

Ecosystem — Assignment 2

Class 12 Biology · Higher-difficulty challenge set + integrated problems · Answer key included · Narayan Gurukul Academy

Instructions: (1) Attempt all questions; start with the topic-wise challenge set, then attempt the integrated (multi-topic) problems.
(2) Give all answers with correct SI units. $g = 10 \text{ m/s}^2$ unless stated.
(3) A final answer key is provided at the end — try the full set before checking it.

Part A — Topic-wise challenge questions

Ecosystem Structure and Components

1. What is an ecosystem?
2. Name the two components of an ecosystem.
3. Describe the structure of an ecosystem.

Productivity — GPP, NPP and R

1. Define gross primary productivity.
2. What is the relationship between GPP, NPP and R?
3. Describe productivity in an ecosystem.

Energy Flow and the 10% Law

1. What is the 10% law?
2. Why is energy flow unidirectional?
3. Explain the 10% law and its significance.

Ecological Pyramids

1. What is an ecological pyramid?
2. Why is the pyramid of energy always upright?
3. Describe the types of ecological pyramids.

Decomposition

1. What is decomposition?
2. What are the factors affecting decomposition?
3. Describe the steps of decomposition.

Nutrient Cycling

1. What is nutrient cycling?
2. Differentiate between gaseous and sedimentary cycles.
3. Explain the gaseous and sedimentary nutrient cycles.

Ecological Succession and Ecosystem Services

1. What is ecological succession?
2. Differentiate between primary and secondary succession.
3. Explain ecosystem services with examples.

Part B — Integrated problems (multi-topic)

1. Describe productivity and energy flow in an ecosystem.
2. Describe the steps of decomposition and the factors affecting it.
3. Describe nutrient cycling and ecological succession.
4. Describe the types of ecological pyramids.
5. Explain the relationship between GPP, NPP and respiration.
6. Explain ecosystem services with examples.

Answer Key

Ecosystem Structure and Components

An ecosystem is a functional unit of nature with biotic (producers, consumers, decomposers) and abiotic components; stratification is vertical distribution.

Productivity — GPP, NPP and R

GPP is total photosynthesis; $NPP = GPP - R$ and is the organic matter available to consumers.

Energy Flow and the 10% Law

Energy flow is unidirectional; the 10% law (Lindeman) states about 10% of energy transfers to the next trophic level.

Ecological Pyramids

Graphs of number, biomass and energy; the energy pyramid is always upright; the sea biomass pyramid is inverted.

Decomposition

Steps: fragmentation, leaching, catabolism, humification and mineralisation; affected by temperature, oxygen and detritus composition.

Nutrient Cycling

Gaseous (carbon, nitrogen) and sedimentary (phosphorus) cycles.

Ecological Succession and Ecosystem Services

Primary begins on bare area, secondary on existing soil; pioneer species colonise first; ecosystem services include air/water purification and pollination.

Integrated problems

- 1: GPP/NPP and unidirectional energy flow. 2: Fragmentation → leaching → catabolism → humification → mineralisation. 3: Gaseous/sedimentary cycles; primary/secondary succession. 4: Number, biomass, energy. 5: $NPP = GPP - R$. 6: Purification and pollination.