

# Chapter 4 Notes

## Section 1

### Objectives

- **Distinguish** between the biotic and abiotic factors in an ecosystem.
- **Describe** how a population differs from a species.
- **Explain** how habitats are important for organisms.

### Defining an Ecosystem

- **Ecosystems** are \_\_\_\_\_ of organisms and their abiotic environment.
- Examples are an oak forest or a coral reef.
- Ecosystems do not have clear \_\_\_\_\_.
- Things move from one ecosystem to another. Pollen can blow from a forest into a field, soil can wash from a mountain into a lake, and birds migrate from state to state.

### Levels of Ecological Organization

- Organism – Population – Community – \_\_\_\_\_ - Biosphere

### The Components of an Ecosystem

- In order to survive, ecosystems need \_\_\_\_\_ basic components: energy, mineral nutrients, water, oxygen, and living organisms.
- Plants and rocks are components of the land ecosystems, while most of the energy of an ecosystem comes from the sun.
- If one part of the ecosystem is \_\_\_\_\_ or \_\_\_\_\_, the entire system will be affected.

### Biotic and Abiotic Factors

- **Biotic factors** are environmental factors that are associated with or results from the activities of \_\_\_\_\_ which includes plants, animals, dead organisms, and the waste products of organisms.
- **Abiotic factors** are environmental factors that are not associated with the activities of living organisms which includes \_\_\_\_\_, \_\_\_\_\_, rocks, and temperature.
- Scientists can organize these living and nonliving things into various levels.

### Organisms

- **Organisms** are living things that can carry out life processes \_\_\_\_\_.
- You are an organism, as is an ant, and ivy plant, and each of the many bacteria living in your intestines.
- Every organism is a member of a \_\_\_\_\_.
- **Species** are groups of organisms that are closely related, and can mate to produce fertile offspring.

### Populations

- Members of a species may not all live in the same place. Field mice in Maine will not interact with field mice in Texas. However, each organism lives as part of a \_\_\_\_\_.
- Populations are groups of organisms of the same species that live in a specific \_\_\_\_\_ area and interbreed.
- For example, all the field mice in a corn field make up a population of field mice.
- An important characteristic of a population is that its members usually \_\_\_\_\_ with one another rather than with members of other populations
- For example, bison will usually mate with another member of the same \_\_\_\_\_, just as wildflowers will usually be \_\_\_\_\_ by other flowers in the same field.

## Communities

- **Communities** are groups of \_\_\_\_\_ species that live in the same habitat and interact with each other.
- Every population is part of a community.
- The most obvious difference between communities is the types of \_\_\_\_\_ they have.
- Land communities are often dominated by a few species of \_\_\_\_\_. These plants then determine what other \_\_\_\_\_ can live in that community.

## Habitat

- **Habitats** are places where an organism usually \_\_\_\_\_.
- Every habitat has specific characteristics that the organisms that live there need to survive. If any of these factors change, the habitat changes.
- Organisms tend to be very well suited to their \_\_\_\_\_. If fact, animals and plants usually cannot survive for long periods of time away from their natural habitat.

## Section 2

### Objectives

- **Explain** the process of evolution by natural selection.
- **Explain** the concept of adaptation.
- **Describe** the steps by which a population of insects becomes resistant to pesticide.

### Evolution by Natural Selection

- English naturalist \_\_\_\_\_ observed that organisms in a population differ slightly from each other in form, function, and behavior.
- Some of these differences are \_\_\_\_\_.
- Darwin proposed that the environment exerts a strong \_\_\_\_\_ over which individuals survive to produce offspring, and that some individuals, because of certain traits, are more likely to survive and reproduce than other individuals.
- **Natural selection** is the process by which individuals that have \_\_\_\_\_ variations and are better adapted to their environment \_\_\_\_\_ and reproduce more successfully than less well adapted individuals do.
- Darwin proposed that over many generations, natural selection causes the characteristics of populations to change.
- **Evolution** is a change in the \_\_\_\_\_ of a population from one generation to the next.

### Nature Selects

- Darwin thought that nature selects for certain traits, such as sharper claws, because organisms with these traits are more likely to survive.
- Over time, the population includes a greater and greater \_\_\_\_\_ of organisms with the beneficial trait.
- As the populations of a given species change, so does the species.

### Summary of Natural Selection

1. Organisms produce more offspring than can survive.
2. The environment is hostile and contains \_\_\_\_\_.
3. Organisms differ in the \_\_\_\_\_ they have.
4. Some inherited traits provide organisms with an \_\_\_\_\_.
5. Each generation contains proportionately more organisms with advantageous traits.

### Nature Selects

- An example of evolution is a population of deer that became isolated in a cold area.
- Some of the deer had \_\_\_\_\_ for thicker, warmer fur. These deer were more likely to survive, and their young with thick fur were more likely to survive to reproduce.
- **Adaptation** is the process of becoming adapted to an environment. It is an anatomical, physiological, or \_\_\_\_\_ change that improves a population's ability to survive.

### Evolution by Artificial Selection

- **Artificial selection** is the selective \_\_\_\_\_ of organisms, by humans, for specific desirable characteristics.
- Dogs have been bred for certain characteristics.
- Fruits, grains, and vegetables are also produced by artificial selection. Humans save seeds from the largest, and sweetest fruits. By selecting for these traits, \_\_\_\_\_ direct the evolution of crop plants to produce larger, sweeter fruit.

### Evolution of Resistance

- **Resistance** is the ability of an organism to \_\_\_\_\_ a chemical or disease-causing agent.
- An organism may be resistant to a chemical when it contains a \_\_\_\_\_ that allows it to break down a chemical into \_\_\_\_\_ substances.
- Humans promote the evolution of resistant populations by trying to control pests and bacteria with \_\_\_\_\_.

### Pesticide Resistance

- A pesticide sprayed on corn to kill grasshoppers, for example, may kill \_\_\_\_\_ of the grasshoppers, but those that survive happen to have a gene that protects them from the pesticide. These surviving insects \_\_\_\_\_ this resistant gene to their offspring.
- Each time the corn is sprayed, more resistant grasshoppers enter the population. Eventually the \_\_\_\_\_ population will be resistant, making the pesticide \_\_\_\_\_.

## Section 3

### Objectives

- **Name** the six kingdoms of organisms and identify two characteristics of each.
- **Explain** the importance of bacteria and fungi in the environment.
- **Describe** the importance of protists in the ocean environment.
- **Describe** how angiosperms and animals depend on each other.
- **Explain** why insects are such successful animals

### The Diversity of Living Things

- Most scientists classify organisms into \_\_\_\_\_ kingdoms based on different characteristics.
- Members of the six kingdoms get their \_\_\_\_\_ in different ways and are made up of different
- types of \_\_\_\_\_, the smallest unit of biological organization.
- The cells of animals, plants, fungi, and protists all contain a \_\_\_\_\_. While cells of bacteria, fungi, and plants all have cell walls.

### The Kingdoms of Life

- Archaeobacteria – Eubacteria – Fungi – Protists – Plants - Animals

### Bacteria

- **Bacteria** are extremely small, \_\_\_\_\_ organisms that usually have a cell wall and reproduce by cell division.
- Unlike all other organisms, bacteria lack \_\_\_\_\_.
- There are two main kinds of bacteria, \_\_\_\_\_ and eubacteria. Most bacteria are eubacteria.
- Bacteria live in every habitat on Earth, from hot springs to the bodies of animals.
- Some kinds of bacteria break down the remains and wastes of other organisms and return the \_\_\_\_\_ to the soil.
- Others recycle nutrients, such as nitrogen and phosphorus.
- Certain bacteria can convert \_\_\_\_\_ from the air into a form that plants can use. This conversion is important because nitrogen is the main component of proteins and genetic material.

### **Bacteria and the Environment**

- Bacteria also allow many organisms, including humans, to extract certain nutrients from their food.
- The bacterium, **Escherichia coli** or **E. coli**, is found in the intestines of humans and other animals and helps digest food and release \_\_\_\_\_ that humans need.

### **Fungi**

- A **fungus** is an organism whose cells have nuclei, rigid cell walls, and no \_\_\_\_\_ and that belongs to the kingdom Fungi.
- Cell walls act like mini-skeletons that allow fungi to stand up right.
- A mushroom is the \_\_\_\_\_ structure of a fungus. The rest of the fungus is an underground network of fibers that absorb food from \_\_\_\_\_ in the soil.
- Fungi get their food by releasing \_\_\_\_\_ that help break down organic matter, and then \_\_\_\_\_ the nutrients.
- The bodies of most fungi are huge networks of threads that grow through the soil dead wood, or other material on which the fungi is feeding.
- Like bacteria, fungi play an important role in breaking down the bodies of dead organisms.
- Some fungi, like some bacteria, cause \_\_\_\_\_. Athlete's foot is an example of a condition caused by fungi.
- Other fungi add flavor to food as in \_\_\_\_\_. The fungus gives the cheese both its blue color and strong flavor.
- Yeasts are fungi that produce the \_\_\_\_\_ that makes bread rise.

### **Protists**

- **Protists** are diverse organisms that belong to the kingdom Protista.
- Some, like \_\_\_\_\_, are animal-like. Others are \_\_\_\_\_, such as kelp, and some resemble fungi.

- Most protists are one-celled microscopic organisms, including diatoms, which float on the ocean surface.
- Another protist, **Plasmodium**, is the one-celled organism that causes the disease \_\_\_\_\_.
- From an environmental standpoint, the most important protists are \_\_\_\_\_.
- Algae are plantlike protists that can make their own food using the energy from the sun.
- They range in size from the giant kelp to the one-celled phytoplankton, which are the \_\_\_\_\_ source of food in most ocean and freshwater ecosystems.

## Plants

- Plants are many-celled organisms that make their own food using the sun's energy and have cell walls.
- Most plants live on land where they use their \_\_\_\_\_ to get sunlight, oxygen, and carbon dioxide from the air. While absorbing nutrients and water from the soil using their \_\_\_\_\_.
- Leaves and roots are connected by vascular tissue, which has thick cell walls and serves as a system of tubes that carries \_\_\_\_\_ and \_\_\_\_\_.

## Lower Plants

- The first land plants had no vascular tissue, and swimming \_\_\_\_\_. They therefore had to live in damp places and couldn't grow very large.
- Their descendents alive today are small plants such as \_\_\_\_\_.
- \_\_\_\_\_ and club mosses were the first vascular plants, with some of the ferns being as large as small trees.

## Gymnosperms

- **Gymnosperms** are woody vascular plants whose seeds are not enclosed by an ovary or fruit.
- Conifers, such as pine trees, are gymnosperms that bear cones.
- Much of our lumber and paper comes from gymnosperms.
- Gymnosperms have several adaptations that allow them to live in \_\_\_\_\_ conditions than lower plants.
  - They can produce \_\_\_\_\_, which protects and moves sperm between plants.
  - These plants also produce seeds, which protect developing plants from drying out.
  - A conifer's needle-like leaves also lose little \_\_\_\_\_.

## Angiosperms

- **Angiosperms** are flowering plants that produce seeds within \_\_\_\_\_. Most land plants are angiosperms.
- The flower is the reproductive structure of the plant. Some angiosperms, like grasses, have small flowers, that use wind to disperse their pollen.
- Other angiosperms have large flowers to attract \_\_\_\_\_ and birds. Many flowering plants depend on \_\_\_\_\_ to disperse their seeds and carry their pollen.

- Most land animals are \_\_\_\_\_ on flowering plants.
- Most of the food we eat, such as wheat, rice, beans, oranges, and lettuce comes from flowering plants.
- Building materials and \_\_\_\_\_, such as oak and cotton, also come from flowering plants.

### **Animals**

- Animals cannot make their own \_\_\_\_\_. They must take it in from the environment.
- Animal cells also have no cell walls, making their bodies soft and \_\_\_\_\_. Although, some animals have evolved hard exoskeletons.
- As a result, animals are much more \_\_\_\_\_ than plants. All animals move around in their environment during at least one stage in their lives.

### **Invertebrates**

- **Invertebrates** are animals that do not have \_\_\_\_\_.
- Many live attached to hard surfaces in the ocean and \_\_\_\_\_ their food out of the water, such as corals, various worms, and mollusks.
- These organisms are only mobile when they are \_\_\_\_\_. At this early stage in their life they are part of the ocean's plankton.
- Other invertebrates, including squid in the ocean and insects on land, actively move in search of food.
- More \_\_\_\_\_ exist on Earth than any other type of animal.
- Insects are successful for many reasons: they have a waterproof skeleton, can move and reproduce quickly, most insects can fly, and their small size allows them to live on little food and to hide from enemies in small places.
- Many insects and plants have evolved \_\_\_\_\_ and depend on each other to survive.
- Insects carry pollen from male fruit parts to fertilize a plant's egg, which develops into fruits such as tomatoes, cucumbers, and apples.
- Insects are also valuable because they eat other insects that we consider to be pests.
- However, insects and humans are often \_\_\_\_\_.
- Bloodsucking insects transmit human \_\_\_\_\_ such as malaria, sleeping sickness, and West Nile virus.
- Insects do most damage indirectly by eating our \_\_\_\_\_.

### **Vertebrates**

- **Vertebrates** are animals that have a backbone, and include mammals, birds, reptiles, amphibians, and fish.
- The first vertebrates were \_\_\_\_\_, but today most vertebrates live on land.
- The first land vertebrates were \_\_\_\_\_. These animals were successful because they have an almost waterproof egg which allows the egg to hatch on land, away from predators in the water.
- Birds are warm-blooded vertebrates with \_\_\_\_\_. They keep their hard shelled eggs and young warm until they have developed insulating layers of fat and feathers.
- Mammals are warm-blooded vertebrates that have fur and feed their young \_\_\_\_\_.
- Birds and mammals have the ability to maintain a high \_\_\_\_\_ which allows them to live in cold areas, where other animals cannot live.