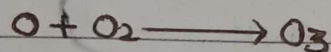
- Oxygen molecule (O_2) is split apart into oxygen atoms (Free) by UV rays.



Ozone layer
is mainly found in
lower layer of Strato-
Sphere, from approx.

15-35 km (9 to 22 mi)
above Earth.

- The free oxygen atoms combine with molecular oxygen to form ozone.



ozone was first
discovered by

(1913) French

physicists

Charles Fabry and
Henri Buisson.

▣ Ozone layer and its depletion.

- Amount of ozone began to drop sharply in 1980s
- Reason: Due to synthetic chemicals like chlorofluorocarbons (CFC's) used in refrigerants and in fire extinguishers.

- Step taken to control ozone depletion.

In 1987, the United Nations Environment Programme (UNEP) succeeded in freezing CFC Production.

Good News....

- Ozone layer depletion has decreased upto 50% in 2022.

- Scientists estimate that it will recover completely by 2060.

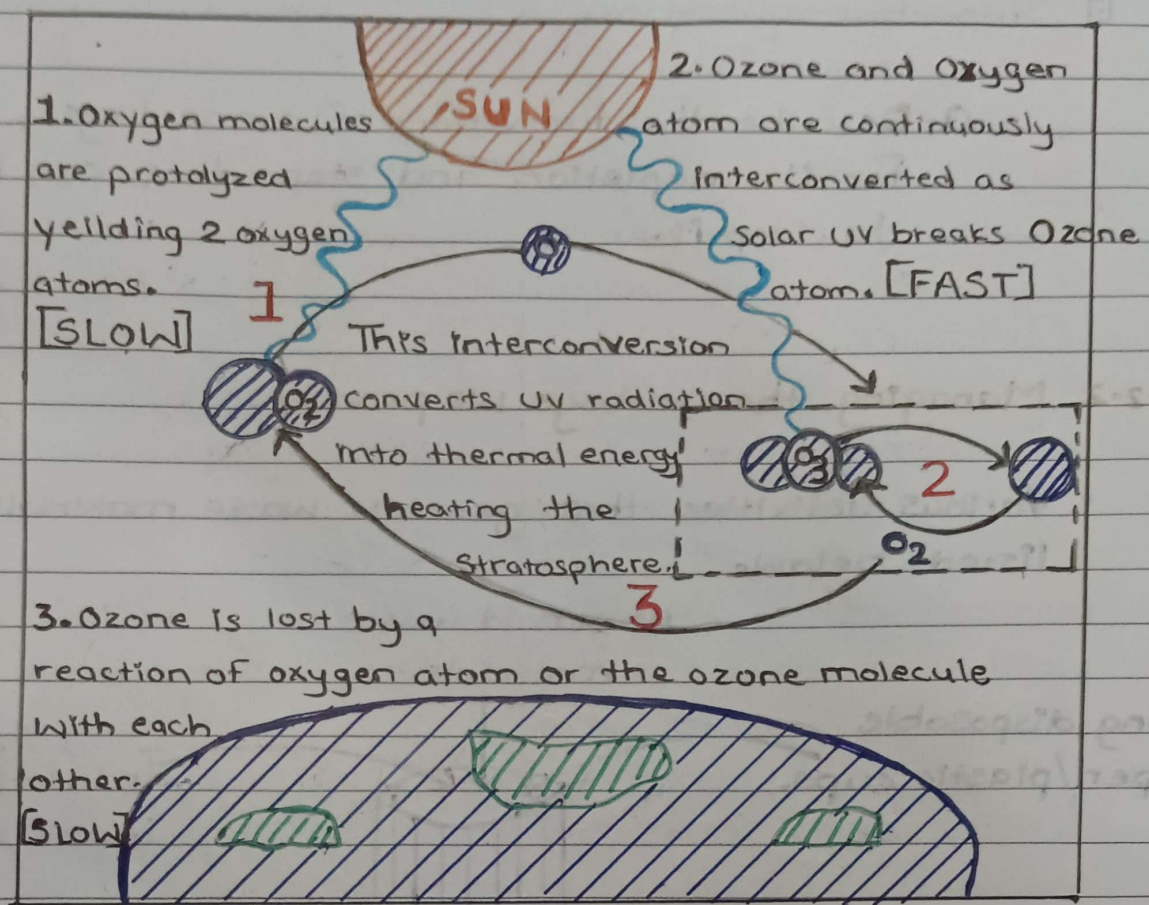


Fig:- Ozone - Oxygen Cycle

Note: In above figure; SLOW and FAST = Reaction rate.

☐ Think over it...

Q- Other than CFC's, are there any other chemicals which deplete the ozone layer?

Q- What will happen if ozone layer suddenly vanished?

☐ Topic related questions.

Q- What is ozone? How does it affect our health?

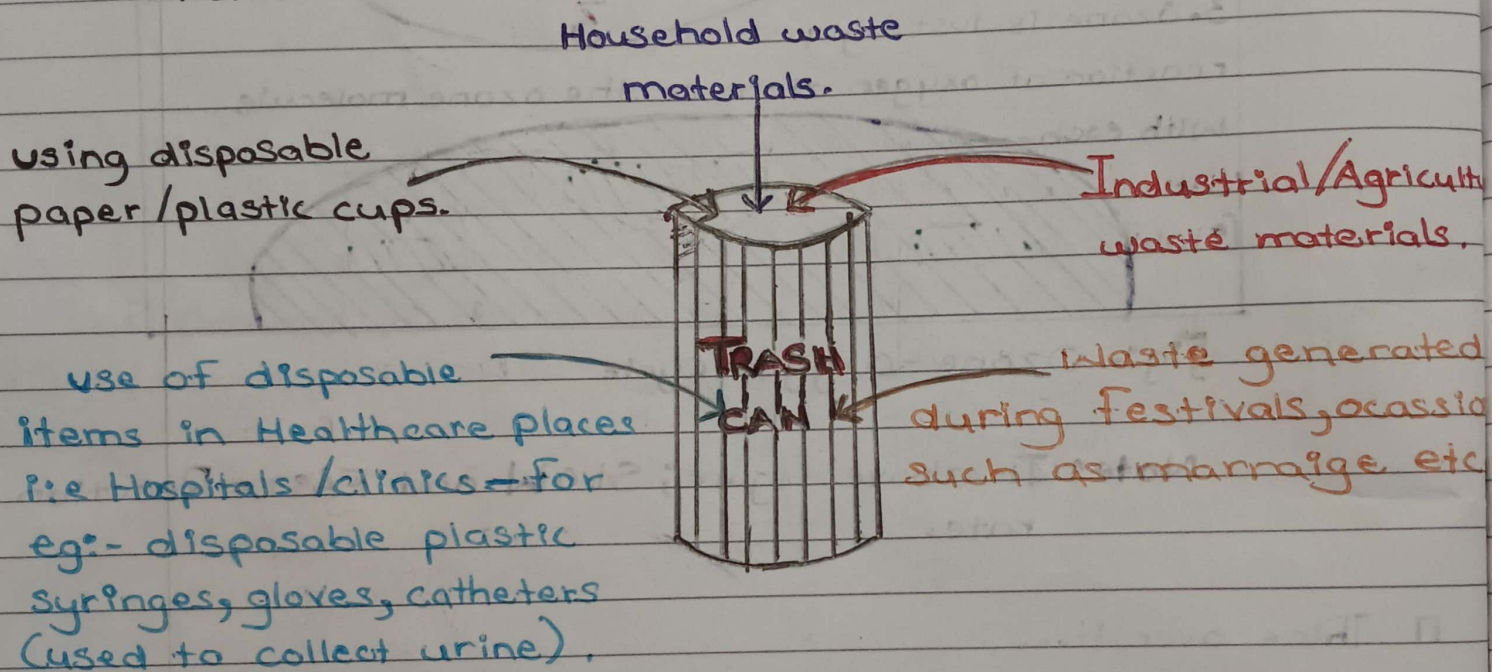
Q- What are the reasons for ozone layer depletion? When was it observed first?

□ Important questions.

Q- Describe the formation of ozone layer, reasons for its depletion and steps that can be taken to stop it.

15.2.2 Managing the Garbage we produce.

- Various activities that generate waste materials are listed below.



- The food we eat are acted upon by enzymes and converted into the products (nutrients) that we use to stay alive.
- However enzymes are specific in their action and therefore can only degrade specific things.
- Not all the things can be degraded by enzymes, hence some of them remain in the environment for millions of years. For eg:- Plastic bags.

New Caledonia is the world's least polluted country. with only $3.8 \mu\text{g}$ of pollutants Per m^3

Bio-degradable Substances.	Non Bio-degradable Substances.
• Substances that can be broken down by biological processes. • They remain/persis in the environment for a short period of time. • They do not harm the environment and living organisms. • Ex: Paper, Wood	• Substances that cannot be broken down by such bio-logical processes. • They remain/persist in the environment for a very long period of time. • They harm the environment and are toxic to living organisms. • Ex: Plastic, some metals

Polyethylene Terephthalate.

▣ Solutions to reduce non-biodegradable waste in the environment.

Researchers at the university of Texas has used AI to make an enzyme called Hydrolase which can degrade PET Plastic.

• Follow the principle of 3 R's

- Reduce the usage of non-biodegradable materials.
- Reuse the waste material as much as possible.

- Recycle the waste material by converting it in a useful product.
- Use disposable paper cups insted of plastic cups.
- Always carry a paper bag or a cloth bag while shopping for groceries and other household items.

- Develop a safe method for the disposal of non-biodegradable items.
- Promote usage of manure over fertilizers and other harmful pesticides.

▣ Think over it....

Q- Is there a way to create biodegradable plastic?
Do biodegradable plastics not harm the environment? Give reasons to support your answer.

Q- Can we totally ban the usage of plastic products? IF Yes/No - Give reasons?

▣ Questions related to topic.

Q- Write any 5 points that show how our environments gets polluted.

Q- Differentiate between bio-degradable and non-biodegradable waste.

Q- What are the by which the addition of pollutants to the environment can be reduced?

□ Previous Year Question Answers.

> Short Answer Type Questions.

1. Define ecosystem. Name two natural ecosystems.
[CBSE 2016-17]

2. What are decomposers? Write the role of decomposers in the environment. [CBSE 2016-17]

3. We do not clean ponds/lakes, but an aquarium needs to be cleaned regularly. Explain [2013, 17]

Ans: A pond is a complete, natural and self-sustaining ecosystem whereas an aquarium is an artificial and incomplete ecosystem, without decomposers therefore it needs to be cleaned regularly.

4. In the following food chain, 100J of energy is available to the lion. How much energy was available to the producer? [AI 2017]

Plants $\rightarrow$ Deer $\rightarrow$ Lion.

5. Why should biodegradable and non-biodegradable waste be discarded in two separate dustbins? [Delhi, 2013, 15].

Ans: Because biodegradable wastes get decomposed by microorganisms whereas non-biodegradable wastes can be recycled and reused.

6. What is ten percent law? Explain with an example how energy flows through different trophic levels. [Delhi, 2015]

Ans: Energy available at each successive trophic levels of food chain is ten percent of that at previous level. This is called 10% Law.

Thus, 90 per cent energy is lost to the surroundings

at each trophic level. However plants absorb only one percent of radiant energy of sun during photosynthesis.

This is explained as under:-

1000 J as light

↓↓↓

Plant → Deer → Lion.

10 J

1 J

0.1 J

as food

as food

as food.

7. The following organisms form a food chain. Which of these have the lowest amount of energy available?

Hawk, cow, Plants, Grasshopper, snake.

Ans:- Hawk: Because it is at the last trophic level and energy available decreases by 90% as we move from 1st trophic level to another.

8. The first trophic level in a food chain is always a green plant. Why? [Delhi, 2019]

Ans: Only green plants can make their own food from sunlight. Green plants therefore, always occupy 1st trophic level in food chain.

9. (a) What is biodiversity? What will happen if biodiversity of an area is not preserved? Mention one effect of it. [2015]

(b) With the help of an example explain that a garden is an ecosystem.

(c) Why only 10% energy is transferred to the next trophic level?

Ans: (a) Biodiversity is the existence of wide variety of species of plants, animals and microorganisms in a natural habitat within a particular environment.

- Biodiversity of an area is the number of species or range of different life forms found there.
- 'Forests' are 'Biodiversity hotspots'. Each living being is dependent on another living being. It is a chain.
- If biodiversity is not maintained, the links of the chain go missing. If one organism goes missing, this will affect all the living beings who are dependent on it.

(b) A garden comprises of different kind of flora and fauna such as grasses, flowering and nonflowering plants, trees, frogs, insects, birds etc. All these living organisms ^{and} depend and interact with each other for their growth, reproduction and other vital biological activities depend upon the abiotic component comprising of physical factors like temperature, rainfall, wind, soil and minerals. Therefore, we can say that garden is an ecosystem.

(c) Only 10% energy is transferred to the next trophic level because other 90 per cent is used for things like respiration, digestion, running away from predators.