Dev Academy
Yamunanagar (Haryana)

Revision Notes

Our Environment

Class 10

Revision Notes

SCIENCE

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1. **Environment:**
   An environment is the sum of all biotic (i.e., plants, animals, and microbes) and abiotic (i.e., soil, water, air, temperature, light, humidity, etc.) components around us that directly or indirectly influence us.

2. **Biotic and Abiotic Components:**
   (a) **Biotic Components** comprise all the living components of the environment or ecosystem, such as plants, animals, and microorganisms.
   (b) **Abiotic Components** comprise all the non-living components of the environment or ecosystem, such as water, soil, air, light, temperature etc.

3. **Ecosystem:**
   An ecosystem is a self-regulating segment of the environment where all biotic and abiotic factors interact with each other, resulting in a dynamic flow of energy and nutrient cycles.

4. **Types of Ecosystems:**
   (a) **Natural Ecosystem:**
   Natural ecosystems are those that occur naturally without significant human intervention. They can be further classified into:
      i. **Permanent Natural Ecosystem:**
         - They are not influenced by seasonal changes.
         - Relatively more stable.
         - They have well-established food chain and nutrient cycle.
         - Examples: Tropical Rain forests, Rivers, and Oceans.
      ii. **Temporary Natural Ecosystem:**
         - They can be influenced by seasonal changes.
         - Relatively less stable. They may disappear over time.
         - Examples: Ponds, temporary streams, and seasonal wetlands.

   (b) **Artificial Ecosystem:**
   Artificial ecosystems are created and maintained by humans. They are often designed to serve specific purposes, such as agriculture, aquaculture, or urban landscaping.
   Examples: Agriculture fields, Aquarium, and Urban parks etc.

5. **Habitat:**
   It is the part of environment or ecosystem where an organism lives and grows.
   Example: Terrestrial habitats (Forests, grasslands, deserts, and mountains)
   Aquatic habitats (Lakes, Rivers, Wetlands, and Oceans)

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6. Producers, Consumers, and Decomposers:

An ecosystem functions through the interaction of three main groups of organisms:

(a) Producers (Plants, Algae, Phytoplankton):

- These organisms, primarily green plants, produce their own food through photosynthesis.
- They use sunlight, water, and carbon dioxide to create organic matter (like carbohydrate), serving as the base of the food chain.

(b) Consumers (Animals and Zooplankton):

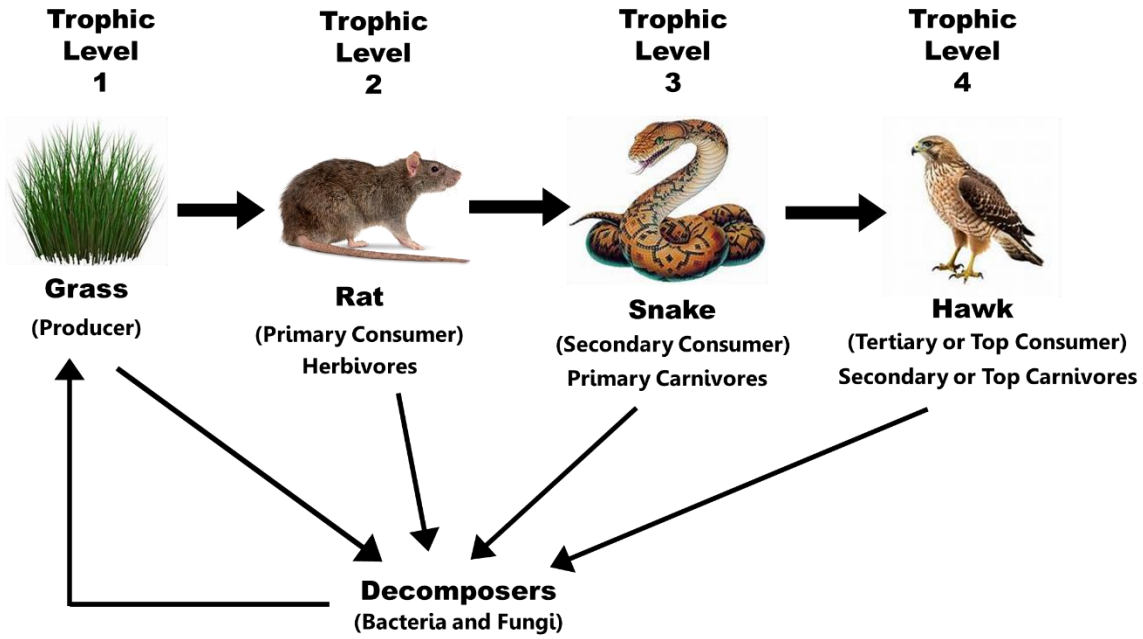
- They depend on other organisms for their food.
- They can be categorized into:
  - **Primary consumers:** Herbivores that eat plants directly.
  - **Secondary consumers:** Carnivores that eat herbivores.
  - **Tertiary consumers:** Carnivores that eat other carnivores.
  - **Omnivores:** Organisms that consume both plants and animals.

(c) Decomposers (Bacteria and Fungi):

- Decomposers break down dead organisms and organic waste into simpler substances.
- They return essential nutrients to the soil, making them available for producers.

7. Trophic Levels: The Feeding Hierarchy

Trophic levels refer to the position of an organism in a food chain or food web. They represent the feeding relationships between different organisms in an ecosystem.



8. **Herbivores, Carnivores, Omnivores, and Detritivores:**
   Based on dietary habits, animals can be classified into three main categories:
   - **(a) Herbivores:**
     - These animals primarily consume plant matter, such as leaves, fruits, and seeds.
     - Examples: Cows, deer, rabbits, and giraffes.
   - **(b) Carnivores:**
     - These animals primarily consume other animals (herbivores and other carnivores).
     - They have sharp teeth and claws to capture and kill prey.
     - Examples: Lions, tigers, wolves, and sharks.
   - **(c) Omnivores:**
     - These animals consume both plant and animal matter.
     - Examples: Humans, bears, pigs, and chickens.
   - **(d) Detritivores:**
     - The organisms that feed on dead bodies or remains of animals and plants (often referred to as detritus).
     - Example: Invertebrates like Earthworm, millipedes, woodlice etc.
       Vertebrates like Vultures, Eagle, hyenas etc.

9. **Food Chain and Food Web:**
   - **(a) Food Chain:** It is a linear sequence of organisms that shows how energy and nutrients flow through an ecosystem from one organism to another.
     Types of food chains:
     - **(i) Terrestrial Food Chains:**
       - **Grassland or Grazing Food Chain**
         Grass → Rat → Snake → Hawk
         Grass → Grasshopper → Frog → Snake → Hawk
       - **Forest Food Chain**
         Trees → Deer → Wolf → Lion
       - **Desert Food Chain**
         Shrubs/Cacti → Insects → Lizards → Snake → Owls
       - **Detritus Food Chain**
         Dead Leaves → Fungi → Earthworm → Bird
     - **(ii) Aquatic Food Chains:**
       - **Fresh water Food Chain**
         Phytoplankton → Zooplankton → Small fish → large fish → Bird
       - **Marine Food Chain**
         Phytoplankton → Zooplankton → Small or Large fish → Shark

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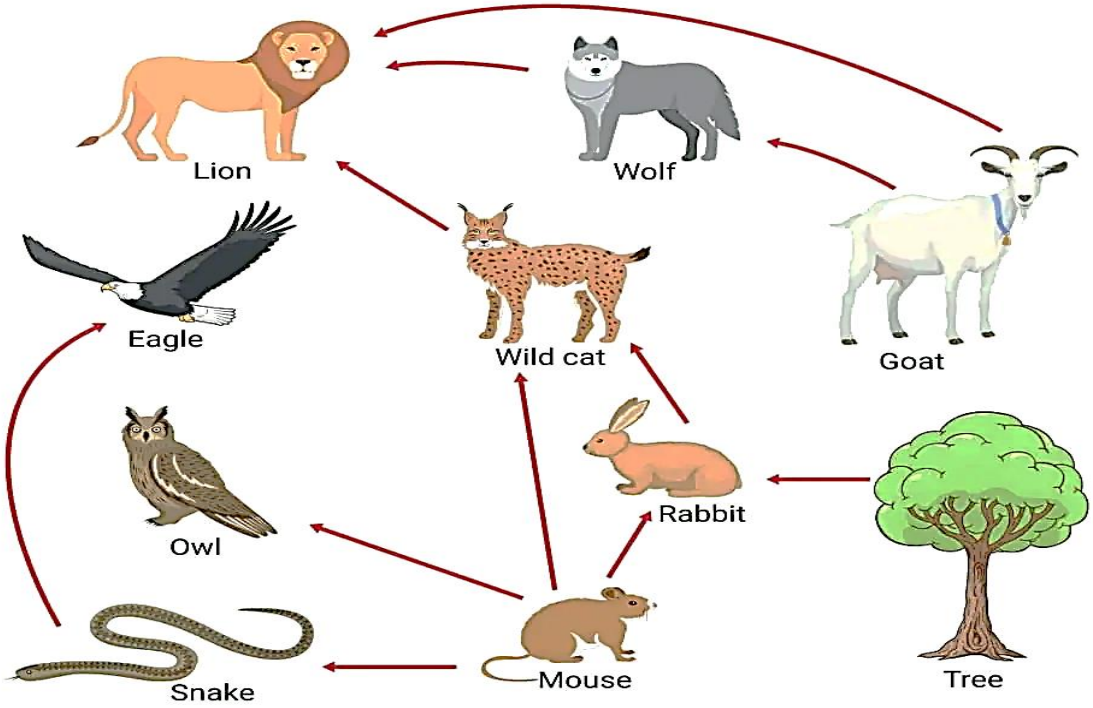
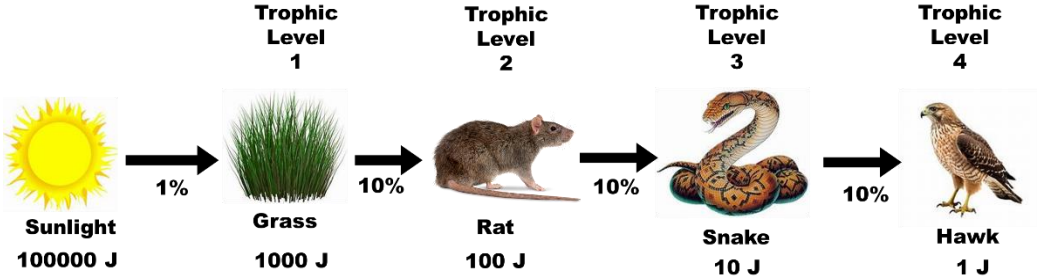
(b) Food Web:

It is a more complex network of interconnected food chains within an ecosystem. It shows the multiple feeding relationships between organisms. It gives more realistic view of nutrient and energy flow in an ecosystem.



10. Flow of energy within the Ecosystem:

- Sunlight is the ultimate source of energy in an ecosystem. Plants convert **1% of the total sunlight** that falls on them into chemical energy (like carbohydrates).
- Now, **10% of the total available chemical energy** at one trophic level is transferred to the next trophic level. The remaining 90% is lost as heat during metabolic processes or is used for the growth, reproduction, and other life functions of the organism.
  This law is called the **10 percent law**. It was proposed by Lindemann.



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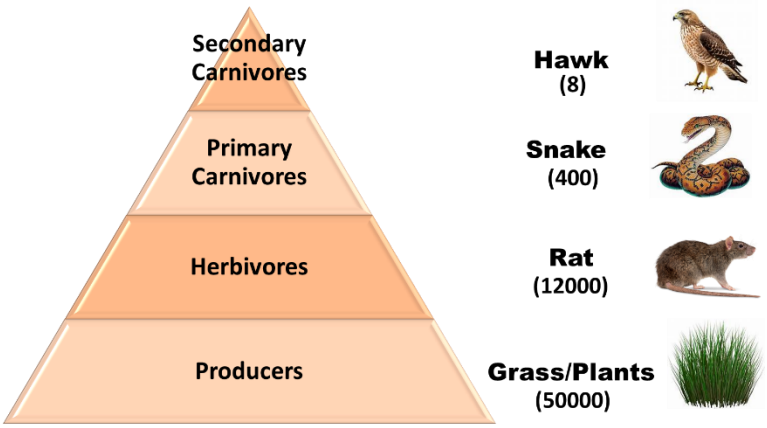
11. Ecological Pyramids:

Ecological pyramids are graphical representations that show the relationship between different trophic levels in an ecosystem. They can be based on three different parameters: (a) Numbers, (b) biomass, and (c) energy.

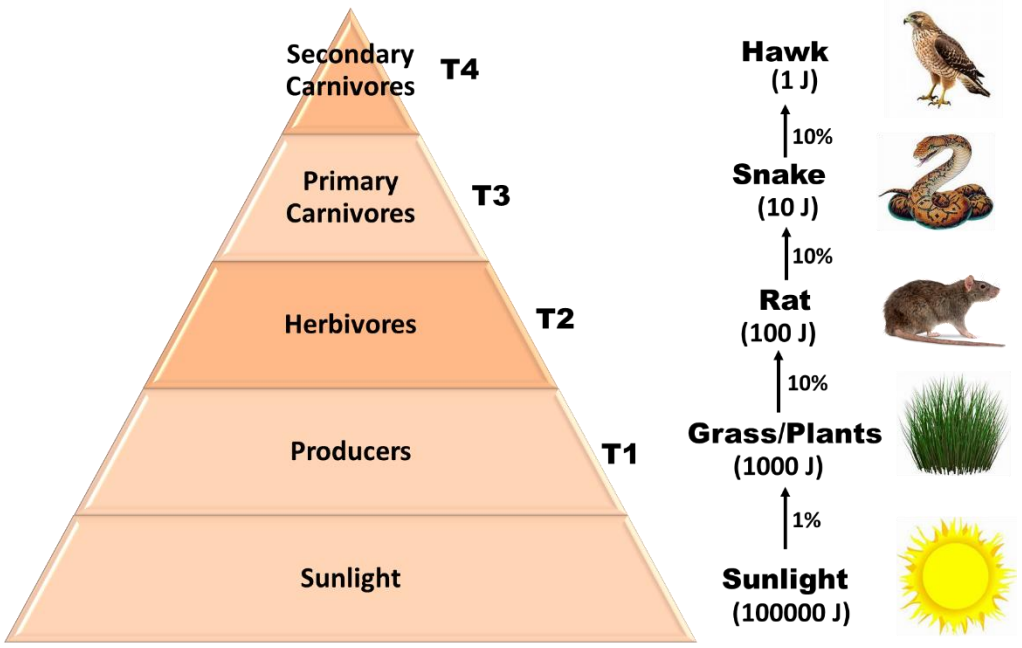
(a) Pyramids of Numbers:

It represents the number of individuals at each trophic level. It can be upright or inverted.



(b) Pyramids of Energy:

It represents the amount if energy available at each trophic level. It is always upright. This is because only 10% of the total available energy at one trophic level is transferred to the next trophic level. This law is called **10 percent law**.



(c) Pyramids of Biomass:
It represents the total biomass (mass of living organisms) at each trophic level. It can be upright or inverted.

12. Biodegradable and Non-Biodegradable Substances:

(a) Biodegradable Substances:

- These are the substances that can be decomposed by microorganisms like bacteria and fungi into simpler, non-toxic substances over time. This process is called biodegradation.
- Biodegradable substances are usually made of organic materials (like carbohydrates, proteins, and fats) that are easily recognized and metabolized by microbes. These microbes have enzymes that can degrade such substances.
- Examples: Plant waste, Animal waste, Paper, Cotton, Sewage, Manure etc.

(b) Non-Biodegradable Substances:

- These are substances that cannot be easily broken down by microorganisms and remain in the environment for a very long time, causing pollution.
- These substances are often synthetic, made of materials that do not occur naturally (e.g., plastics, metals). Due to their complex chemical structure and strong chemical bonds, it is very difficult for microbes to break them down into simpler substances. Also, microbes do not have suitable enzymes to degrade them.
- Examples: Plastics, Glass, Metals, Synthetic fibers (i.e., Nylon) etc.

13. Harmful effects of Biodegradable and Non-Biodegradable substances on the Environment:

(a) Harmful effects of Biodegradable Substances:

- Methane gas produced during the decomposition released in atmosphere. Methane gas is a potent greenhouse gas that contributes to climate change.
- Improper disposal of food waste can attract pests like rats and flies. Additionally, decaying matter can release foul smell and affects air quality.

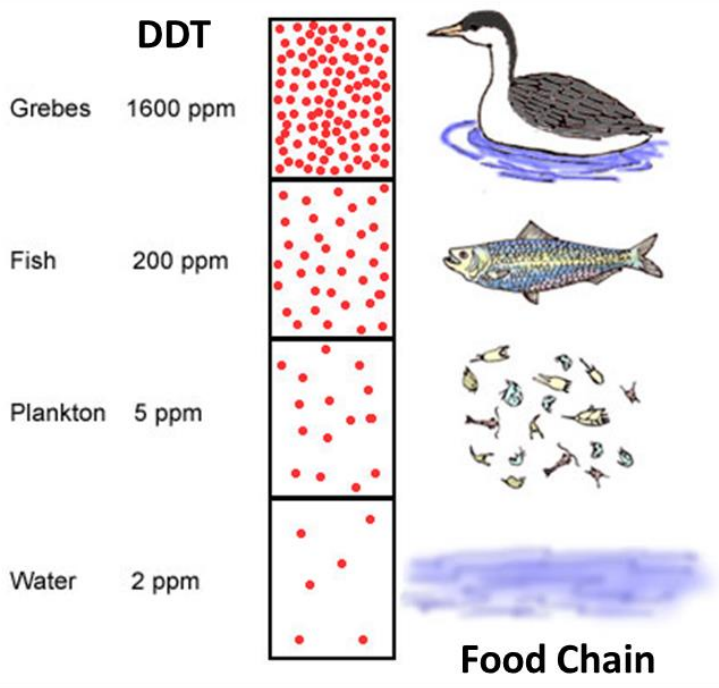
(b) Harmful effects of Non-Biodegradable Substances:

- Their accumulation takes up valuable space and harms the environment. This can lead to soil pollution.

- Plastic pollutants can end up in water bodies, harming marine life.
- Pollutants like DDT, when entering the food chain, can cause **biomagnification**.

14. Biomagnification:

- Biomagnification is the process by which the concentration of harmful substances (like pesticides, DDT, or other toxins) increases from one trophic level to the next trophic level in a food chain.
- This happens because these substances are not easily broken down, so they accumulate in the bodies of organisms at each trophic level.



- Biomagnification of dangerous pollutants like insecticide-**DDT** (Dichloro-diphenyl-trichloroethane) causes:
  - Eggshell thinning in birds.
  - Cancer, Liver damage and reproductive problems in humans.

15. Greenhouse Effect

- The greenhouse effect is a natural process where certain gases in the Earth's atmosphere (called greenhouse gases) trap heat from the Sun, preventing it from escaping back into space. This process keeps the Earth warm enough to sustain life.
- Greenhouse gases are Carbon dioxide (CO_2), Methane (CH_4), Water vapour (H_2O), Nitrous oxide (N_2O), and ozone (O_3).

16. **Benefits of the Greenhouse effect:**
    - Without the greenhouse effect, the Earth's surface temperature would drop to about -18°C (0°F), making it too cold for most life forms.
    - Warm temperatures enable liquid water to exist, a key ingredient for life.
    - Prevents extreme temperature fluctuations between day and night.

17. **Harm of the Enhanced Greenhouse effect (Global Warming)**
    - Human activities, like burning fossil fuels and deforestation, increase greenhouse gases in the atmosphere, resulting in an increased greenhouse effect. This leads to **global warming**.
    - Due to global warming, the following harmful effects are happening:
        - Melting of polar ice caps leading to rising sea level and flooding of coastal areas.
        - Increase in extreme weather events, such as heatwaves, droughts, and storms.
        - Destruction of habitat due to extreme weather events results in species extinction.

18. **Ozone Layer Depletion**
    - Ozone layer depletion refers to the thinning of the ozone layer, particularly over the Antarctic region (known as the **ozone hole**).
    - The ozone layer is a thin layer of ozone gas (O_3) in the Earth's stratosphere (about 15-30 km above the surface). It acts as a protective shield against harmful ultraviolet (UV) radiation of the Sun.
    - **Main cause of Ozone depletion:**
        - Chlorofluorocarbons (CFCs) were widely used in refrigerators, Air conditioners, and aerosol sprays. When CFCs released into the atmosphere, it reacts with the ozone and destroying it.
    - **Effect of Ozone depletion:**
        - Due to ozone depletion harmful ultraviolet (UV) radiations of the Sun are reaching to the Earth's surface and causing:
            - Skin cancer on prolong exposure.
            - Damage to eyes
            - Damage to plant's chlorophyll resulting reduced growth and productivity.

19. **Formation of Ozone:**
    Ozone is formed naturally in the stratosphere through a two-step process involving ultraviolet (UV) radiation and oxygen molecules:

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- **Step 1:** Ultraviolet radiation from the Sun strikes an oxygen molecule (O_2). This high-energy radiation breaks the oxygen molecule into two individual oxygen atoms (O).

$$O_2 \xrightarrow{\text{Ultraviolet light (UV)}} O + O$$

- **Step 2:** A free oxygen atom (O) collides with an oxygen molecule (O_2). This collision forms an ozone molecule (O_3).

$$O + O_2 \longrightarrow O_3$$

20. International measure to control ozone depletion (Montreal Protocol):

- To address the issue of ozone depletion, the Montreal Protocol was signed in 1987. This international agreement (UNEP – United Nations Environment Programme) has led to a significant reduction in the production and use of ozone-depleting substances such as CFCs. As a result, the ozone layer is gradually recovering.

21. Managing the Garbage we Produce:

OR

RRR (Reduce, Reuse, and Recycle) to save the environment:

- **Reduce:** This involves minimizing consumption and waste generation by reducing our consumption of unnecessary products. This includes reducing the use of single-use plastics.
- **Reuse:** This involves using items multiple times instead of discarding them after a single use. Examples include reusing bags, bottles, and containers, repairing broken items, and donating unwanted items.
- **Recycle:** This involves processing used materials into new products. Recycling helps conserve natural resources and reduces the need for new raw materials. Examples of recyclable materials include paper, cardboard, glass, metal, and plastic.

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Practice Questions

1. Very Short Answer Type Questions (1 mark each)

Q 1. Why are green plants called producers?
Q 2. What are the Three R's in saving the environment?
Q 3. Write the full form of CFC.
Q 4. Name any two non-biodegradable wastes.
Q 5. State one advantage of using disposable paper cups over disposable plastic cups.
Q 6. Which gas shield the surface of Earth from harmful radiation of the Sun? Why are UV radiations harmful to organisms?
Q 7. Identify producer from the following: Frog, blue-green algae, grasshopper, fish, and grass.
Q 8. How is the increasing demand of energy adversely affecting our environment?
Q 9. Why is the government stressing upon the use of jute/cloth carry bags?
Q 10. Which of the following are biodegradable? Gold coin, glass, nylon cloth, oil, silver-foil, and leather.
Q 11. Why should biodegradable and non-biodegradable wastes be discarded in two separate dustbins?
Q 12. A geographical area contains organisms like snake, grasshopper, Peacock, grass, and frog. If pesticide was used in this area to kill insects, which among the organisms will have maximum amount of pesticides? Name the phenomena involved.
Q 13. Define environment.
Q 14. What is an ecosystem?
Q 15. Name any 2 methods of solid waste disposal.
Q 16. How much of solar energy falling on green plants is utilized by them?
Q 17. What are consumers?
Q 18. What are the 3 major steps in the food chain?
Q 19. Rearrange the following according to their trophic level in a food chain. Phytoplankton, fish, crocodile, zooplankton.
Q 20. What is the ultimate source of energy for organisms in an ecosystem?
Q 21. What will be the amount of energy available to the organisms of the second trophic level of a food chain? If the energy available at the first trophic level is 10,000 Joules.
Q 22. What is the function of ozone in the upper atmosphere?
Q 23. The depletion of ozone layer is a cause of concern. Why?

Q 24. State a way to prevent accumulation of harmful chemicals in our body.
Q 25. List two man-made ecosystems.

2. Short Answer Type Questions (2 marks each)

Q 1. Describe how decomposers facilitate recycling of matter in order to maintain balance in the ecosystem.
Q 2. 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.
Q 3. 'The maximum concentration of harmful chemicals accumulates in human beings.' State the phenomena involved and justified this statement.
Q 4. The food chain, grass → deer → lion. Is operating in a forest. What will happen if all the (a) Loans are removed (b) Deer are removed?
Q 5. What do you mean by food chain and food web?
Q 6. Differentiate between herbivores and carnivores.
Q 7. Distinguish between producers and consumers.
Q 8. Mention the international efforts to check ozone depletion.
Q 9. What are the functions of ozone layer?
Q 10. What are the harmful effects of biodegradable wastes?

3. Short Answer Type Questions (3 marks each)

Q 1. Explain the phenomena of 'biological magnification'. How does it affect organisms belonging to different trophic levels, particularly the tertiary consumers?
Q 2. Why are bacteria and fungi called decomposers? List any two advantages of decomposers to the environment.
Q 3. What is an ecosystem? List its two main components.
Q 4. Our food grains such as wheat and rice, the vegetables, and fruits and even meat are found to contain varying amounts of pesticides residues. State the reason to explain how and why it happens.
Q 5. "Energy flow in a food chain is unidirectional" justify this statement.
Q 6. How is ozone formed in the higher level of atmosphere? 'Damage to the ozone layer is a cause of concern'. Justify this statement.
Q 7. Differentiate between biodegradable and non-biodegradable substances with the help of one example each. List two changes in habit that people

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must adopt to dispose non-biodegradable waste, for saving the environment.

Q 8. What is ozone? How and where it is formed in the atmosphere? Explain how does it affect an ecosystem?

Q 9. What are ecological pyramids? Why is the pyramid of energy always upright?

Q 10. What is greenhouse effect?

4. Long Answer Type Questions (5 marks each)

Q 1. Describe the different methods of solid waste disposal.

Q 2. Explain food web with suitable example.

Q 3. Give an account of biological magnification with an example.

Q 4. What is global warming? Why it is a cause of concern?

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