OJEE 2026 BSc Nursing 4 May Shift 1

Question Paper (Memory-Based) with Solutions PDF

Conducted by Odisha Joint Entrance Examination Committee (OJEEC)

General Instructions

(i) The examination will be conducted in Computer-Based Test (CBT) mode.

(ii) Each question carries +4 marks for correct answer and 1 mark for wrong answer.

(iii) The total number of questions and duration will vary depending on the course.

(iv) Duration of the exam is 2 hours (120 minutes).

1. In a stable ecosystem, the relationship between Gross Primary Productivity (GPP) and community respiration (R) is:

(A) GPP $<$ R

(B) GPP $=$ R

(C) GPP $>$ R always

(D) GPP independent of R

Correct Answer: (B) GPP $=$ R

Solution:

Step 1: Understanding the Concept:

Gross Primary Productivity (GPP) is the total rate at which solar energy is captured by autotrophs to produce organic matter.

Community Respiration (R) is the total energy consumed by all organisms (producers, consumers, and decomposers) in the ecosystem for metabolic processes.

Stability in an ecosystem refers to a state of equilibrium, often achieved in a climax community.

Step 2: Detailed Explanation:

In a stable ecosystem, there is a balance between energy gain (production) and energy loss (respiration).
During the early stages of succession, GPP is typically greater than R, leading to an accumulation of biomass.
As the community reaches its stable climax stage, the rate of organic matter production (GPP) becomes almost equal to the rate of consumption (R).
This means the Net Ecosystem Productivity (NEP = GPP − R) approaches zero.
If GPP were less than R, the ecosystem would lose its biomass and eventually collapse.
Thus, for long-term stability, GPP must be equal to R.

Step 3: Final Answer:
In a stable or climax ecosystem, the total production is balanced by total community respiration, resulting in the relationship GPP = R.

Quick Tip: The P/R ratio (Production to Respiration) is a reliable indicator of ecosystem maturity.
In a stable climax community, the P/R ratio is always equal to 1.
If P/R > 1, it is an autotrophic or successional system.

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2. Which process contributes MOST to nutrient recycling in ecosystem?

(A) Grazing food chain
(B) Decomposers
(C) Producers
(D) Carnivores

Correct Answer: (B) Decomposers

Solution:

Step 1: Understanding the Concept:
Nutrient recycling, or biogeochemical cycling, involves the movement of essential elements like Carbon, Nitrogen, and Phosphorus from the environment to living organisms and back

again.
Without the return of these elements to the soil or water, primary production would eventually stop due to nutrient depletion.

Step 2: Detailed Explanation:
Producers (C) take up inorganic nutrients and fix them into organic molecules.
Consumers (A, D) transfer these nutrients through various trophic levels of the food chain.
However, nutrients remain "trapped" in the organic tissues of dead plants and animals (detritus).
Decomposers (bacteria and fungi) perform the process of mineralization.
They secrete enzymes that break down complex organic matter into simple inorganic ions.
This process releases the nutrients back into the abiotic reservoir (soil/water), making them available for producers once more.

Step 3: Final Answer:
Decomposers act as the vital link that returns nutrients to the environment, making them the most significant contributors to nutrient recycling.

Quick Tip: Producers are the "Fixers," and Decomposers are the "Recyclers."
In the absence of decomposers, life would vanish because nutrients would be permanently locked in dead bodies.

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

(A) Grass → Snake → Frog → Hawk
(B) Grass → Frog → Insect → Hawk
(C) Grass → Insect → Frog → Snake → Hawk
(D) Insect → Grass → Frog → Snake

Correct Answer: (C) Grass → Insect → Frog → Snake → Hawk

Solution:

Step 1: Understanding the Concept:

A food chain is a linear sequence showing how energy passes from one organism to another. It must start with a Producer (T1) and follow correct predator-prey relationships.

Step 2: Detailed Explanation:

Let's evaluate the biological accuracy of each sequence:

(A) Grass → Snake: Snakes are carnivores; they do not eat grass. Incorrect sequence.

(B) Grass → Frog → Insect: Insects eat plants, and frogs eat insects. This sequence is out of order.

(C) Grass (Producer) → Insect (Herbivore) → Frog (Primary Carnivore) → Snake (Secondary Carnivore) → Hawk (Top Predator). This follows the correct natural hierarchy.

(D) Insect → Grass: The sequence must start with a producer. Insects do not produce energy for grass. Incorrect.

Step 3: Final Answer:

Option (C) correctly describes the unidirectional flow of energy through appropriate trophic levels.

Quick Tip: The arrow (→) always indicates the direction of energy flow: "is eaten by."

Ensure the chain starts with a green plant (autotroph) in a grazing food chain.

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4. Which ecological pyramid can be inverted in aquatic ecosystems due to high turnover rate?

(A) Energy pyramid

(B) Biomass pyramid

(C) Number pyramid always

(D) Productivity pyramid

Correct Answer: (B) Biomass pyramid

Solution:

Step 1: Understanding the Concept:

Ecological pyramids are graphical representations of trophic levels.

An inverted pyramid means the base (producers) is smaller than the higher levels (consumers).

"Turnover rate" refers to how quickly a population replaces its biomass.

Step 2: Detailed Explanation:

In aquatic ecosystems, the primary producers are phytoplankton.

Phytoplankton are very small, have short lifespans, and reproduce extremely rapidly.

This high turnover rate means they are consumed almost as quickly as they are produced.

As a result, the "standing crop" (the biomass present at any single moment) of phytoplankton is very low.

However, their high productivity is sufficient to support a much larger biomass of zooplankton and fish.

When measured at a single point in time, the biomass of producers is less than that of consumers, creating an inverted shape.

Step 3: Final Answer:

The biomass pyramid in aquatic systems is inverted because the rapid consumption and reproduction of producers result in a low standing crop biomass.

Quick Tip: The Pyramid of Energy is **NEVER** inverted because energy is lost at each transfer.

Inverted Biomass Pyramid = Aquatic Ecosystem.

Inverted Number Pyramid = Tree Ecosystem (One tree, many birds/insects).

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5. Standing crop refers to:

(A) Biomass present at a given time

(B) Total productivity of ecosystem

(C) Annual yield of crop

(D) Rate of biomass formation

Correct Answer: (A) Biomass present at a given time

Solution:

Step 1: Understanding the Concept:
Ecology uses specific terms to describe the static state of an ecosystem versus its dynamic rates. "Standing" terms refer to a snapshot in time.

Step 2: Detailed Explanation:
Standing Crop is defined as the total mass of living organic matter (biomass) in a specific area or trophic level at a particular point in time.
It is typically measured as the dry weight or fresh weight per unit area (e.g., g/m^2).
Let's distinguish this from other options:
- (B) Total productivity is a rate (energy/mass per area per time).
- (D) Rate of biomass formation is specifically Net Primary Productivity (NPP).
- Standing State: This refers to the amount of inorganic nutrients present in the soil at a given time.

Step 3: Final Answer:
Standing crop represents the current biological capital or biomass of an ecosystem at any snapshot in time.

Quick Tip: Standing **C**rop = Living **C**reatures/Biomass.
Standing **S**tate = **S**oil/Inorganic Substances.

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6. Pyramid of energy is always:

(A) Inverted
(B) Upright
(C) Spindle shaped

(D) Horizontal

Correct Answer: (B) Upright

Solution:

Step 1: Understanding the Concept:
The Pyramid of Energy displays the total energy available at each trophic level over a given period of time.

Step 2: Detailed Explanation:
Energy flow in an ecosystem follows the 10% Law of Lindeman.
This law states that when energy is transferred from one trophic level to the next, only about 10% of that energy is stored as biomass.
The remaining 90% is lost to the environment as heat through respiration and other metabolic processes.
Because energy cannot be recycled and is progressively lost at each step, the level below must always have more energy than the level above it.
Producers (T1) > Primary Consumers (T2) > Secondary Consumers (T3).
This strict decline ensures that the pyramid base is always the widest, making the shape always upright.

Step 3: Final Answer:
The thermodynamic loss of energy during transfer ensures that the pyramid of energy remains universally upright with no exceptions.

Quick Tip: This is a standard exam fact: While number and biomass pyramids can be inverted, the energy pyramid is **always** upright.

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7. Which interaction leads to evolution of mimicry?

(A) Commensalism

(B) Predation

(C) Mutualism

(D) Competition

Correct Answer: (B) Predation

Solution:

Step 1: Understanding the Concept:

Mimicry is an adaptation where a species (the mimic) evolves to resemble another species (the model) or an object to gain a survival advantage.

Step 2: Detailed Explanation:

The primary driver of mimicry is the survival pressure exerted by predators.

Species that can effectively deceive a predator have a higher probability of survival and reproduction.

There are two main types of mimicry driven by predation:

1. **Batesian Mimicry:** A harmless species mimics a toxic or dangerous one to avoid being eaten (e.g., hoverflies mimicking wasps).
2. **Mullerian Mimicry:** Two or more harmful species look like each other to reinforce a single warning signal to predators.

Because the benefit of mimicry is avoiding the lethal consequences of being preyed upon, Predation is the key evolutionary interaction.

Step 3: Final Answer:

Predation acts as the selective force that favors individuals with deceptive appearances, thus driving the evolution of mimicry.

Quick Tip: Mimicry and Camouflage are defense mechanisms. All defense mechanisms evolve primarily to counter the pressure of Predation.

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8. Gause's Competitive Exclusion Principle states that:

(A) Two species always coexist

(B) Species compete only indirectly

(C) Two species with identical niche cannot coexist indefinitely

(D) Competition increases biodiversity

Correct Answer: (C) Two species with identical niche cannot coexist indefinitely

Solution:

Step 1: Understanding the Concept:

G.F. Gause formulated this principle based on his experiments with *Paramecium*.

A "niche" is the specific functional role and resource requirements of a species.

Step 2: Detailed Explanation:

The principle states that two species competing for the exact same limiting resources (identical niche) cannot live together in the same place for a long time.

In such a scenario, one species will eventually prove to be slightly more efficient in using those resources.

The superior competitor will increase its population while the inferior one declines.

Eventually, the inferior competitor will be "excluded" or eliminated from that habitat.

Coexistence is only possible if the species evolve to use different resources (Resource Partitioning).

Step 3: Final Answer:

Gause's principle concludes that intense competition in identical niches leads to the local extinction of the weaker species.

Quick Tip: Key phrase: "Complete competitors cannot coexist."

If you see the word "Niche" and "Exclusion" in a question about Gause, they are directly related.

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9. Detritus food chain starts with:

(A) Living producers

(B) Dead organic matter

(C) Herbivores

(D) Carnivores

Correct Answer: (B) Dead organic matter

Solution:

Step 1: Understanding the Concept:

Ecosystems have two main energy pathways: the Grazing Food Chain (GFC) and the Detritus Food Chain (DFC).

Step 2: Detailed Explanation:

The Grazing Food Chain begins with living primary producers (plants) and solar energy.

In contrast, the Detritus Food Chain (DFC) begins with dead organic matter (detritus), such as leaf litter, dead animals, and organic waste.

This dead matter contains stored chemical energy that is utilized by detritivores (e.g., earthworms) and decomposers (e.g., bacteria, fungi).

Energy flows from these decomposers to small carnivores that feed on them.

In many terrestrial ecosystems, the DFC is the major pathway for energy flow because most of the plant biomass dies without being eaten by herbivores.

Step 3: Final Answer:

The starting point and primary energy source for a detritus food chain is non-living, dead organic matter.

Quick Tip: DFC = Dead organic matter → Detritivores → Predators.

GFC = Green plants → Herbivores → Carnivores.

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10. Brood parasitism is shown by:

(A) Cuckoo laying eggs in crow nest

(B) Orchid on tree

(C) Bacteria in gut

(D) Lichen

Correct Answer: (A) Cuckoo laying eggs in crow nest

Solution:

Step 1: Understanding the Concept:

Brood parasitism is a behavioral parasitism where one species (the parasite) tricks another species (the host) into raising its offspring.

Step 2: Detailed Explanation:

The classic example of brood parasitism is the relationship between the Cuckoo (Koel) and the Crow.

The Cuckoo does not build its own nest or incubate its eggs.

Instead, it lays its eggs in the nest of a host Crow.

The Cuckoo's eggs have evolved to look like the Crow's eggs to avoid detection.

The Crow spends its time and energy incubating the eggs and feeding the Cuckoo's hatchlings, often at the expense of its own chicks.

Evaluation of other options:

(B) Orchid on tree is Commensalism (+, 0).

(C) Bacteria in gut is usually Mutualism (+, +).

(D) Lichen is an obligate Mutualism (+, +).

Step 3: Final Answer:

The interaction where a Cuckoo uses a Crow's nest for its offspring is the standard example of brood parasitism.

Quick Tip: "Brood" refers to the young of an animal. Brood parasitism = hijacking another organism's parental care.