
# Our Environment and its Pollution

## Environment

- It encompasses all those things and set of conditions which directly or indirectly influence the life of organisms including their growth, survival, development and reproduction. Thus, environment is composed of the physical surroundings, living organisms and climatic conditions of the region in which an organism lives.
- The living organisms adjust to the environment in which they start living by acquiring certain characteristic features and this process is known as **adaptation**.
- The place where an organism lives, is called its **habitat** and a **community** consists of all living things in a habitat. All these elements make an ecosystem.

## Ecosystem

The term ecosystem was given by **A G Tansley** (1935). Interaction between living and non-living components is called **ecosystem.**

*There are two types of ecosystems :*

### Natural Ecosystem

- These are operated by themselves under natural conditions without any major interference by man.
  *These are of two types:*
  (i) **Terrestrial** e.g. Grassland, forest, desert ecosystem, etc.
  (ii) **Aquatic** *It is further of two types:*
  (a) **Fresh Water** Which may be lotic (running water as springs stream or river) or lentic (standing water as lake, ponds, ditch, swamp, etc).
  (b) **Marine** Ocean and sea.

### Artificial Ecosystem

These are maintained artificially by man. It is also known as man made ecosystem.

e.g. Crop land ecosystem, aquarium.

## Components of Ecosystem

*Ecosystem has two components*

I. Abiotic (non-living e.g. soil, water, temperature)

II. Biotic (Living e.g. plants, animals bacteria)

# Food Chain

The process of transfer of energy from producer through a series of organism to consumers is known as food chain.

e.g. Grass (Producer) $\xrightarrow{\text{Eaten by}}$ Rabbit (Primary consumer) $\xrightarrow{\text{Eaten by}}$ Hawk (Scondary consumer)

In nature, the two types of food chains are present:

(i) Grazing food chain starts with green plants, which are eaten by herbivores, which in turn eaten by carnivores.

(ii) Detritus food chain starts with dead organic matter acted upon by decomposers.

# Food Web

Various food chains are interconnected with each other forming an interlocked system, which is known as food web. These food web are very important in maintaining equilibrium of ecosystem.

**Differences between Food Chain and Food Web**

| Food Chain | Food Web |
|---|---|
| It is straight single pathway. | It consists of number of interconnected food chains. |
| Members of higher trophic level feed upon a single type of organisms of lower trophic level. | Members of higher trophic level can feed as a member of alternative organisms of power trophic level. |

# Ecological Pyramids

- The producers and consumers can be arranged into several feeding or nutritional groups, each is known as trophic level.
- Trophic structure of an ecosystem can be express by means of ecological pyramids.
- The concept of ecological pyramid was given by Charles Elton in 1927.

Each food level is also called trophic level.

## Types of Ecological Pyramids

*These are of three types:*

1. **Pyramid of Number** In this, number of individuals at each trophic level is shown. Pyramid of number is upright in case of grassland and pond ecosystem.
2. **Pyramid of Biomass** In this, the biomass of each trophic level is shown in pyramid. Pyramid of biomass may be upright in grassland and forest ecosystem whereas it is inverted in pond ecosystem.
3. **Pyramid of Energy** Energy content or productivity of different trophic level is shown in pyramid of energy. Pyramid of energy is always upright in all ecosystems.

# Pollution

It is undesirable change in physical, chemical and biological properties of air, water and soil, which directly or indirectly affect human beings, is called pollution. Pollution causing agents or substances are called **pollutants**.

## Air Pollution

- It is due to excess of different gases, smoke, particulate matters, chemicals, allergens, in the atmosphere.
- Important primary air pollutants are CO, $SO_2$, $NO_2$, HF, etc.
- Most important gaseous air pollutant is $SO_2$. It is produced due to combustion of fossil fuels.
- $SO_2$ above 1 ppm affects human beings in terms of irritation of eyes, respiratory tract, bronchitis asthma etc.
- Yellowing and blackening of Taj Mahal in Agra is due to $SO_2$ released by Mathura refinery. This type of pollution is called **'Stone cancer'**.
- Increase in global temperature mainly due to $CO_2$ concentration is called Green-house effect.
- The mixture of $SO_2$ and $NO_2$ with water is called **acid rain**.

## Water Pollution

- It is mainly due to addition of sewage, detergents, domestic wastes, infectious agents, industrial wastes, minerals, etc, in the ordinary water.
- Degree of water pollution is measure in terms of BOD (Biological Oxygen Demand).
- Mercury (Hg) is very persistent effluent.
- Cadmium (Cd) accumulation in liver, kidney and thyroid causes itai-itai (ouch-ouch) disease.

## Soil Pollution

- It results from chemical wastes, which has adverse effect on human beings.
- Excessive use of nitrogen fertilisers has increased level of nitrates in soil, which is responsible for blue-baby syndrome.
- Major cause of soil pollution is disposal of plastics.
- Plastic articles are non-biodegradable, *i.e.* they cannot be decomposed.

## Noise Pollution

- Unwanted sound is called noise it is measured in term of decibles (dB).
- Generally, sound above 80 dB is termed as noise.
- Kanpur is the most noise polluted city in UP.
- Large green plants, which are planted in high noise pollution zone are known as green mufflers as they have the capacity to absorb sound waves.

## Radioactive Pollution

- Chief sources are nuclear explosions.
- Sr-90 accumulates in bone marrow and causes cancer (leukaemia).
- $Cs^{137}$ accumulates in muscles and causes muscular pain.
- Radioactive disaster was first occurred in 1945 in Hiroshima and Nagasaki (Japan), when USA was dropped nuclear bombs during **Second World War**.
- Recently in 1986, nuclear accident occurred at Chernobyl (USSR).
- In an ecosystem, a feedback mechanism operates which controls the number of producers and herbivores.
- Methaemoglobinaemia is produced when nitrates from nitrogen fertilisers combine with haemoglobin of blood.

# Practice Exercise

**1.** Which of the following cannot be called a habitat?
(a) A desert with camels
(b) A pond with fishes
(c) A jungle with wild animals
(d) Cultivated land with grazing cattle

**2.** Among the following, which is not a type of terrestrial habitat?
(a) Desert
(b) Grassland
(c) Freshwater
(d) Tundra

**3.** Select those who are all the types of aquatic habitats?
(a) Freshwater, coastal and rainforest
(b) Marine, tundra and desert
(c) Mountain, grassland and coastal
(d) Marine, freshwater and estuaries

**4.** Which of the following constitute the biotic components of the environment?
(a) Plants and animals
(b) Soil and minerals
(c) Air and water
(d) Sunlight and temperature

**5.** Carbon dioxide in air is used by plants to
(a) breathe
(b) make food
(c) remove waste
(d) trap energy of the sun for photosynthesis

**6.** Food chain starts with
(a) nitrogen-fixation (b) decay
(c) photosynthesis (d) respiration

**7.** Food chain consists of
(a) producers and primary consumers
(b) producers and herbivores
(c) producers, consumers and decomposers
(d) producers, carnivores and decomposers

**8.** The 10% energy transfer law of food chain was given by
(a) Weisman (b) Stanley
(c) Lindemann (d) Tansley

**9.** The pyramid of number in a grassland ecosystem is
(a) linear (b) upright
(c) irregular (d) invert

**10.** The only source of energy for an ecosystem is
(a) Sun (b) ATP
(c) DNA (d) RNA

**11.** When peacock eats snakes which eat insects thriving on green plants, the peacock is at
(a) a primary consumer
(b) a primary decomposer
(c) final decomposer
(d) the apex of food pyramid

**12.** Decomposers are
(a) autotrophs (b) heterotrophs
(c) autoheterophs (d) organotrophs

**13.** Food levels in an ecosystem are called
(a) trophic levels
(b) consumer levels
(c) producer levels
(d) herbivore levels

**14.** Acid rain contains
(a) $SO_2$ and $NO_2$ (b) $NO_3$
(c) $O_3$ (d) CO

**15.** Major pollution causing agent are
(a) animals
(b) human activities
(c) hydrogen gases
(d) None of the abpve

**16.** Lichens are indicater of
(a) $SO_2$ pollution (b) $CO_2$ pollution
(c) $O_3$ pollution (d) $NO_3$ pollution

**17.** Noise pollution is measured in
(a) decibles (b) picogram
(c) microgram (d) hertz

**18.** Which is a primary consumer?
(a) Scavenger
(b) Saprophyte
(c) Carnivores
(d) Herbivores

**19.** Green-house effect is due to the presence of
(a) ozone layer in the atmosphere
(b) infrared light reaching the earth
(c) moisture layer in the atmosphere
(d) high $CO_2$ content in the atmosphere

**20.** Lead (Pb) causes
(a) soil pollution
(b) air pollution
(c) radioactive pollution
(d) All of the above

## Answers

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | *(d)* | 2 | *(c)* | 3 | *(d)* | 4 | *(a)* | 5 | *(b)* | 6 | *(c)* | 7 | *(c)* | 8 | *(c)* | 9 | *(b)* | 10 | *(a)* |
| 11 | *(d)* | 12 | *(b)* | 13 | *(a)* | 14 | *(a)* | 15 | *(b)* | 16 | *(a)* | 17 | *(a)* | 18 | *(d)* | 19 | *(d)* | 20 | *(c)* |