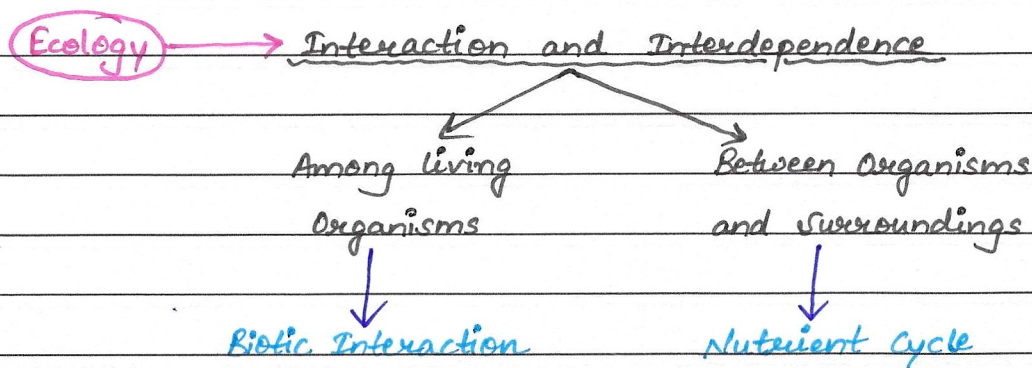




Ecology

- The word "Ecology" is derived from two Greek words — "Oikos" and "logos". Oikos means home or place to live and logos means study. So, it means the study of the house of living organisms in which they live.
- The term "ecology" was first coined and used by the German scientist "Ernst Haeckel" in 1866.
- Definition: Ecology is the scientific study of the relationship between living organisms and their environment.
 - According to Sutherland (1976), "Ecology is the science of study of the relationship of living organisms with each other and their environment".
 - According to Stiling (2002), "Ecology is the study of interactions among organisms and between organisms and their environment".
- Therefore, from the above definitions, it can be said that "Ecology is the scientific study of the interaction and interdependence among all living organisms together-with interaction with surroundings".



- Hence, Ecology helps us to understand how organisms depend on each other and interact with their environment for survival.



Types of Ecology

Ecology is the study of how living organisms interact with each other and their environment. Based on the level of interactions and focus areas, ecology is divided into different types:-





• (1.) Autecology! —

- It is the study of how a single species or individual organism interacts with its environment.
- It is also known as "Species Ecology".
- It focuses on the growth, development, survival strategies and behaviour of one species in different environmental conditions.
- Example: How a cactus survives in the desert with less water.

• (2.) Synecology! —

- It is the study of how group of organisms, many species or entire communities interact with their environment.
- It is also known as "Community Ecology".
- It examines the structure and organization of species, their behaviour and how they coexist, compete and cooperate in a shared habitat.
- Examples:
 - A forest where trees, birds, insects and animals interact together.
 - A coral reef with fish, corals and seaweed coexisting.
- Synecology is further divided into! —

• (i) Population Ecology! —

- * It is the study of interactions within a group of the same species (called a population).
- * It focuses on population size, growth, reproduction and how they survive.
- * Example: A herd of elephants in a jungle.



• (ii) Community Ecology! —

- * It is the study of interactions between different species living in the same area.
- * It focus on how species depend on each other (like food chains).
- * Example: Animals, plants and micro-organisms living together in a pond.

• (iii) Ecosystem Ecology! —

- * It is the study of how living organisms (plants, animals, microbes) interact with non-living components (air, water, soil, sunlight) in an environment.

* It focuses on! —

- Energy Flow (how energy moves through food chains).
- Nutrient Cycle (like the carbon cycle, nitrogen cycle).
- How living and non-living components depend on each other.

* Examples:

- A pond ecosystem where fish, algae, water and sunlight interact.
- A desert ecosystem with cacti, sand, temperature, and animals like lizard.

• (3) Habitat Ecology! —

- It is the study of specific habitats where organisms live and how they adapt to these conditions.
- It examines the conditions of the habitat like soil, temperature, sunlight, water and climate, and also examines how organisms survive in different habitats.



→ Types of Habitat Ecology:-

- * Forest Ecology → Study of forests (e.g. → Amazon Rainforest).
- * Grassland Ecology → Study of grasslands (eg. → African Savanna).
- * Freshwater Ecology → Study of rivers, lakes, and ponds (e.g. → River Ganges ecosystem).
- * Marine Ecology → Study of Oceans (eg. → Pacific ocean).
- * Coral Reef Ecology → Study of coral ecosystems (eg. → Great Barrier Reef).

→ Examples:

- Studying how mangrove trees grow in salty coastal water.
- Observing aquatic plants in a freshwater lake.
- Studying how polar bears live in the Arctic, where it's extremely cold.
- Understanding how camels survive in the hot deserts with very less water.

• (4.) Biome Ecology:-

- It is the study of how large ecological regions, called biomes, function. A biome is a big area of land or water with a specific climate, distinct types of plants, animals and environmental conditions.
- It focuses on how different biological communities (groups of plants, animals and micro-organisms) interact with each other and adapt to climatic conditions like temperature, rainfall, soil type and sunlight in large areas.

→ Examples:

- Tropical rainforests with dense trees & diverse wildlife.
- Tundras with cold climates, snow & minimal vegetation.



• (5) Applied Ecology! —

→ It is the study of using ecological knowledge to solve environmental problems and manage natural resources sustainably.

→ It focuses on conservation, resource management and reducing environmental issues like pollution and biodiversity loss.

→ Examples:

- Wildlife conservation to protect endangered species.
- Sustainable farming to improve crop production without harming the environment.
- Pollution control to keep water bodies clean.

• (6) System Ecology! —

→ This branch of ecology uses mathematical models and formulas to understand how ecological concepts and systems work.

→ It describes complex ecological processes like energy flow and nutrient cycle with the help of formulas and models.

→ Examples:

- Using computer models to predict climate change effects on the environment.
- Modeling the impact of deforestation on carbon-dioxide levels.

• (7) Genecology! —

→ It is the study of how the genetic composition of organisms changes in response to different environmental



conditions.

→ It focuses on how genes help species adapt, survive and evolve in various habitats, leading to the development of new species or ecotypes.

→ Examples:

- Studying how wheat varieties develop resistance to drought in dry regions.
- Observing genetic changes in frogs that help them survive in polluted water.
- Understanding how polar bears have evolved thick fur and fat layers to survive in freezing temperatures.

• (8) Social Ecology! —

→ This concept was introduced by an American thinker "Murray Bookchin".

→ This type of ecology connects ecological problems with social issues like poverty, inequality and cultural conflicts.

→ It suggests that to solve environmental problems, we must also address social issues such as poor governance, economic inequality and industrialization.

→ Focus:

- Human impact on the environment.
- Solutions to both environmental and social issues.

→ Examples:

- Deforestation caused by industrial activities, affecting both nature and local communities.
- Impact of Urbanization on green spaces and wildlife habitats.



MCQs

Q① Who coined the term "ecology"?

- a) Charles Darwin
- b) Carl Linnaeus
- c) Jean-Baptiste Lamarck
- ☒ d) Ernst Haeckel

Answer: (d) Ernst Haeckel

Explanation: The term "ecology" was coined by the German scientist "Ernst Haeckel" in 1866. He derived it from the Greek words — oikos (meaning "home") and logos (meaning "study").

Q② What does autecology focus on?

- a) The study of multiple species in an ecosystem.
- b) The study of human impact on the environment.
- c) The study of individual organisms and their environment.
- ☒ d) The study of plant and animal interrelations.

Answer: (c) The study of individual organisms and their environment.

Explanation: Autecology focuses on studying how a single species or individual organism interacts with its environment. It is also known as "Species Ecology".

Q③ Which type of ecology studies the flow of energy and nutrients through ecosystems?

- ☒ a) Ecosystem Ecology
- b) Population Ecology
- c) Biome Ecology
- d) Habitat Ecology



Answer: (a) Ecosystem Ecology

Explanation: Ecosystem Ecology examines how energy flows & nutrient cycle through different ecosystems, connecting the living and non-living components of an environment.

Q(4) What is the primary concern of applied ecology?

- a) Studying basic ecological concepts
- b) Understanding the structure of ecosystems
- ☒ c) Implementing ecological knowledge to solve environmental problems
- d) Analyzing the behaviour of endangered species

Answer: (c) Implementing ecological knowledge to solve environmental problems

Explanation: Applied ecology focuses on using ecological principles to address practical environmental issues such as conservation, resource management and climate change.

Q(5) Which of the following is NOT an example of a synecology study?

- a) Studying how different plant species compete for sunlight in a forest
- b) Studying the mutualistic relationship between bees and flowers
- c) Studying the impact of predators on prey populations
- ☒ d) Studying how squirrels adapt to cold weather

Answer: (d) Studying how squirrel adapt to cold weather

Explanation: Synecology is all about how group of organisms or different species interacts with each other in a community. "The adaptation of squirrels to cold weather would be studied in autecology, not in synecology."