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 groups contains only biodegradable items?

(a) Paper, wool, plastic

(b) Wood, leather, cotton

(c) Glass, metal, paper

(d) Plastic, nylon, rubber

Q2. The organisms which can make their own food are called:

(a) Heterotrophs

(b) Autotrophs

(c) Consumers

(d) Decomposers

Q3. In a grassland ecosystem, which organism represents the second trophic level?

(a) Grass

(b) Grasshopper

(c) Frog

(d) Snake

Q4. The use of which of the following is mandatory in refrigerators today?

(a) CFC

(b) CFC-free refrigerants

(c) Freon

(d) Chloroform

Q5. How many trophic levels are generally present in a food chain?

(a) 1-2
(b) 2-3
(c) 3-4
(d) 5-6

Q6. Which of the following constitutes a food chain?
(a) Grass, wheat, mango
(b) Grass, goat, human
(c) Goat, cow, elephant
(d) Grass, fish, goat

Q7. The waste material which can be broken down by biological processes is called:
(a) Non-biodegradable
(b) Biodegradable
(c) Recyclable
(d) Inert

Q8. UV radiation causes which disease in humans?
(a) Malaria
(b) Typhoid
(c) Skin cancer
(d) Tuberculosis

Q9. The branching network of many interconnected food chains is called:
(a) Food pyramid
(b) Food web
(c) Trophic level
(d) Energy pyramid

Q10. Which of the following are environment-friendly practices?
(a) Using cloth bags for shopping
(b) Walking to school
(c) Switching off unnecessary lights
(d) All of the above

SECTION B - Short Answer Questions (2 marks each)

Q11. Write two essential differences between producers and consumers.

Q12. Why are there greater numbers of individuals at the lower trophic levels of an ecosystem?

Q13. Write the chemical equations for the formation of ozone in the atmosphere.

Q14. Why can't we remove plastic waste by burning? Suggest two alternatives.

SECTION C - Short Answer Questions (3 marks each)

Q15. Construct a terrestrial food chain with four trophic levels. Why do we not find food chains of more than four trophic levels in nature?

Q16. What is the difference between a food chain and a food web? Why is a food web more realistic

representation of an ecosystem?

Q17. Explain how increasing amount of non-biodegradable waste is creating environmental problems. Suggest any two methods to overcome this problem.

SECTION D - Long Answer Question (5 marks)

Q18. What is biological magnification? Explain with a suitable example how pesticides enter the human body through food chains. Why is this phenomenon harmful?

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

Q19. Case Study 1:

A farmer sprays pesticides on his crop to protect it from insects. These pesticides get absorbed by plants along with water and minerals. Small insects eat the plants, birds eat the insects, and eagles hunt the birds. Over time, eagles in the area show signs of poisoning.

(i) Name the phenomenon responsible for poisoning of eagles. (1 mark)
(ii) Why do eagles have the highest concentration of pesticides? (1 mark)
(iii) Are pesticides biodegradable or non-biodegradable? Explain. (1 mark)
(iv) Suggest two ways farmers can reduce pesticide use. (1 mark)

Q20. Case Study 2:

A school conducted an audit of waste generated in one day. They found: 5 kg fruit and vegetable peels, 2 kg paper waste, 1 kg plastic wrappers, 500g glass pieces, and 300g metal items. The school decided to implement a waste segregation system.

(i) Which materials from the above list are biodegradable? (1 mark)
(ii) How can the school utilize the biodegradable waste productively? (1 mark)
(iii) What should be done with plastic, glass, and metal waste? (1 mark)
(iv) Calculate the percentage of biodegradable waste in the total waste. (1 mark)

DETAILED ANSWER KEY - PAPER 03

SECTION A - Answers to MCQs

Ans 1. (b) Wood, leather, cotton

Wood, leather, and cotton are all organic materials that can be broken down by biological processes (bacteria and fungi). Plastic, glass, metal, nylon, and rubber are non-biodegradable.

Ans 2. (b) Autotrophs

Autotrophs (meaning "self-feeders") are organisms that can make their own food from inorganic substances using light or chemical energy. Examples include green plants and certain bacteria.

Ans 3. (b) Grasshopper

In a grassland food chain: Grass (first trophic level/producer) → Grasshopper (second trophic level/primary consumer) → Frog (third trophic level/secondary consumer) → Snake (fourth trophic level/tertiary consumer).

Ans 4. (b) CFC-free refrigerants

Following the Montreal Protocol of 1987, it is now mandatory for all manufacturing companies worldwide to make CFC-free refrigerators to protect the ozone layer.

Ans 5. (c) 3-4

Food chains generally consist of only 3-4 trophic levels because of the 10% law of energy transfer. Very little usable energy remains after 4 levels to support higher trophic levels.

Ans 6. (b) Grass, goat, human

This is a valid food chain: Grass (producer) → Goat (herbivore/primary consumer) → Human (omnivore/secondary consumer). The other options don't show proper feeding relationships.

Ans 7. (b) Biodegradable

Biodegradable substances are those that can be broken down into simpler substances by biological processes involving bacteria, fungi, and other decomposers.

Ans 8. (c) Skin cancer

Ultraviolet (UV) radiation from the Sun is known to cause skin cancer in human beings. It can also cause eye damage and cataracts. The ozone layer protects us from this harmful radiation.

Ans 9. (b) Food web

A food web is a complex network showing multiple interconnected food chains in an ecosystem, representing the various feeding relationships among organisms.

Ans 10. (d) All of the above

All three practices are environment-friendly: using cloth bags reduces plastic waste, walking reduces pollution and fuel consumption, and switching off unnecessary lights conserves electricity.

SECTION B - Answers to Short Answer Questions

Ans 11.

Differences between Producers and Consumers:

Producers:

1. Can make their own food through photosynthesis
2. Use inorganic substances (CO_2, water, minerals) and sunlight
3. Are at the first trophic level
4. Examples: Green plants, algae, certain bacteria

Consumers:

1. Cannot make their own food, depend on others
2. Feed on producers or other consumers
3. Are at second or higher trophic levels
4. Examples: Herbivores (cow, deer), Carnivores (lion, tiger)

Ans 12.

There are greater numbers of individuals at lower trophic levels because:

- Energy decreases progressively at each trophic level (only 10% is transferred)
- To support organisms at higher levels, a large number of organisms are needed at lower levels
- Producers form the base and are most numerous as they capture solar energy
- To feed one carnivore, many herbivores are needed
- To feed those herbivores, even more plants are needed
- This forms a pyramid structure with maximum individuals at the base

Ans 13.

Chemical Equations for Formation of Ozone:

Step 1: UV radiation splits oxygen molecules into free oxygen atoms

O_2 --UV--> O + O

Step 2: Free oxygen atoms combine with oxygen molecules to form ozone

O + O_2 ---> O_3 (Ozone)

Overall Process:

UV radiation acts on oxygen (O_2) molecules in the upper atmosphere (stratosphere), producing free oxygen atoms (O) which then combine with oxygen molecules to form ozone (O_3).

Ans 14.

Why Burning Plastic is Harmful:

- Burning plastic releases toxic fumes and harmful gases
- Produces poisonous chemicals like dioxins and furans
- Causes severe air pollution
- Can harm respiratory system of humans and animals
- Some plastics release carcinogenic (cancer-causing) substances when burned

Two Alternatives:

1. **Recycling:** Collect and send plastic waste to recycling facilities where it can be processed and reused to make new products

2. **Reduce and Reuse:** Minimize plastic use by using cloth/jute bags, reusing plastic containers multiple times, and avoiding single-use plastics

SECTION C - Answers to Short Answer Questions

Ans 15.

Terrestrial Food Chain with Four Trophic Levels:

Grass → Grasshopper → Frog → Snake

- First Trophic Level: Grass (Producer)
- Second Trophic Level: Grasshopper (Primary Consumer/Herbivore)
- Third Trophic Level: Frog (Secondary Consumer/Carnivore)
- Fourth Trophic Level: Snake (Tertiary Consumer/Top Carnivore)

Why Food Chains are Limited to 3-4 Trophic Levels:

- Only about 10% of energy is transferred from one trophic level to the next
- 90% of energy is lost at each level as heat during metabolism, movement, and other life processes
- If grass has 10,000 J, grasshopper gets 1,000 J, frog gets 100 J, snake gets 10 J
- After 4 levels, very little usable energy (about 1 J) remains
- This insufficient energy cannot support a viable population at higher levels
- Therefore, food chains rarely extend beyond 4 trophic levels in nature

Ans 16.

Differences:

Food Chain:

- A linear sequence showing who eats whom
- Simple, straight-line pathway of energy flow
- Each organism typically eats only one type of organism
- Example: Grass → Deer → Tiger

Food Web:

- A complex network of many interconnected food chains
- Shows multiple pathways of energy flow
- Each organism may eat and be eaten by several different organisms
- Example: In a forest, deer may eat grass, leaves, and fruits; tiger may eat deer, wild boar, and other animals

Why Food Web is More Realistic:

- In nature, organisms don't rely on just one food source
- Most animals have varied diets and eat multiple types of food
- Shows the actual complexity of feeding relationships in an ecosystem
- Provides stability - if one food source disappears, organisms have alternatives
- Better represents the interconnectedness of all organisms in an ecosystem
- Shows that organisms can occupy multiple trophic levels
- More accurately depicts how energy flows through multiple pathways

Ans 17.

Environmental Problems Created by Non-biodegradable Waste:

1. Pollution:

• Contaminates soil, making it infertile
• Pollutes water bodies when washed into rivers and oceans
• Creates air pollution if burned

2. Persistence in Environment:

• Remains in environment for hundreds to thousands of years
• Accumulates continuously as it doesn't decompose
• Takes up valuable land space in landfills

3. Harm to Wildlife:

• Animals may ingest plastic waste and die
• Marine life gets entangled in plastic debris
• Disrupts natural habitats

4. Health Hazards:

• Toxic chemicals leach into groundwater
• Creates breeding grounds for disease vectors
• Harmful chemicals enter food chains

Methods to Overcome This Problem:

1. Reduce and Reuse:

• Minimize use of non-biodegradable materials
• Use cloth/jute bags instead of plastic
• Reuse containers and avoid disposable items
• Choose products with minimal packaging

2. Recycle:

• Separate waste for recycling
• Send plastic, glass, metal to recycling facilities
• Support and use recycled products
• Establish efficient waste collection and recycling systems

SECTION D - Answer to Long Answer Question

Ans 18.

Biological Magnification:
Biological magnification (or biomagnification) is the phenomenon where the concentration of harmful, non-degradable chemicals increases progressively at each successive trophic level in a food chain.

How Pesticides Enter Human Body Through Food Chains:

Step 1 - Application:

• Farmers spray pesticides on crops to protect them from pests and diseases
• These chemicals are also used to increase crop yields

Step 2 - Entry into Environment:

• Pesticides are washed into the soil by rain
• They seep into groundwater and water bodies
• Some chemicals remain on plant surfaces

Step 3 - Absorption by Producers:

• Plants absorb these chemicals along with water and minerals from soil
• Aquatic plants take them up from contaminated water
• Pesticides accumulate in plant tissues

Step 4 - Transfer to Primary Consumers:

• Herbivores (insects, small fish, cattle) eat contaminated plants
• Pesticides are not broken down or excreted
• They accumulate in the bodies of these animals
• Concentration becomes higher than in plants

Step 5 - Transfer to Secondary Consumers:

• Small carnivores eat many herbivores
• Pesticides from all the prey accumulate in the predator
• Concentration increases further

Step 6 - Transfer to Tertiary Consumers:

• Top carnivores accumulate pesticides from all lower levels
• Concentration reaches maximum at this level

Step 7 - Reaching Humans:

• Humans eat contaminated food grains, vegetables, fruits
• We also consume meat, fish, and dairy products
• Being at the top of food chains, we get maximum concentration
• Pesticides accumulate in our body tissues

Example with Numbers:

If water has 0.02 ppm (parts per million) of pesticide:

• Algae might have 0.04 ppm
• Small fish eating algae: 0.5 ppm
• Large fish eating small fish: 2 ppm
• Birds eating large fish: 25 ppm

The concentration increases 1,250 times from water to top consumer!

Why This Phenomenon is Harmful:

1. Health Effects:

• Pesticides are toxic chemicals that can cause various diseases
• Can cause cancer, nervous system disorders, reproductive problems
• Weakens immune system
• Can cause birth defects

2. Cannot Be Removed:

• Washing or cooking doesn't remove accumulated pesticides completely

• They are stored in fatty tissues of organisms

• Remain in body for long periods

3. Affects Future Generations:

• Can pass from mother to child through placenta and breast milk

• May cause genetic mutations

4. Ecosystem Damage:

• Top predators like eagles, tigers can die from poisoning

• Disrupts entire food webs

• Can lead to extinction of sensitive species

5. Continuous Accumulation:

• Each meal adds more pesticides to our body

• Over lifetime, dangerous levels can accumulate

• Effects may appear after years of exposure

SECTION E - Answers to Case Study Based Questions

Ans 19.

(i) Phenomenon: Biological magnification (or biomagnification)

(ii) Why Eagles Have Highest Concentration:

• Eagles are at the top of the food chain (tertiary/top consumers)

• They eat many birds, each containing pesticides from many insects

• Each insect consumed many contaminated plants

• Pesticides are non-biodegradable and accumulate progressively at each level

• Eagles don't excrete these chemicals; they keep accumulating in their bodies

• The concentration multiplies at each trophic level

• Therefore, top predators like eagles have the maximum concentration

(iii) Are Pesticides Biodegradable?

Pesticides are **non-biodegradable**.

Explanation:

• They cannot be broken down by biological processes (bacteria, fungi)

• Remain in the environment and in organisms for very long periods

• This is why they accumulate in food chains

• If they were biodegradable, they would decompose and not accumulate

(iv) Ways to Reduce Pesticide Use:

1. **Use Biological Pest Control:** Introduce natural predators of pests (like ladybugs for aphids) instead of chemicals

2. **Practice Organic Farming:** Use natural fertilizers and pest control methods like neem-based

products, crop rotation, and companion planting

(Other acceptable answers: Use of pest-resistant crop varieties, integrated pest management, mechanical pest removal)

Ans 20.

(i) Biodegradable Materials:

- Fruit and vegetable peels (5 kg)
- Paper waste (2 kg)

Total biodegradable waste = 7 kg

(ii) Productive Use of Biodegradable Waste:

- Make compost in a compost pit in the school garden
- Use vermicomposting (using earthworms) to produce nutrient-rich manure
- Use the compost as fertilizer for school garden plants
- Can also be used to produce biogas if facilities are available
- This reduces waste while creating useful products

(iii) What to Do with Non-biodegradable Waste:

Plastic Waste:

- Separate and send to authorized recycling centers
- Can be recycled into new plastic products
- Ensure proper collection and disposal

Glass Pieces:

- Collect carefully (safely handling sharp edges)
- Send to glass recycling facilities
- Glass can be melted and reused indefinitely

Metal Items:

- Separate different types of metals if possible
- Send to metal recycling centers
- Metals can be melted and reused to make new products

(iv) Percentage Calculation:

Total waste generated:
= 5 kg + 2 kg + 1 kg + 0.5 kg + 0.3 kg
= 8.8 kg

Biodegradable waste = 5 kg + 2 kg = 7 kg

Percentage of biodegradable waste:
= (Biodegradable waste / Total waste) × 100
= (7 / 8.8) × 100
= 79.54%
≈ **80%** (approximately)

This means about 80% of the school's waste is biodegradable and can be composted, while 20% is non-biodegradable and needs recycling or proper disposal.

Made with ❤ by Sumeet Sahu

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