

UNIQUE STUDY POINT

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Class: X	Subject: Science	Session: 2025-26
Chapter: 13 - Our Environment	Time: 1½ Hours	Max. Marks: 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.** Which of the following is an abiotic component of an ecosystem?
- (a) Plants
 - (b) Animals
 - (c) Sunlight
 - (d) Decomposers
- Q2.** What percentage of energy is transferred from one trophic level to the next?
- (a) 1%
 - (b) 10%
 - (c) 50%
 - (d) 100%
- Q3.** Which organisms convert dead organic matter into simple inorganic substances?
- (a) Producers
 - (b) Consumers
 - (c) Decomposers
 - (d) Herbivores
- Q4.** Ozone layer is present in which part of the atmosphere?
- (a) Troposphere
 - (b) Stratosphere
 - (c) Mesosphere
 - (d) Thermosphere
- Q5.** Which chemical is primarily responsible for ozone layer depletion?

- (a) Carbon dioxide
- (b) Methane
- (c) Chlorofluorocarbons (CFCs)
- (d) Nitrogen oxides

Q6. Which of the following is biodegradable?

- (a) Plastic bag
- (b) Glass bottle
- (c) Fruit peels
- (d) Metal can

Q7. What is the phenomenon of accumulation of harmful chemicals at successive trophic levels called?

- (a) Eutrophication
- (b) Biological magnification
- (c) Biomagnification
- (d) Both (b) and (c)

Q8. In a food chain, the organisms at the first trophic level are:

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

Q9. Which ecosystem is an example of a human-made ecosystem?

- (a) Forest
- (b) Pond
- (c) Aquarium
- (d) Lake

Q10. The flow of energy in an ecosystem is:

- (a) Bidirectional
- (b) Unidirectional
- (c) Multidirectional
- (d) Cyclic

SECTION B - Short Answer Questions (2 marks each)

Q11. Differentiate between biotic and abiotic components of an ecosystem with two examples each.

Q12. Why are food chains generally limited to 3-4 trophic levels?

Q13. What is the role of ozone in the atmosphere? How is it formed?

Q14. Distinguish between biodegradable and non-biodegradable substances with examples.

SECTION C - Short Answer Questions (3 marks each)

Q15. Explain the concept of food web. How is it different from a food chain?

Q16. What is biological magnification? Explain with an example how pesticides enter our food.

Q17. Describe the steps taken internationally to reduce ozone layer depletion.

SECTION D - Long Answer Question (5 marks)

Q18. Draw a diagram showing energy flow in an ecosystem. Explain why energy flow is unidirectional and how energy gets diminished at each trophic level.

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

Q19. Case Study 1:

In a forest ecosystem, plants capture about 1% of solar energy that falls on them. Deer feed on these plants, and tigers hunt the deer. The forest also has decomposers like bacteria and fungi that break down dead matter.

- (i)** What is the role of plants in this ecosystem? (1 mark)
- (ii)** If plants capture 10,000 J of energy, how much energy will be available to deer? (1 mark)
- (iii)** Why are decomposers essential for this ecosystem? (1 mark)
- (iv)** Construct a food chain with at least 3 organisms from this ecosystem. (1 mark)

Q20. Case Study 2:

A city generates large amounts of waste daily including kitchen waste, plastic bags, paper, glass bottles, and metal cans. The municipal corporation is planning to implement a better waste management system.

- (i)** Classify the given waste materials as biodegradable and non-biodegradable. (1 mark)
- (ii)** Why is it important to separate biodegradable and non-biodegradable waste? (1 mark)
- (iii)** Suggest two ways to reduce plastic waste generation. (1 mark)
- (iv)** What happens when non-biodegradable waste accumulates in the environment? (1 mark)

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DETAILED ANSWER KEY - PAPER 01

SECTION A - Answers to MCQs

Ans 1. (c) Sunlight

Abiotic components are non-living physical factors of the environment such as temperature, rainfall, wind, soil, minerals, and sunlight.

Ans 2. (b) 10%

Only about 10% of energy is transferred from one trophic level to the next. The rest is lost as heat during metabolic processes, movement, and other life activities.

Ans 3. (c) Decomposers

Decomposers (bacteria and fungi) break down complex organic substances from dead organisms into simple inorganic substances that return to the soil.

Ans 4. (b) Stratosphere

The ozone layer is located in the stratosphere, at higher levels of the atmosphere where it shields Earth from harmful UV radiation.

Ans 5. (c) Chlorofluorocarbons (CFCs)

CFCs, used in refrigerators and fire extinguishers, are the primary chemicals responsible for ozone layer depletion.

Ans 6. (c) Fruit peels

Fruit peels are organic matter that can be broken down by biological processes. Plastic, glass, and metals are non-biodegradable.

Ans 7. (d) Both (b) and (c)

Both biological magnification and biomagnification refer to the same phenomenon where harmful chemicals accumulate progressively at each trophic level.

Ans 8. (c) Producers

Producers (green plants and certain bacteria) are always at the first trophic level as they produce food through photosynthesis.

Ans 9. (c) Aquarium

An aquarium is a human-made (artificial) ecosystem. Forests, ponds, and lakes are natural ecosystems.

Ans 10. (b) Unidirectional

Energy flow in an ecosystem is unidirectional - it flows from the Sun to producers, then to consumers, and is not recycled back.

SECTION B - Answers to Short Answer Questions

Ans 11.

Biotic Components: These are living organisms in an ecosystem.

- Examples: Plants, animals, bacteria, fungi
- They include producers, consumers, and decomposers

Abiotic Components: These are non-living physical factors.

- Examples: Sunlight, temperature, water, soil, minerals
- They affect the growth and reproduction of organisms

Ans 12.

Food chains are limited to 3-4 trophic levels because:

- Only 10% of energy is transferred from one trophic level to the next
- 90% of energy is lost as heat during metabolic processes, movement, and other activities
- After 3-4 levels, very little usable energy remains
- This insufficient energy cannot support organisms at higher trophic levels

Ans 13.

Role of Ozone: Ozone shields the Earth's surface from harmful ultraviolet (UV) radiation from the Sun, which can cause skin cancer and damage organisms.

Formation of Ozone:

- UV radiation splits oxygen molecules (O_2) into free oxygen atoms (O)
- $O_2 \rightarrow O + O$ (under UV radiation)
- These oxygen atoms combine with oxygen molecules to form ozone
- $O + O_2 \rightarrow O_3$ (Ozone)

Ans 14.

Biodegradable Substances:

- Can be broken down by biological processes (bacteria, fungi)
- Examples: Food waste, paper, wood, cotton cloth, vegetable peels
- Do not persist in the environment for long

Non-biodegradable Substances:

- Cannot be broken down by biological processes
- Examples: Plastics, glass, metals, synthetic fibers
- Persist in the environment for a very long time and may cause harm

SECTION C - Answers to Short Answer Questions

Ans 15.

Food Web: A food web is a network of interconnected food chains showing the feeding relationships among various organisms in an ecosystem.

Differences from Food Chain:

Food Chain:

- Linear sequence of organisms where each is eaten by the next
- Shows a single pathway of energy flow
- Example: Grass \rightarrow Grasshopper \rightarrow Frog \rightarrow Snake \rightarrow Eagle

Food Web:

- Complex network with multiple interconnected food chains

- Shows multiple pathways of energy flow
- More realistic representation as organisms usually eat multiple food sources
- Provides stability to the ecosystem

Ans 16.

Biological Magnification: It is the phenomenon where harmful chemicals accumulate progressively at each successive trophic level in a food chain.

How Pesticides Enter Our Food:

- Pesticides are sprayed on crops to protect them from pests and diseases
- These chemicals are washed into soil and water bodies
- Plants absorb them along with water and minerals
- Aquatic plants and animals take them up from water
- These chemicals are non-degradable and accumulate in organisms
- As herbivores eat plants, and carnivores eat herbivores, the concentration increases
- Humans, being at the top of food chains, get maximum concentration in their bodies
- This is why our food grains, vegetables, fruits, and meat contain pesticide residues

Ans 17.

International Steps to Reduce Ozone Layer Depletion:

- In 1987, the United Nations Environment Programme (UNEP) forged the Montreal Protocol
- This agreement aimed to freeze CFC production at 1986 levels
- It is now mandatory for all manufacturing companies worldwide to make CFC-free refrigerators
- Production and use of ozone-depleting substances have been phased out globally
- Alternative refrigerants and chemicals are being developed and used
- Regular monitoring of the ozone layer is conducted
- International cooperation continues to protect the ozone layer

SECTION D - Answer to Long Answer Question

Ans 18.

Energy Flow Diagram:

SUNLIGHT (Solar Energy)
 ↓
 PRODUCERS (Green Plants) - 1% captured
 ↓ 10% transferred
 PRIMARY CONSUMERS (Herbivores)
 ↓ 10% transferred
 SECONDARY CONSUMERS (Small Carnivores)
 ↓ 10% transferred
 TERTIARY CONSUMERS (Large Carnivores)

→ Heat lost at each level (90%)

Why Energy Flow is Unidirectional:

- Energy captured by producers from sunlight does not revert to the Sun
- Energy that passes to herbivores does not return to plants

- Energy progressively moves through trophic levels and cannot flow backward
- Once used, energy is lost as heat to the environment and cannot be reused

How Energy Gets Diminished:

- Green plants capture only about 1% of solar energy for photosynthesis
- When herbivores eat plants, much energy is lost as heat during metabolism
- Energy is used for digestion, movement, growth, and reproduction
- Only about 10% of food eaten is converted to body mass
- This pattern repeats at each trophic level
- After 3-4 levels, very little usable energy remains
- This is why food chains are limited in length

SECTION E - Answers to Case Study Based Questions

Ans 19.

(i) Plants are producers in this ecosystem. They capture solar energy through photosynthesis and convert it into chemical energy (food), making it available to all other organisms.

(ii) Only 10% of energy is transferred to the next level. Therefore, energy available to deer = 10% of 10,000 J = 1,000 J

(iii) Decomposers are essential because:

- They break down dead organisms and waste products
- Convert complex organic matter into simple inorganic substances
- Return nutrients to the soil for plant use
- Without them, dead matter would accumulate and nutrients would not be recycled

(iv) Food Chain: Plants (Grass) → Deer → Tiger

Or: Plants → Herbivorous insects → Small birds → Tiger

Ans 20.

(i) Classification of Waste:

Biodegradable: Kitchen waste, paper

Non-biodegradable: Plastic bags, glass bottles, metal cans

(ii) Importance of Separation:

- Biodegradable waste can be composted to produce manure
- Non-biodegradable waste needs different treatment (recycling, safe disposal)
- Prevents harmful materials from contaminating useful organic waste
- Makes recycling more efficient and effective

(iii) Ways to Reduce Plastic Waste:

- Use cloth bags instead of plastic bags for shopping
- Avoid disposable plastic items and use reusable containers
- Use paper or jute bags instead of plastic packaging
- Say no to plastic straws and cutlery

(iv) Effects of Non-biodegradable Waste Accumulation:

- Persists in the environment for very long periods
 - Causes soil and water pollution
 - Harms animals who may eat or get entangled in it
 - Clogs drains and water bodies
 - Takes up landfill space that could be used better
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