Our Environment

Assess Yourself

Q. 1. State one reason to justify the position of man at the apex of most food chains.

Answer: The position of man is at the apex of most food chains as he is an intelligent organism and can take any advantageous position by manipulation. Also, man can eat any food and thus can be positioned at apex.

Q. 2. If a harmful chemical enters a food chain comprising snakes, hawks, mice and plants, which of these organisms is likely to have maximum concentration of the harmful chemicals in its body?

Answer: The food chain will be Plants → Mice → Snakes → Hawks

Hawks will have maximum concentration of harmful chemicals in its body as the accumulation of harmful chemicals which are non-biodegradable increases at every trophic level. This phenomenon of increase in concentration of harmful chemicals at every trophic level is called biomagnification. Since hawks are placed at top of this food chain so it will likely to have maximum concentration of the harmful chemicals in its body.

Q. 3. Name the organisms belonging to the second and fourth trophic levels in the food chain comprising the following:

Frogs, Plants, Snakes, Hawks, Insects.

Answer: The food chain will be-

Plants → Insects → frogs → snakes → Hawks

Insect belongs to second trophic level and snakes belong to fourth trophic level.

Q. 4. What are the functions of an ecosystem?

Answer: The functions of an ecosystem are-

a) Regulating Function:

Maintenance of essential ecological process and life support system. Explanation:

Both biotic and abiotic components live in an ecosystem which interacts with each other forming a stable, self-supporting system.

b) Energy Flow:

The ecosystem act as a buffer through which the flow of energy takes place to all the organisms in the ecosystem. Explanation:

Energy flow in a unidirectional manner starting from sunlight to producers, herbivores, carnivores and finally decomposers thus utilising solar energy to produce chemical energy in the form of glucose by plants which are the main source of energy for all living organisms.

c) Recycling of nutrients

The ecosystem is responsible for the recycling of the minerals in the biodiversity.

Explanation:

The plants take inorganic material from the soil and convert it into food with help of sunlight. The food is used to produce chemical energy by the secondary level organism which breaks them into simple organic compound when the secondary level organism dies it gets decomposed by the action of decomposers which convert the complex substance to simple inorganic substance which are then mixed with soil. Thus, the ecosystem is designed to recycle nutrients.

Q. 5. Give proper term for each of the following:

(a) Smaller constituent operational unit of biosphere.
(b) Accumulation of non-biodegradable toxic substance in the increasing order in a food chain.

Answer: a. Ecosystem

It is structural and functional unit of biosphere comprising of both biotic and abiotic components.

b. Biomagnification

The phenomenon of increase in concentration of harmful chemicals mainly non-biodegradable toxic chemicals at every trophic level is called biomagnification.

Q. 6. Which layer is found above ozone layer of the atmosphere? Mention one characteristic feature of this layer.

Answer: Ozone layer is found in stratosphere and above it is mesosphere. In this layer meteors burns up and this layer extends up to 85 km high.

Q. 7. Why do harmful chemicals concentrate as we go up in a food chain?

Answer: Harmful chemicals are non-biodegradable in nature so they get accumulated inside the body of living organisms and when they move up in a food chain their concentration increases progressively as they cannot be excreted out from the body as they are insoluble or less soluble in water. They accumulate in the body at higher concentrations so as we go up in the food chain their concentration increases. This phenomenon is called biomagnification.

Q. 8. With the knowledge of energy transfer in the food chain, man can place himself at an advantageous position in the food chain. Explain.

Answer: According to 10% Law, only 10% of energy is transferred from one trophic level to next trophic level. Plants are producers so if man will be vegetarian then he will directly eat plant based foods so will get maximum energy but if he will be non-vegetarian he will eat herbivores like goat, hen that feeds upon plants so man will be at higher trophic level and will get minimum energy as compared to being vegetarian. So accordingly in a food chain man can place himself in an advantageous position. For example- animals which are herbivores get 10% of energy from plants suppose 100 J according to 10% rule. When man will feed upon these animals they get only 10 J which is 10% of 100 J. But if man will feed directly on plants get 100 J hence vegetarians are at an advantageous position and get more energy than non-vegetarians.

Q. 9. A food chain consists of the following members. If the last member receives 30 J of energy, make a diagrammatic representation to show the flow of energy.

Snake, Vulture, Plants and Rat.

Answer: Plants (30000 J) → Rat(3000 J) → Snake (300 J) → Vulture (30 J)

According to 10% Law

The 10% of the energy present in snakes is passed to the vultures.

$$\text{Therefore, energy present in snakes} = 30 \times \left(\frac{100}{10}\right) = 300\,J$$

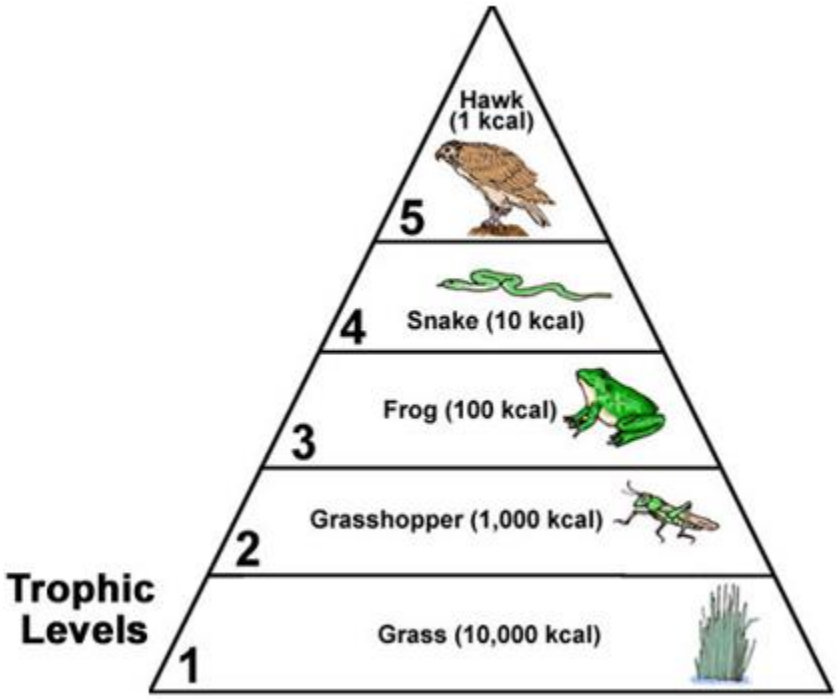
$$\text{Similarly, energy present in rats} = 300 \times \left(\frac{100}{10}\right) = 3000\,J$$

$$\text{and the energy present in plants} = 3000 \times \left(\frac{100}{10}\right) = 30000\,J$$

Q. 10. Describe with a diagram how energy flows through different trophic levels. Describe how transfer and circulation of material takes place in nature, and the role of decomposers in the process. State how recycling of materials benefits living organisms.

Answer: Each step or level of the food chain where transfer of food or energy takes place is referred to as a trophic level. The energy relationship between trophic levels is shown in a form of pyramid. Consider a food chain Grass → Grasshopper →Frog →

Snake → Hawk. This food chain can also be considered as energy chain. We can place these animals in different trophic levels, for example:



Grass: They are the producers so are placed in first trophic level. They utilize solar energy to prepare food. They transfer this energy to grasshopper, but only 10% of the energy is available to grasshopper according to Lindeman's 10% Law. If grass has 10,000 kcal of energy only 1000 kcal will be transferred to grasshopper. So energy at next trophic level is reduced.

Similarly grasshopper is placed at second trophic level; frog in third, snake in fourth and fifth trophic level is occupied by hawk. At each trophic level the energy goes on decreasing i.e. frog will receive 100 kcal of energy, snake 10 kcal and finally hawk only 1 kcal. Thus energy at each trophic level goes on decreasing and the animal placed at apex will receive lowest energy.

Decomposers like bacteria, fungi etc. act upon dead and decay organisms to convert organic compounds into simpler forms. These simple substances get mixed up in the soil and are used as nutrients by the producers. From producers it goes to consumers and so on. Thus there is recycle of matter which is done by decomposers that maintain balance in the ecosystem. Recycling of materials helps in reuse of same materials again and again. Decomposers provide space for new life in biosphere and without them all life will ultimately cease to exist as dead remains and waste organic matter.

Q. 11. With the help of examples discuss in brief the role of decomposers in cycling of materials.

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Q. 12. Consider the following food chains:

(a) Plants → Mice → Snakes → Hawks

(b) 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 what factor? Justify your answer.

Answer: In case of b hawks will get more energy as they are placed in third trophic level in food chain b but in food chain a, they are placed at fourth trophic level. According to 10% Law by Lindeman only 10% of energy is transferred from one trophic level to next. So organisms placed at higher trophic levels will get less energy than organisms placed at lower trophic levels.

If energy available at the producer level in both the food chains is 100 J than in first case according to 10% law mice will get 10 J which is 10% of 100 J, snakes will get 1 J and Hawks will get 0.1 J. In second case mice will get 10 J and hawks will get 1 J according to 10% law. So in first case hawks will get 0.1 J and in second case hawks will get 1 J of energy as food.

Q. 13. What are chlorofluorocarbons? How are they responsible for causing ozone hole in atmosphere? What will be the consequence of ozone hole?

Answer: CFCs are synthetic harmful chemicals which are mainly responsible for ozone layer depletion. CFCs release chlorine atoms which break ozone to oxygen. More amounts of CFCs thus released will cause depletion of ozone layer. CFCs are used as coolants in air-conditioners, refrigerators, aerosols sprays, fire extinguishers etc.

Some effects of ozone depletion on living organisms are:

a. It causes skin cancer due to exposure to harmful UV radiations.

b. Causes genetic variations due to mutations.

c. Decreases photosynthetic rate in plants.

d. Decrease immune power in humans and cause eyesight problem.

e. It decreases crop yield.

f. It also disturbs rainfall causing ecological disturbance and reduces global food production.

Q. 14. Ayush went to Puri in Orissa on a holiday recently. There are lots of tourists on the beach and the beach was very dirty with plastic, paper, waste food, mineral water bottle, etc. Ayush decided to do something to save the beach.

(a) What can Ayush do to save the beach from becoming a dumping ground?

(b) How can government help in keeping the beach clean?

Answer: a. Ayush with his friends can form a team of volunteers to keep the beach clean. He can conduct cleanliness drive, can prepare banners to request tourists to keep beach clean. He can keep dustbins at different places on beach and request tourists to throw wastes into dustbins.

b. Government can enforce laws to prevent people throwing waste items on the beach otherwise some punishment would be there. Dustbins should be kept at proper distances on beach and people should be encouraged to throw wastes into dustbins.