

PRACTICE PAPER 01 (2026-27)
CHAPTER 13: OUR ENVIRONMENT
(STEP-BY-STEP SOLUTIONS)

SUBJECT: SCIENCE

MAX. MARKS : 40

CLASS : X

DURATION : 1½ hrs

General Instructions:

- (i) All questions are compulsory.
- (ii) This question paper contains **20** questions divided into five Sections A, B, C, D and E.
- (iii) **Section A** comprises 10 MCQs and Assertion-Reason questions of **1 mark** each. **Section B** comprises 4 Very Short Answer questions of **2 marks** each. **Section C** comprises 3 Short Answer questions of **3 marks** each. **Section D** comprises 1 Long Answer question of **5 marks**. **Section E** comprises 2 Case Study Based questions of **4 marks** each.
- (iv) There is no overall choice. Internal choice is provided in Section E.
- (v) Use of calculators is not permitted.

SECTION - A

Questions 1 to 10 carry 1 mark each.

1. Which of the following is an abiotic component of an ecosystem?

- | | |
|-----------------|--------------|
| (a) Grass | (b) Frog |
| (c) Temperature | (d) Bacteria |

Solution:

Ans: (c) Temperature

- Abiotic components are physical factors – temperature, rainfall, wind, soil, minerals.

2. Which of the following is a human-made (artificial) ecosystem?

- | | |
|----------------|----------|
| (a) Forest | (b) Pond |
| (c) Crop-field | (d) Lake |

Solution:

Ans: (c) Crop-field

- Gardens, crop-fields and aquariums are human-made; forests, ponds and lakes are natural.

3. Green plants occupy the first trophic level in every food chain because they

- (a) are eaten by all animals
- (b) make food from inorganic substances using sunlight
- (c) decompose dead organisms
- (d) are present in the largest area

Solution:

Ans: (b) make food from inorganic substances using sunlight

- As producers (autotrophs), they fix solar energy and make it available to consumers.

4. Which of the following represents a correct food chain?

- (a) Grass → Frog → Grasshopper → Snake
- (b) Grass → Grasshopper → Frog → Snake
- (c) Grasshopper → Grass → Frog → Snake
- (d) Snake → Frog → Grasshopper → Grass

Solution:

Ans: (b) Grass → Grasshopper → Frog → Snake

- Producer → herbivore → small carnivore → larger carnivore.

5. If the producers in a food chain make 10 000 J of energy available, the energy available to the tertiary consumers (fourth trophic level) is about
- (a) 1000 J (b) 100 J
(c) 10 J (d) 1 J

Solution:

Ans: (c) 10 J

- 10% passes to each next level: 10 000 → 1000 (primary) → 100 (secondary) → 10 J (tertiary).

6. At higher levels of the atmosphere, ozone is formed when
- (a) CFCs react with oxygen
(b) UV radiation splits O_2 and the free O atoms combine with O_2
(c) oxygen combines with nitrogen
(d) plants release ozone during photosynthesis

Solution:

Ans: (b)



7. The depletion of the ozone layer has been linked mainly to
- (a) carbon dioxide (b) chlorofluorocarbons (CFCs)
(c) sulphur dioxide (d) methane

Solution:

Ans: (b) chlorofluorocarbons (CFCs)

- CFCs are used as refrigerants and in fire extinguishers.

8. Which of the following groups contains only biodegradable items?
- (a) Vegetable peels, paper, cotton cloth
(b) Plastic bag, paper, wood
(c) Glass, vegetable peels, cotton
(d) Polythene, leather, grass

Solution:

Ans: (a) Vegetable peels, paper, cotton cloth

- Plastic, polythene and glass are not broken down by biological processes.

In the following questions 9 and 10, a statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as:

- (a) Both (A) and (R) are true and (R) is the correct explanation of (A).
(b) Both (A) and (R) are true but (R) is not the correct explanation of (A).
(c) (A) is true but (R) is false.
(d) (A) is false but (R) is true.

9. **Assertion (A):** Food chains generally consist of only three or four steps.

Reason (R): The loss of energy at each step is so great that very little usable energy remains after four trophic levels.

Solution:

Ans: (a)

10. **Assertion (A):** The flow of energy in an ecosystem is unidirectional.

Reason (R): The energy captured by autotrophs reverts back to the solar input.

Solution:

Ans: (c)

- (A) is true. (R) is false – energy captured by autotrophs does **not** revert to the solar input, and energy passed to herbivores does not come back to autotrophs; that is why the flow is one-way.

SECTION - B

Questions 11 to 14 carry 2 marks each.

- 11.** What is the role of decomposers in an ecosystem? What would happen if there were no decomposers?

Solution:

Decomposers (bacteria and fungi) **break down the dead remains and waste products** of organisms – complex organic substances – into **simple inorganic substances** that go into the soil and are used again by plants. [1]

Without them, **dead bodies and garbage would pile up** and the **natural replenishment of the soil** would stop, so nutrients would not be recycled. [1]

- 12.** (a) Distinguish between the biotic and abiotic components of an ecosystem, giving two examples of each.

(b) Why is a garden called an ecosystem?

Solution:

(a) Biotic: **living organisms** – e.g. plants, animals, microorganisms. Abiotic: **physical factors** – e.g. temperature, rainfall, wind, soil, minerals. [1]

(b) In a garden, living organisms (grasses, trees, flowering plants, frogs, insects, birds) **interact with each other**, and their growth and reproduction are affected by the abiotic components. All of these together form an ecosystem. [1]

- 13.** (a) Why is the ozone layer in the upper atmosphere important?

(b) Why is ozone considered harmful near the ground?

(c) What step was taken by UNEP in 1987 to protect the ozone layer?

Solution:

(a) It **shields the earth's surface from ultraviolet (UV) radiation** of the Sun, which is highly damaging to organisms (e.g. causes skin cancer). [1]

(b) Ozone is a **deadly poison** for living organisms. [$\frac{1}{2}$]

(c) An agreement to **freeze CFC production at 1986 levels**. [$\frac{1}{2}$]

- 14.** (a) Why are some substances non-biodegradable?

(b) Give two ways in which non-biodegradable substances harm the environment.

Solution:

(a) Enzymes are **specific in their action**; bacteria and other saprophytes have no enzymes to break down human-made materials like plastics, so these persist for a long time. [1]

(b) Any two: they **persist** in the environment for a long time and pile up as garbage; they can **harm members of the ecosystem** (e.g. animals eating plastics); some like pesticides enter food chains and cause **biological magnification**; they pollute soil and water. [$\frac{1}{2} + \frac{1}{2}$]

SECTION - C

Questions 15 to 17 carry 3 marks each.

- 15.** A student sets up an aquarium with water, fish, an aerator and fish food.
- (a) What should be added to make it a self-sustaining ecosystem, and why?
 - (b) Why should a predatory fish that eats other fish not be put in it?
 - (c) Why does an aquarium need cleaning, while ponds and lakes do not?

Solution:

- (a)** A few **aquatic plants** (producers) and small aquatic animals. Plants produce food and oxygen by photosynthesis, so energy and nutrients flow and the system can sustain itself. [1]
- (b)** It would **eat the other fish**, disturbing the balance and the food chain of the small system. [1]
- (c)** An aquarium is a small, human-made system with too few **decomposers** to break down all the dead remains and wastes, so they accumulate. In natural ponds and lakes, decomposers break down wastes and the system is **self-maintaining**. [1]

- 16.** (a) What is the difference between a food chain and a food web?
(b) What is a trophic level? Name the trophic levels in the food chain: Grass → Deer → Lion.
(c) Why are there generally more individuals at the lower trophic levels?

Solution:

- (a)** A food chain is a **single, straight series** of organisms feeding on one another. A food web is a network of **many interconnected (branching) food chains**, since each organism is eaten by two or more kinds of organisms. [1]
- (b)** Each step of a food chain is a trophic level. Grass - **first (producer)**; deer - **second (primary consumer/herbivore)**; lion - **third (secondary consumer/carnivore)**. [1]
- (c)** Only about **10%** of the energy passes to the next level; with less energy available higher up, fewer organisms can be supported, so the greatest number is of producers. [1]

- 17.** (a) Suggest two ways in which you can help reduce the problem of waste disposal.
(b) Kulhads (clay cups) were once suggested in place of disposable plastic cups in trains. Why was this idea not suitable on a large scale? State one advantage of disposable paper cups over plastic cups.

Solution:

- (a)** Any two: carry **cloth bags** for shopping; **segregate** biodegradable and non-biodegradable waste; reuse/recycle items; avoid disposable products; compost kitchen waste. [$\frac{1}{2}$ + $\frac{1}{2}$]
- (b)** Making kulhads on a large scale would cause **loss of the fertile top-soil**. [1] Paper cups are **biodegradable** - they are broken down by microorganisms and do not persist in the environment like plastic. [1]

SECTION - D

Question 18 carries 5 marks.

- 18.** (a) What percentage of the sunlight falling on their leaves do green plants in a terrestrial ecosystem convert into food energy?
(b) State the 10 percent law. What happens to the rest of the energy at each level?
(c) In a food chain Grass → Grasshopper → Frog → Snake, the grass has 20 000 kJ of energy. How much energy will be available to the frog and to the snake?
(d) Why is the flow of energy in an ecosystem said to be unidirectional?
(e) What will happen if all the herbivores in an ecosystem are removed?

Solution:

(a) About **1%**. [1]

(b) On average only **10%** of the food (energy) eaten at one trophic level is turned into body matter and is available to the next level. The rest is **lost as heat** to the environment and used in **digestion and doing work**. [1]

(c) Grasshopper: 10% of 20 000 = 2000 kJ. Frog: 10% of 2000 = **200 kJ**. Snake: 10% of 200 = **20 kJ**. [1]

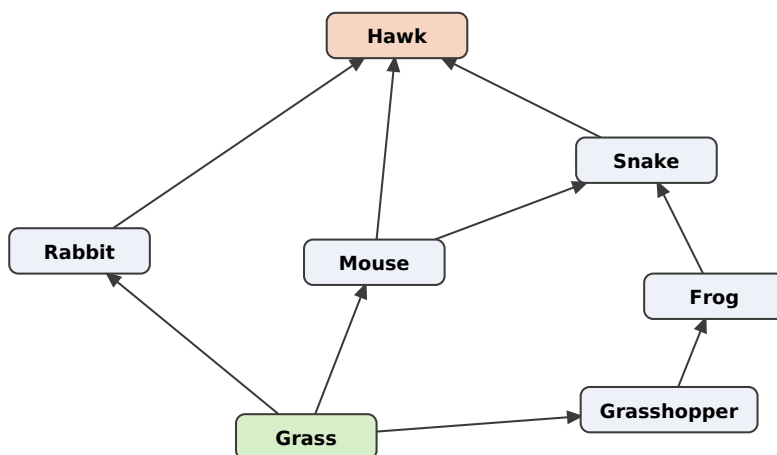
(d) Energy captured by autotrophs does not revert to the solar input, and energy passed to herbivores does not return to autotrophs; it moves **progressively forward** and is no longer available to the previous level. [1]

(e) The **carnivores** that depend on them would starve and decline; the **producers** would grow unchecked; the balance of the ecosystem would be **disturbed**. [1]

SECTION - E (Case Study Based Questions)

Questions 19 and 20 carry 4 marks each.

19. Study the food web of a grassland ecosystem shown below and answer the questions.



Arrows point from the organism eaten to the organism that eats it

(a) Write the longest food chain in this food web. **(1)**

(b) Name an organism that occupies more than one trophic level. State the levels. **(1)**

(c) Suppose all the frogs are removed. How will this affect the grasshoppers and the snakes? Why are food webs more stable than single food chains? **(2)**

OR

(c) If the grass captures 10 000 J of energy, how much energy reaches the hawk through (i) the shortest and (ii) the longest food chain? **(2)**

Solution:

(a) Grass → Grasshopper → Frog → Snake → Hawk. [1]

(b) Hawk: 3rd level (Grass → Rabbit → Hawk), 4th level (Grass → Mouse → Snake → Hawk) and 5th level (longest chain). (Or **snake:** 3rd and 4th levels.) [1]

(c) Grasshoppers will increase (no frogs to eat them). **Snakes** lose one food source but can still feed on mice, so they may decline slightly but survive. [1]

In a web, each organism has **alternative food sources**, so the loss of one species does not break the whole system; it is more stable. [1]

OR

(c) (i) Shortest: Grass → Rabbit → Hawk: 10 000 → 1000 → **100 J**. [1]

(ii) Longest: Grass → Grasshopper → Frog → Snake → Hawk: 10 000 → 1000 → 100 → 10 → **1 J**. [1]

20. A lake near farmland receives water draining from fields sprayed with a pesticide. Scientists measured the pesticide concentration (hypothetical data) at different levels:

Level	Lake water	Phytoplankton	Small fish	Large fish	Fish-eating birds
Pesticide (ppm)	0.02	0.5	5	50	500

- (a) Name the phenomenon shown by this data and define it. **(1)**
(b) Why does the concentration increase at every level instead of decreasing? **(1)**
(c) Why are human beings likely to have the maximum concentration of such chemicals?
Suggest two ways to reduce our intake of pesticides. **(2)**

OR

- (c) By what factor does the concentration increase from the small fish to the fish-eating birds?
How do these chemicals enter the food chain in the first place? **(2)**

Solution:

(a) Biological magnification: the progressive **accumulation of non-degradable chemicals** at each successive trophic level of a food chain. [$\frac{1}{2} + \frac{1}{2}$]

(b) The pesticide is **not degradable**; organisms cannot break it down or excrete it, so it builds up in their bodies and is passed on in larger amounts as each level eats many organisms of the level below. [1]

(c) Human beings occupy the **top level in any food chain**, so the maximum concentration accumulates in our bodies. [1]

Ways (any two): use **fewer chemical pesticides** (organic farming / natural pest control); support **bans on harmful pesticides**; prefer food grown without heavy pesticide use; wash fruits and vegetables well (though this does not remove all residues). [$\frac{1}{2} + \frac{1}{2}$]

OR

(c) $500 \div 5 = 100$ times. [1]

Pesticides are washed into the **soil and water bodies**; plants absorb them from the soil with water and minerals, and aquatic plants and animals take them up from water. [1]