

# ZOO507 – PRINCIPLES OF ANIMAL ECOLOGY

## MID TERM MOST IMPORTANT QUESTIONS

PREPARED BY: **SIR MUGHAL** (ADMIN, BS ZOOLOGY ANNOUNCEMENT)

**GROUP LINK:** <https://chat.whatsapp.com/BjC6W0jZx8o9yaC2ISh1Gu>

### 1. Name three strata of tropical rainforest.

The three main strata (layers) of a tropical rainforest are:

#### 1. Emergent Layer:

- The tallest layer, with trees reaching up to 200 feet (60 meters).
- Trees here rise above all others and receive the most sunlight.
- Home to birds, bats, and some insects.

#### 2. Canopy Layer:

- Forms a dense roof of closely packed trees around 100–130 feet (30–40 meters) tall.
- Most of the rainforest's animal species live here, including monkeys, sloths, and many insects.

#### 3. Understory Layer:

- Located beneath the canopy, receiving limited sunlight.
- Contains smaller trees, shrubs, and plants adapted to low light.
- Inhabited by frogs, snakes, insects, and some mammals.

### 2. Define consumer and its types.

#### Definition of Consumer:

A consumer is an organism that cannot produce its own food and must obtain energy by eating other organisms. Consumers depend on producers (like plants) or other consumers for nutrition.

#### Types of Consumers:

- **Primary Consumers (Herbivores):** They eat producers (plants and algae). Examples: Deer, rabbits, grasshoppers.
- **Secondary Consumers (Carnivores or Omnivores):** They eat primary consumers. Examples: Frogs, small snakes, some birds.
- **Tertiary Consumers:** They eat secondary consumers. Often top predators in an ecosystem. Examples: Eagles, big cats (like lions), sharks.

- **Quaternary Consumers (Apex Predators):** They eat tertiary consumers. Have few or no natural predators. Examples: Orcas, polar bears.
- **Omnivores:** They eat both plants and animals. Can function at multiple levels in the food chain. Examples: Humans, bears, raccoons.
- **Detritivores and Decomposers (sometimes included):** They feed on dead organic matter. Examples: Earthworms (detritivores), fungi and bacteria (decomposers).

### 3. Write importance of ecology.

#### Importance of Ecology:

##### 1. **Understanding the Environment:**

Ecology helps us understand how living organisms interact with each other and with their physical surroundings, giving insight into the structure and function of natural ecosystems.

##### 2. **Environmental Conservation:**

It guides conservation efforts by identifying endangered species, fragile habitats, and the impact of human activities, helping to protect biodiversity.

##### 3. **Sustainable Resource Management:**

Ecology informs how we use natural resources like forests, water, and soil responsibly, ensuring they are available for future generations.

##### 4. **Combating Climate Change:**

By studying ecological systems, we understand the role of forests, oceans, and other ecosystems in regulating climate and carbon cycles.

##### 5. **Improving Agriculture:**

Ecological principles help in developing sustainable farming practices that maintain soil health, reduce pests naturally, and increase crop yields without harming the environment.

##### 6. **Maintaining Ecosystem Services:**

Ecology highlights the value of services provided by ecosystems—such as pollination, water purification, and nutrient cycling—that are essential for human survival.

##### 7. **Public Health and Disease Control:**

It helps track how changes in the environment influence the spread of diseases, supporting better health policies and prevention strategies.

## 4. What are flora and fauna of temperate deciduous forest?

### Flora and Fauna of Temperate Deciduous Forest

#### *Flora (Plant Life):*

Temperate deciduous forests have four seasons and rich soil, supporting a wide variety of plant life. Key flora include:

- **Deciduous Trees** (shed leaves in autumn): Oak, Maple, Beech, Birch, Hickory,
- **Shrubs and Understory Plants:** Rhododendron, Azaleas, Dogwood, Ferns,
- **Herbs and Ground Plants:** Wildflowers (e.g., trillium, violets), Mosses, Grasses

#### *Fauna (Animal Life):*

These forests support a wide range of animals adapted to seasonal changes.

- **Mammals:** Deer, Foxes, Black bears, Raccoons, Squirrels
- **Birds:** Woodpeckers, Owls, Hawks, Warblers, Turkeys
- **Reptiles and Amphibians:** Snakes, Turtles, Frogs, Salamanders
- **Insects:** Butterflies, Beetles, Ants, Bees

## 5. Give distribution of tropical forest.

### Distribution of Tropical Forests:

Tropical forests are mainly found near the equator, between the Tropic of Cancer and the Tropic of Capricorn. These regions have warm temperatures and high rainfall year-round, ideal for dense forest growth.

### Main Regions of Tropical Forest Distribution:

- **Amazon Basin (South America):** Countries: Brazil, Peru, Colombia, Venezuela, Ecuador, Bolivia. The Amazon Rainforest is the largest tropical rainforest in the world.
- **Central Africa (Congo Basin):** Countries: Democratic Republic of the Congo, Republic of the Congo, Cameroon, Gabon, Central African Republic. The Congo Rainforest is the second-largest tropical forest.
- **Southeast Asia and Pacific Islands:** Countries: Indonesia, Malaysia, Thailand, the Philippines, Papua New Guinea, Vietnam, and parts of India. Includes tropical rainforests and mangrove forests.
- **Central America and the Caribbean:** Countries: Costa Rica, Panama, Nicaragua, Honduras, and tropical islands like Puerto Rico and the Dominican Republic. Known for lush, biodiverse rainforests.
- **Northern Australia:** Especially in Queensland. Contains small but unique tropical forests like the Daintree Rainforest.

## 6. What is population ecology and its types?

### Population Ecology:

Population ecology is the branch of ecology that studies populations of organisms, especially their **size**, structure, growth, density, distribution, and how they interact with the environment over time. It focuses on how populations change and what factors influence those changes (such as birth rates, death rates, immigration, and emigration, competition, and resource availability).

### Types of Population Ecology:

#### 1. **Population Size and Density:**

- Studies how many individuals are in a population and how densely they are packed in a given area.
- Helps understand population health and resource use.

#### 2. **Population Distribution (Dispersion):**

- Describes how individuals are spread across a space.
- Types:
  - **Clumped:** Most common (e.g., animals around water sources).
  - **Uniform:** Evenly spaced (e.g., nesting birds).
  - **Random:** No specific pattern (e.g., plants with wind-dispersed seeds).

#### 3. **Population Growth:**

- Examines how populations increase or decrease over time.
- Types:
  - **Exponential Growth (J-curve):** Rapid growth under ideal conditions.
  - **Logistic Growth (S-curve):** Growth slows as resources become limited.

#### 4. **Population Structure (Age and Sex):**

- Studies the composition of a population (e.g., number of young vs. old, male vs. female).
- Important for predicting future growth and reproductive potential.

#### 5. **Population Dynamics:**

- Focuses on how populations interact with environmental factors like predators, food supply, diseases, and habitat conditions.
- Includes study of carrying capacity and limiting factors.

## 7. What are characteristics of population?

### Characteristics of Population:

1. **Size** – Total number of individuals.
2. **Density** – Number of individuals per unit area.
3. **Distribution** – Spatial arrangement: clumped, uniform, or random.
4. **Age Structure** – Proportion of individuals in different age groups.
5. **Sex Ratio** – Ratio of males to females.
6. **Birth Rate** – Number of births over time.
7. **Death Rate** – Number of deaths over time.
8. **Immigration/Emigration** – Movement in and out of the population.

## 8. What is ecosphere?

The ecosphere is the global sum of all ecosystems, representing the zone of life on Earth. It includes all living organisms (the biosphere) and their interactions with the physical components of the environment—such as air, water, soil, and sunlight. The ecosphere functions as a self-regulating system where energy flows and nutrients cycle through various living and non-living components, maintaining balance and supporting life. It encompasses land, oceans, and the atmosphere, forming a complex network of ecosystems that are interconnected and interdependent. In essence, the ecosphere is Earth's life-support system, sustaining all forms of life through continuous interaction between organisms and their environment.

## 9. Define exponential growth and logistic growth.

**Exponential growth** is a pattern of population increase where the number of individuals grows rapidly and continuously at a constant rate, resulting in a J-shaped curve. This occurs when resources are unlimited and conditions are ideal.

**Logistic growth** describes population growth that starts exponentially but slows down as the population reaches the environment's carrying capacity (maximum sustainable size). This creates an S-shaped curve, reflecting limited resources and increased competition.

## 10. Mention steps involved in carbon cycle.

### Steps Involved in the Carbon Cycle:

1. **Photosynthesis:** Plants absorb carbon dioxide ( $\text{CO}_2$ ) from the atmosphere and convert it into organic compounds like glucose using sunlight.
2. **Consumption:** Animals eat plants, transferring carbon through the food chain.
3. **Respiration:** Both plants and animals release  $\text{CO}_2$  back into the atmosphere by breaking down organic compounds for energy.
4. **Decomposition:** Decomposers break down dead organisms, releasing carbon into the soil and atmosphere.
5. **Combustion:** Burning of fossil fuels and biomass releases stored carbon as  $\text{CO}_2$  into the air.
6. **Carbon Storage:** Some carbon gets stored in oceans, fossil fuels, and soil for long periods.

## 11. What is Amensalism?

Amensalism is a type of biological interaction where one organism is harmed or inhibited, while the other is unaffected. In this relationship, one species produces substances or causes conditions that negatively impact another species without gaining any benefit itself.

### Example:

- A large tree shading smaller plants below, preventing their growth by blocking sunlight (the tree is unaffected, the smaller plants are harmed).
- The production of antibiotics by certain fungi that inhibit nearby bacteria.

## 12. What is resource partitioning?

Resource partitioning is a process where similar species living in the same habitat divide resources like food, space, or time to reduce competition and allow coexistence. By using different parts or aspects of the same resource, species avoid direct conflict and can thrive together.

### Example:

- Different bird species feeding on different parts of the same tree (some eat insects on leaves, others on bark).
- Nocturnal animals and diurnal animals feeding on the same food but at different times.

## 13. Differentiate between reuse and recycle.

**Reuse** refers to the practice of using an item multiple times in its original form or with minimal changes, instead of throwing it away after a single use. This helps reduce waste and conserves resources by extending the life of products. For example, glass jars can be cleaned and used to store food, or old clothes can be donated or repurposed as cleaning rags. Reusing items is often a simple and cost-effective way to minimize environmental impact without the need for additional processing.

**Recycle** involves collecting waste materials and processing them to create new products. Unlike reuse, recycling requires breaking down the original item through industrial processes, such as melting, pulping, or shredding, before turning it into raw materials for manufacturing. This method helps reduce the demand for virgin resources and decreases the amount of waste sent to landfills. Common examples include recycling plastic bottles into new plastic products or turning old newspapers into recycled paper. Although recycling uses energy and technology, it plays a vital role in managing waste sustainably.

## 14. What are sources of carbon?

### Sources of Carbon:

Carbon enters the environment from various natural and human-made sources, including:

1. **Atmospheric Carbon Dioxide (CO<sub>2</sub>):** Released from volcanic eruptions, respiration of plants and animals, and the decay of organic matter.
2. **Fossil Fuels:** Carbon stored in coal, oil, and natural gas is released as CO<sub>2</sub> when these fuels are burned for energy.
3. **Plants and Animals:** Through the process of respiration, both plants and animals release CO<sub>2</sub> into the atmosphere.
4. **Oceans:** Absorb CO<sub>2</sub> from the atmosphere and store large amounts of carbon in dissolved forms and marine organisms.
5. **Soil:** Contains organic carbon from decomposed plants and animals.
6. **Deforestation and Land Use Changes:** Cutting down trees releases stored carbon into the atmosphere.

## 15. How community help to understand the interaction of species?

A community in ecology refers to all the different species living and interacting in a particular area. Studying a community helps us understand how species interact with each other through relationships like competition, predation, mutualism, and commensalism. These interactions shape the structure, diversity, and stability of ecosystems. By observing communities, ecologists learn how species influence each other's survival, reproduction, and distribution. For example, understanding predator-prey dynamics or how plants and pollinators depend on each other reveals how energy and nutrients flow through ecosystems. Overall, communities provide a natural setting to study complex biological interactions and their effects on biodiversity and ecosystem health.

## 16. Explain population growth curves.

Population growth curves show how the size of a population changes over time. There are two main types:

### Exponential Growth Curve (J-shaped curve):

This curve represents rapid population increase when resources are unlimited. The population grows faster and faster, creating a steep upward curve. It often happens in new or ideal environments where there's little competition or predation.

### Logistic Growth Curve (S-shaped curve):

This curve starts with exponential growth but slows down as resources become limited and environmental resistance increases. The population growth rate decreases until it stabilizes at the **carrying capacity**—the maximum number the environment can support sustainably. This creates an S-shaped curve.

## 17. What are decomposers?

Decomposers are organisms that break down dead plants, animals, and waste materials into simpler substances. They play a crucial role in ecosystems by recycling nutrients back into the soil, making them available for plants to use. Common decomposers include fungi, bacteria, and some insects like earthworms. Without decomposers, dead organic matter would accumulate, and nutrient cycling would be disrupted, affecting the health and balance of ecosystems.

## 18. Explain climate of Coniferous forests.

The climate of coniferous forests, also known as taiga or boreal forests, is characterized by long, cold winters and short, mild summers. These forests are typically found in high northern latitudes, just below the Arctic Circle. Winters are often harsh, with heavy snowfall and temperatures that can drop well below freezing. Summers, though brief, provide enough warmth and moisture for tree growth. Precipitation is moderate, mostly falling as snow in winter. The overall climate is generally cool and moist, which suits the conifer trees like pines, spruces, and firs that dominate these forests. This climate creates a unique environment where trees have needle-like leaves adapted to conserve water and withstand cold conditions.

## 19. Why phosphorus is important?

Phosphorus is important because it is a key nutrient essential for all living organisms. It plays a crucial role in forming DNA and RNA, which carry genetic information. Phosphorus is also a vital part of ATP (adenosine triphosphate), the molecule that provides energy for many cellular processes. Additionally, it contributes to the formation of cell membranes and helps build strong bones and teeth in animals. Without phosphorus, organisms cannot grow, reproduce, or function properly, making it a fundamental element in ecosystems and life.

## 20. What is recycling? Write its benefits.

Recycling is the process of collecting and processing used materials (waste) to make new products. Instead of throwing items away, recycling transforms them into raw materials that can be reused, reducing the need for extracting fresh resources.

### Benefits of Recycling:

- Conserves natural resources like timber, water, and minerals.
- Reduces waste sent to landfills and incinerators.
- Saves energy compared to producing goods from raw materials.
- Lowers pollution by cutting down on manufacturing emissions and waste.
- Reduces greenhouse gas emissions, helping to combat climate change.
- Creates jobs in recycling and manufacturing industries.

## 21. Explain phosphorus cycle.

The phosphorus cycle is the process by which phosphorus moves through the environment, primarily between the soil, water, and living organisms. Unlike other nutrient cycles, phosphorus does not have a gaseous phase and mostly cycles through rocks, water, and living things.

1. **Weathering:** Phosphorus is released from rocks and minerals into the soil and water through natural weathering processes.
2. **Absorption by Plants:** Plants absorb phosphate ions from the soil to build important molecules like DNA, RNA, and ATP.
3. **Consumption:** Animals obtain phosphorus by eating plants or other animals.
4. **Return to Environment:** When plants and animals die or excrete waste, decomposers break down organic matter, returning phosphorus to the soil.
5. **Sedimentation:** Some phosphorus washes into water bodies and can settle as sediments, eventually forming new rocks over millions of years.
6. **Geological Uplift:** Over time, geological processes uplift these rocks, restarting the cycle.

## 22. Define: Limnology, Aestivation, Homeostasis, Sere, Succession, Food Chain, Humidity.

- **Limnology:** The scientific study of freshwater ecosystems such as lakes, rivers, ponds, and wetlands.
- **Aestivation:** A state of dormancy or inactivity that some animals enter during hot or dry periods to survive unfavorable conditions.
- **Homeostasis:** The ability of an organism or cell to maintain a stable internal environment despite changes in external conditions.
- **Sere:** A series of ecological communities that successively develop during the process of ecological succession in a particular area.
- **Succession:** The gradual and natural process by which ecosystems change and develop over time, leading to a stable climax community.
- **Food Chain:** A sequence of organisms where each is eaten by the next member in the chain, showing the flow of energy and nutrients.
- **Humidity:** The amount of water vapor present in the air.

## 23. What are laws of thermodynamics?

The laws of thermodynamics are fundamental principles that describe how energy behaves in physical systems:

### 1. First Law of Thermodynamics (Law of Energy Conservation):

Energy cannot be created or destroyed, only transformed from one form to another. The total energy of an isolated system remains constant.

### 2. Second Law of Thermodynamics:

In any energy transfer or transformation, some energy is lost as heat, increasing the entropy (disorder) of the universe. Energy transformations are not 100% efficient.

### 3. Third Law of Thermodynamics:

As the temperature of a system approaches absolute zero, the entropy of a perfect crystal approaches zero.

## 24. Name the animals of Arctic Tundra.

Animals commonly found in the Arctic Tundra include: Polar bears, Arctic foxes, Caribou (reindeer), Snowy owls, Arctic hares, Lemmings, Musk oxen, Wolverines, Seals (near coastal areas) & various migratory birds like geese and shorebirds.

## 25. What is tolerance range?

Tolerance range refers to the range of environmental conditions (such as temperature, humidity, light, or pH) within which an organism can survive, grow, and reproduce. Outside this range, the organism experiences stress or may not survive. It defines how much variation in conditions a species can handle before it becomes too difficult to live.

## 26. What is conservation of organisms?

Conservation of organisms means protecting and managing plants, animals, and their habitats to prevent extinction, maintain biodiversity, and ensure healthy ecosystems. It involves actions like preserving natural habitats, restoring damaged environments, regulating hunting and fishing, and raising awareness about the importance of wildlife. Conservation helps sustain the balance of nature and the resources that humans and other species depend on.

## 27. Differentiate between biotic and abiotic.

### Biotic Factors:

Biotic factors refer to all the living components of an ecosystem. These include plants, animals, fungi, bacteria, and any other organisms that interact with each other in various ways such as competition, predation, mutualism, and parasitism. Biotic factors influence the structure and function of ecosystems because they are involved in processes like reproduction, feeding, and growth. They depend on each other for survival and help maintain ecological balance by forming food chains and webs.

### Abiotic Factors:

Abiotic factors are the non-living physical and chemical elements in an ecosystem that influence living organisms. These include sunlight, temperature, water, air, soil, and minerals. Abiotic factors determine the conditions of the environment and affect how organisms live, grow, and reproduce. For example, the availability of sunlight affects photosynthesis in plants, while temperature influences the metabolic rates of animals. Together, abiotic factors shape the habitat and influence the distribution and behavior of living organisms.

## 28. Define commensalism.

Commensalism is a type of biological interaction where one species benefits while the other is neither helped nor harmed. In this relationship, the benefiting organism gains food, shelter, or support, but the other species remains unaffected. An example is barnacles attaching to a whale's skin—barnacles get transportation and access to food particles, while the whale is not impacted.

## 29. What is interference competition?

Interference competition occurs when organisms directly compete with each other by physically preventing others from accessing resources like food, space, or mates. This can involve aggressive behavior, territorial defense, or other interactions where one species actively inhibits another's ability to survive or reproduce. Unlike exploitative competition, which is indirect, interference competition involves direct confrontation between competitors.

### 30. What are effects of overexploitation of fishes?

The overexploitation of fishes leads to several harmful effects, including:

1. **Decline in fish populations:** Excessive fishing reduces the number of fish, sometimes to dangerously low levels, risking extinction.
2. **Disruption of aquatic ecosystems:** Removing large numbers of fish affects food chains and can cause imbalances, harming other marine life.
3. **Loss of biodiversity:** Overfishing can eliminate certain species, reducing genetic diversity and ecosystem resilience.
4. **Economic impact:** Declining fish stocks affect fisheries and communities that depend on fishing for livelihood and food.
5. **Bycatch problems:** Overfishing often involves catching non-target species, causing further damage to marine populations.

### 31. What are four levels of biological organization?

The four levels of biological organization are:

1. **Organism:** An individual living being, such as a plant, animal, or microbe.
2. **Population:** A group of individuals of the same species living in a specific area.
3. **Community:** Different populations of various species living and interacting in a particular area.
4. **Ecosystem:** A community of living organisms along with the non-living environment interacting as a system.

### 32. Define community structure.

Community structure refers to the composition and arrangement of different species living together in a particular area. It includes aspects like the number of species (species diversity), the relative abundance of each species, the types of interactions among them (such as competition or predation), and how these species are distributed in space. Community structure helps ecologists understand the complexity, stability, and functioning of ecosystems.

### 33. Name and define branches of ecology.

1. **Autecology:** The study of individual organisms and their interactions with the environment.
2. **Synecology:** The study of groups of organisms (populations and communities) and their interactions within ecosystems.
3. **Population Ecology:** Focuses on populations of a species, studying their size, density, distribution, and dynamics.
4. **Community Ecology:** Examines interactions between different species living together in a community.
5. **Ecosystem Ecology:** Studies both living organisms and their physical environment as an integrated system, including energy flow and nutrient cycling.
6. **Behavioral Ecology:** Looks at how animal behavior is influenced by ecological factors.
7. **Conservation Ecology:** Focuses on protecting and managing biodiversity and natural resources.

### 34. Differentiate between autecology and synecology.

#### Autecology:

Autecology is the branch of ecology that focuses on the study of individual organisms or a single species and how they interact with their environment. It examines the behavior, physiology, life cycle, and adaptations of one species to various environmental factors such as temperature, light, water, and soil. By understanding these interactions, autecology helps explain how a species survives, grows, and reproduces in its habitat. This branch provides detailed insights into the specific needs and responses of organisms to their surroundings.

#### Synecology:

Synecology is the study of groups of organisms, including populations and communities, and how they interact within their environment. It focuses on the relationships between different species living together, such as competition, predation, mutualism, and other ecological interactions. Synecology also explores community structure, species diversity, and how ecosystems function as a whole. By examining these interactions, synecology helps us understand the complexity and dynamics of natural communities and how multiple species coexist and affect one another.

#### Disclaimer:

*For best results, it is advised NOT to rely on this file only. Go through video lectures, handouts and other sources as well.*

*Regards,*

*Sir Mughal,*

*BS Zoology, Virtual University of Pakistan*

*B.Sc (Honors), University of Karachi.*