Ecosystem

Class 12 Biology · 24 NEET MCQs with answers & explanations

Ecosystem is a high-yield ecology chapter for NEET. It covers ecosystem structure (biotic + abiotic), energy flow (food chains, food webs, trophic levels), ecological pyramids, productivity (GPP, NPP), nutrient cycling (carbon, phosphorus) and ecological succession. The 10% energy transfer law and the difference between primary and secondary succession are NEET favourites.

Key Ecosystem Facts

Concept	Key Fact
Energy flow	Unidirectional; 10% law (Lindeman) — only 10% energy passes to next trophic level
GPP vs NPP	GPP = total photosynthesis; NPP = GPP − Respiration (available to consumers)
Pyramid of energy	Always upright; pyramid of biomass inverted in aquatic (phytoplankton < zooplankton)
Decomposition	Fragmentation → leaching → catabolism → humification → mineralisation
Carbon cycle	Atmosphere ↔ biosphere via photosynthesis and respiration; fossil fuels add CO_2
Ecological succession	Primary (bare rock → lichens → mosses → herbs → shrubs → trees); secondary (disturbed area)

Questions

Q1. Which of the following is NOT a characteristic feature of an ecosystem?

(A) Nutrients are recycled between biotic and abiotic components
(B) Energy flow is unidirectional from producers to higher trophic levels
(C) It contains both biotic and abiotic components
(D) Energy is recycled continuously between trophic levels

Q2. Which statement best defines a food chain in an ecosystem?

(A) Linear sequence showing energy flow through feeding
(B) Network of interconnected food chains
(C) Cyclic nutrient movement between organisms
(D) Hierarchy of ecological communities

Q3. Which pair is INCORRECTLY matched with its role in decomposition?

(A) Fragmentation — detritivores
(B) Leaching — formation of humus
(C) Catabolism — microbial enzymatic breakdown
(D) Mineralisation — release of inorganic nutrients

Q4. Which of the following correctly represents the relationship between gross primary productivity and net primary productivity?

(A) NPP = GPP + R
(B) NPP = GPP − R
(C) GPP = NPP + R
(D) NPP = GPP × R

Q5. Which statement best defines an ecosystem according to NCERT?

(A) Functional unit where organisms interact with each other and their physical environment
(B) A region defined by its dominant plant species only
(C) A group of populations belonging to the same trophic level
(D) A biome characterised by uniform climatic conditions

Q6. Which feature of a food web makes it more stable than a single food chain?

(A) Fewer trophic levels involved
(B) Multiple feeding pathways between levels
(C) Only one producer species present
(D) Higher energy transfer efficiency

Q7. Which ecological factor most strongly increases the stability of a food web?

(A) Dependence on a single food source
(B) Greater species diversity with many feeding links
(C) Absence of all predators
(D) Single trophic pathway only

Q8. Which ecological process describes the circulation of chemical elements between organisms and the physical environment?

(A) Nutrient cycling
(B) Biomagnification
(C) Ecological succession
(D) Trophic transfer

Q9. Which group of organisms forms the autotrophic component of an ecosystem?

(A) Producers fixing solar energy
(B) Herbivores consuming plants
(C) Carnivores feeding on animals
(D) Decomposers breaking down detritus

Q10. Which ecological pyramid represents the number of organisms at each trophic level?

(A) Pyramid of numbers
(B) Pyramid of biomass
(C) Pyramid of energy
(D) Pyramid of productivity

Q11. Which component of productivity represents the total energy captured by producers during photosynthesis before any losses?

(A) Net primary productivity
(B) Gross primary productivity
(C) Secondary productivity
(D) Standing crop productivity

Q12. Which ecological process converts complex organic matter into simpler inorganic substances?

(A) Decomposition
(B) Photosynthesis
(C) Respiration
(D) Assimilation

Q13. Which ecological process describes gradual and predictable change in species composition over time?

(A) Ecological succession
(B) Nutrient cycling
(C) Energy flow
(D) Population regulation

Q14. Which law states that only about 10% of energy is transferred from one trophic level to the next?

(A) Law of thermodynamics
(B) Ten percent law
(C) Liebig's law of minimum
(D) Trophic balance law

Q15. Which ecosystem component converts solar energy into chemical energy supporting all trophic levels?

(A) Producers
(B) Primary consumers
(C) Decomposers
(D) Secondary consumers

Q16. Interaction between organisms and their physical environment in an ecosystem primarily results in which two ecological processes?

(A) Evolution and speciation
(B) Energy flow and nutrient cycling
(C) Population growth and species dispersal
(D) Competition and predation only

Q17. Which feature best represents the structural aspect of an ecosystem?

(A) Rate of energy transfer between trophic levels
(B) Occurrence of biogeochemical cycling
(C) Arrangement of biotic and abiotic components within the system
(D) Speed of decomposition of organic matter

Q18. Which feature primarily represents the functional aspect of an ecosystem?

(A) Vertical stratification of vegetation layers
(B) Types and proportions of soil minerals
(C) Number of species in the biological community
(D) Transfer of energy through food chains and nutrient cycling

Q19. Which of the following correctly explains why ecosystem structure and function are inseparable?

(A) Function occurs independently of component arrangement
(B) Structure determines what components exist, and these components drive ecological processes
(C) Abiotic components perform functions without biotic components
(D) Structure and function operate on different timescales with no interaction

Q20. Which component of ecosystem structure includes temperature, light, and water?

(A) Biological community of the ecosystem
(B) Abiotic components of the ecosystem
(C) Consumer trophic levels only
(D) Detritivore functional group

Q21. Which example correctly represents a natural ecosystem?

(A) Aquarium maintained with artificial aeration
(B) Botanical garden managed by humans
(C) Forest with natural producers, consumers, and decomposers
(D) Crop field regularly tilled and fertilised

Q22. Which statement about ecosystem boundaries is most accurate according to NCERT?

(A) All ecosystems have sharp, geographically fixed borders
(B) Boundaries exist only in aquatic ecosystems
(C) Adjacent ecosystems are always completely isolated
(D) Ecosystem boundaries are often not sharply defined and frequently overlap

Q23. Which observation best indicates that an ecosystem is dynamic rather than static?

(A) Decomposers are present at the base of food webs
(B) Energy and matter continuously move between organisms and their environment
(C) Producers fix solar energy at a constant rate each year
(D) Species composition remains unchanged over decades

Q24. Which of the following is an example of an artificial ecosystem created and maintained by humans?

(A) Tropical rainforest
(B) Coral reef ecosystem
(C) Alpine grassland
(D) Crop field (agro-ecosystem)

Answer key

1-D	**2-A**	**3-B**	**4-B**	**5-A**	**6-B**	**7-B**	**8-A**
9-A	**10-A**	**11-B**	**12-A**	**13-A**	**14-B**	**15-A**	**16-B**
17-C	**18-D**	**19-B**	**20-B**	**21-C**	**22-D**	**23-B**	**24-D**

Answers with explanations

Q1 — Answer: (D) Energy is recycled continuously between trophic levels
An ecosystem has both biotic and abiotic components; nutrients are recycled and energy enters as solar radiation and flows unidirectionally. Energy is NOT recycled — it is progressively lost as heat at each trophic transfer. Options A, B and C are all valid characteristics; Option D is the false statement.

Q2 — Answer: (A) Linear sequence showing energy flow through feeding
A food chain is a linear sequence through which energy flows from producers to successive consumers via feeding relationships. A food web (option B) is the interconnected network, not a single chain. Nutrient cycling (option C) is a separate process.

Q3 — Answer: (B) Leaching — formation of humus
Leaching involves removal of water-soluble substances from detritus into deeper soil layers; it does not form humus. Humification is the process associated with humus formation. Fragmentation, catabolism and mineralisation are correctly matched with their respective roles.

Q4 — Answer: (B) NPP = GPP − R
Gross primary productivity is total photosynthetic production by producers. After subtracting producer respiratory losses, the remaining organic matter is net primary productivity. The correct relationship is NPP = GPP minus R. Option A adds respiration incorrectly and Option C rearranges the formula wrongly.

Q5 — Answer: (A) Functional unit where organisms interact with each other and their physical environment
An ecosystem is defined as a functional unit of nature where living organisms interact with each other and with their physical environment. A biome is a broader unit; trophic groupings and plant-dominance criteria do not define ecosystems.

Q6 — Answer: (B) Multiple feeding pathways between levels
A food web contains multiple interconnected food chains, providing alternative feeding pathways. If one species is lost, energy can still flow through alternate routes, making the system more stable than a linear food chain.

Q7 — Answer: (B) Greater species diversity with many feeding links
Greater biodiversity creates multiple alternative feeding pathways — if one species declines, consumers switch to alternatives, buffering the ecosystem. Single food source dependence (option A) maximally destabilizes a food web.

Q8 — Answer: (A) Nutrient cycling
Nutrient cycling (also called biogeochemical cycling) is the movement of nutrient elements through the biotic and abiotic components of an ecosystem. Biomagnification is the increase in concentration of a toxic substance at successive trophic levels, succession is the change in community composition over time, and trophic transfer refers to movement of energy or matter along a food chain.

Q9 — Answer: (A) Producers fixing solar energy
Producers are autotrophs that synthesise organic food from inorganic substances using solar energy. Herbivores and carnivores are heterotrophs; decomposers are heterotrophs that act on dead matter.

Q10 — Answer: (A) Pyramid of numbers
Pyramid of numbers counts individual organisms at each trophic level. Pyramid of biomass measures dry mass, not count. Pyramid of energy measures rate of energy flow per unit area per unit time.

Q11 — Answer: (B) Gross primary productivity
GPP is the total rate of photosynthesis including all energy fixed before respiratory losses. NPP = GPP − Respiration, so NPP is always less than GPP.

Q12 — Answer: (A) Decomposition
Decomposition converts dead organic matter into inorganic substances via microbial activity. Respiration releases energy from living cells — it is not the same as decomposition of dead matter.

Q13 — Answer: (A) Ecological succession
Ecological succession is the orderly, directional change in community structure and species composition over time. Nutrient cycling and energy flow are ongoing processes, not directional community change.

Q14 — Answer: (B) Ten percent law
Lindeman's ten percent law states that only ~10% of energy at one trophic level is transferred to the next. Liebig's law refers to nutrient limitation, not energy transfer.

Q15 — Answer: (A) Producers
Producers fix solar energy via photosynthesis into organic molecules, forming the base of all energy flow. Decomposers recycle nutrients but do not fix solar energy.

Q16 — Answer: (B) Energy flow and nutrient cycling
NCERT explicitly states that interactions between biotic and abiotic components result in energy flow and nutrient cycling. Evolution and population growth are consequences of other ecological dynamics, not the primary outcome of organism–environment interaction.

Q17 — Answer: (C) Arrangement of biotic and abiotic components within the system
Ecosystem structure refers to the arrangement and composition of living and non-living components. Energy transfer rate and decomposition speed are functional aspects; biogeochemical cycling is also a function, not structure.

Q18 — Answer: (D) Transfer of energy through food chains and nutrient cycling
Ecosystem function refers to ecological processes — principally energy flow and nutrient cycling. Stratification, soil type, and species count are structural features describing what components are present, not what processes operate.

Q19 — Answer: (B) Structure determines what components exist, and these components drive ecological processes
NCERT treats structure (components) and function (processes) as interlinked: the identity and arrangement of biotic and abiotic components directly determines the ecological processes — energy flow and nutrient cycling — that occur. Separating them is conceptually incorrect.

Q20 — Answer: (B) Abiotic components of the ecosystem
Abiotic components encompass all physical and chemical factors — temperature, light, water, soil, wind — that constitute the non-living environment. Community refers strictly to biotic (living) components.

Q21 — Answer: (C) Forest with natural producers, consumers, and decomposers
A forest develops and self-regulates without direct human management, making it a natural ecosystem. Aquaria, botanical gardens, and crop fields are artificial ecosystems maintained through sustained human intervention.

Q22 — Answer: (D) Ecosystem boundaries are often not sharply defined and frequently overlap
NCERT explicitly notes that most ecosystems do not have sharply defined boundaries — transition zones (ecotones) exist where adjacent ecosystems overlap. The idea of strict, fixed borders applies to artificial or human-defined units, not natural ecosystems.

Q23 — Answer: (B) Energy and matter continuously move between organisms and their environment
Ecosystems are dynamic because energy flows unidirectionally and nutrients cycle continuously among biotic and abiotic components. Constant energy fixation rate or unchanged species composition would suggest stasis, not dynamism.

Q24 — Answer: (D) Crop field (agro-ecosystem)
NCERT lists crop fields (agro-ecosystems) and aquaria as examples of man-made artificial ecosystems. Tropical rainforests, coral reefs, and alpine grasslands are natural ecosystems that develop without sustained human management.

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