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CLASS X · SCIENCE (086) · BIOLOGY · CBSE BOARD EXAMINATION 2027

CHAPTER 13

Our Environment

Answer Booklet · CBSE marking-scheme answers with marks for every point

Every question of the chapter booklet | Marks shown point by point | MCQ keys with reasons

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HOW TO USE THE ANSWERS

1. Answer the question in your notebook **first**. Open this booklet only to check.
2. Each answer is written the way the CBSE marking scheme sets it out: **value points**, with the **mark for each point** in orange beside it.
3. Give yourself marks point by point. Use the same **key words** in your own answers.
4. Equations must be balanced; diagrams must be labelled; numericals need formula, substitution and unit.
5. Copy every wrong answer to the My Mistakes page of your booklet.

READ THIS FIRST

Marking Guide

Model answers to every question in the chapter booklet, set out the way a CBSE examiner marks them.

HOW MARKS ARE GIVEN IN SCIENCE ANSWERS

1. **MCQ and assertion–reason (1 mark):** only the correct option scores. The reason given here is for your understanding.
2. **2 and 3 marks:** one mark (or ½) for each correct **value point**. The examiner looks for the key word – a long answer without it scores less than a short answer with it.
3. **Equations:** a correct balanced equation earns its full mark; an unbalanced one, or one with wrong formulae, usually earns ½ or nothing.
4. **Numericals:** formula, substitution and the final answer **with unit** are marked separately.
5. **Diagrams:** marks for a correct drawing and for the labels asked for. An unlabelled diagram earns little.
6. **Case study (4 marks):** 1 + 1 + 2. **Long answer (5 marks):** the split is shown beside each point.

PART A · ANSWERS

A NCERT Practice – Answers

Marking-scheme answers for every question in Part A of the chapter booklet.

Ecosystem and its components

A1. What is an ecosystem? Name its two main kinds of components, with two examples of each. **[3]**

An ecosystem is all the living organisms of an area together with the non-living parts of their surroundings, interacting with each other. 1

Biotic (living) components – e.g. plants, animals, bacteria (any two). 1

Abiotic (non-living) components – e.g. sunlight, temperature, water, soil, minerals (any two). 1

A2. Classify the following as natural or artificial ecosystems: forest, crop field, pond, aquarium, garden, lake. **[2]**

Natural: forest, pond, lake. 1

Artificial (human-made): crop field, aquarium, garden. 1

A3. What would happen if all the decomposers were removed from an ecosystem? Give two effects. **[2]**

Dead plants, animals and wastes would pile up and not be broken down. 1

Nutrients would not be returned to the soil, so the soil would lose fertility and plants (and so all life) would suffer. 1

Food chains and energy flow

A4. What are trophic levels? Write a food chain of four trophic levels and name the trophic level of each organism. [3]

Trophic levels are the various steps in a food chain at which transfer of food (energy) takes place. 1

Food chain: grass → grasshopper → frog → snake (any correct chain of four). 1

Grass – producer (T1); grasshopper – primary consumer/herbivore (T2); frog – secondary consumer (T3); snake – tertiary consumer (T4). 1

A5. Why are producers always placed at the first trophic level? [1]

Producers (green plants) make food from sunlight by photosynthesis; all other organisms depend on them directly or indirectly for food. 1

A6. State the 10 per cent law. A food chain has producers with 50,000 J of energy. How much energy is available to the secondary consumers? [2]

Only about 10% of the energy at one trophic level is passed on to the next level. 1

Producers 50,000 J → primary consumers 5,000 J → secondary consumers **500 J**. 1

A7. Why is the flow of energy in an ecosystem said to be unidirectional? [2]

Energy captured by plants passes to herbivores and then to carnivores; it does not come back to the earlier level. 1

Energy is lost as heat at each level and cannot be reused; it never goes back to the sun. So energy flows in one direction only. 1

A8. Why do food chains usually have only three or four trophic levels? [2]

At each step about 90% of the energy is lost (as heat and in life processes); only about 10% passes on. 1

After three or four steps the energy left is too small to support another level of organisms. 1

A9. What is a food web? How is it different from a food chain? [2]

A food web is a network of interconnected food chains in an ecosystem. 1

A food chain is a single straight path of feeding; in a food web each organism may eat, and be eaten by, several others – so it is more stable. 1

Biological magnification

A10. What is biological magnification? Will its effect be the same at all trophic levels? Explain. [3]

Biological magnification is the increase in concentration of harmful non-biodegradable chemicals (e.g. pesticides) at successive trophic levels of a food chain. 1

No – the concentration is lowest at the producers and increases at each higher level. 1

The chemical is not broken down or excreted, and each organism eats many organisms of the level below; so the top level (e.g. humans) has the most. 1

Waste and its management

A11. Classify the following as biodegradable or non-biodegradable: fruit peels, polythene bag, cotton cloth, glass bottle, newspaper, DDT. [3]

Biodegradable: fruit peels, cotton cloth, newspaper. 1½

Non-biodegradable: polythene bag, glass bottle, DDT. 1½

A12. Why are some substances biodegradable and some non-biodegradable? [2]

Substances that can be broken down by the action of decomposers (bacteria, fungi) are biodegradable. 1

Decomposers' enzymes are specific; they cannot break down substances such as plastics, so these are non-biodegradable. 1

A13. Give two ways in which biodegradable substances and two ways in which non-biodegradable substances affect the environment. [2]

Biodegradable: in large heaps they rot, give a foul smell and breed flies and germs; but they decompose and add nutrients to the soil (any two). 1

Non-biodegradable: they stay for years and pollute soil and water; they enter food chains (biomagnification); they choke drains and harm animals that eat them (any two). 1

Ozone layer

A14. How is ozone formed in the upper atmosphere? How does the ozone layer protect us? [3]

High-energy UV radiation splits oxygen molecules into free oxygen atoms: $O_2 \xrightarrow{UV} O + O$ 1

A free oxygen atom combines with an oxygen molecule to form ozone: $O + O_2 \longrightarrow O_3$ 1

The ozone layer absorbs most of the harmful UV radiation of the sun, which causes skin cancer and other damage. 1

A15. Why is the damage to the ozone layer a cause for concern? What steps have been taken to limit it? [2]

A thinner ozone layer lets more UV radiation reach the earth, causing skin cancer, cataract and harm to plants and animals. 1

In 1987 UNEP got countries to agree to freeze CFC production at 1986 levels; CFC-free refrigerators are now used. 1

A16. Give any four ways in which you can help to reduce the problem of waste disposal at home and at school. [2]

Segregate waste into biodegradable and non-biodegradable bins; compost kitchen and garden waste. 1

Carry cloth or jute bags; reuse and recycle paper, glass and plastic; avoid disposable plates and cups. 1

B

PART B · ANSWERS

Exemplar Practice – Answers

Marking-scheme answers for every question in Part B of the chapter booklet.

Multiple choice

Q	Answer	Working / reason
B1	**(a)** Grass, wheat, mango tree	Only green plants are producers.
B2	**(b)** primary consumer	A herbivore that eats the producer is the primary consumer.
B3	**(c)** 10 J	Plants 10,000 J → primary 1,000 J → secondary 100 J → tertiary 10 J.
B4	**(d)** Producers	Energy is highest at the first trophic level.
B5	**(b)** Bacteria and fungi	Bacteria and fungi break down dead matter into simple substances.
B6	**(c)** Crop field and aquarium	Crop fields and aquariums are made and kept by humans.
B7	**(d)** top carnivores	Biological magnification: highest at the top level.
B8	**(c)** Leather belt	Leather is broken down slowly by decomposers; the others are non-biodegradable.
B9	**(b)** they are non-biodegradable	Plastic is not broken down by decomposers and pollutes the environment.
B10	**(b)** chlorofluorocarbons	CFCs release chlorine, which breaks down ozone.

Short answer

B11. In a food chain of four levels, the producers have 20,000 kJ of energy. Find the energy at each of the other levels. Which level would have the fewest individuals? **[3]**

- Primary consumers: 10% of 20,000 = 2,000 kJ. — 1
- Secondary consumers: 200 kJ; tertiary consumers: 20 kJ. — 1
- The tertiary (top) consumers have the fewest individuals, because the least energy reaches them. — 1

B12. In a forest food chain, all the frogs are killed by a disease. Grasshoppers eat grass, frogs eat grasshoppers and snakes eat frogs. What will happen to the grasshoppers and to the snakes? **[2]**

- Grasshoppers will increase in number, as no frogs eat them; they may then eat up much of the grass. — 1
- Snakes will decrease (or move away), since their food (frogs) is gone. — 1

B13. Why should we prefer cloth bags to plastic bags? Give two reasons. **[2]**

- Cloth is biodegradable and can be reused many times. — 1
- Plastic bags are non-biodegradable: they pollute soil and water, choke drains and kill animals that swallow them. — 1

B14. Ozone is a poisonous gas, yet the ozone layer is important for life. Explain. [2]

At ground level ozone is a deadly poison (harmful to breathe). 1

In the upper atmosphere the ozone layer absorbs harmful UV rays of the sun and protects living things from skin cancer and other damage. 1

PART C · ANSWERS

C Board Pattern Practice – Answers

Marking-scheme answers for every question in Part C of the chapter booklet.

Food chains, trophic levels and the 10% law

Q	Answer	Working / reason
C1	**(c)** third trophic level	Phytoplankton T1, zooplankton T2, small fish T3, kingfisher T4.
C2	**(b)** 200 J	Going down the chain multiply by 10 at each step: T3 2 J → T2 20 J → T1 200 J.
C3	**(c)** Wheat → human	The shorter the chain, the more energy reaches the top: wheat → human has only one transfer.
C4	**(a)**	Both true, and the large energy loss explains why chains are short.
C5	**(a)**	Both true; alternative food sources give stability, so R explains A.
C6	**(a)**	Without lions, deer increase and overgraze the grass. R correctly explains A.

C7. Arrange deer, grass, lion, snake and rabbit into two food chains. Why do primary consumers get more energy than secondary consumers? Why is the base of an energy pyramid broad? [3]

Grass → deer → lion; grass → rabbit → snake. 1

Primary consumers are one step nearer the producers; only about 10% passes from one level to the next, so less energy reaches secondary consumers. 1

The base (producers) holds the most energy and the most organisms; energy decreases at each higher level. 1

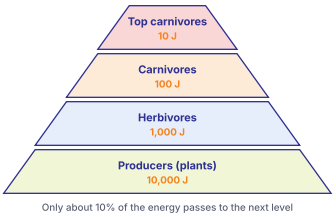
C8. What is meant by trophic levels? Why are the organisms of the first trophic level always green plants? [2]

Each step of a food chain at which energy is transferred is a trophic level. 1

Green plants make their own food from sunlight (photosynthesis); every other organism depends on them for energy. 1

C9. Draw an energy pyramid for the food chain: plants → goat → human, if the plants receive 30,000 J. What happens to the remaining 90% of energy at each step? **[3]**

Pyramid: plants 30,000 J (base) → goat 3,000 J → human 300 J (top), with a broad base and narrow top. **2**



The remaining energy is lost as heat, used up in life processes (respiration, movement) or stays in undigested/uneaten parts. **1**

Decomposers and the ecosystem

Q	Answer	Working / reason
C10	**(b)** Making food by photosynthesis	Decomposers are heterotrophs; they cannot photosynthesise.
C11	**(a)**	Both true; R explains why they are called decomposers.

C12. Why does an aquarium need to be cleaned regularly while a pond or lake does not? **[2]**

A pond/lake is a natural ecosystem with enough decomposers, which break down wastes and dead matter; it cleans itself. **1**

An aquarium is an artificial ecosystem with very few decomposers, so wastes collect and the water must be cleaned by us. **1**

C13. Define decomposers. Give two examples. How do they help in keeping a balance in an ecosystem? **[3]**

Decomposers are organisms that break down the dead remains and wastes of plants and animals into simpler substances. **1**

Examples: bacteria, fungi (e.g. mushroom, bread mould). ½ + ½ **1**

They return nutrients to the soil for plants to use again (recycling) and clean the environment of dead matter. **1**

C14. Give one difference between consumers and decomposers. **[1]**

Consumers feed on other living organisms (or their parts) and digest food inside their body; decomposers feed on dead matter and wastes, breaking it down outside their body into simple substances. **1**

Biological magnification

Q	Answer	Working / reason
C15	**(c)** DDT	Only non-biodegradable chemicals such as DDT build up along a food chain.
C16	**(c)**	A is true. R is false – pesticides are non-biodegradable, which is why they build up.

C17. A farmer sprays a non-biodegradable pesticide on his crop. Explain how it can reach a person eating fish from a nearby pond, and why the person gets the largest amount. [3]

Rain washes the pesticide into the soil and the pond; water plants and phytoplankton absorb it. 1

It passes along the food chain: plankton → small fish → big fish → human. 1

It is not broken down or excreted, so it collects at each level; the human, at the top, has the highest concentration (biological magnification). 1

C18. What is the impact of biological magnification on human beings? Suggest one way to reduce it. [2]

Pesticides collect in the human body (at the top of the food chain) and can damage organs, nerves and cause diseases. 1

Use fewer or biodegradable pesticides / organic farming; wash fruits and vegetables well. 1

Biodegradable, non-biodegradable and garbage

Q	Answer	Working / reason
C19	**(b)** Polythene, detergent, PVC	Polythene, synthetic detergent and PVC are not broken down by decomposers.
C20	**(b)** it removes fertile top soil	Clay for kulhads comes from fertile top soil.

C21. List two differences between biodegradable and non-biodegradable substances, with two examples of each. [3]

Biodegradable substances are broken down by decomposers; non-biodegradable ones are not. 1

Biodegradable wastes do not stay long and may add nutrients to soil; non-biodegradable ones remain for a long time and harm the environment. 1

Examples: biodegradable – vegetable peels, paper; non-biodegradable – plastic, glass. 1

C22. Suggest four steps your school can take to manage the garbage it produces. [2]

Put separate bins for biodegradable and non-biodegradable waste; make compost from leaves and canteen waste. 1

Send paper, plastic and metal for recycling; ban single-use plastic and use steel plates/cups in the canteen. 1

Ozone layer

Q	Answer	Working / reason
C23	**(c)** It is beneficial to breathe at ground level	At ground level ozone is a deadly poison.
C24	**(b)** freeze CFC production at 1986 levels	Countries agreed to freeze CFC production at 1986 levels.

C25. Name the compounds mainly responsible for depleting the ozone layer and give two of their uses. Write two harmful effects of UV rays on human beings. [3]

Chlorofluorocarbons (CFCs). 1

Used as refrigerants (fridges, ACs) and in fire extinguishers / aerosol sprays. 1

UV rays cause skin cancer and cataract (eye damage); they weaken the immune system (any two). 1

Long answer

C26. (a) What is an ecosystem? Name its biotic and abiotic components. (b) Draw a food chain of four trophic levels and label them. (c) State the 10% law and use it to explain why the energy available to the fourth level is small. (d) Why is the role of decomposers important? [5]

(a) Living organisms with their non-living surroundings, interacting; biotic – producers, consumers, decomposers; abiotic – light, temperature, water, soil. 1

(b) e.g. grass (T1, producer) → grasshopper (T2, herbivore) → frog (T3, carnivore) → snake (T4, top carnivore). 1

(c) Only about 10% of energy passes to the next level; if plants have 10,000 J, the fourth level gets only 10 J, since 90% is lost at each step as heat and in life processes. 2

(d) They break down dead matter, recycle nutrients to the soil and clean the environment. 1

D

PART D · ANSWERS

Case-Based Questions – Answers

Marking-scheme answers for every question in Part D of the chapter booklet.

D1. Case Study · The Village Pond [4]

(i) Write the food chain of this pond. [1]

Algae / water plants → zooplankton → small fish → kingfisher. 1

(ii) Which organism is at the third trophic level? [1]

Small fish. 1

(iii) If the algae trap 40,000 J, how much energy reaches the kingfisher? What happens to the rest? [2]

40,000 → 4,000 → 400 → **40 J** for the kingfisher. 1

The rest is lost as heat and used in life processes at each level. 1

OR

(iii) Why is the pond a self-sustaining ecosystem, while an aquarium is not? [2]

The pond has producers, consumers and decomposers in balance; decomposers recycle nutrients from dead matter. 1

An aquarium is artificial: it has few decomposers and needs regular cleaning and feeding by humans. 1

D2. Case Study · Poison in the Plate [4]

(i) Name the phenomenon shown by these figures. **[1]**

Biological magnification. 1

(ii) Why is the concentration highest in the birds? **[1]**

The birds are at the top trophic level; each eats many fish and gathers all the DDT in them. 1

(iii) Why does DDT build up along the food chain while glucose does not? **[2]**

DDT is non-biodegradable: it is not broken down or excreted and collects in body fat. 1

Glucose is used up in respiration (broken down), so it does not accumulate. 1

OR

(iii) How could DDT reach human beings, and what can farmers do to reduce the problem? **[2]**

Through grains, vegetables, fish and milk that contain DDT; humans are at the top of these food chains. 1

Use fewer, biodegradable pesticides; organic farming / natural pest control. 1

D3. Case Study · Clean-up Drive [4]

(i) Name two biodegradable items from the list. **[1]**

Any two: vegetable peels, paper, dry leaves. 1

(ii) Why can plastic wrappers and thermocol not be broken down by decomposers? **[1]**

Decomposers' enzymes are specific and cannot act on plastics and thermocol, so these are non-biodegradable. 1

(iii) Suggest how the club should deal with (a) the biodegradable waste (b) the non-biodegradable waste. **[2]**

(a) Compost the peels and leaves in a compost pit (or use for biogas). 1

(b) Segregate and send plastic, glass and paper for recycling; reduce use of thermocol and plastic. 1

OR

(iii) What is meant by the 3 Rs? Give one example of each from school life. **[2]**

Reduce, Reuse, Recycle. 1

Reduce – carry a steel bottle instead of buying plastic bottles; reuse – use the back of printed sheets; recycle – send old notebooks to a recycler. 1