

# UNIQUE STUDY POINT

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<b>Class:</b> X	<b>Subject:</b> Science	<b>Session:</b> 2025-26
<b>Chapter:</b> 13 - Our Environment	<b>Time:</b> 1½ Hours	<b>Max. Marks:</b> 40

## General Instructions:

1. All questions are compulsory.
2. This question paper contains 20 questions divided into five sections A, B, C, D and E.
3. Section A contains 10 MCQs of 1 mark each.
4. Section B contains 4 questions of 2 marks each.
5. Section C contains 3 questions of 3 marks each.
6. Section D contains 1 question of 5 marks.
7. Section E contains 2 Case Study Based questions of 4 marks each.

## SECTION A - Multiple Choice Questions (1 mark each)

**Q1.** In an ecosystem, the various components are interdependent on each other for:

- (a) Food
- (b) Shelter
- (c) Energy
- (d) All of the above

**Q2.** Lions, tigers, and snakes are examples of:

- (a) Herbivores
- (b) Carnivores
- (c) Omnivores
- (d) Producers

**Q3.** The pyramid of energy in an ecosystem is always:

- (a) Upright
- (b) Inverted
- (c) Spindle-shaped
- (d) Diamond-shaped

**Q4.** Ozone is a molecule made up of:

- (a) One oxygen atom
- (b) Two oxygen atoms
- (c) Three oxygen atoms
- (d) Four oxygen atoms

**Q5.** Which of the following can be easily recycled?

- (a) Cotton
- (b) Plastic
- (c) Wool
- (d) Wood

**Q6.** In a pond ecosystem, which organism is a producer?

- (a) Fish
- (b) Frog
- (c) Algae
- (d) Insects

**Q7.** Bacteria and fungi are examples of:

- (a) Producers
- (b) Primary consumers
- (c) Decomposers
- (d) Secondary consumers

**Q8.** The ozone hole refers to:

- (a) A hole in the ozone layer
- (b) Depletion of ozone layer
- (c) Increase in ozone layer
- (d) Formation of new ozone

**Q9.** Which of the following is the correct sequence in a food chain?

- (a) Producer → Decomposer → Consumer
- (b) Consumer → Producer → Decomposer
- (c) Producer → Consumer → Decomposer
- (d) Decomposer → Producer → Consumer

**Q10.** If all the waste we generate is biodegradable:

- (a) It will have no impact on environment
- (b) It can still pollute if not managed properly
- (c) It will solve all environmental problems
- (d) It will increase oxygen in atmosphere

### SECTION B - Short Answer Questions (2 marks each)

**Q11.** What is an ecosystem? Give two examples of natural ecosystems.

**Q12.** Why is the number of trophic levels limited in a food chain? Explain briefly.

**Q13.** What are CFCs? Why were they banned internationally?

**Q14.** List four materials that are biodegradable and four that are non-biodegradable.

### SECTION C - Short Answer Questions (3 marks each)

**Q15.** Explain the role of decomposers in the environment. What would happen if there were no decomposers?

**Q16.** Draw a diagram to show the formation of ozone in the atmosphere. Explain why ozone layer is

important for life on Earth.

**Q17.** Discuss two ways in which biodegradable and two ways in which non-biodegradable substances affect the environment.

#### SECTION D - Long Answer Question (5 marks)

**Q18.** What are trophic levels? Explain energy flow in an ecosystem with the help of a diagram. Why does energy decrease at successive trophic levels?

#### SECTION E - Case Study Based Questions (4 marks each)

##### **Q19. Case Study 1:**

In a village, people started using disposable plastic cups for tea instead of traditional clay cups (kulhads). This resulted in accumulation of plastic waste everywhere. The village panchayat decided to take action.

- (i)** Why is plastic waste a problem for the environment? (1 mark)
- (ii)** What were the advantages of using clay cups? (1 mark)
- (iii)** Suggest two measures the panchayat could take to reduce plastic waste. (1 mark)
- (iv)** How long does plastic take to decompose naturally? (1 mark)

##### **Q20. Case Study 2:**

A farmer noticed that crop-eating insects were damaging his crops. He sprayed heavy doses of chemical pesticides. While insects died, he also noticed that the population of frogs and birds in his field decreased significantly over time.

- (i)** Why did frogs and birds die even though pesticides were meant for insects? (1 mark)
- (ii)** What is this phenomenon called? (1 mark)
- (iii)** Suggest two natural alternatives to chemical pesticides. (1 mark)
- (iv)** How can pesticides from the field reach humans? (1 mark)

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SECTION A - Answers to MCQs

**Ans 1. (d) All of the above**

In an ecosystem, components are interdependent for food (energy), shelter (habitat), and various other resources. All organisms rely on each other and the physical environment for survival.

**Ans 2. (b) Carnivores**

Lions, tigers, and snakes are carnivores as they feed on other animals (meat-eaters). They are consumers that occupy higher trophic levels in food chains.

**Ans 3. (a) Upright**

The energy pyramid is always upright because energy decreases progressively from producers to top consumers. Maximum energy is at the base (producers) and minimum at the top.

**Ans 4. (c) Three oxygen atoms**

Ozone (O<sub>3</sub>) is a molecule formed by three atoms of oxygen. It is different from the oxygen (O<sub>2</sub>) we breathe, which has two atoms.

**Ans 5. (b) Plastic**

Among the options, plastic can be recycled through industrial processes, though it's not biodegradable. Cotton, wool, and wood are biodegradable but not typically recycled like plastic.

**Ans 6. (c) Algae**

Algae are producers in a pond ecosystem. They produce their own food through photosynthesis and form the base of aquatic food chains. Fish, frogs, and insects are consumers.

**Ans 7. (c) Decomposers**

Bacteria and fungi are decomposers. They break down dead organic matter and waste products into simpler inorganic substances, recycling nutrients back into the ecosystem.

**Ans 8. (b) Depletion of ozone layer**

The term "ozone hole" refers to areas where the ozone layer has become thinner due to depletion, particularly over Antarctica. It's not an actual hole but a region of reduced ozone concentration.

**Ans 9. (c) Producer → Consumer → Decomposer**

The correct sequence is: Producers make food → Consumers eat producers or other consumers → Decomposers break down dead organisms and return nutrients to the environment.

**Ans 10. (b) It can still pollute if not managed properly**

Even biodegradable waste can cause pollution if not managed properly. Accumulation of organic waste can create foul odors, attract pests, contaminate water, and spread diseases.

SECTION B - Answers to Short Answer Questions

**Ans 11.**

**Ecosystem:**

An ecosystem is a functional unit consisting of all the interacting organisms (biotic components) in a particular area together with the non-living physical environment (abiotic components). It includes producers, consumers, decomposers, and environmental factors like soil, water, temperature, and climate.

**Two Examples of Natural Ecosystems:**

1. **Forest Ecosystem:** Includes trees, shrubs, animals, insects, bacteria, fungi, soil, water, sunlight, etc.
2. **Pond Ecosystem:** Includes aquatic plants (algae, lotus), fish, frogs, insects, bacteria, water, minerals, sunlight, etc.

Other examples: Ocean, lake, river, desert, grassland, mountain ecosystem

**Ans 12.**

The number of trophic levels is limited in a food chain because:

**1. Energy Loss at Each Level:**

- Only about 10% of energy is transferred from one trophic level to the next
- 90% of energy is lost as heat through respiration, movement, and metabolic processes

**2. Insufficient Energy:**

- After 3-4 trophic levels, very little usable energy remains
- This small amount cannot support a viable population at higher levels
- For example: If producers have 1000 J, herbivores get 100 J, small carnivores get 10 J, large carnivores get only 1 J

**3. Result:**

- Food chains rarely exceed 4-5 trophic levels in nature
- There isn't enough energy to sustain organisms beyond this point

**Ans 13.****What are CFCs?**

- CFC stands for Chlorofluorocarbons
- These are synthetic chemical compounds containing chlorine, fluorine, and carbon
- Were widely used as refrigerants in refrigerators and air conditioners
- Also used in aerosol spray propellants and fire extinguishers

**Why Were They Banned?**

- CFCs were found to be the primary cause of ozone layer depletion
- When released into atmosphere, they rise to the stratosphere
- UV radiation breaks them down, releasing chlorine atoms
- Each chlorine atom can destroy thousands of ozone molecules
- This creates "holes" in the ozone layer, especially over Antarctica
- The Montreal Protocol (1987) mandated phasing out CFC production globally
- Now CFC-free alternatives are mandatory in all products

**Ans 14.**

**Biodegradable Materials (can be broken down by biological processes):**

1. Food waste (fruit and vegetable peels, leftover food)
2. Paper and cardboard
3. Cotton cloth and natural fibers (wool, jute, silk)
4. Wood and wooden products

**Non-biodegradable Materials (cannot be broken down by biological processes):**

1. Plastics (bags, bottles, containers)
2. Glass and glass products
3. Metals (aluminum cans, steel items, copper wires)
4. Synthetic fibers (nylon, polyester, acrylic)

**SECTION C - Answers to Short Answer Questions**

**Ans 15.**

**Role of Decomposers in the Environment:**

**1. Breakdown of Organic Matter:**

- Decomposers (bacteria and fungi) break down dead plants and animals
- They also decompose waste products of organisms
- Convert complex organic substances into simpler inorganic substances

**2. Nutrient Recycling:**

- Release nutrients back into the soil
- Make minerals and nutrients available for plants to absorb
- Complete the nutrient cycle in ecosystems

**3. Environmental Cleansing:**

- Prevent accumulation of dead matter
- Help maintain cleanliness in the environment
- Prevent spread of diseases from decomposing matter

**4. Energy Flow:**

- Help in the final stages of energy flow in ecosystems
- Ensure no organic matter is wasted

**What Would Happen Without Decomposers:**

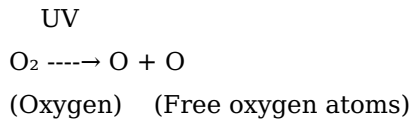
**Negative Consequences:**

- Dead bodies of plants and animals would pile up everywhere
- Nutrients would be locked in dead organic matter
- Soil would become depleted of essential nutrients
- Plants would not get minerals for growth
- Nutrient cycles would stop functioning
- The entire ecosystem would collapse
- Foul smell and disease would spread
- Life on Earth would become unsustainable

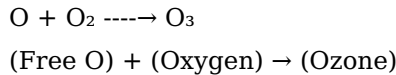
## Ans 16.

### Formation of Ozone - Diagram:

STEP 1: UV Radiation splits O<sub>2</sub>



STEP 2: Free oxygen combines with O<sub>2</sub>



### Process Explanation:

- High-energy UV radiation from the Sun acts on oxygen molecules (O<sub>2</sub>)
- This splits some O<sub>2</sub> molecules into free oxygen atoms (O)
- These free oxygen atoms then combine with other O<sub>2</sub> molecules
- This produces ozone (O<sub>3</sub>) molecules
- This process occurs in the stratosphere (upper atmosphere)

### Importance of Ozone Layer:

#### 1. UV Protection:

- Ozone layer absorbs harmful ultraviolet (UV) radiation from the Sun
- Acts as a protective shield for all life on Earth

#### 2. Prevents Health Problems:

- Protects from skin cancer and other skin diseases
- Prevents eye damage and cataracts
- Reduces risk of immune system suppression

#### 3. Protects Ecosystems:

- Shields marine life, especially phytoplankton (base of ocean food chains)
- Protects crops and vegetation from UV damage
- Ensures survival of many organisms sensitive to UV radiation

#### 4. Makes Life Possible:

- Without ozone layer, UV radiation would make Earth's surface uninhabitable
- Essential for the continuation of life as we know it

## Ans 17.

### Effects of Biodegradable Substances on Environment:

#### Positive Effect 1:

- Can be converted into useful compost or manure
- Enriches soil with nutrients when properly composted
- Supports plant growth and soil fertility

**Negative Effect 1:**

- If not managed properly, can create foul odors
- Accumulation attracts flies, mosquitoes, and rats
- Can spread diseases if left to rot in open areas

**Negative Effect 2:**

- Decomposing organic waste can contaminate water sources
- Runoff from decomposing matter can pollute rivers and lakes
- Can cause eutrophication in water bodies

**Effects of Non-biodegradable Substances on Environment:**

**Negative Effect 1:**

- Persists in the environment for very long periods (hundreds to thousands of years)
- Accumulates continuously as it doesn't decompose
- Pollutes soil, making it less fertile
- Takes up valuable space in landfills

**Negative Effect 2:**

- Harms wildlife - animals may ingest plastic or get entangled
- Toxic chemicals from plastics can leach into soil and water
- Enters food chains and causes biological magnification
- Burning releases harmful toxic gases causing air pollution

**SECTION D - Answer to Long Answer Question**

**Ans 18.**

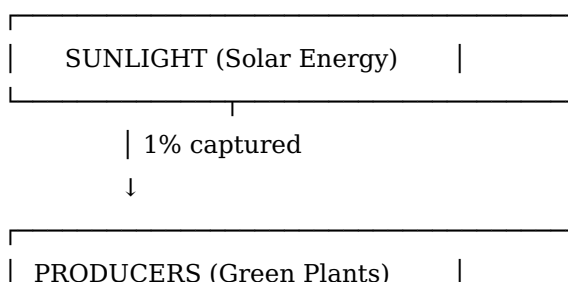
**What are Trophic Levels?**

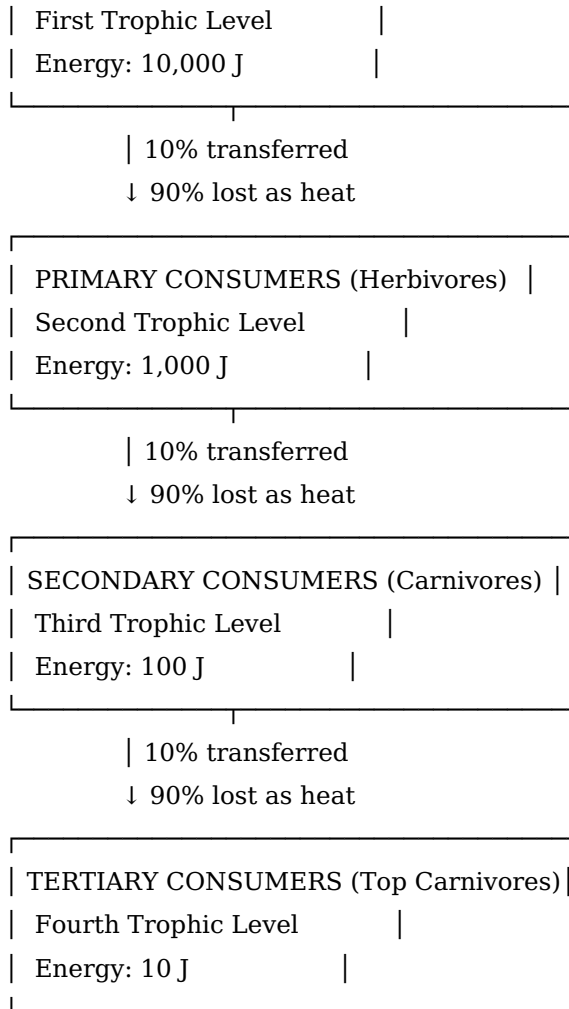
Trophic levels are the different steps or stages in a food chain where organisms obtain their energy. Each level represents a feeding stage in the transfer of energy and nutrients through an ecosystem. The word "trophic" means feeding or nutrition.

**Different Trophic Levels:**

- **First Trophic Level:** Producers (green plants, algae)
- **Second Trophic Level:** Primary consumers (herbivores)
- **Third Trophic Level:** Secondary consumers (small carnivores)
- **Fourth Trophic Level:** Tertiary consumers (large carnivores)
- **Decomposers:** Work at all levels

**Energy Flow in Ecosystem - Diagram:**





Heat Energy Lost to Environment →→→

### Why Energy Decreases at Successive Trophic Levels:

#### 1. 10% Law of Energy Transfer:

- Only about 10% of energy is transferred from one level to the next
- 90% of energy is lost at each step
- This is known as the 10% law or Lindeman's law

#### 2. Energy Loss Mechanisms:

##### a) Metabolic Processes:

- Energy used for respiration (breathing)
- Energy lost as heat during cellular processes
- Energy used to maintain body temperature

##### b) Movement and Activities:

- Energy used for walking, running, swimming, flying
- Energy spent in searching for food
- Energy used in escaping from predators

##### c) Growth and Reproduction:

- Energy used for growth and development
- Energy spent in reproduction
- Only this portion (about 10%) becomes available to next level

**d) Undigested Food:**

- Not all food eaten is digested
- Some parts are excreted as waste
- This energy is not available to the consumer

**3. Consequences:**

- Limits the length of food chains to 3-4 levels
- Explains pyramid shape of energy distribution
- Explains why there are fewer organisms at higher levels
- Demonstrates that energy flow is unidirectional

**Conclusion:**

The progressive decrease in energy at each trophic level is a fundamental principle of ecology that shapes the structure and functioning of all ecosystems on Earth.

**SECTION E - Answers to Case Study Based Questions**

**Ans 19.**

**(i) Why Plastic Waste is a Problem:**

- Plastic is non-biodegradable and persists for hundreds of years
- Accumulates in the environment causing pollution
- Clogs drains and water bodies
- Animals may eat plastic and die
- Cannot be broken down by natural processes
- Burning plastic releases toxic fumes harmful to health
- Makes soil infertile and pollutes groundwater

**(ii) Advantages of Clay Cups (Kulhads):**

- Made from natural material (clay/soil)
- Completely biodegradable - decomposes naturally
- No environmental pollution
- When broken, returns to soil without harm
- Provides employment to potters (traditional artisans)
- Gives a unique taste to tea/beverages
- Eco-friendly and sustainable option

**(iii) Two Measures to Reduce Plastic Waste:**

**1. Ban on Single-Use Plastics:**

- Prohibit use of disposable plastic cups, plates, and bags
- Impose fines on shops using plastic
- Encourage use of alternatives like paper cups, kulhads, or reusable cups

**2. Awareness and Education:**

- Conduct awareness campaigns about harmful effects of plastic
- Promote use of cloth bags and steel/glass containers
- Install separate bins for plastic waste collection
- Organize waste segregation and recycling programs

**(iv) Decomposition Time for Plastic:**

Plastic takes approximately **500-1000 years** to decompose naturally, depending on the type of plastic.

Some plastics may take even longer:

- Plastic bags: 500-1000 years
- Plastic bottles: 450-1000 years
- Styrofoam: Never fully decomposes

This is why plastic waste is such a serious environmental problem - it persists for many generations.

**Ans 20.**

**(i) Why Frogs and Birds Died:**

- Frogs ate the insects that had consumed pesticide-contaminated plants
- Birds ate both contaminated insects and poisoned frogs
- Pesticides accumulated in the bodies of insects
- When frogs and birds ate many contaminated insects/frogs, the pesticide concentration in their bodies increased
- This accumulation of poison eventually killed them
- This shows how harmful chemicals pass through the food chain

**(ii) Name of Phenomenon: Biological Magnification** (or Biomagnification)

**(iii) Two Natural Alternatives to Chemical Pesticides:**

**1. Biological Pest Control:**

- Introduce natural predators of pests
- For example: Ladybugs to control aphids, birds to control caterpillars
- Use of parasitic wasps to control pest populations
- Maintain biodiversity to keep pest populations in check naturally

**2. Organic/Natural Pesticides:**

- Use neem-based pesticides (neem oil spray)
- Plant pest-repelling crops alongside main crops (companion planting)
- Use garlic spray, chili spray, or other natural repellents
- Practice crop rotation to break pest life cycles
- Use pheromone traps to catch pests

**(iv) How Pesticides Reach Humans:**

**Route 1 - Through Plant Foods:**

- Pesticides sprayed on crops are absorbed by plants
- Remain on fruits and vegetables even after washing

- Humans consume these contaminated food items directly

**Route 2 - Through Animal Products:**

- Cattle eat pesticide-contaminated fodder/grass
- Pesticides accumulate in their bodies
- Pass into milk, meat, and other animal products
- Humans consume these contaminated animal products

**Route 3 - Through Water:**

- Pesticides wash into water sources
- Contaminate drinking water supplies
- Enter aquatic food chains (fish, prawns)
- Humans consume contaminated water and aquatic food

**Result:**

- Being at the top of food chains, humans accumulate the highest concentration
- Long-term exposure can cause serious health problems
- May lead to cancer, neurological disorders, and other diseases

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