Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_ Block \_\_\_\_\_\_\_\_\_\_\_

**Ecology & Cycles**

**Changes in Living Things Over Time**

In order for a species to survive, in an ever changing environment, they must gradually change over time, **evolution**. Scientists have discovered, through studying organisms from the past and comparing them to organisms that are currently living, that gradual changes have been taking place throughout time that made organisms better suited for their environment and increased their chances of survival, **adaptations**. Adaptations increase variations within a species that in turn decrease their chance of extinction. If these changes did not take place an organism and its species would die out and become **extinct**.

Some evidences used to support the concept that organisms have evolved are; fossil evidence, radioactive dating, law of superposition, anatomical evidence and chemical evidence.

1. **Fossil Evidence** are the remains of once living things; bones, prints, shelter, pollen and drawings.
2. **Radioactive Dating** measures the age of a fossil through the decay rate of radioactive elements in the fossils. Usually Carbon 14 (C14), with a half-life of 5730 years, is used to age an organism’s fossils.
3. **Law of Superposition** is the idea that an older a fossil is the deeper it will be located within Earth’s crust. The younger an organism’s fossil is the closer to Earth’s surface it would be located.
4. **Anatomical Evidence** compares body parts of different organisms that are used for different purposes but are structurally similar; bat wing, human hand, whale flipper and a dog leg – **homologous structures**.
5. **Chemical Evidence** uses genetic information (DNA) to identify common ancestors.

**Analysis**:

\_\_\_\_\_ 1. Evolution A. Similar structures, different functions.

\_\_\_\_\_ 2. Adaptation B. A species that is gone forever.

\_\_\_\_\_ 3. Extinct C. Gradual changes in an organism over time.

\_\_\_\_\_ 4. Homologous Structures D. Changes in an organism that increase its

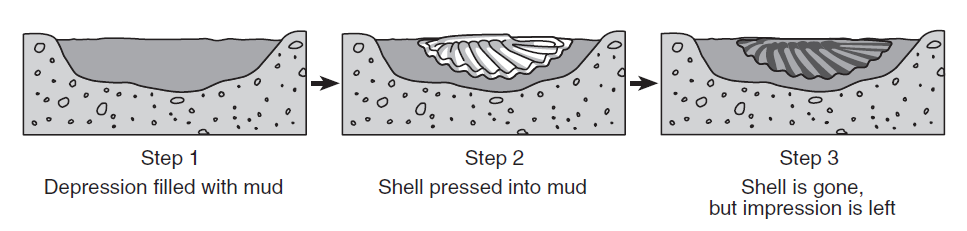
chances for survival.

5. What eventually happens to a species when the environment changes but the organisms

do not? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Making Connections** – Use the diagrams to answer the questions that follow.

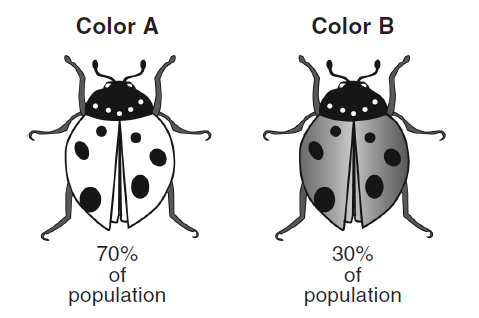


\_\_\_\_\_ 6. What type of evolutionary evidence does the picture above best represent?

1. law of superposition b. chemical evidence

c. fossil evidence d. anatomical evidence

The diagram below represents a species of beetle with two different body colors; Color A and Color B. These beetles live on trees and are eaten by birds. The percentage of each body color in the population of this species is indicated. The habitat of this beetle population is a group of trees with light-colored bark.



7. By having **two different colors within this species**, this would demonstrate: \_\_\_\_\_\_\_\_\_\_\_\_\_

8. According to this diagram, which beetle is best adapted for the habitat described, why?

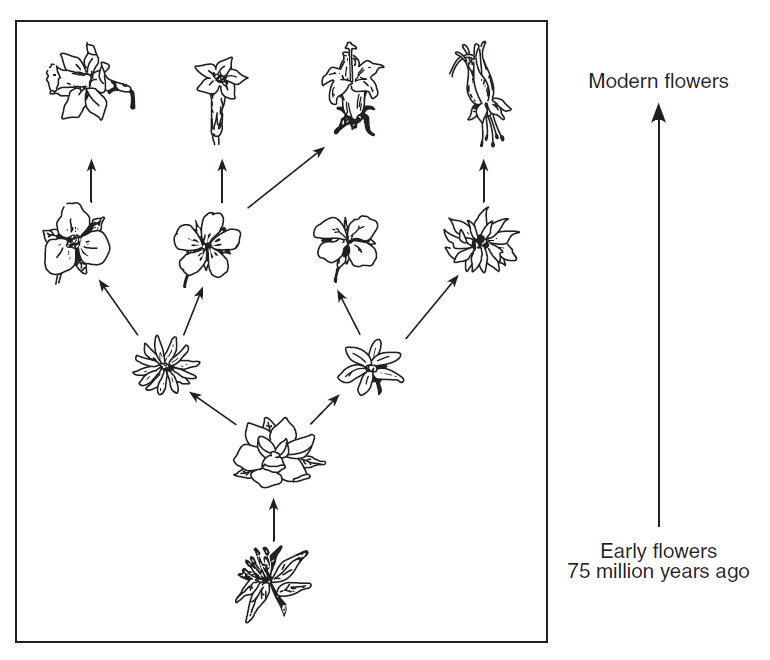
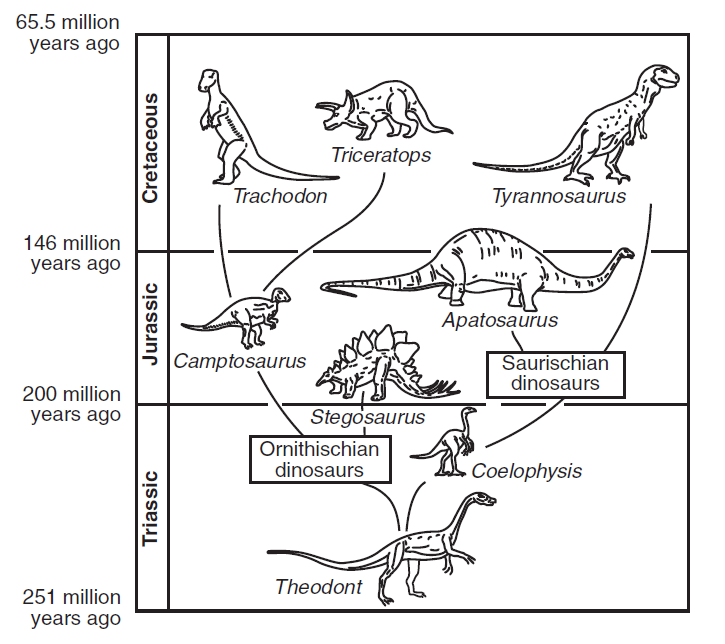
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9. As long as the trees in this habitat remain light in color, what do you think may happen to

Color B? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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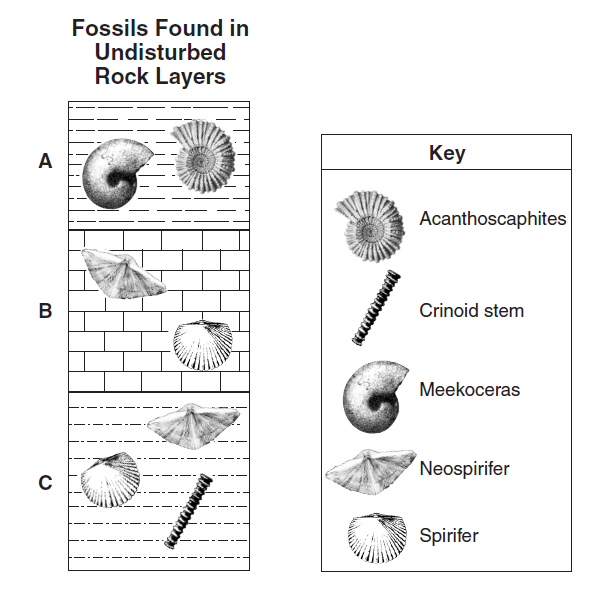


\_\_\_\_\_ 10. What type of evolutionary evidence do the pictures above best represent?

1. law of superposition b. chemical evidence

c. fossil evidence d. anatomical evidence

11. Which dinosaur is the common ancestor to all the other dinosaurs? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



\_\_\_\_\_ 12. What type of evolutionary evidence does the picture to the right best represent?

1. law of superposition b. chemical evidence

c. fossil evidence d. anatomical evidence

\_\_\_\_\_ 13. Which layer of rock contains the oldest fossils?

1. A b. B c. C

14. Name **two** organisms that can be found in two different layers.

15. Why would **Meekoceras** be considered one of the youngest fossils?

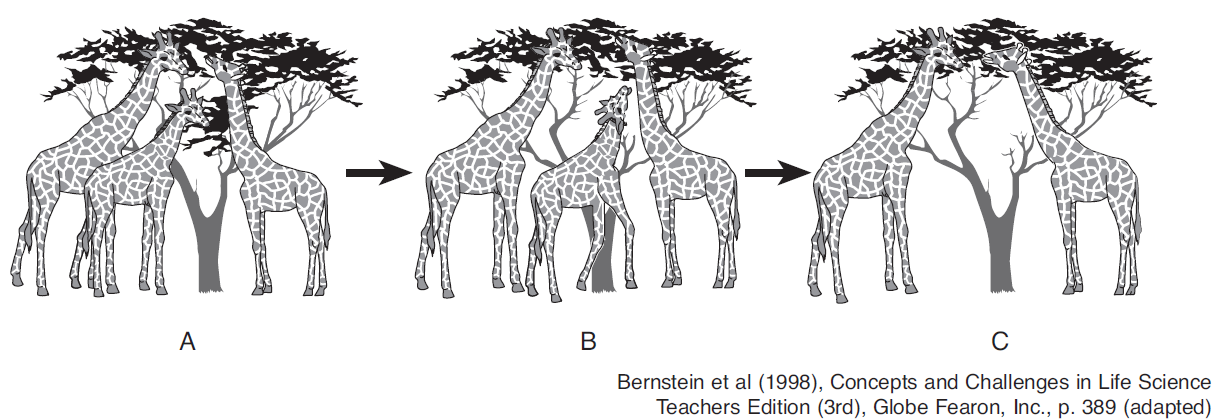
**Natural Selection**

In 1858, Charles Darwin published his book *On the Origin of Species*, in which he described his theory of evolution, **Natural Selection**. After spending 5 years aboard the *HMS Beagle*, as a naturalist, he noticed that many of the plants and animals he encountered had adapted to the specific environments that each of the different islands, forming the Galapagos island chain, offered. Through the survival and reproduction of those organisms best suited for a specific environment he noted that natural selection ensures the survival of the fittest.

**Analysis:**

1. Define **Natural Selection**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Making Connections** – Use the diagram to answer the questions that follow.

1. Which diagram above show an organism struggling for resources needed for survival? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   1. What do you think may happen to this organism due to its struggle? \_\_\_\_\_\_\_\_\_\_
      1. What process do you think this best demonstrates? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. Why? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Interactions Among Living Things**

An **environment** is all of the living (biotic) and nonliving (abiotic) components that an organism reacts with. It provides all the resources needed by an organism for it to live and grow. Organisms occupying an environment can fit within several different levels of organization; individual, population, community or ecosystem.

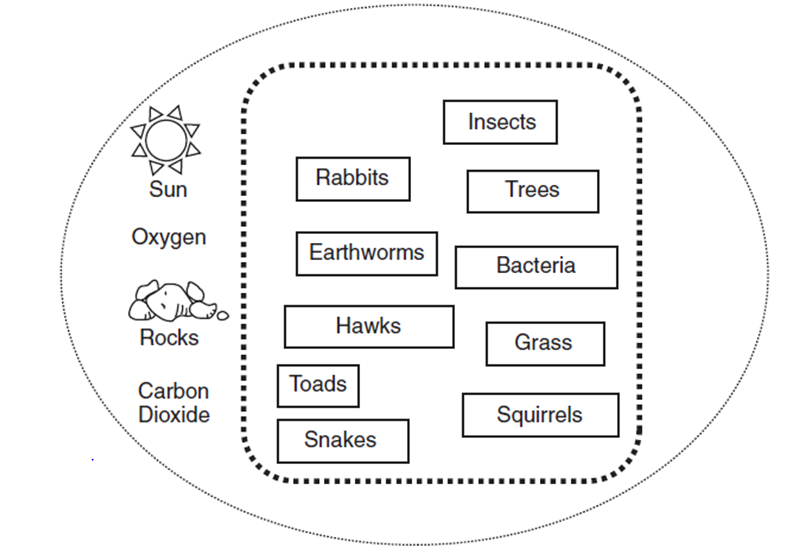
* **Individual** – a single member of a species.
* **Population** – a group of individuals from the same species living in a specific area at the same time.
* **Community** – All the interacting populations of a species in an environment.
* **Ecosystem** – The entire community of organisms and their abiotic surroundings.

**Analysis**:

1. Define **Environment**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Making Connections** – Use the diagram to answer the questions that follow.



\_\_\_\_\_ 2. Individual A. Rabbits, hawks, insects, squirrels, snakes and

earthworms.

\_\_\_\_\_ 3. Population B. Oxygen, sun, rocks, hawks, toads, trees, grass, insects

and squirrels.

\_\_\_\_\_ 4. Community C. A family of squirrels

\_\_\_\_\_ 5. Ecosystem D. A squirrel

1. Name **two** abiotic components of this ecosystem. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What is the original source of all energy for this ecosystem? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Habitats** are the places in which an organism lives. They provide everything an organism needs for its survival. Organisms living within a habitat fall into one of several different feeding levels; producers, consumers, and decomposers.

* **Producers** “autotrophs”, are the source of all food within an ecosystem. They use the sun’s energy to convert carbon dioxide and water into glucose and oxygen, **photosynthesis**.
* **Consumers** feed directly or indirectly on producers, they do not have the ability to make their own food. There are four types of consumers:
  + **Herbivores** – eat only Plants
  + **Carnivores** – eat only meat
  + **Omnivores** – eat plants and meat
  + **Scavengers** – eat dead organisms
* **Decomposers** “nature’s recyclers”, break down dead organisms into simpler substances.

**Analysis:**

\_\_\_\_\_ 1. Producers A. “nature’s recyclers”

\_\_\_\_\_ 2 Decomposers B. “autotrophs”

\_\_\_\_\_ 3. **People** are an example of this feeding level:

1. producers b. herbivore c. carnivore d. omnivore

\_\_\_\_\_ 4. **Rabbits** are an example of this feeding level:

1. producers b. herbivore c. carnivore d. omnivore

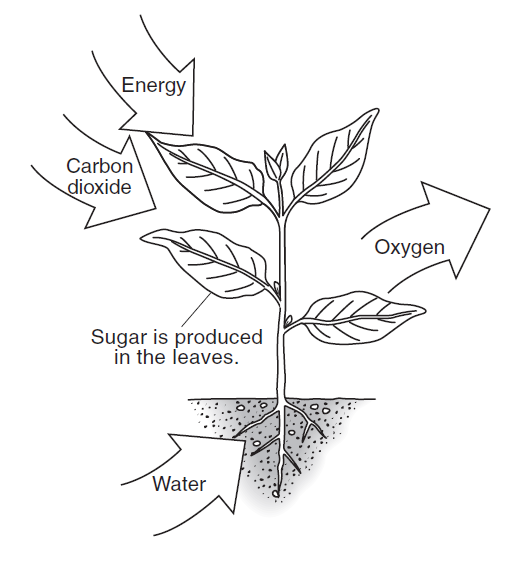
\_\_\_\_\_ 5. **Plants** are examples of this feeling level:

1. producers b. herbivore c. carnivore d. omnivore

\_\_\_\_\_ 6. **Lions** are examples of this feeding level:

1. producers b. herbivore c. carnivore d. omnivore

**Making Connections** – Use the diagram to answer the questions that follow.



7. What **process** does this diagram best represent?

1. What components are needed by this plant for

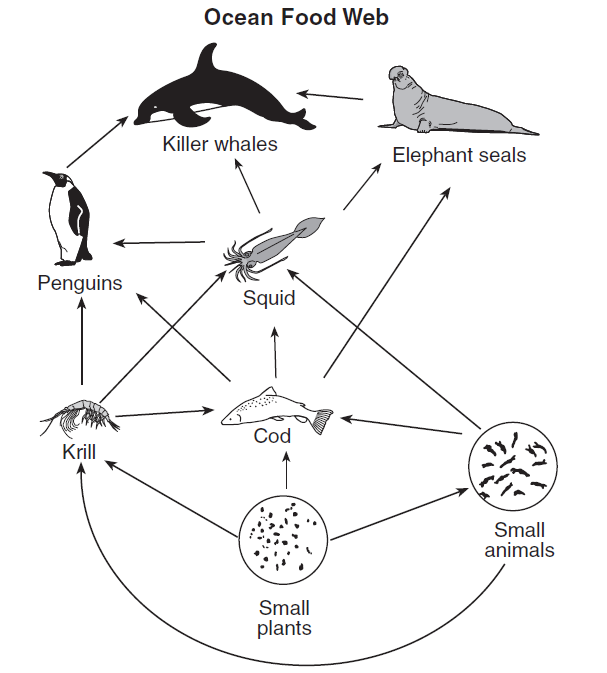
this process to take place (**reactants**)?

1. What components are produced by the plant as

waste products from the process (**products**)?

1. What is the primary source of all energy in an ecosystem?

Energy flows through an ecosystem, due to feeding levels, as food chains or in food webs. A **food chain** is a direct link from one organism to another in a feeding pathway. A **food web** depicts all the feeding relationships within an ecosystem.

**Analysis:**

1. Name **two** organism from the diagram

that eats small plants and animals:

1. Name **one** organism from the diagram

that gets its energy directly from the sun.

1. If elephant seals were removed from this food

web, how would this affect:

1. the **cod** population:
2. the **squid and penguin** populations:
3. If small plants were removed from this food web,

how would it affect the food web?

Organisms that make up the community within an ecosystem coexist by having one of three different relationships; symbiosis, competition or predation.

* **Symbiosis** – a close relationship between individuals of two or more species. They can occur in one of three ways:
  + One organism lives **near** another organism
  + One organism lives **on** another organism
  + One organism lives **in** another organism.

Types of symbiotic relationships:

1. **Commensalism**: one organism benefits and the other is NOT harmed.
2. **Mutualism**: both organisms benefit
3. **Parasitism**: one organism benefits and the other is harmed.

* **Competition** – when two species struggle for the same limited resource. Each is hurt by the presence of the other – this is the most important cause of evolution by natural selection.
* **Predation** – when one organism kills and eats another organism. The **predator** is doing the killing and eating, the **prey** is the organism being killed and eaten.

**Analysis:**

\_\_\_\_\_ 1. What type of symbiotic relationship would be taking place between a **tapeworm &**

**dog**?

1. commensalism b. mutualism c. parasitism

\_\_\_\_\_ 2. What type of symbiotic relationship would be taking place between a **honeybee &**

**flower**?

1. commensalism b. mutualism c. parasitism

\_\_\_\_\_ 3. What type of symbiotic relationship would be taking place between a **barnacle &**

**whale**?

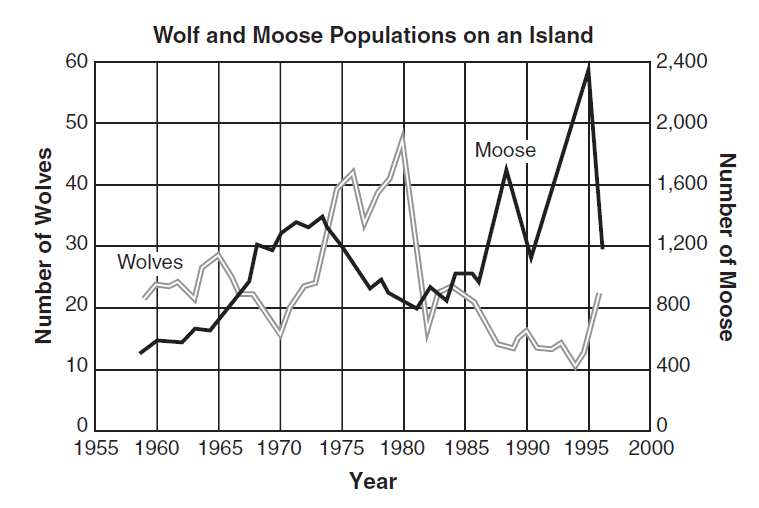
1. commensalism b. mutualism c. parasitism

\_\_\_\_\_ 4. When two organisms struggle for the same limited resources; food or breeding

rights, this is called:

1. predation b. competition c. symbiosis

**Making Connections** – Use the diagram to answer the questions that follow.



\_\_\_\_\_ 5. The diagram above best represents this type of relationship:

1. competition b. predation c. mutualism d. parasitism
2. The **wolf** would be an example of the: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. The **Moose** would be an example of the: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Cycles in Nature**

Many of the daily, monthly and seasonal changes that take place on Earth are cycles that occur over and over, **rhythms**.

1. **Day/Night Cycle**

Earth **rotates**, spins, once on its axis every 24 hours (1 day). It spins from the West to the East, so the sun looks to rise in the East and set in the West. Half of the Earth is lit by the sun at any given time. Organisms that live out their daily process during the day are called diurnal. Organisms that live out their daily processes during the night are called nocturnal.

1. **Tides**

Earth has its own natural satellite, the moon, that **revolves** (orbits) around it. For the Moon to orbit once around the Earth takes 27.3 days (1 month). The moon has a

gravitational pull that pulls on Earth’s water – pulling it toward the direction of the

moon causing tides. As Earth rotates, it moves into the tidal bulge twice daily – causing

two high tides and two low tides daily, 12 hours apart.

1. **Lunar Phases**

As the moon revolves around the Earth it is also rotating on its axis at the same rate of speed, so rotation = revolution and we only ever see one side of the moon. With the moon’s revolution, we see different amounts of the lit surface of the moon causing moon phases. During waxing phases, the lit surface is increasing in size and the light is on the right. During waning phases, the lit surface is decreasing in size and the light is on the left.

1. **Season**

It takes the Earth 365¼ days to revolve once around the sun. But it is because of Earth’s tilted axis that we experience season. Earth is tilted 23.5° off perpendicular meaning that throughout Earth’s revolution that poles receive varying amounts of sunlight.

* **Summer** (June 21) – the sun is directly over the Tropic of Cancer so the North Pole receives more daylight, South Pole receives less.
* **Fall** (September 23) – the sun is directly over the equator – equal day and night for both hemispheres.
* **Winter** (December 22) – The sun is directly over the Tropic of Capricorn so the South Pole receives more daylight, North Pole receives less.
* **Spring** (March 21) – the sun is directly over the equator – equal day and night for both hemispheres.

**Analysis**:

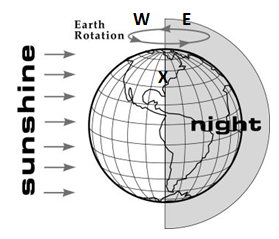
\_\_\_\_\_ 1. Rotation A. When one object **orbits** around another object.

\_\_\_\_\_ 2. Revolution B. A **cycle** that occurs over and over, in a predictable

pattern.

\_\_\_\_\_ 3. Rhythm C. When an object **spins** on its axis.

**Making Connections** – Use the diagrams to answer the questions that follow.

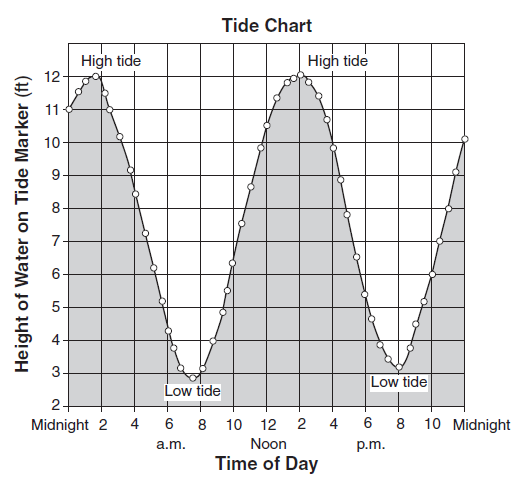


4. What type of cycle does this diagram best represent?

1. In which direction is Earth rotating?
2. If NY is located at X, what time of day would

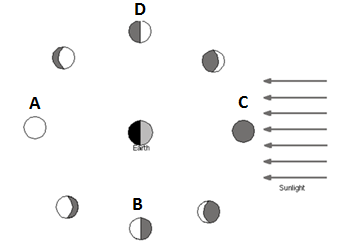
we be experiencing?

1. One complete rotation of Earth would take how long?



1. What is the primary cause of tides?
2. How many **high tides** took place on this day?
3. What time?
4. Approximately how many hours after the high tide did

the low tide take place?

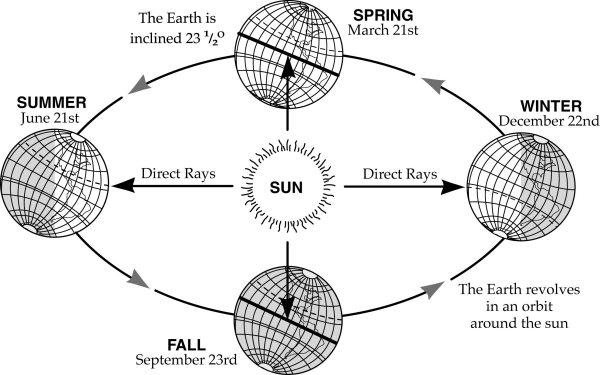
1. What type of tide were we going into at **7pm**?
2. What type of cycle does this diagram best represent?
3. How long does it take the moon to complete one

revolution around the Earth?

1. As the moon moves from **A** to **C**, what is happening

to the amount of lit surface we see from Earth?

1. At letter **D**, what side of the moon is the light on?
   * What phase would the moon be in?



1. What type of cycle does this diagram best represent?
2. How long does it take the Earth to complete one revolution around the sun?
3. In which season(s) would the North Pole experience 12 hours of daylight and 12 hours of nighttime?
4. If the South Pole has more daylight than night, which season would they most likely be in?

The cycles taking place in nature also contribute to the environmental cycles that organisms have to adapt to; water cycle, carbon/oxygen cycle, and ecological succession.

* **Water Cycle** – the constant circulation of Earth’s water between the lithosphere and atmosphere.
  + **Evaporation** – liquid water to water vapor due to the addition of heat.
  + **Condensation** – water vapor to liquid droplets through the removal of heat.
  + **Precipitation** – falling water from the clouds back to Earth’s surface.
  + **Infiltration** – absorption of water back into the lithosphere.
  + **Groundwater** – stored water in the lithosphere.
  + **Runoff** – freely flowing water.
* **Carbon/Oxygen Cycle** – the exchange of carbon dioxide and oxygen. Plants need carbon dioxide but release oxygen as a waste product of photosynthesis. Animals need oxygen but release carbon dioxide as a waste product of respiration.
* **Ecological Succession** – the gradual long term changes in altered ecosystems. The first organisms to reoccupy an area after it is altered – **pioneer organisms**. They usually make the environment more favorable for other organisms but less favorable for themselves. The **Climax community** is the final stable community to occupy a habitat. They tend to occupy this area for hundreds to thousands of years.

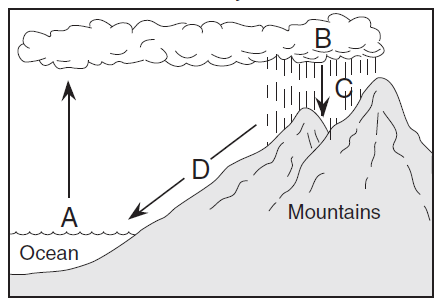
**Analysis**:

1. Define **Ecological Succession**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Making Connections** – Use the diagrams to answer the questions that follow.

1. What cycle does this diagram best represent?

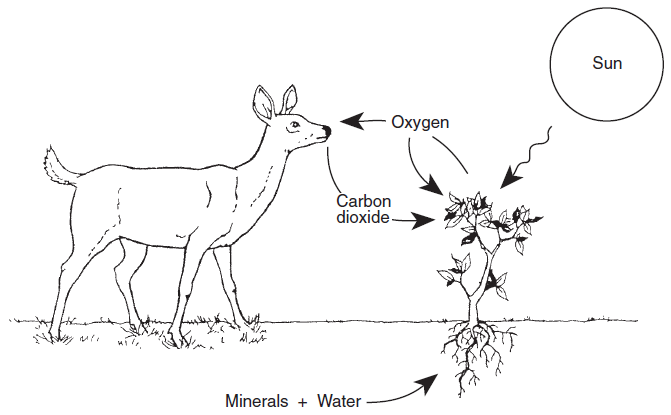


\_\_\_\_\_ 3. Runoff

\_\_\_\_\_ 4. Precipitation

\_\_\_\_\_ 5. Evaporation

\_\_\_\_\_ 6. Condensation



7. What cycle does this diagram best represent?

1. What process would the deer be completing

in this cycle?

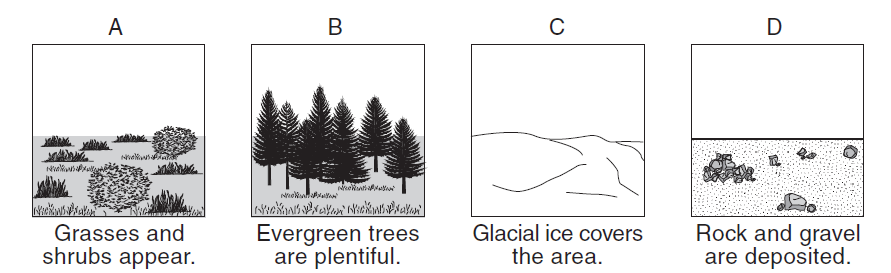
1. What process would the plant be completing

in this cycle?

1. The primary source of all energy in an ecosystem

is:

1. What do the following formulas stand for:
   1. Carbon dioxide + water + sunlight = glucose + oxygen -
   2. Oxygen + glucose = carbon dioxide + water + energy -



1. What cycle does the diagram above best represent?
2. Put the letter in their correct order from beginning to end:
3. Which letter represents the:
   1. Pioneer Community:
   2. Climax Community:

**Earth’s Biomes**

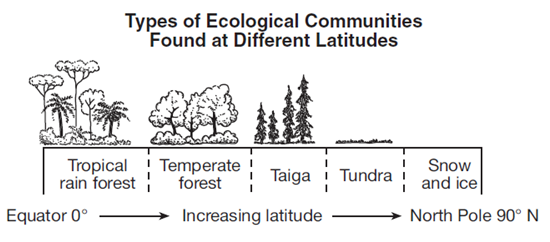
A **biome** is a group of ecosystem with similar climates (temperature and precipitation) and organisms. The climate limits the distribution of plants and in turn plants determine the kinds of animals that live there.

There are six main land biomes on Earth; tropical rain forest, desert, grassland, deciduous forest, coniferous forest and tundra. There are also three different aquatic biomes; marine, freshwater and estuaries.

**Analysis**:

1. What type of biome would you say NY is located within?
2. What characteristics determine climate?

**Making Connections** – Use the diagram to answer the questions that follow.



1. The further away from the equator you move, what do you think happens to both temperature and precipitation?
2. Which biome do you think would have the greatest variety of plants and animals?