

## TOPIC 1

## ECOSYSTEM

The environment includes our physical surroundings like air, water, soil and all the organisms such as plants, animals, human beings and micro-organisms like bacteria and fungi (called decomposers).

An ecosystem is a self-contained unit of living things and their non-living environment. All the interacting organisms in an area together with the non-living constituents of the environment form an ecosystem. It therefore consists of biotic components and abiotic components.

There are two types of ecosystem:

- (1) **Terrestrial ecosystem:** These are land based ecosystems such as forest, grassland, desert, mountains etc.
- (2) **Aquatic ecosystem:** These are water based ecosystems such as ponds, lakes, river, sea, aquarium etc.

Ecosystems can also be classified as natural ecosystem and artificial ecosystem. Examples of natural ecosystem are forests, ponds etc whereas examples of artificial ecosystem are gardens, aquarium and crop-fields.

## Components of an Ecosystem

### Abiotic Components

The abiotic components of an ecosystem include the physical environment like air, water, soil alongwith the inorganic substances like carbon dioxide, nitrogen, oxygen, water, phosphorus, sulphur, sodium and other elements present in them. The physical factors which affect our climate such as light, temperature, pressure, humidity are also considered as abiotic components.

### Biotic Components

The biotic components of an ecosystem is a community of organisms which is made up of many inter dependent populations. It includes three types of organisms:

- (1) **Producers:** These are the autotrophs which synthesize their own food such as green plants and certain blue green algae.
- (2) **Consumers:** These are the heterotrophs which depend on other organisms for food. These organisms consume the food produced either directly from producers or indirectly by feeding on other consumers. They can be further classified as herbivores, carnivores, omnivores and parasites.
- (3) **Decomposers:** These are the organisms which consume the dead remains of other organisms. The micro organisms comprising bacteria and fungi break down the dead remains and waste products of organisms which comprises of complex inorganic substances into simpler inorganic substances that go into the soil and are used up once more by the plants.

### The Functioning of an Ecosystem

An ecosystem is a self sufficient unit. It involves input of energy and matter which are exchanged between the living and non living components in a cyclic process.

### Importance of Decomposers

The decomposers help in decomposing the dead bodies of plants and animals and in this way act as cleansing agents of environment. The various nutrients which are initially taken by plants from the soil, air and water are returned to the soil, air and water (nutrient pool) after the death of plants and animals. They help in recycling the materials in the ecosystem.

## MOST LIKELY Questions

### Short Answer Type-I Questions (SA-I)

[ 2 marks ]

1. Why are crop fields known as artificial ecosystems?

**Ans.** An ecosystem consists of biotic components comprising living organisms and abiotic components comprising physical factors like temperature, rainfall, wind, soil and minerals. Artificial ecosystems are those

ecosystems which have been modified by human beings for their own benefit. Crop fields are man made and some biotic and abiotic components are manipulated by humans.

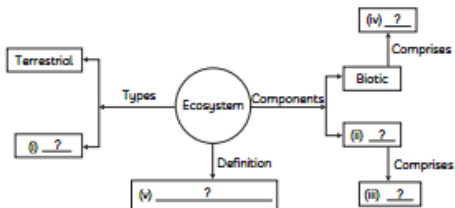
In a crop field, plants do not grow naturally. They are mostly grown by humans, hence, they are considered as artificial ecosystems.

These activities of man alter the biotic and abiotic components of the ecosystem. Therefore, crop fields are known as artificial ecosystems.

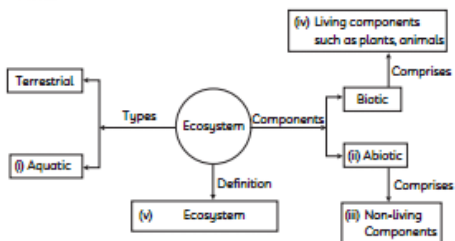
## Short Answer Type-II Questions (SA-II)

[ 3 marks ]

2. Complete the following flow chart based on ecosystem and its components.



Ans.



**Ecosystem:** It is a structural and functional unit of the biosphere which comprises living and non-living components that interact by means of food chains and chemical cycles resulting in energy flow, biotic diversity and material cycling to form a stable and self supporting system.

3. Complete the following table:

	Oxygen	Ozone
Formula	(A) .....	(B) .....
Benefits to biotic component	(C) .....	(D) ..... ..... .....

Ans. (A) O<sub>2</sub>

(B) O<sub>3</sub>

(C) Benefits of oxygen to biotic component.

Breathing: All biotic components inhale oxygen from the atmosphere and exhale CO<sub>2</sub>.



### Related Theory

Decomposition: The break down of complex food material (dead plants and animals) into simpler material requires oxygen.

Combustion: The burning of fossil fuels requires oxygen.

- (D) Benefits of Ozone to biotic component-the ozone layer is important for the existence of life on earth because it absorbs most of the harmful ultra violet radiations coming from the sun and prevents them from reaching the earth.



### Related Theory

O<sub>3</sub> gas is poisonous in nature if inhaled.

4. How will you create an artificial aquatic ecosystem, which is self-sustainable?

- Ans. (1) Large jar filled with water, oxygen, food and aquatic plants and animals.  
 (2) Oxygen/oxygen pump.  
 (3) Fish food.  
 (4) Aquatic plants/Producers provide O<sub>2</sub> during photosynthesis.  
 (5) Aquatic animals/Consumers release CO<sub>2</sub> for the process of photosynthesis.  
 (6) Decomposers are also important for natural cleaning of the aquarium.

## Case Based Questions

[ 4 marks ]

5. You might have seen an aquarium. Let us try to design an aquarium. We need to keep in mind when we create an aquarium. The fish would need a free space for swimming (it could be a large jar), water, oxygen and food. We can provide oxygen through an oxygen pump (aerator) and fish food which is available in the market. If we add a few aquatic plants and animals it can become a self sustaining system.

(A) Name two human-made ecosystems.

(B) What are the biotic and abiotic components in an aquarium?

(C) (i) Aquariums have to be cleaned periodically whereas ponds and lakes do not need such cleaning. Why?

(ii) What would have happened if we had put predator fishes in the aquarium?

Ans. (A) Aquariums and crop fields are human made ecosystems as these have been made by humans.

(B) The biotic components of an aquarium are the aquatic plants and animals whereas the abiotic components are the glass tank, water and aerator.

(C) (i) An aquarium is an artificial ecosystem and the organisms present in it are maintained in an artificially created and restricted environment. In the aquarium the uneaten food as well as the waste generated by the fishes mixes with the water and is left untreated as

decomposers are absent. The waste materials thus accumulate in the water making it toxic. Hence an aquarium has to be cleaned after regular intervals.

On the other hand, a pond or a lake ecosystem is a natural ecosystem and the types of organisms present in it re-balanced. The decomposers present in ponds and lakes break-down the dead remains and waste products of

organisms and thus keeps the water clean. Therefore, ponds and lakes do not require physical cleaning.

- (ii) Predator fishes are fishes that eat other fishes. If we add such species together eventually there will be only predator fishes as they would eat all the smaller fishes. To avoid this we should not mix a predatory fish with prey fish.

## TOPIC 2

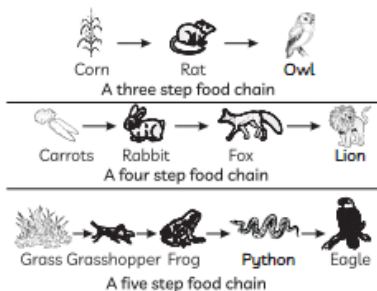
### FOOD CHAINS AND FOOD WEBS

The food or energy can be transferred from one organism to the other by means of food chains. All the food chains begin with the autotrophs as they are the producers of food. Food chain is therefore the sequence of living organisms in a community in which one organism consumes another organism to transfer energy.

#### Examples of Food Chain

Following are a few examples of food chains:

- (1) Grass → Deer → Lion
- (2) Grass → Insects → Frog → Birds
- (3) Plants → Worms → Birds → Cat
- (4) Algae → Protozoa → Small Fish → Big Fish



#### Trophic Levels

The various steps in a food chain at which the transfer of food or energy takes place are called trophic levels. In a food chain, each step forms a trophic level.

- (1) The autotrophs or the producers are at the first trophic level. They fix up the solar energy and make it available for heterotrophs or the consumers.
- (2) The herbivores or the primary consumers come at the second trophic level.

- (3) Small carnivores or the secondary consumers are at the third trophic level.
- (4) Larger carnivores or the tertiary consumers form the fourth trophic level.

**An example of trophic level:** Consider the food chain in a grassland:

Grass → Insects → Frog → Birds

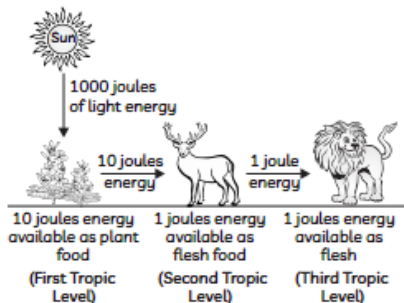
In this food chain, grass represents the 1<sup>st</sup> trophic level, insects represent the 2<sup>nd</sup> trophic level, frog represent the 3<sup>rd</sup> trophic level and birds are at the 4<sup>th</sup> trophic level.

#### Flow of Energy in a Food Chain

- (1) The green plants in a terrestrial ecosystem capture about 1% of the energy of sunlight that falls on their leaves and convert it into food energy.
- (2) When green plants are eaten by primary consumers, a great deal of energy is lost as heat to the environment, some amount goes into digestion and in doing work and the rest goes towards growth and reproduction.
- (3) **Ten percent law:** An average of 10% of the food eaten is turned into its own body and made available for the next level of consumers. Therefore, 10% can be taken as the average value for the amount of organic matter that is present at each step and reaches the next level of consumers.
- (4) **Number of trophic levels are limited:** Since so little 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 great that very little usable energy remains after four trophic levels. There are generally a greater number of individuals at the lower trophic levels of an ecosystem, the greatest number is of the producers.

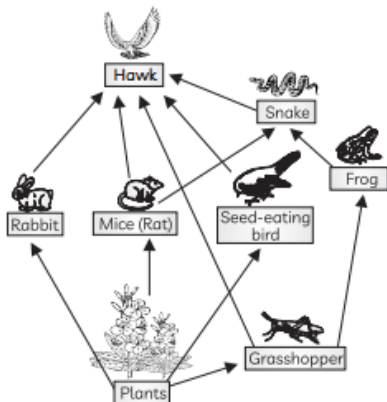
**Illustration of the 10 percent law:** Suppose 1000 joules of light energy emitted by the sun falls on the plants (called producers). We know that the plants convert only one per cent (1%) of the light energy falling on them into chemical energy of food. So, the energy which will be available in plant matter as food will be only 1% of 1000 Joules, which comes to 10 joules. The remaining  $1000 - 10 = 990$  joules of light energy or solar energy which is not utilized by the plants is reflected back into the environment (see Figure). The ten per cent law will not apply at this stage. It will apply only in the transfer of energy in a food chain.

According to the 10% law, only 10% of 10 joules of energy i.e., 1 Joule will be available for transfer to the next trophic level.



## Food Web

The network of a large number of food chains existing in an ecosystem is called a food web. As the length and complexity of food chains vary greatly and each organism is generally eaten by two or more other kinds of organisms which in turn are eaten by several other organisms. So, instead of a straight line food chain, the relationship can be shown as a series of branching lines called a food web.



There are six food chains in the above food web, marked as 1, 2, 3, 4, 5 and 6.

- (1) In the 1<sup>st</sup> food chain, plants are eaten by rabbit and then rabbit is eaten by hawk:

Plants → Rabbit → Hawk

- (2) In the 2<sup>nd</sup> food chain, plants are eaten by mice and the mice are eaten by hawks:

Plants → Mice → Hawk

- (3) In the 3<sup>rd</sup> food chain, plants are eaten by mice; mice are eaten by snakes and then snakes are consumed by hawks:

Plants → Mice → Snake → Hawk

- (4) In the 4<sup>th</sup> food chain, plants are eaten by seed-eating birds and the seed-eating birds are consumed by hawks:

Plants → Seed-eating Bird → Hawk

- (5) In the 5<sup>th</sup> food chain, plants are eaten up by grasshopper and the grasshopper is consumed by hawks:

Plants → Grasshopper → Hawk

- (6) In the 6<sup>th</sup> food chain, plants are eaten by grasshopper, grasshopper is eaten by frog; frog is eaten by snake and then snake is consumed by hawk:

Plants → Grasshopper → Frog → Snake → Hawk

## Energy Flow Diagram

If we study the energy flow diagram in a food chain, we find that the flow of energy is 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 the autotrophs.

## Biological Magnification

The increase in concentration of harmful chemical substances like pesticides in the body of living organisms at each trophic level of a food chain is called biological magnification. These chemicals are absorbed from the soil by the plants and from the water bodies by the aquatic plants and animals. As these are non-biodegradable, they get accumulated progressively at each trophic level. This is also the reason why our food grains such as wheat and rice, vegetables and fruits contain varying amounts of pesticide residue.



## MOST LIKELY Questions

### Short Answer Type-I Questions (SA-I)

[ 2 marks ]

6. (A) Create a food chain of the following organisms:

Insect, Hawk, Grass, Snake, Frog

- (B) Name the organism at the third trophic level of the created food chain.

Ans. (A) Food chain

Grass → Insect → Frog → Snake → Hawk

- (B) The organism at the third trophic level of the created food chain is frog.

### Short Answer Type-II Questions (SA-II)

[ 3 marks ]

7. (A) Construct a terrestrial food chain comprising four trophic levels.

- (B) What will happen if we kill all the organisms in one trophic level?

- (C) Calculate the amount of energy available to the organisms at the fourth trophic level if the energy available to the organisms at the second trophic level is 2000 J.

Ans. (A) A terrestrial food chain comprising of four trophic levels:

Grass → Grasshopper → Frog → Snake

- (B) If we kill all the organisms in one trophic level the transfer of food energy to next level will stop.

Organisms of previous trophic level will also increase.

For example: If all herbivores in an ecosystem are killed:

There will be no food available for the carnivores of that area.

Consequently they will also die or will shift to other areas.

Populations of producers will also increase in absence of herbivores causing imbalance in the ecosystem.

- (C) Consider the same food chain as we have made in 19 (a):

Grass → Grass hopper → Frog → Snake

In this food chain, second trophic level is grass hopper and the energy available at this trophic level is 2000 J.

According to 10% law, 10% of energy will be available to frog (Third trophic level) which is 200 J.

The energy available to the snakes will be available as 10% of 200 J. Thus, the energy available to the snake is 20 J.

**Explanation:** 10% law states that during transfer of energy from one trophic level to the next trophic level, only about 10% energy is available to the higher trophic level.

To summarise:

Grass	→	Grass hopper	→	$10\%$	→	Frog	→	$10\%$	→	Snakes
First Trophic level		Second trophic level				Third Trophic level				Fourth Trophic level
		2000 J				200 J				20 J

8. (A) State with reason the consequence of decrease in number of carnivores in an ecosystem.

- (B) In a food chain, state the trophic level at which the concentration of harmful chemicals is maximum. Why is it so?

Ans. (A) If there is decrease in number of carnivores in an ecosystem, then there will be no predator or very less predator control over the population of herbivores. One of this the population of herbivores will increase. Herbivores eat grass, so an increase in herbivore population will lead to excessive grazing of grass. The density of producers like grass will be much reduced. Overgrazing may eliminate the grass and other green plants completely and turn the forest into a desert area.

**Explanation:** (a) : Grass → Deer → Lion

If all lions are removed or their number reduces by killing or capturing the population of deer will increase. Increase in deer population will lead to excessive grazing of grass. Overgrazing will eliminate the grass and forest will become barren land.

- (B) In a food chain, the highest trophic level will have the maximum concentration of harmful chemicals.

**Explanation:** (a) : Grass → Grasshopper → Frog → Snake.

In this food chain, snake will have the maximum concentration of chemicals in its body as it occurs at the highest trophic level.

### Case Based Questions

[ 4 marks ]

9. India today is facing the problem of overuse of resources, contamination of water and soil and lack of methods of processing the waste. The time has come for the world to say goodbye to

"single-use plastics." Steps must be undertaken to develop environment-friendly substitutes, effective plastic waste collection and methods of its disposal.

Indore treated 15 lakh metric tonnes of waste in just 3 years, through biomining and bioremediation techniques. Bioremediation involves introducing microbes into a landfill to naturally 'break' it down and biomining involves using trommel machines to sift through the waste to separate the 'soil' and the waste component.

The city managed to chip away 15 lakh metric tonnes of waste at a cost of around ₹ 10 crore. A similar experiment was successfully carried out in Ahmedabad also.

- (A) State two methods of effective plastic waste collection in your school.
- (B) Name any two uses of "single-use plastic" in daily life.
- (C) (i) If we discontinue the use of plastic, how can an environment-friendly substitute be provided?
- (ii) Do you think microbes will work similarly in landfill sites as they work in the laboratory?

Ans. (A) Plastic consumption has grown at tremendous rate over the past two decade in our country. Collection and disposal is an important environmental challenge.

Two methods of effective plastic waste collection in our school are:

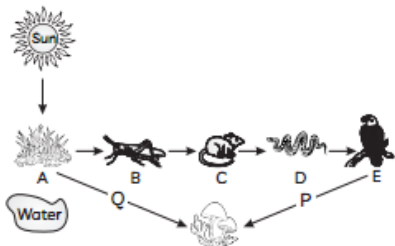
- Collection centre having separate bin for collection of plastic articles having separate bin for collection of Plastic articles has been put up at strategic point to collect the plastic waste.
  - Students, parents, teachers and all other stake holders have been made aware about the harmful effects of plastic and are encouraged not to use plastic and to reduce its use
- (B) Uses of "Single-use plastic" in daily life.
- In medical field: Plastic syringes, plastic gloves are made of single-use plastic and are used so that infection can be controlled.
  - Single-use plastic is also used in food industry for packing, straws, wrappers, spoons etc.
  - In emergency/ disaster situations where food and water has to be transported. Plastic will be light in weight and this packaging will be helpful to transport. (Any two)

(C) (i) If we discontinue the use of plastic we can provide an environment friendly substitute as:

- Reuseable cloth and jute bags
- Glass articles because it is renewable as it is made up of sand and water.

(ii) No, the microbes will not work similarly in landfill sites as they work in laboratory. Microbes need suitable conditions like temperature, moisture etc. and nutrients to grow. In laboratory we provide this atmosphere artificially to microbes for their growth but landfill sites do not have suitable atmosphere to grow.

10. The sun is the ultimate source of light and heat for planet Earth and sets in motion very large and complex systems that develop and sustain life. One such land-based ecosystem is the forest, supporting a biodiverse set of plants, which in turn provide food for other living things. Several distinct types of woodland habitats exist on Earth, such as conifer, deciduous and mixed. A study of the deciduous forest shows how a food chain functions within an ecosystem that experiences distinct seasonal changes.



- (A) What are functional components of an ecosystem?
- (B) Identify P and Q from the figure of food chain given. Justify your answer.
- (C) Identify A, B, C and D in the figure of food chain given above. Justify your answer.

Ans. (A) There are four functional components of an ecosystem: Abiotic factors, Producers, Consumers, and Decomposers. The latter three are living which are very important in ecosystems.

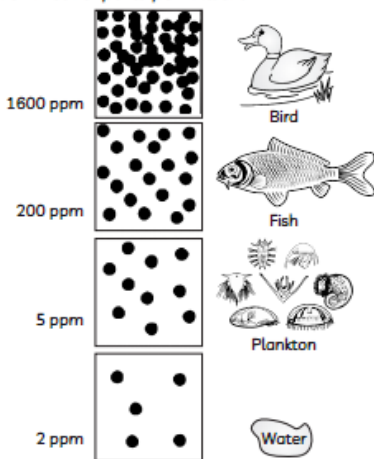
(B) P: Decomposers, Q: Nutrients

**Explanation:** Decomposers feed on dead and decaying organic matter and apart from cleansing of our environment, they also recycle the nutrients and return the nutrients to the soil for the producers.

- (C) A: Producer; B: Primary Consumer; C: Secondary Consumer; D: Tertiary Consumer

**Explanation:** In all food chains, the green plants are the producers as they synthesize food by utilizing solar energy. The small insects marked 'B' or herbivores are the primary consumers as they feed on plants. Small animals marked 'C' are secondary consumers as they feed on small insects and similarly larger carnivores are tertiary consumers and marked 'D' and 'E'.

11. Toxic substances move up the food chain and become more concentrated at each level. These substances are often pollutants from industries or pesticides from farming. Consider any small fish that eats plankton that has been tainted with mercury. Hundreds of small fish might then contain just few parts of the mercury, not enough to cause major harm. A bird then might eat hundreds of the small fish, so that now instead of 200 ppm in a single fish, that bird has much higher levels of mercury. The toxin amplifies as it moves up the food chain. The amount of mercury is measured in ppm, which means "parts per million."



### TOPIC 3

## EFFECT OF OUR ACTIVITIES ON ENVIRONMENT

Since we are an integral part of the environment, our activities also change the environment around us.

### Ozone Layer and its Depletion

Ozone ( $O_3$ ) is a deadly poisonous gas which is formed by three atoms of oxygen. It shields the surface of the earth from harmful ultraviolet (UV) rays of the sun, which are known to cause skin cancer in human

beings. They also damage the eyes and our immune system.

### Formation of Ozone

Ozone is a product of UV radiation acting on oxygen ( $O_2$ ) molecule, which splits apart some molecular oxygen ( $O_2$ ) into free oxygen atoms (O) which combine with the molecular oxygen to form ozone.

- (A) It was observed that at places where DDT was used to control mosquitoes and other pests, the eggs of eagles would become fragile and break and the eagle almost became extinct. After DDT was banned by lawmakers, eagle population has recovered. What is the possible reason for this?

- (B) What is the cause of biological magnification?

- (C) Which the organism in a food web contains the lowest and highest concentration of harmful chemical pollutants? Give reason.

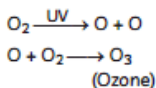
- Ans. (A) DDT is non-biodegradable and hence found in largest concentration in tertiary consumers.

**Explanation:** DDT is a non-biodegradable pesticide and when sprayed, it finds its way to soils from where it enters the food chain. The concentration of DDT increases progressively as we go up the trophic level due to biological magnification.

- (B) Biological magnification is a result of pollution caused by spraying pesticides etc which pollute the water and soil.

- (C) The concentration of harmful chemical pollutants such as DDT and other pesticides increases progressively at each trophic level. Therefore, tertiary consumers which occupy the highest trophic level will have the highest concentration and producers which occupy the lowest trophic level will have the lowest concentration of harmful chemical pollutants.





### Depletion of Ozone Layer

The amount of ozone in the atmosphere is getting depleted due to the use of synthetic chemicals like chlorofluorocarbons (CFCs), which are used as refrigerants and in fire extinguishers. The CFCs released into the air react with the ozone gas present and destroy it gradually due to which the ozone layer is becoming thinner leading to more UV rays entering the earth.

In 1987, the United Nations Environment Programme succeeded in forging an agreement to freeze CFC production at 1986 levels.

### Managing the Garbage We Produce

#### Biodegradable and Non-biodegradable Wastes

All the waste materials produced by the various activities of man and animals can be sub-divided into the following groups:

#### (1) Biodegradable Wastes

#### (2) Non-biodegradable Wastes

The waste materials which can be broken down to non-poisonous substances in nature in due course of time by biological processes like the action of micro-organisms are called biodegradable wastes.

Some examples of bio-degradable wastes are cattle dung, compost, animal bones, leather, tea-leaves, wool, paper, wheat, wood, hay, cotton, jute, grass, fruit and vegetable peels, leaves, flowers, cake etc. Bio-degradable wastes usually do not pollute the environment.

The waste materials which cannot be broken down into non-poisonous or harmless substances in nature are called non-biodegradable wastes.

Some examples of non-biodegradable wastes are DDT, plastics, polythene bags, synthetic fibres, glass, metal cans, iron nails, silver foils, radioactive wastes etc.

These are the major environmental pollutants as these cannot be decomposed by micro-organisms.

## MOST LIKELY Questions

### Short Answer Type-I Questions (SA-I)

[ 2 marks ]

12. List any two ways that you would stress in your talk to bring in awareness amongst your fellow friends that would also help in protection of ozone layer as well as the environment.

**Ans.** Two ways that can be stressed to bring in awareness that would also help in protection of ozone layer and the environment:

- (1) By organizing poster making and painting competitions in institutions with emphasis on the importance of ozone layer, harmful effects of its depletion and various chemicals and substances causing its depletion such as CFCs, aerosols etc.
- (2) By organizing street plays, talk shows, debates etc on ways to protect the ozone layer by minimising the use of vehicles to limit emission of harmful gases that cause damage to the ozone layer, convincing people not to buy products in aerosol cans and proper maintenance of their air conditioning filters and units

### Short Answer Type-II Questions (SA-II)

[ 3 marks ]

13. Why is improper disposal of waste a curse to environment?

**Ans.** Disposal of waste means getting rid of waste. Improper disposal of waste can cause significant harm to human health, safety and can develop causing serious environmental problems.

- (1) The accumulation of biodegradable wastes causes an obnoxious smell, which is created during the process of decomposition.
- (2) There can also be a possibility of sparking an epidemic if the waste is dumped near a residential area or is allowed to contaminate the water bodies. People living in areas near old and abandoned waste disposal sites are in a particularly vulnerable position.
- (3) Improper waste storage or disposal frequently contaminates surface and groundwater supplies.

In case of non-biodegradable substances, for example, chemical fertilizers, the nutrients in the soil are destroyed which thus affects health and reduces the longevity of the people who consume the food cooked with the produce grown in such a soil.

- (4) Improper disposal of plastics prevents the seepage of rainwater underground and lead to water scarcity.
- (5) If the waste is not properly segregated at some place, it might not biodegrade and simply persist in the environment for a long time or may harm the various members of the ecosystem.



14. List two main causes of the pollution of water of the river Ganga. State how pollution and contamination of river water prove harmful for the health of the people of neighbouring areas.

Ans. Causes:

- (1) Disposal of industrial effluents
- (2) Human activities like bathing, washing, it is religious practice and sentiment
- (3) Disposal of untreated sewage (any two)

**Harmful effects on health:**

- (1) Spreads water borne diseases,
- (2) Consumptions of contaminated fishes  
(or any other relevant affect)

### Case Based Questions

[ 4 marks ]

15. Human body is made up of five important components, of which water is the main component. Food as well as potable water are essential for every human being. The food is obtained from plants through agriculture. Pesticides are being used extensively for a high yield in the fields.

These pesticides are absorbed by the plants from the soil along with water and minerals and from the water bodies these pesticides are taken up by the aquatic animals and plants. As these chemicals are not biodegradable, they get accumulated progressively at each trophic level.

The maximum concentration of these chemicals gets accumulated in our bodies and greatly affects the health of our mind and body.

- Why is the maximum concentration of pesticides found in human beings?
- Give one method which could be applied to reduce our intake of pesticides through food to some extent.
- (i) What does the various steps in a food chain represent?  
(ii) With regard to various food chains operating in an ecosystem, what does a man stand?

Ans. (A) As human beings occupy the top level in any food chain, the maximum concentration of these chemicals get accumulated in our bodies due to biological magnification.

Explanation: Pesticides are being used extensively for a high yield in the fields. These pesticides mix up with soil and water. From soil and water, these pesticides are

absorbed by the plants along with water and minerals. When herbivores eat this plant food, these chemicals pesticides go into their bodies through the food chain. When the next trophic level, carnivores eat herbivores, these pesticides get transferred to their bodies. As these chemicals are not biodegradable, they get accumulated progressively at each trophic level.

- We can reduce our intake of pesticides through food to some extent:  
Wash fruits and vegetables before eating.  
Buy organic and locally grown fruits and vegetables.
- (i) Trophic level represents the various steps in a food chain.

Explanation:



Pyramid of numbers showing 3 step food chain the base of this pyramid shows producers and the top of this pyramid is formed by carnivores. As we go higher and higher in each trophic levels, the number of organisms goes on decreasing.

- A man stands at consumer level in a food chain.

Explanation: If we consider a food chain in which human beings are vegetarians, human beings will eat plants or plant products, their the food chain has only two trophic levels-producers and consumers.

Plants → Man  
(Producers) (Consumer)

But in case of non-vegetarians, man eats meat of animals like goat or any other animal then the food chain will be 3 step 'food chain'.

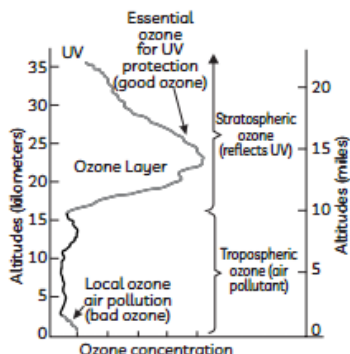
Plants → Goat → Man  
(Producers) (Herbivore) (Omnivore)  
(Primary (Secondary  
consumer) consumer)

16. Ozone (O<sub>3</sub>) is a gas which is present naturally within Earth's atmosphere and is formed of three oxygen atoms. In the figure we see a standard profile of ozone gas concentration through the Earth's atmosphere, extending from ground level up to 40 kilometres in altitude.

Ozone plays a different role in atmospheric chemistry at different heights in the Earth's atmosphere. We can differentiate this profile into two key zones:

Tropospheric ozone is that which is present in the lower atmosphere. Throughout most of the troposphere, ozone concentrations are relatively low (as shown in the diagram).

Stratospheric ozone is that which is present in the upper atmosphere. As shown in the diagram, concentrations of ozone are higher in the stratosphere than in the troposphere.

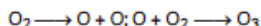


- (A) Identify good ozone and bad ozone by studying the graph given above.  
 (B) How is ozone formed?

- (C) (i) Write name of few products which contain ozone-depleting substances?  
 (ii) What is the consequence of ozone layer depletion?

Ans. (A) Good ozone: Stratosphere; Bad ozone: Troposphere

(B) Ozone at the higher levels of the atmosphere is a product of ultraviolet 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 as shown:



(C) (i) Car with AC, refrigerator, fire extinguisher, aerosol sprays

**Explanation:** The depletion of ozone layer is linked to synthetic chemicals such as chlorofluorocarbons (CFCs) which are used as refrigerants, aerosol sprays and in fire extinguishers.

(ii) Ozone layer depletion causes increased incidence of ultraviolet radiations on the surface of the earth and this causes skin cancer, cataract and other eye damage. Tides are caused due to the gravitational pull of the moon on the earth.