CHAPTER

6

Ecological Interactions and Environment

Ecology

- Interaction between living organism and their environment is called as **Ecology** (Haeckel).
- **R Mishra** is known as father of Indian Ecology.

Ecosystem

- It may be defined as any unit that includes all the organisms, *i.e.*, the communities in a given area, along with their interaction with the physical environment so that the flow of energy leads to the occurrence of trophic structure, biotic diversity and material cycle, within the system.
- Term ecosystem was given by Tansley.

Kinds of Ecosystem

Natural Ecosystem They are present naturally in nature.

Artificial Ecosystem These are maintained artificially by man.

Structure of Ecosystem

Abiotic Factors

Abiotic factors of environment are of two types :

(a) **Climatic Facors,** *e.g.*, temperature, light, wind, humidity, precipitation and water.

(b) **Edaphic Factors** They pertain to soil. It includes soil texture, mineral composition, pH, etc.

Owing to the abiotic factors of environment, animals used to adopt certain modifications.

Biotic Factors

- **Autotrophic Component** This component is constituted mainly by the green plants, that have the capability of forming complex substances at the expense of light energy and simple inorganic substances. They are also called producers.
- **Heterotrophic Component** (a) Also called consumers. They utilize complex substances produced by plants. They can be furthers categorized as primary, secondary and tertiary consumers.

(b) Food levels in ecosystem are called as trophic levels.

(c) Energy is transferred from one level to the other in a food chain.

Producers → Primary consumers → Secondary consumers → Decomposess

(d) Ecological Pyramids are discovered by Charles Elton.

Pyramid of numbers	Upright in pond and grasslands inverted in forest or tree ecosystem
Pyramid of Biomass	Upright in grassland and forest inverted in pond ecosystem
Pyramid of energy	Always up right

Ecological Interactions

Members of different species often interact, *i.e.*, affect each other, in various ways in their environment.

They can be of three main types

Positive or Beneficial Interactions

In which one or both participating species are benefited.

It can be :

(a) **Scavenging** The act of feeding by an animal on the remains of dead animals and other refuse is called scavenging, *e.g.*, vultures feed on carcoses.

(b) **Commensalism** It is the relationship between individuals in which one is benefitted and the other is unaffecced. *e.g., E. coli* lives in the large intestine of humans for getting food, shelter and side.

(c) **Proto-cooperation** It is an association between individuals of two different species in which each one is benefitted but can live equally well in absence of association, *e.g.*, birds and cattle. Birds feed on lice and ticks so birds get food and cattle is relieved from parasites.

(d) **Mutualism** It is an association between two individuals of two species both of which are benefitted but can not live separately, *e.g.*, ruminants and microorganism Microbe can get food and in turn make cellulose available in ruminant's stomach for cellulose digestion.

Negative or Antagonistic Interactions in which one Species is Harmed

(a) **Amensalism** One species causes harm to another by its toxic secretion The adversly affected species is **amensal** and the affecting species is **inhibitor,** *e.g.*, *Streptomyces griseus* secretes streptomycin, *i.e.*, an antibiotic inhibiting other bacteria.

(b) **Competition** It is an interaction that occurs between two or more organisms when the resources neccessary for them are limited and adversely affect them. Competition can be inter or intra specific, *e.g.*, carnivorous animals, such as tigers, leopards compete for the prey.

(c) **Parasitism** It is an association of two organisms of different sizes and species in which the smaller one is benefitted and the larger one is harmed. The organism which is benefitted is called **parasite** and the organism that suffers is called **host.**

e.g., *Anopheles* spreads malaria.

(d) **Predation** One species is killed and eaten up by another. The species that captures is called **predator** and the one, *i.e.*, caught is prey, *e.g.*, all carnivores are **predators.**

Neutral Interactions

In which neither species benefits or suffers.

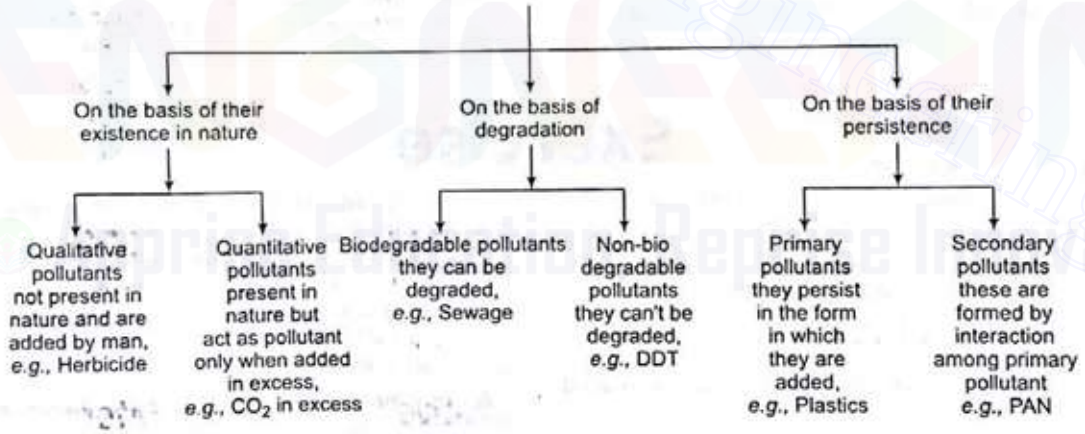
Mimicry It is the resemblance of organisms with other organisms or with non-living objects in form, colour and behaviour to escape predator's notice. An organism that bears resemblance is called **mimic** and the organism to which a mimic resembles is called **model.**

Pollution

It may be defined as an undesirable change in the physical, chemical or biological aspects of environment.

- **Pollutants** The material or energies that make the environment unfit.

Classification of Pollutants



Types of Pollution

Air Pollution

It refers to the release of undesirable material into the atmosphere in concentrations that are harmful to nature.

Causes of Air pollution

- **Human Activities,** *e.g.*, over population, deforestation, nuclear explosions, industrialization, etc.
- **Nature,** *e.g.*, volcanic eruptions, electric storms, solar fares, etc.
- **Greenhouse Effect** It is a process by which thermal radiation from a planetary surface is absorbed by atmospheric greenhouse gases (CO_2, O_3 CH_4, N_2O and water vapour) and re-radiated in all directions, thus raising the temperature of planet.
- Hey fever is caused by the pollen grains of *Amaranthus.*
- Natural pollution indicator lichens.
- In presence of SO_2 lichens start disappearing.
- SO_2 affected the Taj Mahal (Released from Mathura oil refinery.
- Ozone Peroxy Acetyl Nitrate (PAN) are secondary pollutants causing photo chemical smog.
- Aerosols or CEC (Chloroflouoro carbon) released by jet plane emissions cause destruction of ozone layer.
- Methome (CH_4) liberate from rice fields is a greenhouse gas.

- Carbon monoxide oxide has 200 times greater affinity for haemoglobin then oxygen.
- **Acid Rain** Sulphur dioxide and sulphur trioxide react with water to form sulphurous acid and sulphuric acid respectively. The sulphurous and sulphuric acids may precipitate as rain or snow, producing acid rain or acid precipitation.
- **Eutrophication** Phosphorus and nitrates dissolved in water act as nutrients and accelerate the growth of algae that forms mat on water surface. This phenomenon is called eutrophication.
- Natural indicator of pollution in lake *Daphnia*, larva of stonefly, tubifex.
- Mercury poisoning —Minamata disease
- Cadmium poisoning — itai rai disease.
- Nitrate poisoning — Methaemoglobinemia in infants
- Bhopal gas tragedy occurs due to leakage of methyl Iso cyanate (MIC) on 3rd Dec. 1984.

Water Pollution

It is the addition of organic, inorganic or biological substances to water that can make it unfit for use.

Cause of Water Pollution

- **Organic wastes** (community waste water) Waste from petroleum refineries, food processing plants, poultry, etc.
- Pathogenic organisms, e.g., bacteria, protozoans, helminth egg.
- Inorganic wastes (chemicals and minerals) Waste from farm run off industries, etc.

Soil Pollution

- Alternation in soil by addition and removal of materials leading to reduced productivity.
- **Causes of Soil Pollution** Causes of soil pollution includes chemicals, perticides, fertilizers organic manure, radioactive wastes, etc.

Wild Life Conservation

- **Red Data Book** contain list of all endangered animals and plants.
- This book is mainland by International Union for Conservation of Nature and Natural Resources (IUCN).
- Wildlife conservation may exsitu (i.e., in artificial habitat) or *in setu* (*i.e.*, natural habitat) type.
- **Ex situ** Seed bank, Botanical garden, Aquaria, Zoos.
- **In situ** Biosphere reserve, National Park, Wildlife sanctuaries.
- Project tiger was launched in 1973 in India.
- First national park in India Corbett National Park (Uttarakhand)
- Dudhwa National Park (Uttar Pradesh)
- Periyar National Park Kerala (Elephant)
- Simlipal Biosphere Reserve Odisha
- Panda is the symbol of world wild life fund (WWF)
- Bandipur National Park is located in Karnataka
- Chipka movement was started by Sunderlal Bahunguna for forest conservation in Tehri Garhwal (Uttarakhand). Asiatic lion, one horned Rhinoceros, Musk deer are endangered species.

Exercise

1. Change of the colour of the skin is observed in
   (a) prawn (b) starfish
   (c) chameleon (d) shark
2. Which of the following is biodegradable?
   (a) Paper (b) DDT
   (c) Polythene (d) Plastic
3. Ozone layer of upper atmosphere is being destroyed by
   (a) sulphur dioxide
   (b) chlorofluorocarbon
   (c) photochemical oxidants
   (d) smog
4. Acid rain is caused by increase in the atmospheric concentration of
   (a) Ozone
   (b) SO_2 and NO_2
   (c) SO_3
   (d) SO_2 and CO
5. With reference to atmospheric pressure, consider the following statements.
   I. Atmospheric pressure decreases towards poles.
   II. Atmospheric pressure decreases with altitude.
   III. High pressure is experienced over continents during winter.
   IV. All deserts is experience low pressure throughout the year.
   Which of the above statements are correct?
   (a) I and III
   (b) II and III
   (c) I and IV
   (d) II and IV
6. In a forest the following four-step food chain operates
   Grass — Insects — Frogs — Birds
   Which of these organisms can be classified as a primary carnivore on the basis of this food chain?
   (a) Grass (b) Bird
   (c) Frog (d) Insect
7. 'Green house effect' means
   (a) pollution in house in tropical region
   (b) trapping of solar energy due to atmospheric carbon dioxide
   (c) prevention from ultra violet radiations by the ozone
   (d) None of the above
8. Acid rain is caused due to pollution of atmosphere by
   (a) oxide of carbon and nitrogen
   (b) oxide of nitrogen and sulphur
   (c) oxide of nitrogen and phosphorus
   (d) None of the above

9. Cochineal insects are used to eradicate the weed called
(a) chaulai (b) Jai
(c) bathua (d) *Opuntia*

10. The process of separating grain from chaff and hay with the help of wind is called
(a) sieving (b) threshing
(c) winnowing (d) None of these

11. Life is absent on moon due to lack of
(a) water (b) carbon
(c) nitrogen (d) hydrogen

12. Match list I with list II and select the correct answer using the codes given below the lists.

List I	List II
A. Global warming	1. Oxides of nitrogen and sulphur
B. Acid rain	2. Airport
C. Noise pollution	3. Decibel
D. Noise level	4. Green house effect
	5. Nuclear tests

Codes

	A	B	C	D		A	B	C	D
(a)	4	1	2	3	(b)	3	1	2	5
(c)	1	4	3	2	(d)	1	2	3	5

13. Eutrophication causes a decrease in
(a) dissolved hydrogen
(b) dissolved salts
(c) dissolved oxygen
(d) All of the above

14. UV radiation causes cancer of
(a) skin (b) mouth
(c) liver (d) lung

15. Minamata disease is caused by
(a) automobile exhausts containing lead
(b) water pollution from sewage
(c) industrial wastes having mercury compounds
(d) water from tanneries

16. It has been observed that astronauts lose substantial quantity of calcium through urine during space flight. This is due to **(CDS 2011 II)**
(a) hypergravity
(b) microgravity
(c) intake of dehydrated food tablet
(d) low temperature in cosmos

17. Polar bears are carnivores and prey on many arctic birds and fishes. However, under natural conditions, no one found polar bears predating any penguin. This is because **(2011 II)**
(a) penguins have chemical substance in their muscles which is toxic to polar bears
(b) penguins are gregarious and always move in groups. Therefore, a polar bear cannot approach them
(c) polar bears and penguins never coexist under natural conditions. The former lives in the North Pole while the latter lives in the South Pole
(d) polar bears and penguins display symbiotic relationships and they help each other for their existence in the ice-cold ecosystem

18. Rain water collected after 30 to 40 min of raining is not suitable for drinking because it **(CDS 2011 I)**
(a) contains bacteria and dirt
(b) contains dissolved toxic chemicals
(c) is deficient in minerals
(d) is acidic

19. Which one among the following group of items contain only biodegradable items? **(CDS 2011 I)**
(a) Wood, Grass, Plastic
(b) Wood, Grass, Leather
(c) Fruit peels, Lime juice, China clay cup
(d) Lime juice, Grass, Polystyrene cup

20. Photochemical smog occurs in **(CDS 2011 I)**
(a) cool and humid climate
(b) warm, dry and sunny climate
(c) cool, dry and sunny climate
(d) warm and humid climate

21. Which one of the following plants is popularly grown along the road for absorbing vehicular pollutants? **(CDS 2010 I)**
(a) *Nerium* (b) Neem
(c) *Bougainvillea* (d) *Calotropis*

22. Which one of the following is not a feature of eutrophic lakes? **(CDS 2009 II)**
(a) Blooms are frequent in eutrophic lakes
(b) Plant nutrient flux is high
(c) Primary productivity is low
(d) Dominated by blue green algae

23. Which one of the following is a free living bacterium that helps in nitrogen fixation in soil? **(CDS 2009 I)**
(a) *Azotobacter* (b) *Anabaena*
(c) *Azolla* (d) *Nostoc*

24. Consider the following statements.
I. Cigarette smoking exposes a person to benzene.
II. Benzene is a known carcinogen.
Which of the statements given above is/are correct? **(CDS 2008 I)**
(a) I only
(b) II only
(c) Both I and II
(d) Neither I nor II

Answers

1. (c)	2. (a)	3. (b)	4. (b)	5. (b)	6. (c)	7. (b)	8. (b)	9. (d)	10. (c)
11. (a)	12. (a)	13. (c)	14. (a)	15. (c)	16. (b)	17. (c)	18. (d)	19. (b)	20. (b)
21. (c)	22. (c)	23. (a)	24. (c)						