

Our Environment

Question 1:

What is the functional unit of the environment comprising of the living and non-living components called ?

Solution :

Ecosystem.

Question 2:

Name two natural ecosystems and two artificial ecosystems.

Solution :

Natural ecosystems – Grass land and forest. Artificial ecosystems – Parks and Gardens.

Question 3:

Which one of the following is not a terrestrial ecosystem ?

Forest, Grassland, Aquarium, Desert

Solution :

Aquarium.

Question 4:

Why are plants called producers ?

Solution :

Plants are called producers because green plants prepare their own food from simple inorganic substances like carbon dioxide and water by using sunlight energy in the presence of chlorophyll.

Question 5:

What name has been given to those organisms which break down the complex organic compounds present in dead animals and plants ?

Solution :

Decomposers.

Question 6:

What are planktons ?

Solution :

Planktons are very minute or microscopic organisms freely floating on the surface of water in a pond, lake, river or ocean.

Question 7:

State whether the following statements are true or false :State whether the following statements are true or false :

- (a) In biology, human beings are called producers.
- (b) Secondary consumers and tertiary consumers, both are carnivores.

Solution :

- (a) False.
- (b) True.

Question 8:

Which category of organisms forms the starting point of a food chain ?

Solution :

Producer.

Question 9:

Which of the following belong to the same trophic level ?

Goat; Spider ; Plants ; Hawk ; Rat .

Solution :

Goat and Rat (Both are herbivores).

Question 10:

Which of the following belong to the same trophic level ?

Tree ; Frog ; Snake ; Grass ; Lizard

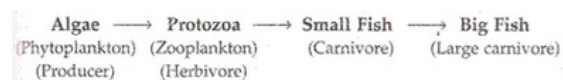
Solution :

Tree and Grass (Both are producers).

Question 11:

Write an aquatic food chain.

Solution :

**Question 12:**

Name the organisms belonging to the second and the fourth trophic levels in the food chain comprising the following :

Frogs, Plants, Snakes, Hawk, Insects

Solution :

Second trophic level: Insects Fourth trophic level: Snakes

Question 13:

What are the various steps of food chain called ?

Solution :

Trophic levels

Question 14:

Construct a food chain comprising the following :

Snakes, Hawk, Rats, Plants

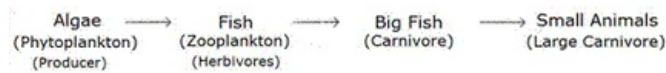
Solution :

**Question 15:**

Arrange the following in a food chain :

Fish, Algae, Small animals, Big Fish

Solution :

**Question 16:**

Which organisms belong to third and fourth trophic levels in the food chain comprising the following ?

Rats, Plants, Hawk, Snakes

Solution :

Third Trophic level: Snakes. Fourth trophic level: Hawk.

Question 17:

Which one term in the following includes the others ?

air, flora, fauna, environment, water, sunlight, soil

Solution :

Environment.

Question 18:

A food chain represents a unidirectional flow of X. What is X ?

Solution :

Energy.

Question 19:

Fill in the following blanks with suitable words : Fill in the following blanks with suitable words :

- (a) Decomposer organisms are..... in their action.
- (b) In nature, all green plants are..... whereas animals are consumers.
- (c) A series of organisms, each of which feeds on the next organism, the beginning of which is a green plant, is called a.....
- (d) The science that deals with the inter-relationships of living things with one another and their environment is called
- (e) Plastic is a..... material whereas paper is a..... material.

Solution :

- (a) Specific.
- (b) Producers.
- (c) Food Chain.
- (d) Ecology.
- (e) Non – biodegradable; Biodegradable.

Question 20:

Explain the terms 'producer' and 'consumer'. Give two examples of producers and two of consumers.

Solution :

1. Producers are the organisms which can prepare their own food from simple inorganic substances like carbon dioxide and water by using sunlight energy in the presence of chlorophyll. Example – Green plants and certain blue-green algae
2. Those organisms which consume food (eat food) prepared by producers are called consumers. Example – Lion and Tiger.

Question 21:

- (a) Define decomposers. Name one decomposer.
- (b) What is the role of decomposers in the ecosystem ?

Solution :

- (a) The micro-organisms which break down the complex organic compounds present in dead organisms like dead plants and animals and their products like faeces, urine, etc., into simpler substances are called decomposers. Example – Bacteria and Fungi.
- (b) The decomposers help in decomposing the dead bodies of plants and animals, and hence act as cleansing agents of environment.

Question 22:

What is meant by a primary consumer, secondary consumer and a tertiary consumer ? Give one example of each.

Solution :

1. The animals which eat only plants are called Herbivores. All herbivores are primary consumers. Example – Goat
2. The small carnivores which feed on herbivores (primary consumers) are called secondary consumers. Example – Frog
3. The Large carnivores (or top carnivores) which feed upon the small carnivores (secondary consumers) are called tertiary consumers. Example – Lion

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Question 23:

Give an example of a four step food chain operating in grassland. Name the secondary consumer in this food chain

Solution :

Food chain in Grass land:

Grass → **Insect** → **Frog** → **Bird**
(Producer) (Herbivore) (Carnivore) (Large Carnivore)

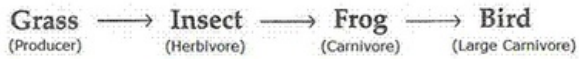
The secondary consumer is Frog.

Question 24:

- (a) Define trophic level. Draw the food chain with four trophic levels.
- (b) What will happen if we kill all the organisms in one trophic level ?

Solution :

- (a) Trophic Levels – The various steps in a food chain at which the transfer of food takes place are called trophic levels. In a food chain, each step representing an organism forms a trophic level.



(b) If we kill all the organisms in one trophic level, then the transfer of food (and energy) to the next trophic level will stop due to which the organisms of next trophic level will starve and die or migrate to other areas. The killing of all the organisms in one trophic level will also lead to the overpopulation of organisms in the previous trophic level. These effects will cause an imbalance in the ecosystem. For example, if we kill all the herbivorous animals like deer, rabbits, etc., in a forest, then the carnivorous animals like lions, tiger, etc., will not get food. Due to this, the lions and tigers etc., will starve and die or migrate from forest and go towards human settlements and attack people. Moreover, in the absence of herbivores like deer, rabbits, etc., the population of the previous trophic level 'plants' (or vegetation) will increase too much (because there are no deer or rabbits to eat them). All these effects will create an imbalance in the ecosystem.

Question 25:

What is the difference between the food habits of organisms belonging to the first and the third trophic levels ? Give one example each of the organisms belonging to these two trophic levels.

Solution :

The organisms belonging to the first trophic level are producers which make their own food with the help of sun's energy. For example – Green plants. The organisms of third trophic level are carnivores that feed upon herbivores. For example – Lion and Tiger.

Question 26:

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

Solution :

No. The impact of removing all the organisms of a trophic level will be different for different trophic levels.

Question 27:

Consider the food chain :

Grass → Deer → Lion

What will happen if all the lions are removed from the above food chain ?

Solution :

If all the lions are removed, then there will be no predator control over the population of deer due to which its populations will greatly increase and deer will eat all grass. Over grazing will eliminate the grass and other green plants completely and turn the lush green forest into a desert area having no vegetation at all.

Question 28:

The number of malaria patients in a village increased tremendously when large number of frogs were exported from the village. What could be the cause for it ?

Solution :

Frogs eat up mosquitoes. In the absence of frogs, the number of mosquitoes increase too much and spread malaria.

Question 29:

How does a biodegradable waste differ from a non-biodegradable waste ? Give two examples of non- biodegradable wastes which pollute our environment.

Solution :**Biodegradable Wastes**

1. Those waste materials which can be broken down to non-poisonous substances in nature by the action of microorganisms (like bacteria) are called biodegradable wastes.
2. They get recycled and therefore do not require dumping sites.
3. They do not cause any pollution to the soil.
Example:- Paper, Wood, etc.

Non-Biodegradable Wastes

1. Those waste materials which cannot be broken down to non-poisonous substances in nature are called non-biodegradable wastes.
2. They cannot be recycled easily and therefore are to be dumped which requires lot of space. This causes wastage of land.
3. The harmful chemicals leach out of these wastes when they are dumped in soil. This leads to soil pollution.
Example:- DDT, Plastic and Polythene bags

Question 30:

Which of the following are biodegradable and which non-biodegradable ?

Glass bottle, Paper, Ball point pen refill, Hay, DDT, Wheat, Cake, Wood, Polythene bag, Jute bag, Cotton cloth, Grass, Vegetable peels

Solution :

Glass bottle – Non-biodegradable Paper – Biodegradable Ball point pen refill – Non-biodegradable Hay – biodegradable DDT – Non-biodegradable Wheat – Biodegradable Cake – Biodegradable Wood – Biodegradable Polythene Bag – Non-biodegradable Jute Bag – Biodegradable Cotton Cloth – Biodegradable Grass – Biodegradable Vegetable peels – Biodegradable

Question 31:

- (a) Describe an activity to show that while paper is biodegradable but plastic (say, polythene) is non-biodegradable.
- (b) Explain why, some materials are biodegradable but some are non-biodegradable.

Solution :

- (a) We take a piece of paper and a plastic bag (Polythene Bag). Now dig the ground to about 15 centimeters depth and place the piece of paper and plastic bag in the dug up ground separately. After a month, we dig up the buried material and observe them. We will find that the piece of paper has been partially eaten up but the plastic bag has been remained unaffected. This means that the paper has been decomposed by the micro-organisms present in the soil. So paper is biodegradable. On the other hand, the plastic bag has not been decomposed by the micro-organisms present in the soil, therefore it is non-biodegradable.
- (b) It is due to the property of decomposer organisms of being specific in their action that some waste materials are biodegradable and others are non-biodegradable.

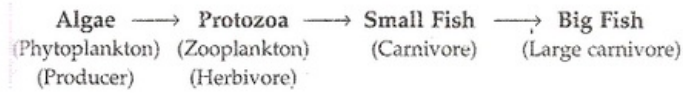
Question 32:

Write down a food chain : Write down a food chain :

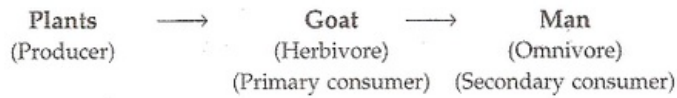
- (a) in the sea
- (b) which ends with humans
- (c) with five links in it.

Solution :

(a)



(b)



(c) Plants → Grasshopper → Frog → Snake → Hawk

Question 33:

At which trophic level a person is feeding when he is eating :At which trophic level a person is feeding when he is eating :

- (a) roasted chicken
- (b) bread
- (c) eggs
- (d) apple
- (e) fish

Solution :

- (a) Third trophic level
- (b) Second trophic level
- (c) Third trophic level
- (d) Second trophic level
- (e) Fourth trophic level

Question 34:

A student went to study a local pond. In one part of the pond she noticed tadpoles scraping at some pond weed. In another part she saw a water beetle holding a tadpole in its jaws. A student went to study a local pond. In one part of the pond she noticed tadpoles scraping at some pond weed. In another part she saw a water beetle holding a tadpole in its jaws.

- (a) Construct a food chain for the pond.
- (b) How many links are there in this chain ?

Solution :

- (a) Weed Tadpole Water beetle
- (b) Three

Question 35:

Construct (a) a long food chain, and (b) a short foodchain, ending with man.

Solution :

(a)



(b)



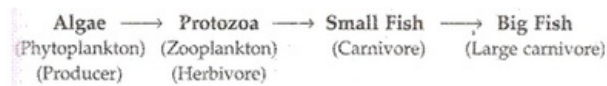
Question 36:

- (a) State one advantage of using jute bags over plastic bags for shopping.
- (b) Write a common food chain of a pond ecosystem having four links.

Solution :

(a) Jute bags should be used for shopping because these are biodegradable whereas plastic bags are non- biodegradable.

(b)



Question 37:

We do not clean ponds or lakes but an aquarium needs to be cleaned periodically. Why ?

Solution :

Pond is a complete eco system having decomposer organisms which are the cleansing agents themselves. Aquarium is an incomplete ecosystem and does not have decomposer organisms for cleansing purposes.

Question 38:

What will be the consequence of the absence of decomposers in the ecosystem ?

Solution :

In the absence of decomposers, the dead bodies of plants and animals would keep lying as such and the elements of plant and animal bodies would never be returned to their original pool like soil, air and water. The cycling process of life and death would be disrupted. The nutrient pool will not be replenished and would exhaust soon.

Question 39:

Give two differences between food chain and food web.

Solution :

Food Chain	Food Web
1. Food Chain is a straight sequence of organisms.	1. Food web is a complex network formed of many food chains.
2. Food chain do not have any cross linkages.	2. Food web has many cross linkages.

Question 40:

Write one or two words for each of the following statements/definitions :Write one or two words for each of the following statements/definitions :

- (a) Each level of food chain where transfer of energy takes place
- (b) The physical factors like temperature, rainfall, light, soil, air and water of an ecosystem
- (c) Organisms which depend on the producers for food either directly or indirectly
- (d) The physical and biological world where we live in
- (e) Selfcontained unit of living things and their non-living environment needing only sunlight for its functioning

Solution :

- (a) Trophic Level
- (b) Abiotic components
- (c) Consumers
- (d) Environment
- (e) Ecosystem

Question 41:

(a) What is meant by biodegradable waste materials ? Give two examples of biodegradable wastes.

(b) Which of the following materials are non-biodegradable ?

Aluminium wire, Tea leaves, Synthetic fibre, Wool

Solution :

(a) The waste materials which can be broken down to non- poisonous substances in nature in due course of time by the action of micro-organisms like certain bacteria are called biodegradable waste materials. Example ? Paper and wool.

(b) Aluminum wire and Synthetic fibre.

Question 42:

(a) What is meant by non-biodegradable waste materials ? Give two examples of non-biodegradable wastes.

(b) Which of the following materials are biodegradable ?Animal bones, Iron nails, Plastic mugs, Leather belts, Silver foil

Solution :

(a) The waste materials which cannot be broken down into non-poisonous or harmless substances in nature are called non-biodegradable waste materials. Example – D.D.T and Plastics. (b) Animal Bones and Leather Belts.

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Question 43:

(a) Define an ecosystem. Give examples of any two ecosystems.

(b) List the biotic and abiotic components of an ecosystem.

Solution :

(a) An eco system is a self contained unit of living things(plants, animals and decomposers), and their non living environment (soil, air and water). Example – a grassland and a forest.

(b)

1. Biotic component – The biotic components of the ecosystem is a community of organisms which is made up of many different inter-dependent populations. It includes – producers, consumers and decomposers.
2. Abiotic components – The abiotic components of the ecosystem (non living components) include the physical environment like soil, water and air alongwith the inorganic substances like carbon dioxide, nitrogen, water and phosphorous.

Question 44:

(a) What is a food chain ? Give one example of a simple food chain.

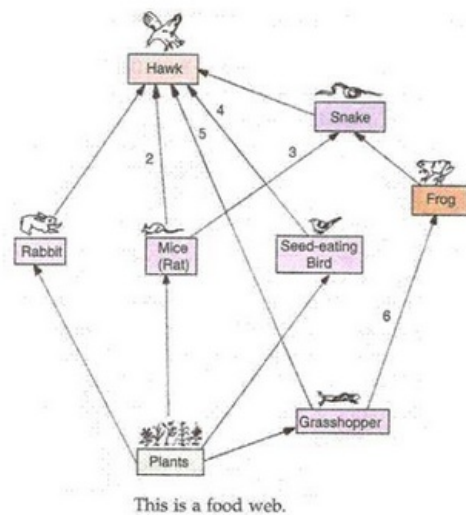
(b) What is a 'food web' ? Show its formation.

Solution :

(a) The sequence of living organisms in a community in which one organism consumes other organisms to transfer food energy is called a food chain. The simple food chain operating in grass land is:



(b) The interconnected food chains operating in an ecosystem which establish a network of relationships between various species is called a food web.



In this food web, we can see a network of numerous pathways along which the food flows within grass land community. This food web starts from the plants which is producer and end in top carnivore hawk.

Question 45:

- What is meant by 'environment' ?
- What type of substances are the major pollutants of the environment ? Name two such substances.
- Name the organisms whose uncontrolled activities are damaging the environment.
- Explain why, it is better to use paper bags than plastic bags.

Solution :

- The physical and biological world together is called environment.
- The non- biodegradable wastes pollutes the environment like plastic and polythene bags.
- Human beings are the only organisms which change the natural environment to fulfill their needs. The uncontrolled activities of human beings are damaging the balanced and healthy environment.
- Paper bags should be used for shopping because these are biodegradable whereas plastic bags are non- biodegradable.

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Question 1:

What percentage of the solar energy is trapped and utilised by the plants ?

Solution :

1%.

Question 2:

What percentage of energy available at the producer level is transferred at successive trophic levels in a food chain ?

Solution :

10%.

Question 3:

Name the process in which a harmful chemical enters the food chain and gets concentrated at each trophic level.

Solution :

Biological Magnification.

Question 4:

In a food chain consisting of grass, frog, bird and insects, where will the concentration of the harmful chemicals be maximum ?

Solution :

Bird.

Question 5:

If a harmful chemical enters a food chain comprising cat, mice and plants, which one of these organisms is likely to have the maximum concentration of the harmful chemical in its body ?

Solution:

Cat.

Question 6:

Which radiations are absorbed by ozone layer ?

Solution :

Ultra Violet radiations.

Question 7:

Name the group of chemical compounds which damages the ozone layer.

Solution :

Chlorofluro Carbons.

Question 8:

Name two waste materials which can be recycled.

Solution :

Paper and Plastics.

Question 9:

Name the process by which the volume of solid wastes can be reduced.

Solution :

Incineration.

Question 10:

If 5 joules of energy is available at producer level (plants), then how much energy will be transferred to the lion in the following food chain ? If 5 joules of energy is available at producer level (plants), then how much energy will be transferred to the lion in the following food chain ?
Plants → Goat → Lion

Solution :

0.05 J.

Question 11:

State whether the following statement is true or false :

Only 10 per cent of the light energy given by the sun is available for transfer at each higher trophic level in a food chain.

Solution :

False.

Question 12:

Where does all the energy in living organisms originate from ?

Solution :

Sun.

Question 13:

Why are there rarely more than five links (or five organisms) in a food chain ?

Solution:

Because after that the energy available for the next organism will be so small that it will be insufficient to sustain the life of that organism.

Question 14:

Name two predators of snakes in a food web operating in a forest ecosystem.

Solution :

Peacock and hawk.

Question 15:

Fill in the following blanks with suitable words : Fill in the following blanks with suitable words :

- (a) Ultraviolet rays can cause skin.....
- (b) Pesticides enter the food chain at the..... level
- (c) Grass → → Human
- (d) Lettuce → → Fox
- (e) Plants → Antelope →

Solution :

- (a) Cancer.
- (b) Producer.
- (c) Goat.
- (d) Rabbit.
- (e) Lion.

Lakhmir Singh Biology Class 10 Solutions Page No:241**Question 16:**

What is ten per cent law ? Explain with an example.

Solution :

Ten PerCent Law – According to ten per cent law, only 10 per cent of the energy entering a particular trophic level of organisms is available for transfer to the next higher trophic level. Example – Suppose 1000 Joules of light energy emitted by the sun falls on the plants. Consider a food chain:



The plants or first trophic level has 10 joules of energy in it. Now according to 10 percent law, only 10% of 10 joules of energy (which is 1 joule) will be available for transfer to the next trophic level, so that the herbivore will have only 1 joule of energy stored as food at the second trophic level. 10% of the remaining 1 joule will be transferred to third trophic level of carnivore. So, the energy available in the lion as food will be only 0.1 joule.

Question 17:

Write the full form of CFC. Give its one harmful effect.

Solution :

CFC – Chlorofluorocarbons. Chlorofluorocarbons released into the air react with ozone gas present in the ozone layer and destroy it gradually.

Question 18:

Explain how, harmful ultraviolet radiations of sunlight are prevented from reaching the earth's surface.

Solution :

Ozone layer absorbs most of the harmful ultra violet radiations coming from the sun and prevents them from reaching the earth.

Question 19:

What are the causes of depletion of ozone layer ? Which diseases are likely to be caused if the ozone layer will become thinner ?

Solution :

The depletion of ozone layer is due to the use of chemicals called chlorofluorocarbons. Skin cancer is caused if the ozone layer will become thinner.

Question 20:

Explain how harmful chemicals enter our bodies.

Solution :

Pesticides are poisonous chemical substances which are sprayed over crop plants to protect them from pests (harmful small animals) and diseases. These chemical pesticides mix up with soil and water. From soil and water, these pesticides are absorbed by the growing plants alongwith water and other minerals. When herbivorous animals eat plant food, then these poisonous chemical pesticides go into their bodies through the food chain. And when the carnivore animals eat herbivores, then the pesticides get transferred to their bodies. Man being an omnivore; eat plant food as well as herbivores. So the pesticides present in plant food and herbivores also get transferred to the man's body through food. Thus, pesticides enter the food chain at the producer level (plant level) and in the process of transfer of food through food chains these harmful chemicals get concentrated at each trophic level.

Question 21:

'If we excessively use pesticides to protect the crops from diseases, then it may cause long-term damage to mankind'. Justify this statement.

Solution :

Pesticides are non – biodegradable chemicals, so they get accumulated at each trophic level. Since humans occupy the top level in any food chain, so the maximum amount of harmful chemical pesticides gets accumulated in our bodies. This damages our health gradually.

Question 22:

What is meant by biological magnification ? With the help of a food chain, explain how biological magnification of harmful chemicals can occur.

Solution :

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. The organism which occurs at the highest trophic level (on the extreme right side) in the food chain will have the maximum concentration of harmful concentration of harmful chemicals in its body. In this case grass is eaten by grasshopper; grasshopper is eaten by frog; frog is eaten by snake and finally snake is eaten by peacock. So, the food chain will be:

Grass → Grasshopper → Frog → Snake → Peacock

Since the peacock occurs at the highest trophic level (on the extreme right side) in this food chain, it will have the maximum concentration of harmful chemicals in its body.

Question 23:

What is meant by bioconcentration of pesticides ? Which common pesticide has accumulated in human body in considerable amounts ?

Solution :

The accumulation of harmful chemicals such as pesticides in the living organisms like plants, animals and humans (men) through the food chain is called bio-concentration of pesticides. DDT has accumulated in human body through food chains.

Question 24:

What is garbage ? What does garbage consist of ?

Solution :

The household wastes are called garbage. It includes left -over food, fruit and vegetable peels, waste paper, unwanted plastic objects etc.

Question 25:

Name the various modes of waste disposal.

Solution :

The various modes of waste disposal are:

1. Recycling
2. Preparation of compost
3. Incineration
4. Landfill
5. Sewage treatment

Question 26:

How can the wastes such as paper, plastic and metal objects be disposed of ?

Solution :

The solid wastes like papers, plastics and metals are recycled. For example – waste paper is sent to paper mills where it is reprocessed to form new paper once again.

Question 27:

Give a method for the disposal of household wastes such as left-over food, fruit and vegetable peels, and leaves of potted plants.

Solution :

Preparation of compost is a method in which the disposal of household wastes such as left-over food, fruit and vegetable peels and leaves of potted plants can be converted into compost by burying in a pit dug into the ground and is used as manure.

Question 28:

What is meant by incineration ? For what purpose is it used ?

Solution :

Incineration means reducing to ashes. It is used to destroy the household waste, chemical waste and biological waste.

Question 29:

How are most of the solid wastes in urban areas disposed of ?

Solution :

Most of the solid waste in urban areas is dumped in low line areas of ground and covered with earth to level the uneven ground. This method is called landfill.

Question 30:

State two advantages of using disposable paper cups over disposable plastic cups.

Solution :

The advantages of using disposable paper cups over disposable plastic cups are:

1. Paper cups are biodegradable. So, even if paper cups are thrown away after use, they will decompose (break down) automatically by the action of micro-organisms in due course of time. On the other hand, plastic cups are non-biodegradable. They will remain as such and pollute the environment.
2. Paper cups can be disposed off by burning without causing much air pollution. On the other hand, burning of plastic cups produces toxic gases (poisonous gases) which causes too much air pollution.

Question 31:

What is sewage ? How is sewage disposed of ?

Solution :

The dirty drain water containing urine and faeces which is carried from our homes by the underground pipes (called sewers) is called sewage. Sewage is disposed off by treating it at the sewage treatment plant (or sewage works). The treatment of sewage produces clean water which is discharged into the river. The organic matter present in sewage is 'digested' in the digesters of sewage treatment plant to produce 'sewage gas' (which is kind of biogas) and manure.

Question 32:

Write the harmful effects of ozone depletion.

Solution :

Harmful effects of ozone depletion are:

1. It can cause skin cancer.
2. It damages the eyes by causing the eye disease called cataract.
3. It damages the immune system by lowering the body's resistance to diseases.

Question 33

What would happen if the ozone layer in the atmosphere completely disappears ?

Solution :

If the ozone layer in the atmosphere disappears completely, then all the extremely harmful ultraviolet radiations coming from the sun would reach the earth. These ultraviolet radiations would cause skin cancer and other ailments in men and animals, and also damage the plants.

Question 34:

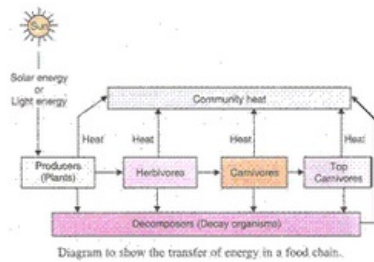
(a) With the help of a flow diagram, describe how energy from the sun flows through various trophic levels.

(b) Explain why, the flow of energy in the ecosystem is said to be unidirectional.

Solution :

(a) The energy from sun flows through various trophic levels. The food and energy are transferred from producer organisms to herbivores and from herbivores to carnivores, through the food chain. First Step – The green plants trap solar energy with the help of green pigment called chlorophyll which converts the sunlight energy into chemical energy. This gets stored as carbohydrates in the plants. About 1% of the sun's energy falling on the leaves is used by the plants in the process of photosynthesis and stored as chemical energy of food. The plants utilize the stored energy for their metabolic activities like respiration and growth. Some of the energy is not utilised and it is released as unusable heat into the environment. Second Step – The plants are eaten up by herbivores and the chemical energy of plants is transferred to them. The herbivores utilize this energy for various metabolic activities and release unused energy as heat energy to the environment.

Third Step – The herbivores are eaten up by carnivores. The chemical energy stored in the flesh of herbivores is transferred to the carnivores and they utilise this energy for their metabolic activities like respiration and growth and some of the energy which remains unutilised, is released into the environment. This process of transfer of energy is repeated with large carnivores and so on.



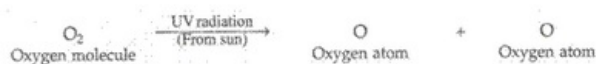
(b) The flow of energy in the ecosystem is said to be unidirectional because the energy lost as heat from the living organisms of a food chain cannot be reused by plants in photosynthesis.

Question 35:

- What is ozone ? How is it formed ?
- How does ozone layer protect us from harmful effects in the environment ?
- What is UNEP ? What step has been taken by UNEP in 1987 to prevent too much damage to the ozone layer ?

Solution :

(a) Ozone is a poisonous gas. It is made up of three atoms of oxygen combined together. It is formed high up in the atmosphere by the action of ultraviolet radiation on oxygen gas. The high energy ultraviolet radiation (UV radiation) coming from the sun splits oxygen gas into free oxygen atoms.



The free oxygen atoms thus produced are very reactive. One oxygen atom reacts with an oxygen molecule to form an ozone molecule:



- Ozone layer protect us from harmful effects as it absorbs most of the ultraviolet radiations coming from the sun and prevents them from reaching the earth.
- UNEP – United Nation Environment Program. In 1987, in an attempt to protect ozone layer, the United Nations Environment Program (UNEP) forged an agreement among its member countries to freeze CFC production at 1986 levels.

Question 36:

- How is energy introduced into the ecosystem ?
- Consider the following food chains :

- Plants → Mice → Snakes → Hawks
- Plants → Mice → Hawks

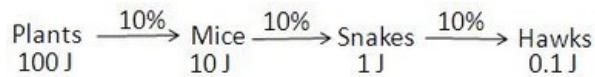
If energy available at the producer level in both the food chains is 100 J, in which case will hawks get more energy as food and by how much ? Justify your answer.

Solution :

(a) The energy enters the living components of the ecosystem through the process of photosynthesis.

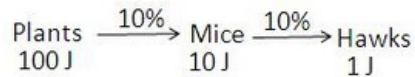
(b) (i) The producer level in the food chain are plants, so 100 J of energy is available in plants as food. Applying the 10% law to the above food chain:

1. According to the 10% law, 10% of energy of plants will be available as food in mice.
Thus, the energy available to mice will be 10% of 100 J, which is 10 J.
2. The energy available to snakes will be 10% of 10 J, which is 1 J.
3. The energy available to hawks will be 10% of 1 J, which is 0.1 J.



(ii) The producer level in the food chain is plants, so 100 J of energy is available in plants as food. Applying the 10% law to the above food chain:

1. According to the 10% law, 10% of energy of plants will be available as food in mice. Thus, the energy available to mice will be 10% of 100 J, which is 10 J.
2. The energy available to hawks will be 10% of 10 J, which is 1 J.



Hawks will get more energy in food chain

1. because in this food chain there are three trophic levels so the energy available will be more as compared to food chain
2. which has four trophic levels.

Question 37:

(a) Explain why, a food chain usually cannot have more than three or four steps.

(b) Calculate the amount of energy that will be available to big fish in the following food chain, if 10,000 J of energy is available to small algae from the sun :

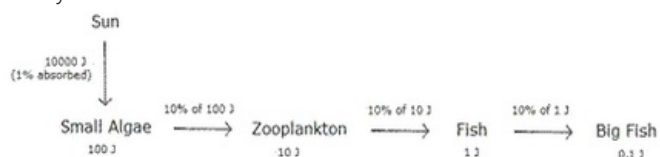
Small algae → Zooplankton → Fish → Big fish

Solution :

(a) Food chain generally consists of three or four steps because after that the energy available for the next organism will be so small that it will be insufficient to sustain the life of that organism.

(b)

1. Small algae can trap only 1% of the sun's energy falling on them. 1% of 10,000 J is 100 J, so the small algae have 100 J of energy available.
2. Small algae are eaten up by zooplankton. According to the 10% law, 10% of 100 J is 10 J of energy which is available in zooplankton.
3. The zooplankton will transfer 10% of its 10 J energy to the fish. Thus, the food energy available to the fish will be 10% of 10 J, which is 1 J.
4. 10% of 1 J will be transferred to big fish which will be 0.1 J. The above result can be clearly shown as:



Question 38:

(a) Name and state the law given by Lindeman which tells us how much energy entering a particular trophic level of organisms is available for transfer to the next higher trophic level.

(b) How much energy will be available to hawks in the food chain comprising hawk, snake, paddy and mice, if 10,000 J of energy is available to paddy from the sun ?

Solution :

(a) The law given by Lindeman is 10% law. According to 10% law, only 10% of the energy entering a particular trophic level of organisms is available for transfer to next higher trophic level.

(b)

1. Paddy can trap only 1% of the sun's energy falling on them. 1% of 10,000 J is 100 J, so paddy have 100 J of energy available in them as food.
2. Paddy is eaten up by mice. Now according to the 10% law, 10% of 100 J is 10 J of energy which is available in mice.
3. The mice will transfer 10% of its 10 J energy to the snake. Thus, the food energy available to the snake will be 10% of 10 J, which is 1 J.
4. 10% of 1 J will be transferred to hawk which will be 0.1 J.

