

Biology Note-taking Handout  
Ecology

Ecology is the scientific study of the \_\_\_\_\_ between organisms and \_\_\_\_\_ and between organisms and \_\_\_\_\_.

These interactions can be studied on many levels. The levels of organization here are listed in order from the largest and most general to the smallest and most specific:

**Biosphere**

**Biome**

**Ecosystem**

**Community**

**Population**

**The definition of *species* is**

**WHAT SHAPES AN ECOSYSTEM**

**Biotic and Abiotic Factors**

Biotic factors include \_\_\_\_\_

examples of biotic factors-

Abiotic factors are \_\_\_\_\_

examples of abiotic factors –

### **The Concept of Niche**

The term **habitat** refers to \_\_\_\_\_

The term **niche** refers to \_\_\_\_\_

An organism's niche though is more than just its "job". An organism's niche is determined by \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

If two niches overlap \_\_\_\_\_

**Biodiversity** is \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

What type of ecosystem will more easily recover from some kind of disturbance?

\_\_\_\_\_

At the core of every organism's interaction with the environment is its need for

\_\_\_\_\_.

The flow of energy through an ecosystem is one of the most important factors that determines \_\_\_\_\_

\_\_\_\_\_

### **PRODUCERS**

\_\_\_\_\_ is the main energy source for life on Earth. Of all of the sun's energy that reaches the Earth's surface only \_\_\_\_\_ is used by living things.

In some ecosystems, organisms obtain energy from a source other than sunlight. These organisms \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

### **autotrophs**

**producers**

**Photosynthesis**

**Chemosynthesis**

**CONSUMERS**

Many organisms, including \_\_\_\_\_  
cannot harness energy directly from \_\_\_\_\_

\_\_\_\_\_

The only way these organisms can acquire energy is \_\_\_\_\_

**heterotrophs**

**consumers**

**herbivores**

**carnivores**

**omnivores**

**Detritivores**

## decomposers

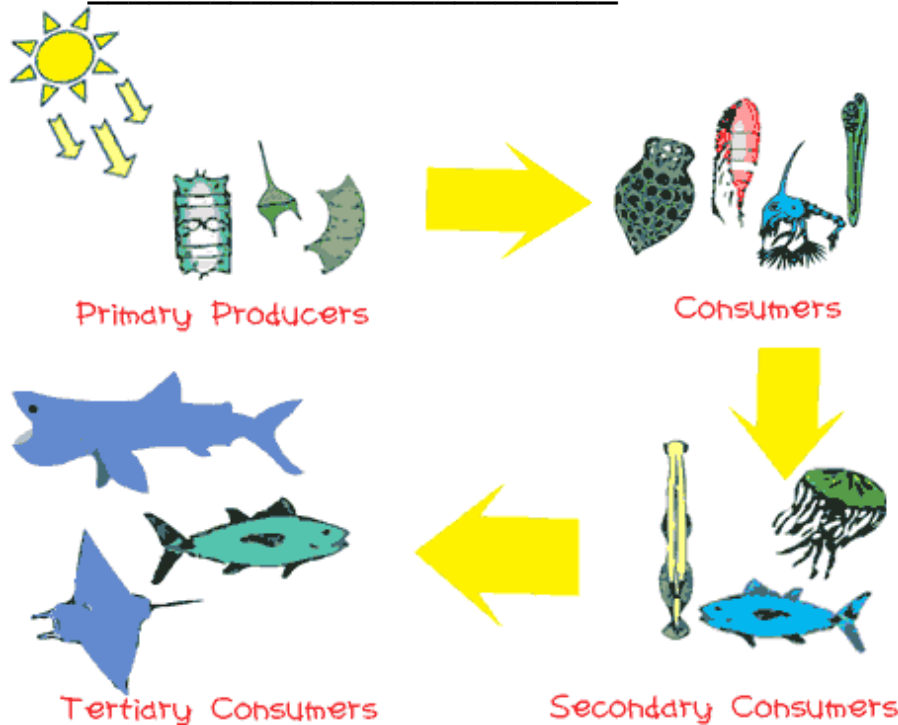
### FEEDING RELATIONSHIPS

Energy flows through an ecosystem in \_\_\_\_\_  
From the \_\_\_\_\_ to \_\_\_\_\_ and then to  
various \_\_\_\_\_

The relationships between producers and the consumers who "eat" them is  
shown in a \_\_\_\_\_

### FOOD CHAINS AND FOOD WEBS

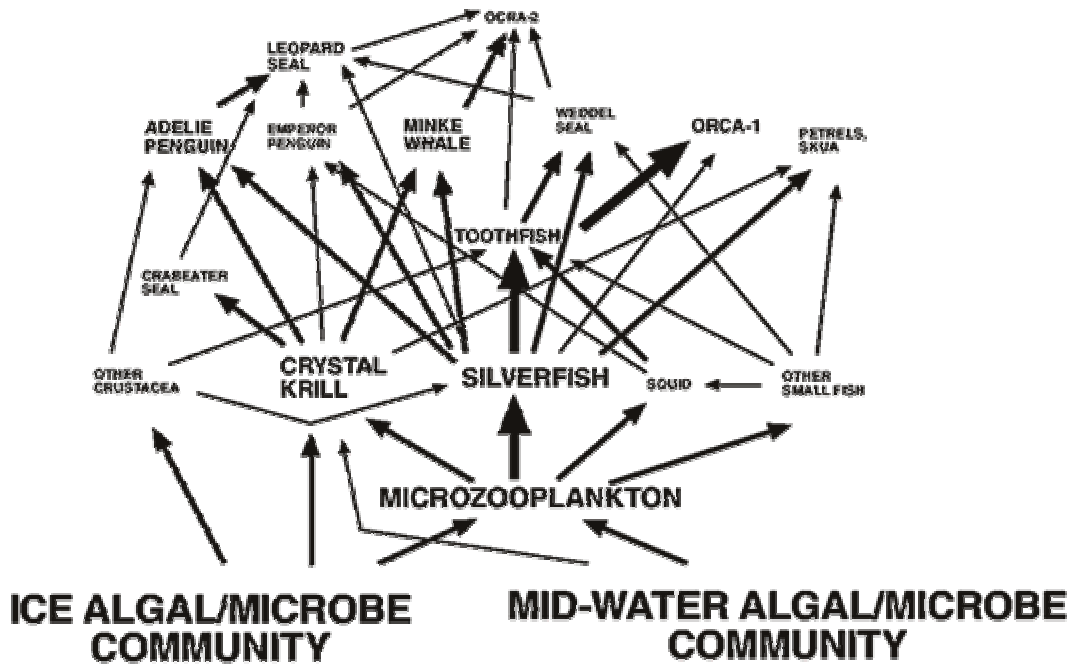
A food chain is a series of steps in which organisms transfer \_\_\_\_\_  
by eating and being eaten. **"Food" does not move through a food  
chain \_\_\_\_\_ does.**



Arrange the following organisms in a food chain:  
*small fish shark algae squid zooplankton*

Food chains must always start with \_\_\_\_\_

How are food webs different from food chains? \_\_\_\_\_



Some food chains that are found in nature include:

## TROPHIC LEVELS

Each step in a food chain or food web is called a \_\_\_\_\_  
\_\_\_\_\_ make up the \_\_\_\_\_ trophic level.  
Consumers make up the \_\_\_\_\_ trophic  
levels. Each consumer depends on the \_\_\_\_\_  
\_\_\_\_\_

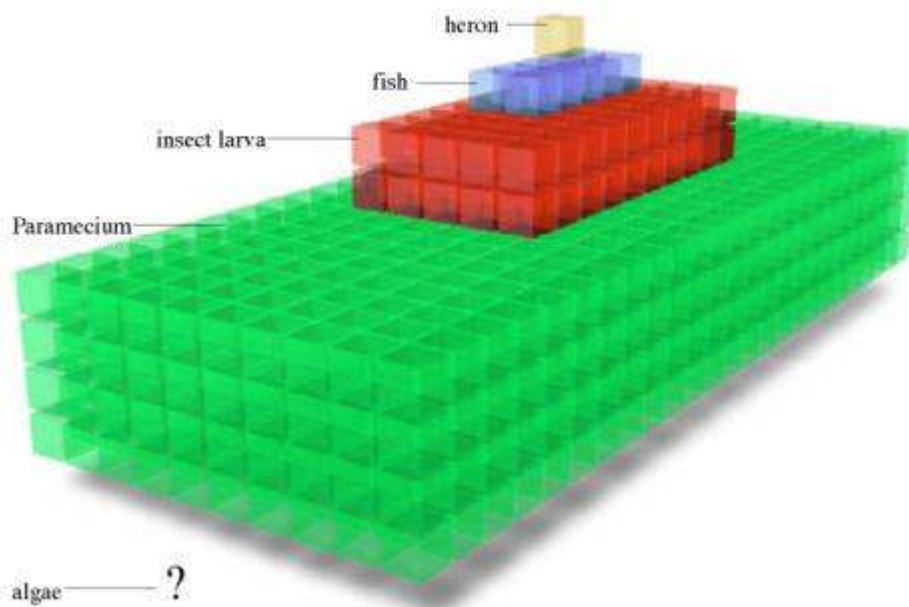
## ECOLOGICAL PYRAMIDS

The \_\_\_\_\_ of energy in an ecosystem can be represented by  
an ecological pyramid. These pyramids show the \_\_\_\_\_

There are three different ways these pyramids can be made.

### Energy Pyramids

### Biomass Pyramid



## Pyramid of Numbers

### CYCLES OF MATTER

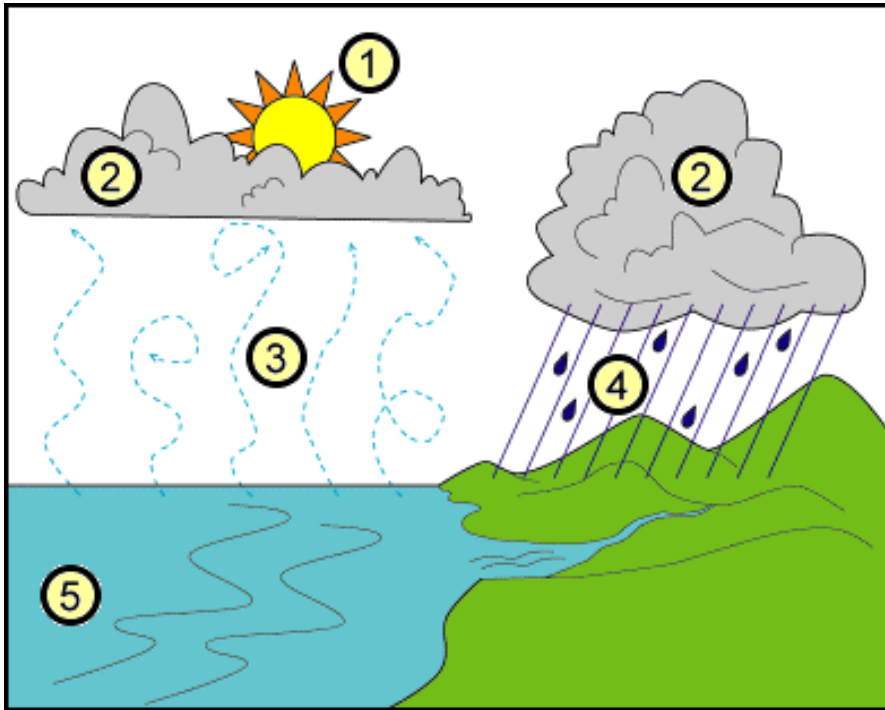
Energy is crucial to an ecosystem. But all organisms need more than energy to survive. They also need \_\_\_\_\_ and \_\_\_\_\_  
In most organisms, more than \_\_\_\_\_% of the body is made up of just four elements: \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_. Although these elements are common on Earth, they must be in a form that organisms can absorb.

**Energy only flows \_\_\_\_\_ through an ecosystem. It can never be \_\_\_\_\_. Matter however is \_\_\_\_\_**

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**biogeochemical cycles**

## The Water Cycle



①

②

③

④

⑤

Water enters the atmosphere by the processes of \_\_\_\_\_

## **NUTRIENT CYCLES**

The food you eat provides \_\_\_\_\_ and \_\_\_\_\_ that keep you alive. **Nutrients** are \_\_\_\_\_

Every living organism needs nutrients to \_\_\_\_\_ and carry out essential life functions. Like water, nutrients are passed between \_\_\_\_\_ and the \_\_\_\_\_ through \_\_\_\_\_ cycles.

### **The Carbon Cycle**

Carbon is an important component of all living things. Carbon and oxygen form Carbon dioxide is taken in by \_\_\_\_\_ during \_\_\_\_\_ and is given off during \_\_\_\_\_ by both \_\_\_\_\_ and \_\_\_\_\_.

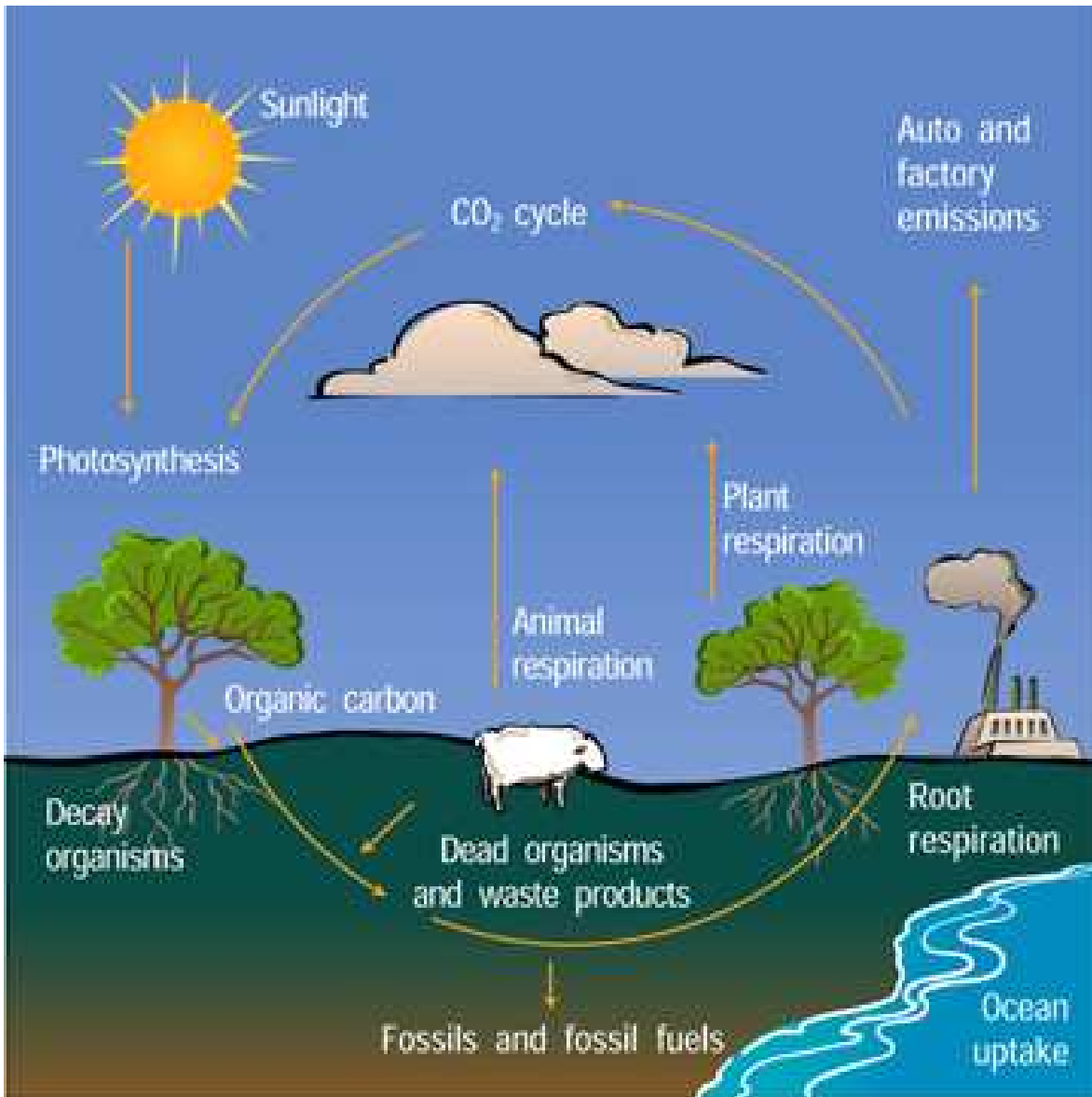
Four main processes move carbon through its cycle.

#### **Biological processes**

#### **Geochemical processes**

#### **Biogeochemical processes**

#### **Human activities**



## The Nitrogen Cycle

All organisms require nitrogen to make \_\_\_\_\_ which in turn are used to build \_\_\_\_\_. Many different forms of nitrogen occur in the biosphere.

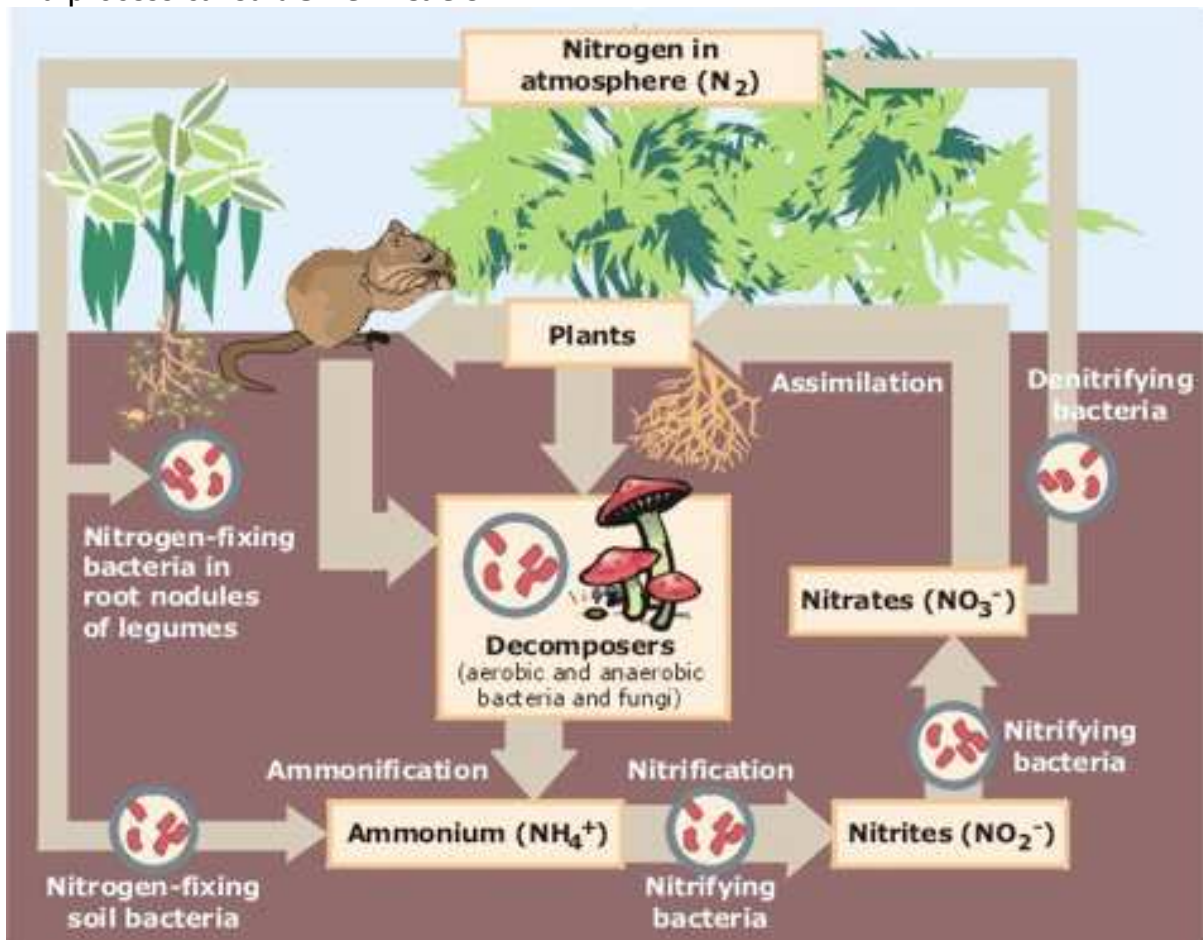
**Nitrogen gas (N<sub>2</sub>)** makes up \_\_\_\_\_% of our atmosphere. Nitrogen-containing substances like \_\_\_\_\_ (\_\_\_\_\_), \_\_\_\_\_ (\_\_\_\_\_), and \_\_\_\_\_ (\_\_\_\_\_) are found in the wastes produced by many organisms and in decaying organic matter.

Although nitrogen gas ( $N_2$ ) is the most abundant form of nitrogen, only a few types of organisms can use nitrogen in this form. These organisms include

\_\_\_\_\_ and live in the \_\_\_\_\_ and on the roots of certain plants in the legume family (\_\_\_\_\_)

**Nitrogen fixation** is the process by which \_\_\_\_\_

When organisms die, \_\_\_\_\_ return the nitrogen to the soil as \_\_\_\_\_. The ammonia may be taken up again by other \_\_\_\_\_ or converted back into nitrogen gas by another special group of bacteria called \_\_\_\_\_ in a process called **denitrification**.

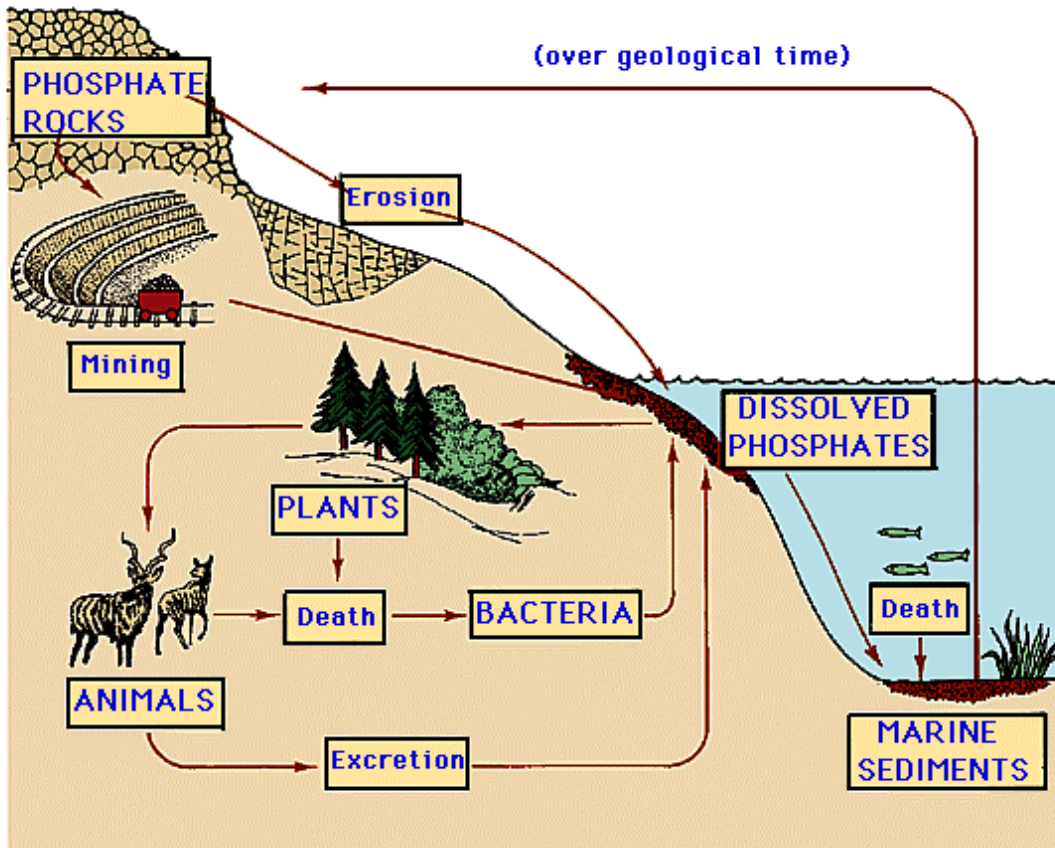


### The Phosphorus Cycle

Phosphorus is important to living things because it forms part of molecules like \_\_\_\_\_. Although phosphorus is extremely important to living things, it is not very \_\_\_\_\_ in the ecosystem.

**Unlike** carbon, nitrogen, and oxygen, phosphorus \_\_\_\_\_

Instead, phosphorus remains mostly on \_\_\_\_\_ in \_\_\_\_\_ and in ocean \_\_\_\_\_. Here the phosphorus exists in the form of **inorganic phosphate**. As the rocks and sediments wear down the phosphorus is released. The phosphate eventually makes its way to the \_\_\_\_\_ where it is used by \_\_\_\_\_



**BIOMES**

Ecologists group Earth's diverse environments into \_\_\_\_\_. A **biome** is \_\_\_\_\_

**The Major Biomes**

**Tropical rain forest**

**Tropical dry forest**

**Tropical savanna**

**Temperate grassland**

**Desert**

**Temperate woodland and shrubland**

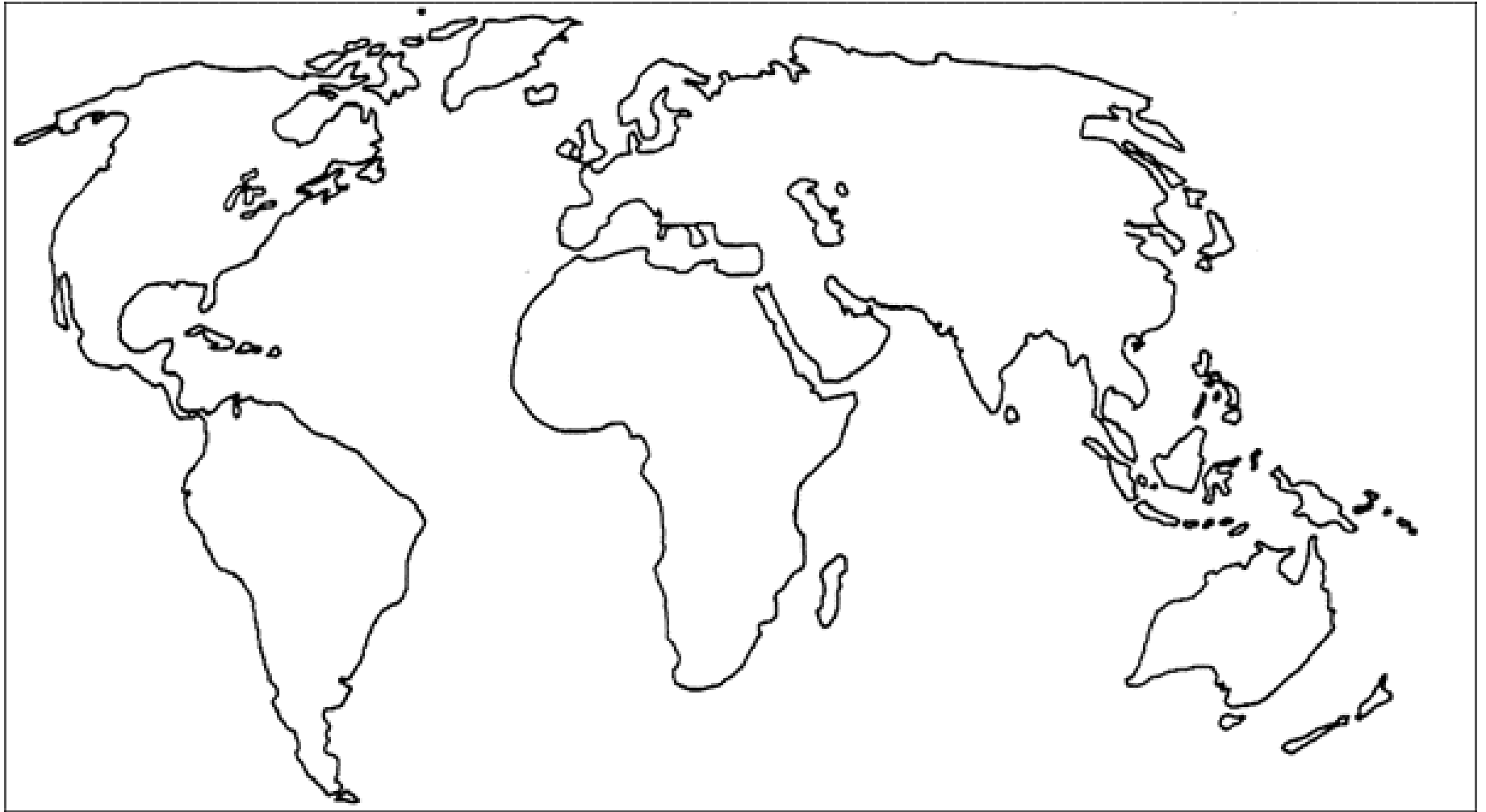
**Temperate forest**

**Northwestern coniferous forest**

**Boreal forest (taiga)**

**Tundra**

**Mountains and ice caps**



## **AQUATIC ECOSYSTEMS**

Nearly three-fourth of the Earth is covered with \_\_\_\_\_ so it's not surprising that many organisms are \_\_\_\_\_. Aquatic communities are governed by the same biotic and abiotic factors as terrestrial (\_\_\_\_\_) communities.

**The most important factors for aquatic communities are**

**(1)** \_\_\_\_\_

**(2)** \_\_\_\_\_

**(3)** \_\_\_\_\_

**(4)** \_\_\_\_\_

### **Freshwater Ecosystems**

Flowing Water Ecosystems

Standing Water Ecosystems

Freshwater Wetlands

**Estuaries**

**Marine Ecosystems**

**POPULATION GROWTH**

Three important features of a population are

- (1) \_\_\_\_\_
- (2) \_\_\_\_\_
- (3) \_\_\_\_\_

**Population density** is \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Three factors affect population size.

- (1) \_\_\_\_\_
- (2) \_\_\_\_\_
- (3) \_\_\_\_\_

**immigration** is \_\_\_\_\_  
\_\_\_\_\_

**emigration** is \_\_\_\_\_  
\_\_\_\_\_

If a population has abundant space and food, and is protected from predators and disease, then organisms in that population will multiply and the population size will \_\_\_\_\_.

What happens when organisms have everything they need to continue to multiply?

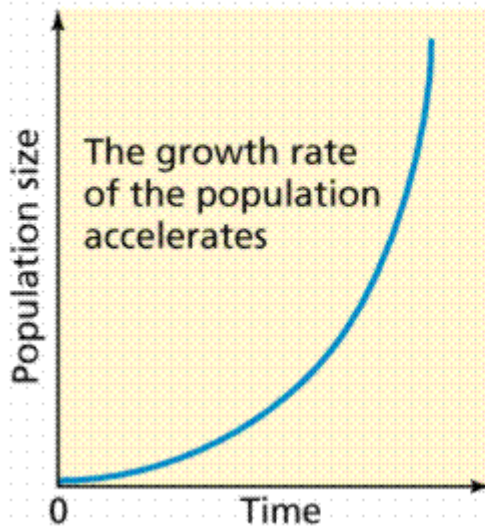
**Bacteria reproduce by splitting in half. If the bacteria have a doubling time of 20 minutes, then within 20 minutes the first bacterium will have divided to produce two bacteria. Twenty minutes later the two bacteria will be four. After another 20 minutes there will be 8 bacteria. In an hour there will be 64. In just one more hour there will be 512. In just one day, this colony of bacteria will grow to an astounding size of 4,720,000,000,000,000,000. Within several days bacteria would cover the planet.**

Under ideal conditions, with unlimited resources, a population grows

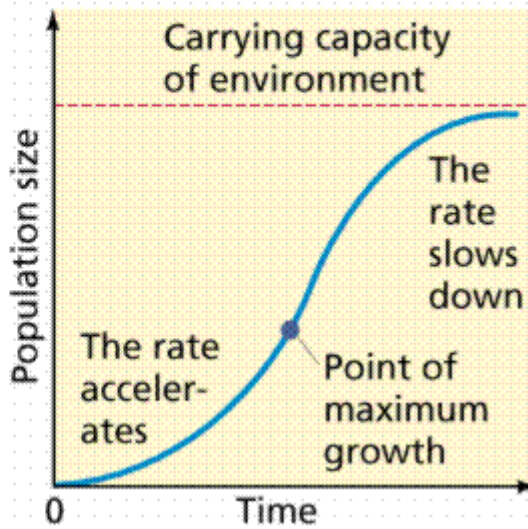
**exponentially.**

**Exponential growth** is \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(a) Exponential (unrestricted) growth



(b) Logistic (restricted) growth



Populations though do not always exist under ideal conditions. As populations increase conditions become less favorable.

### Carrying capacity

### Limiting factors

Density-dependent limiting factors:

Density-independent limiting factors: