ECOSYSTEM

What is an Ecosystem?

1. The Living and Non-Living World

An ecosystem is not just a place; it is a complex "web" of relationships. It consists of all the living things in a specific area interacting with each other and with the physical environment.

Ecosystems can be as large as the **Amazon Rainforest** or as small as a **single puddle** of water after a rainstorm. Every ecosystem is unique because of its climate, soil, and the species that live there.

2. Biotic and Abiotic Factors

To understand how an ecosystem works, we must divide it into two categories:

- **Biotic Factors (The Living):** These include animals, plants, fungi, and bacteria. Even a fallen log is biotic because it was once part of a living tree and is now home to insects and fungi.
- **Abiotic Factors (The Non-Living):** These are the things that organisms need to survive but are not alive themselves. The most important are:
    - **Sunlight:** The primary source of energy.
    - **Water:** Essential for all known forms of life.
    - **Soil:** Provides nutrients and a home for plants.
    - **Temperature:** Determines which animals can survive (e.g., a polar bear cannot live in a desert).

Energy Flow – Producers and Consumers

1. The Role of Producers

Everything starts with the sun. **Producers** (mostly green plants and algae) are the only organisms that can turn sunlight into food. This process is called **Photosynthesis**. Without producers, no other life could exist in the ecosystem because there would be no energy.

2. The Role of Consumers

Animals are called **Consumers** because they cannot make their own food; they must "consume" other organisms.

- **Herbivores:** Animals that eat only plants (e.g., deer, rabbits, cows).
- **Carnivores:** Animals that eat other animals (e.g., lions, hawks, sharks).
- **Omnivores:** Animals that eat both plants and animals (e.g., humans, bears, monkeys).

3. The Role of Decomposers

When a plant or animal dies, the energy doesn't just disappear. **Decomposers** (like mushrooms, mold, and bacteria) go to work. They break down dead matter and turn it into **nutrients**. These nutrients go back into the soil, which helps new plants grow. This is the "Circle of Life."

Food Chains and Food Webs

1. The Food Chain

A food chain is a simple path that shows "who eats whom." It shows how energy moves from one organism to another.

2. The Food Web

In the real world, ecosystems are more complicated. A hawk doesn't just eat frogs; it might eat mice or snakes too. When many food chains in one area are connected, we call it a **Food Web**.

3. The Trophic Levels

Each step in a food chain is called a **Trophic Level**. Usually, there are only 4 or 5 levels. Why? Because as energy moves up the chain, most of it is lost as heat. This is why there are always many more plants (producers) than there are top predators (like lions or eagles).

Types of Biomes

An ecosystem's character is defined by its **Biome**—a large geographical area with a specific climate.

1. Terrestrial Biomes (Land)

- **Forests:** Tropical (hot and wet), Temperate (four seasons), and Boreal (cold and snowy).
- **Deserts:** Very dry areas with plants like cacti that store water.
- **Grasslands:** Wide open spaces with few trees, home to many large herbivores.
- **Tundra:** The coldest biome, where the ground is often frozen.

2. Aquatic Biomes (Water)

- **Freshwater:** Rivers, lakes, and wetlands. These have very little salt.
- **Marine:** Oceans and coral reefs. These contain saltwater and cover about 70% of the Earth's surface.

Biodiversity and Balance

1. What is Biodiversity?

Biodiversity is a measure of how many different species live in an ecosystem. An ecosystem with high biodiversity (like a coral reef) is much stronger than one with low biodiversity. If one type of plant dies out in a high-biodiversity area, the animals have other options to eat.

2. The Balance of Nature

Ecosystems are naturally balanced. For example, if there are too many rabbits, they will eat all the grass. Then, some rabbits will starve, or foxes will eat more rabbits. This keeps the population numbers stable.

3. Human Impact

Unfortunately, humans often disrupt this balance through:

- **Pollution:** Chemicals that kill decomposers or poison water.
- **Habitat Destruction:** Clearing land for houses, which leaves animals with no place to live.
- **Overfishing/Overhunting:** Removing too many predators or prey from the chain.

Exercises

Task 1: Vocabulary Match

1. Biotic	A. An animal that eats both plants and meat.
2. Abiotic	B. The process plants use to make food.
3. Photosynthesis	C. Living parts of an ecosystem.
4. Omnivore	D. Non-living parts of an ecosystem.
5. Niche	E. The specific role or "job" an organism has.
6. Herbivore	F. An animal that eats only plants.
7. Aquatic	G. A very dry land biome.
8. Desert	H. Related to water ecosystems.
9. Primary Consumer	I. An animal that eats producers.
10. Decomposer	J. Organism that recycles nutrients into soil.

Task 2: Gap Fill

Keywords: biodiversity, producers, consumers, chain, habitat, extinct, marine, nutrients, balance, sunlight

1. Every food chain begins with energy from _____.
2. Trees and flowers are _____ because they make their own food.
3. A _____ ecosystem like the ocean contains saltwater.

4. The tropical rainforest is famous for its high _____.
5. When a forest is cut down, many animals lose their _____.
6. A food _____ shows a single path of energy.
7. If a species is no longer found on Earth, it is _____.
8. Decomposers return important _____ to the ground.
9. Predators help maintain the _____ of nature by controlling populations.
10. Humans are _____ because we eat plants and animals.

Task 3: The "What Happens Next?" Scenario

In an ecosystem, one change causes a "domino effect." Read the scenario and predict the result.

The Scenario: A beautiful lake ecosystem has many **Algae (Producers)**, **Small Fish (Primary Consumers)**, and **Large Birds (Predators)**. Suddenly, a new factory nearby causes water pollution that kills most of the **Small Fish**.

1. What will happen to the population of **Algae**? Why?

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2. What will happen to the **Large Birds**? Why?

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3. If the birds leave the lake to find food elsewhere, how does this affect the **Biodiversity** of this lake?

Task 4: Build a Food Web (Mapping)

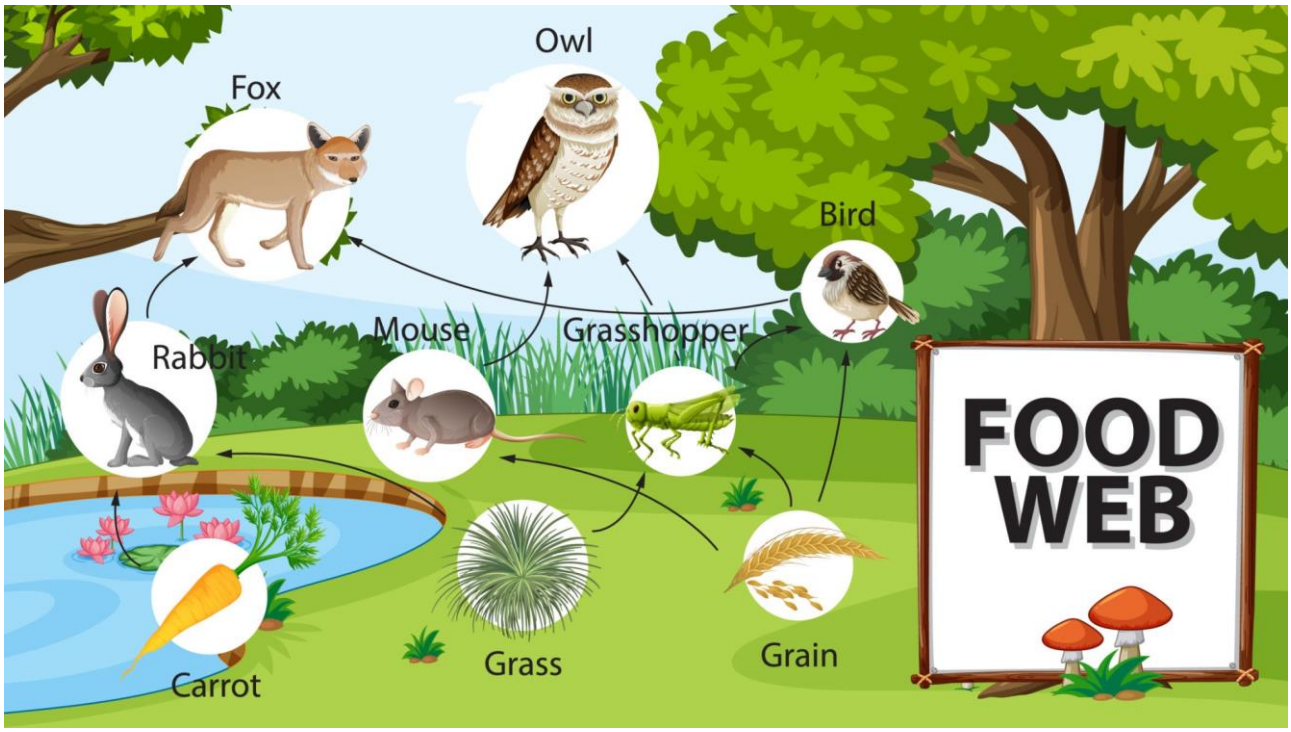
Look at the list of organisms found in a Forest Ecosystem. Draw lines to connect them to create a complex web, then answer the questions.

Organisms: * Sun

- **Berries & Grass** (Producers)
- **Mouse** (Eats berries/grass)
- **Rabbit** (Eats grass)
- **Snake** (Eats mice)
- **Fox** (Eats rabbits and mice)
- **Eagle** (Eats snakes and rabbits)
- **Mushrooms** (Decomposers)

1. Identify one **Top Predator** in your web: _____
2. Identify one **Omnivore** (if you added humans or bears): _____

3. Which organism is responsible for cleaning up the "waste" in the forest? _____



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Task 5: The "Invasive Species" Case Study (Problem Solving)

An Invasive Species is an animal or plant that is brought to a new place where it doesn't belong. Read the case study and answer the questions.

Case Study: In the 1930s, "Cane Toads" were brought to Australia to eat beetles that were destroying sugar crops. However, the toads had no natural predators in Australia. Their skin is poisonous, so local snakes and crocodiles died when they tried to eat the toads. The toad population grew from 100 to over 200 million.

1. Why did the Cane Toad population grow so fast? A. They were very friendly. B. They had no natural predators to keep their numbers in balance. C. They ate the crocodiles.
2. The Cane Toad is an example of a disruption to the **Balance of Nature**. What is the main threat they pose to the ecosystem?

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3. **Discussion:** Should humans intervene (interfere) to fix this, or should we let nature solve it?

TEACHER'S ANSWER KEYS

Task 1: 1-C, 2-D, 3-B, 4-A, 5-E, 6-F, 7-H, 8-G, 9-I, 10-J

Task 2: 1.sunlight, 2.producers, 3.marine, 4.biodiversity, 5.habitat, 6.chain, 7.extinct, 8.nutrients, 9.balance, 10.consumers.

Task 3 (Scenario):

1. **Algae population will increase.** (Because the fish that eat them are gone).
2. **Large Birds will decrease or leave.** (Because their food source, the fish, has disappeared).
3. **Biodiversity will decrease.** (The lake loses species and the balance is destroyed).

Task 4 (Food Web):

1. **Eagle or Fox.**
2. **Fox** (can be considered an omnivore) or **Bear/Human** if added.
3. **Mushrooms** (Decomposers).

Task 5 (Invasive Species):

1. **B** (No natural predators).
2. **They kill native predators** (snakes/crocodiles) and compete with local animals for food, leading to a loss of biodiversity.
3. *Student's own opinion.* (Usually focusing on conservation efforts or the dangers of human interference).

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