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Ecosystem — CBSE Class 12 Biology Chapter Test

FREE CHAPTER TEST · CLASS XII · BIOLOGY (044) · PATTERN OF THE CBSE SAMPLE QUESTION PAPER 2026-27

TIME ALLOWED	MAXIMUM MARKS	QUESTIONS	NAME / ROLL NO.
1½ hours	37	17 (A 8 · B 3 · C 3 · D 1 · E 2)	

GENERAL INSTRUCTIONS

Read the following instructions very carefully and strictly follow them:

1. This question paper contains 17 questions. All questions are compulsory.
2. This question paper is divided into five sections: A, B, C, D and E.
3. Section A (Q1–8) contains 6 multiple choice questions and 2 assertion-reason based questions of 1 mark each.
4. Section B (Q9–11) contains short answer questions of 2 marks each.
5. Section C (Q12–14) contains short answer questions of 3 marks each.
6. Section D (Q15) contains case-based questions of 4 marks each, with sub-parts of 1, 2 and 1 marks.
7. Section E (Q16–17) contains long answer questions of 5 marks each.
8. There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 1 question in Section D, 2 questions in Section E. Attempt only one of the alternatives in such questions.
9. Draw neat, labelled diagrams wherever necessary.
10. This chapter test follows the section structure, question types and marks per question of the CBSE Class XII Biology (044) Sample Question Paper 2026-27, at about half the length of the 70-mark board paper: 37 marks in 1½ hours.
11. The answer key and the marking scheme are at the end of this booklet. Attempt the paper in 1½ hours before you look at them.

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Chapter: Ecosystem · **Topics:** Ecosystem: structure and function · Productivity · Decomposition · Energy flow and food chains · Ecological pyramids

SECTION A

This section comprises 8 questions of 1 mark each: 6 multiple choice questions (MCQs) and 2 assertion-reason based questions.

1. Producers in an ecosystem fix 10 000 J of energy. By the 10 per cent law, the energy available to the tertiary consumers is 1

(A) 1000 J (B) 100 J

(C) 1 J (D) 10 J

2. The gross primary productivity of an ecosystem is 20 units and the energy used by plants in respiration is 8 units. The net primary productivity is 1

(A) 28 units (B) 12 units

(C) 20 units (D) 8 units

3. The rate of formation of new organic matter by consumers is called 1

(A) secondary productivity (B) gross primary productivity

(C) net primary productivity (D) standing state

4. The amount of biomass (organic matter) produced per unit area over a period of time by plants during photosynthesis is called 1

(A) secondary productivity (B) decomposition

(C) primary production (D) humification

5. Which of the following is a man-made ecosystem? 1

(A) A forest (B) A crop field

(C) A pond (D) A desert

6. In aquatic ecosystems, primary productivity is mainly limited by 1

(A) temperature (B) soil

(C) oxygen (D) light

7. **Assertion (A):** Herbivores are called primary consumers. 1
Reason (R): Herbivores feed on other animals.

(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.

8. **Assertion (A):** Green plants are called the producers of an ecosystem. 1
Reason (R): Green plants make their own food from simple inorganic substances using the energy of sunlight.

(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.

SECTION B

This section comprises 3 short answer questions of 2 marks each.

9. (a) What is meant by the standing crop of a trophic level? How is it measured? 2

OR

(b) What is stratification? Explain with the example of a forest.

10. (a) Distinguish between a grazing food chain and a detritus food chain. 2

OR

(b) What is a food web? Why is a food web more stable than a single food chain?

11. Why are food chains in nature usually limited to four or five trophic levels? 2

SECTION C

This section comprises 3 short answer questions of 3 marks each.

12. Describe the steps in the decomposition of detritus. 3

13. Describe the flow of energy through an ecosystem. 3

14. In a grassland, the producers fix 20 000 kJ of energy. Using the 10 per cent law, find the energy available to (i) the herbivores, (ii) the primary carnivores and (iii) the secondary carnivores. 3

SECTION D

This section comprises 1 case-based question of 4 marks, with sub-parts of 1, 2 and 1 marks.

15. A class studies a village pond. They find microscopic floating algae (phytoplankton), rooted and floating plants, tiny animals (zooplankton), insects, small fishes, frogs and a few larger fishes. Dead leaves and dead organisms collect at the bottom, where they slowly decay.

(I) Name the producers in the pond ecosystem. [1]

(II) Write one food chain from the pond, naming the trophic level of each organism. [2]

(III) What is the role of the decomposers at the bottom of the pond? [1]

OR

(III) Name two abiotic components of the pond ecosystem. [1]

SECTION E

This section comprises 2 long answer questions of 5 marks each.

16. (a) What is an ecosystem? Describe its structure (biotic and abiotic components), and name its four important functional aspects. 5

OR

(b) What is primary productivity? Distinguish between gross and net primary productivity, state the factors on which primary productivity depends, and give the annual net primary productivity of the biosphere and of the oceans.

17. (a) What are ecological pyramids? Describe the pyramids of number, biomass and energy, giving one example of an inverted pyramid. State two limitations of ecological pyramids. 5

OR

(b) Describe how the chemical composition of detritus and climatic factors affect the rate of decomposition. What is humus, and why is it important?

END OF THE QUESTION PAPER

ANSWER KEY — SECTION A

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
(D)	(B)	(A)	(C)	(B)	(D)	(C)	(A)

MARKING SCHEME AND WORKED SOLUTIONS

Marks for each step are shown in brackets, as in the CBSE marking scheme. Any correct alternative method earns full marks.

Q1. Answer (D). 10 000 → 1000 (primary) → 100 (secondary) → 10 J (tertiary consumers).

Q2. Answer (B). NPP = GPP − R = 20 − 8 = 12 units.

Q3. Answer (A). Primary productivity refers to producers; secondary productivity is the rate at which consumers form new organic matter.

Q4. Answer (C). Primary production is expressed in terms of weight (g m^{-2}) or energy (kcal m^{-2}); its rate is the productivity.

Q5. Answer (B). Crop fields and aquariums are man-made ecosystems; forests, ponds and deserts are natural ones.

Q6. Answer (D). Light decreases with increasing depth of water, so it limits photosynthesis and hence productivity.

Q7. Answer (C). A is true: herbivores feed directly on the producers (plants). R is false: animals that eat other animals are carnivores. Answer C.

Q8. Answer (A). Because they make food by photosynthesis, on which all other organisms depend, they are the producers. R explains A. Answer A.

Q9. (2 marks) Answer: (a) mass of living material at a time; biomass or number per unit area; (b) vertical layering of species.
(a) The standing crop is the mass of living material at a trophic level at a particular time. [1] It is measured as the biomass of the living organisms (fresh or dry weight) or as their number in a unit area. [1]
OR (b) The vertical distribution of different species occupying different levels. [1] E.g. in a forest, trees occupy the top vertical strata, shrubs the second, and herbs and grasses the bottom layers. [1]

Q10. (2 marks) Answer: (a) living producers vs dead organic matter; (b) interconnected food chains.
(a) The grazing food chain begins with living producers (green plants) and passes to herbivores and carnivores; e.g. grass → goat → man. [1] The detritus food chain begins with dead organic matter (detritus), and is made of decomposers — heterotrophic organisms, mainly fungi and bacteria (saprotrophs); in a terrestrial ecosystem a much larger fraction of energy flows through the detritus food chain. [1]
OR (b) Food chains are interconnected, since an organism may be eaten by more than one kind of animal and may itself eat several kinds of food. [1] This network of interconnected food chains is a food web; it makes the ecosystem more stable than a single chain would. [1]

Q11. (2 marks) Answer: only ~10 % energy passed on.
Only about 10 % of the energy is transferred from one trophic level to the next; the rest is used in respiration and lost as heat. [1] After four or five levels so little energy is left that it cannot support another population of organisms. [1]

Q12. (3 marks) Answer: fragmentation, leaching, catabolism, humification, mineralisation.
Fragmentation: detritivores (e.g. earthworms) break detritus into smaller particles. Leaching: water-soluble inorganic nutrients go down into the soil horizon and get precipitated as unavailable salts. [1]
Catabolism: bacterial and fungal enzymes degrade the detritus into simpler inorganic substances. [1]
Humification: an amorphous, dark-coloured, colloidal substance called humus accumulates; it is highly resistant to microbial action, decomposes very slowly, and is a reservoir of nutrients. Mineralisation: humus is further degraded by some microbes, releasing inorganic nutrients. [1]

Q13. (3 marks) Answer: sun → PAR (2–10 % captured) → unidirectional flow, 10 % law.
The sun is the only source of energy for all ecosystems; less than 50 % of the incident solar radiation is photosynthetically active radiation (PAR), and plants capture only 2–10 % of the PAR. [1]
The energy trapped by producers is passed through the food chain to herbivores and carnivores; the flow is unidirectional — from the sun to producers and then to consumers, and it is not returned. [1]
At each step much energy is lost as heat in respiration, so only about 10 % is transferred to the next trophic level (the 10 per cent law), in accordance with the second law of thermodynamics. [1]

Q14. (3 marks) Answer: (i) 2000 kJ; (ii) 200 kJ; (iii) 20 kJ.
(i) Herbivores (primary consumers): 10 % of 20 000 = 2000 kJ. [1]
(ii) Primary carnivores: 10 % of 2000 = 200 kJ. [1]
(iii) Secondary carnivores: 10 % of 200 = 20 kJ. [1]

Q15. (4 marks) Answer: (I) phytoplankton and plants; (II) phytoplankton → zooplankton → small fish → large fish; (III) decomposers release minerals, or water, soil, light.
(I) Phytoplankton, some algae, and the floating, submerged and marginal plants. [1]
(II) Phytoplankton (producer) → zooplankton (primary consumer) → small fish (secondary consumer) → large fish (tertiary consumer). [1 for the chain, 1 for the trophic levels]
(III) Fungi, bacteria and flagellates break down dead organic matter, releasing minerals back to the water for use by the producers. [1]
OR (III) Any two: water with dissolved inorganic and organic substances; the rich soil deposit at the bottom; sunlight; temperature; pH. [1]

Q16. (5 marks) Answer: (a) biotic and abiotic components; productivity, decomposition, energy flow, nutrient cycling; (b) GPP, NPP, factors; 170 and 55 billion tons.
(a) An ecosystem is a functional unit of nature, where living organisms interact among themselves and with the surrounding physical environment. [1] Biotic components: producers (green plants, phytoplankton), consumers (herbivores and carnivores) and decomposers (bacteria, fungi). [1] Abiotic components: physical factors such as sunlight, temperature, water, soil, and inorganic and organic substances. [1] The interaction of the biotic and abiotic components results in a physical structure characteristic of each ecosystem, e.g. vertical stratification in a forest. [1] Functional aspects: productivity, decomposition, energy flow and nutrient cycling. [1]
OR (b) Productivity is the rate of biomass production, expressed in g m^{-2} yr^{-1} or kcal m^{-2} yr^{-1}. [1] GPP is the rate of production of organic matter during photosynthesis; NPP = GPP − R is the biomass available to heterotrophs. [1] Primary productivity depends on the plant species of an area, the environmental factors, the availability of nutrients and the photosynthetic capacity of plants, so it varies between ecosystems. [1] The annual net primary productivity of the whole biosphere is about 170 billion tons (dry weight) of organic matter; of this, despite occupying about 70 % of the surface, the oceans produce only about 55 billion tons. [2]

Q17. (5 marks) Answer: (a) number, biomass, energy pyramids; inverted for a tree or the sea; limitations; (b) lignin/chitin slow, sugars fast; warm and moist; humus.

(a) Graphical representations of the relationship between organisms at different trophic levels in terms of number, biomass or energy; the base is the producers and the apex the top carnivores. [1] Pyramid of number: generally upright (e.g. a grassland), but inverted for a tree supporting many insects. [1] Pyramid of biomass: generally upright on land; inverted in the sea, where the biomass of fishes far exceeds that of phytoplankton. [1] Pyramid of energy: always upright, because energy is lost as heat at each step. [1] Limitations (any two): they do not take into account the same species belonging to two or more trophic levels; they assume a simple food chain, which hardly ever exists in nature (food webs are ignored); saprophytes are not given any place, although they play a vital role. [1]

OR (b) Chemical composition of the detritus: decomposition is slower when it is rich in lignin and chitin, and quicker when it is rich in nitrogen and water-soluble substances such as sugars. [1½] Climatic factors: temperature and soil moisture are the most important; warm and moist conditions favour decomposition, while low temperature and anaerobic conditions inhibit it, resulting in a build-up of organic material. [1½] Decomposition is largely an oxygen-requiring process. [1] Humus, formed by humification, is highly resistant to microbial action, decomposes very slowly, and being colloidal serves as a reservoir of nutrients. [1]

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