

Nutley High School – Biology

3rd QUARTER REVIEW

NJ BIOLOGY COMPETENCE TEST – 2010

Reviews 2010 NJ CCCS in Biology:

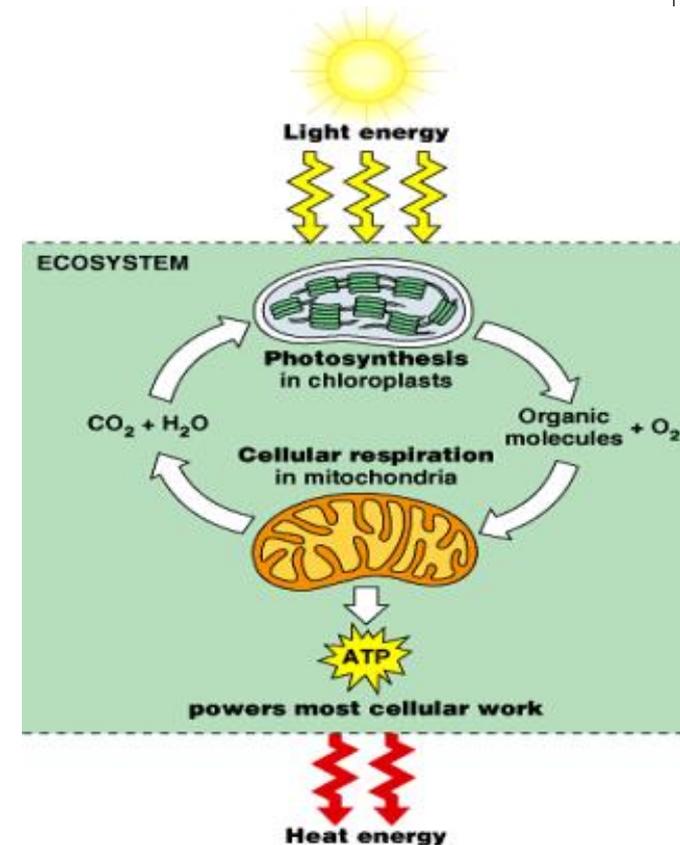
5.1.12 A-C, 5.3.12 A1, 5.3.12A2, 5.3.12.B.2, 5.3.12A3



Photosynthesis and Respiration

Photosynthesis and Cellular Respiration

- Photosynthesis and cellular respiration are cyclic processes.
- The food (organic molecules) produced during photosynthesis are broken down during cellular respiration to produce ATP.
 - In order to produce as much ATP as possible, the mitochondria needs oxygen.
- Photosynthesis is the start of almost all food chains on Earth.



Photosynthesis and Cell Respiration

- Ecosystems depend on the cycling of chemical elements and energy within the ecosystem.
- All living organisms need a constant source of energy to survive
 - Primary source of energy comes from the sun
 - Producers/autotrophs can convert sun's energy into organic compounds during photosynthesis
 - Organic compounds provide a storage unit of energy for cells to use later
 - Energy is released during cellular respiration

Photosynthesis

- Ecosystems depend on the cycling of chemical elements and energy within the ecosystem.

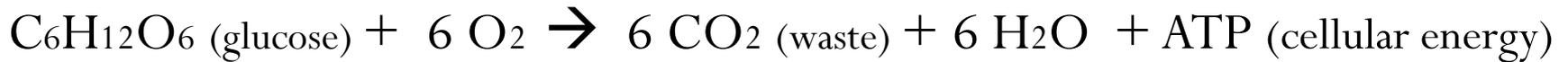
Photosynthesis:



- Autotrophs remove carbon dioxide from the atmosphere.
- Through a complex biochemical pathway, the carbon dioxide (CO_2) is converted into organic compounds
 - Could produce carbohydrates (sugars), lipids, or amino acids (amino acids can then combine to make proteins)

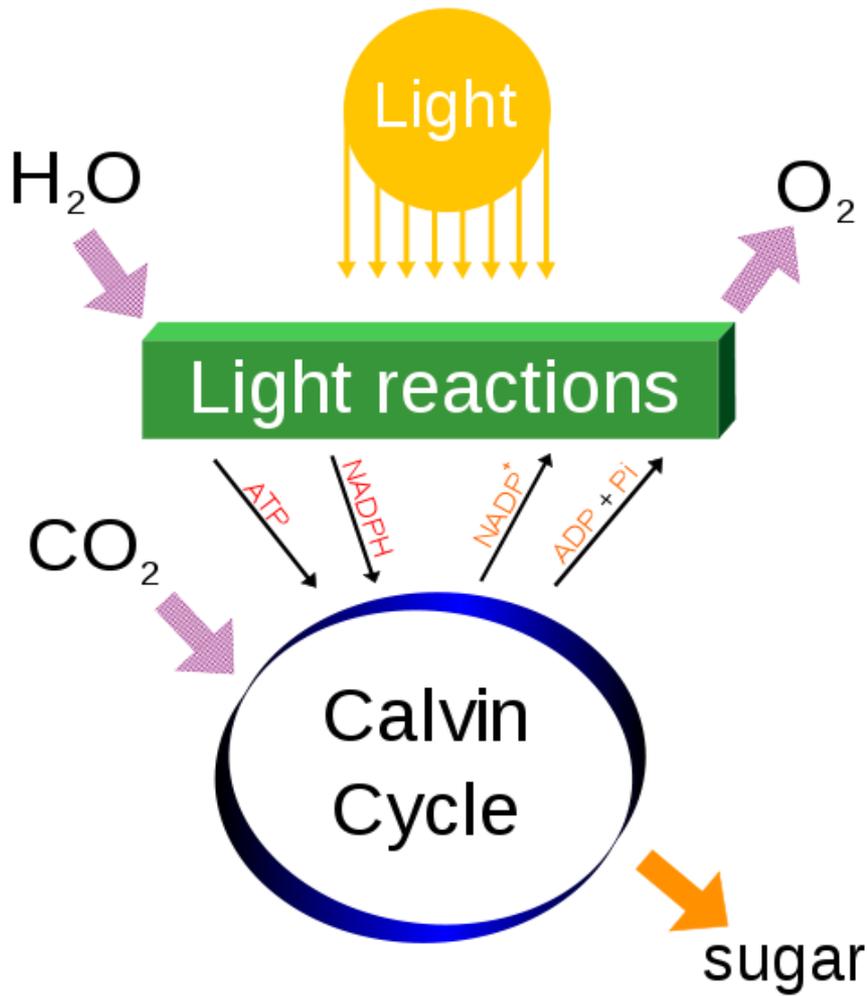
Cellular Respiration

- Cellular Respiration:

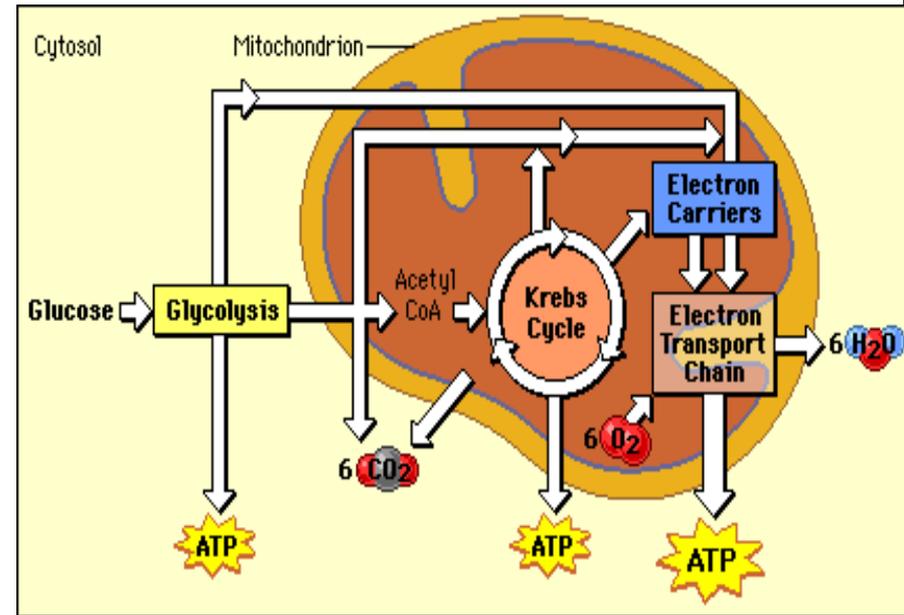


- Using complex cellular processes, ALL living organisms break down organic compounds (even plants).
- When the bonds are broken, energy released can be used to produce ATP.
 - ATP – molecule used to power cellular reactions, “cellular energy”

Photosynthesis



Cellular Respiration



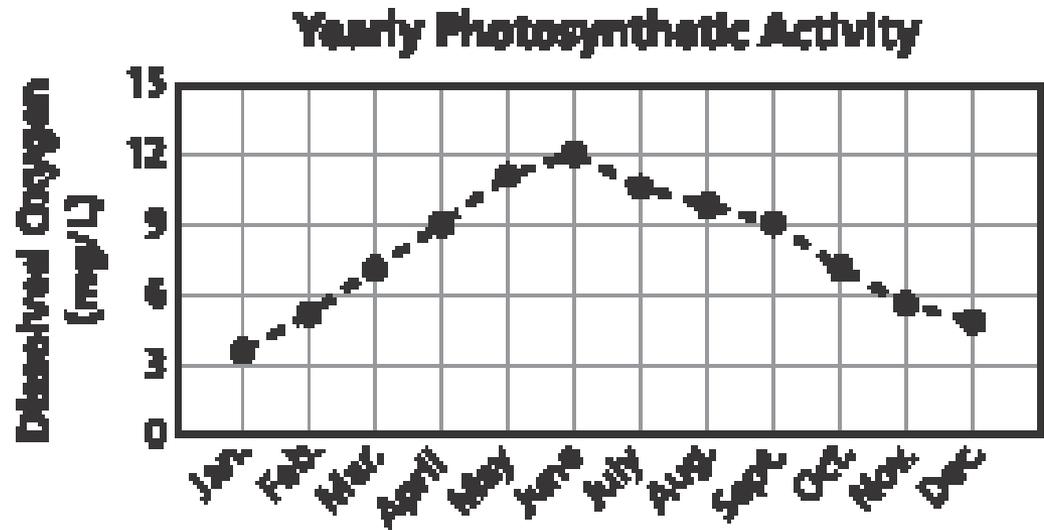
Question #1:

A certain plant requires moisture, oxygen, carbon dioxide, light, and minerals in order to survive. This statement shows that a living organism depends on:

- A. Biotic factors
- B. Abiotic factors
- C. Symbiotic relationships
- D. Carnivore-herbivore relationships



Question #2:



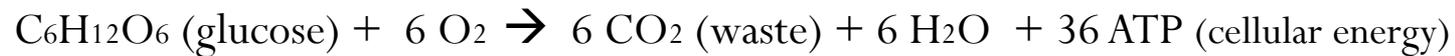
An ecologist performed a study to determine how the rate of photosynthetic activity in a lake changed from month to month. The results of the study are shown in the graph above.

What conclusion is best supported by the evidence?

- A. Photosynthetic organisms were dormant during the months of April through August.
- B. The rate of photosynthesis increased from June through December.
- C. The rate of photosynthesis was greater during the months of May through June.
- D. Photosynthetic organisms experienced die-off during the months of January through June.

Question #3:

The chemical equation below shows the reaction of glucose and oxygen:



What process does this equation represent?

- A. Photosynthesis
- B. Aerobic respiration
- C. Anaerobic respiration
- D. Nitrogen fixation

Question #4:

The process of photosynthesis and respiration can be thought of as a cycle because:

- A. One is used only by plants and the other is used only by animals
- B. Both give off oxygen to be used by animals
- C. The products of one are used as the raw materials of the other
- D. They both have the same purpose

Comparison of Photosynthesis and Respiration

	Photosynthesis	Respiration
Raw Materials	water and CO ₂	glucose and oxygen
Products	glucose and oxygen	water and CO ₂
Purpose	store energy	release energy

Evolution

Theory of Evolution

- **Evolution**, or change over time, is the process by which modern organisms have descended from ancient organisms.
- A scientific **theory** is a well-supported testable explanation of phenomena that have occurred in the natural world.

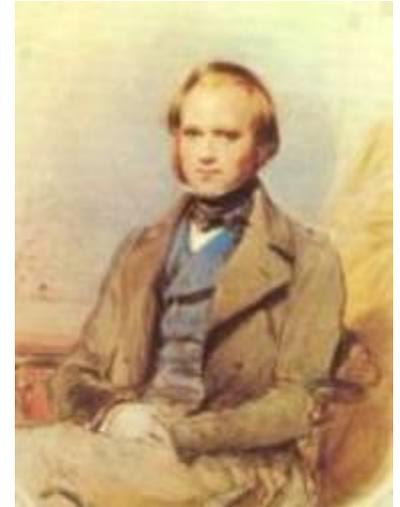
Charles Darwin

Charles Darwin was born on February 12, 1809 in Shrewsbury, England.

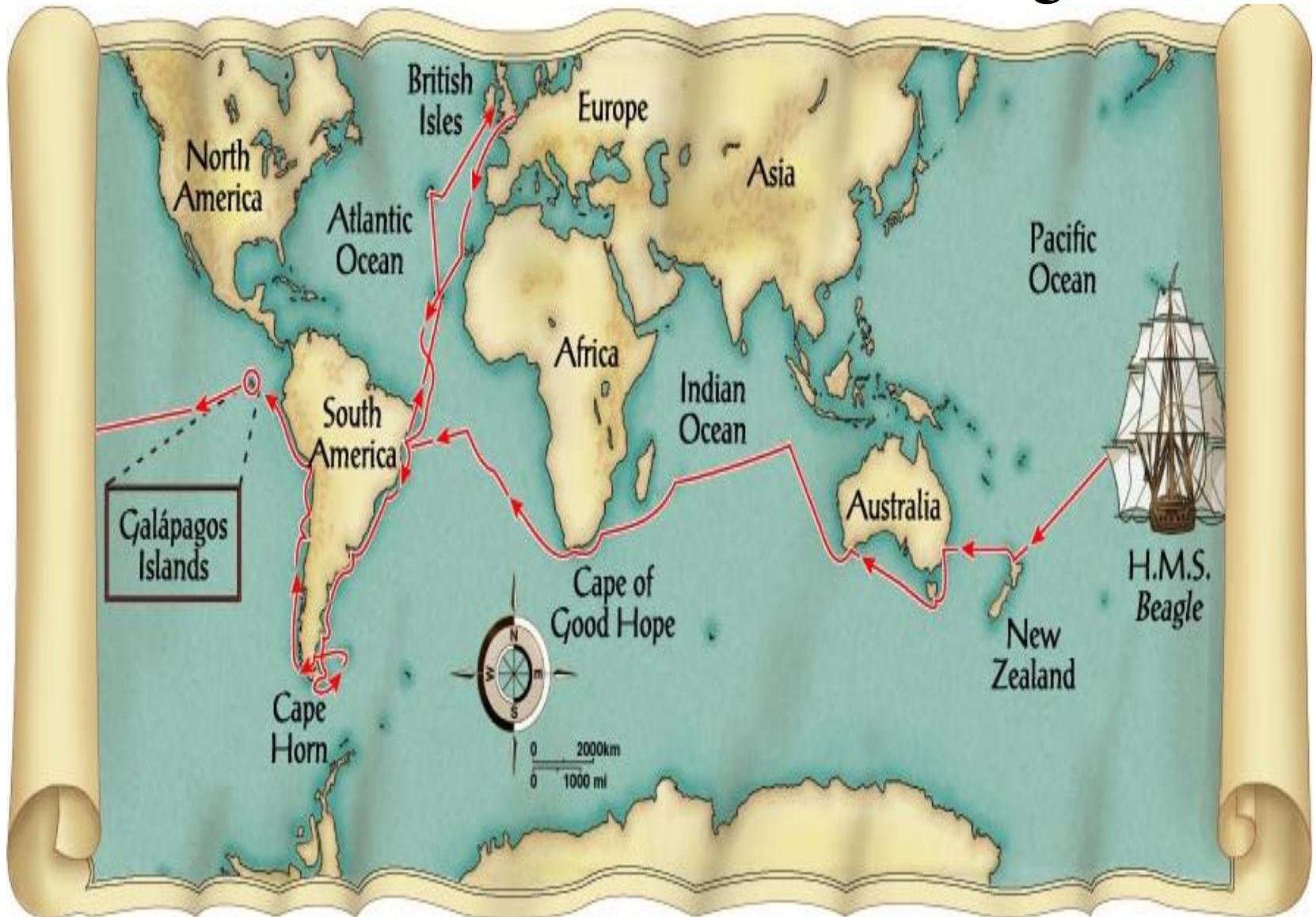
From 1831 to 1836 Darwin served as naturalist aboard the H.M.S. Beagle on a British science expedition around the world.

He observed much variation in related or similar species of plants and animals that were geographically isolated from each other.

These observations were the basis for his ideas.



Darwin's Travels on the HMS Beagle



Natural Selection

- **Individuals** with **favorable traits** are more likely to leave more offspring better suited for their **environment**.
- Also known as:
 - “Differential Reproduction”
 - “Descent with Modification”
 - “Survival of the Fittest”
- Example:
English peppered moth (*Biston betularia*)
 - light and dark phases

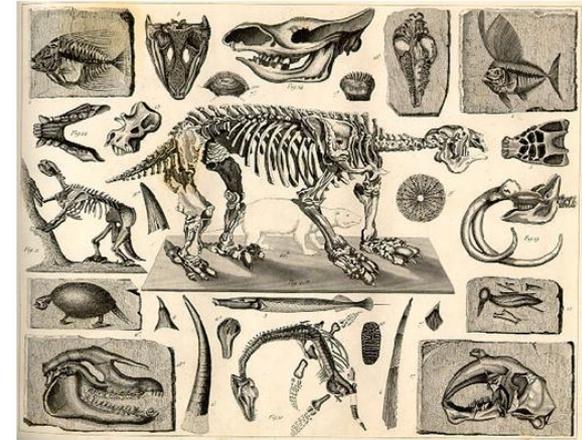
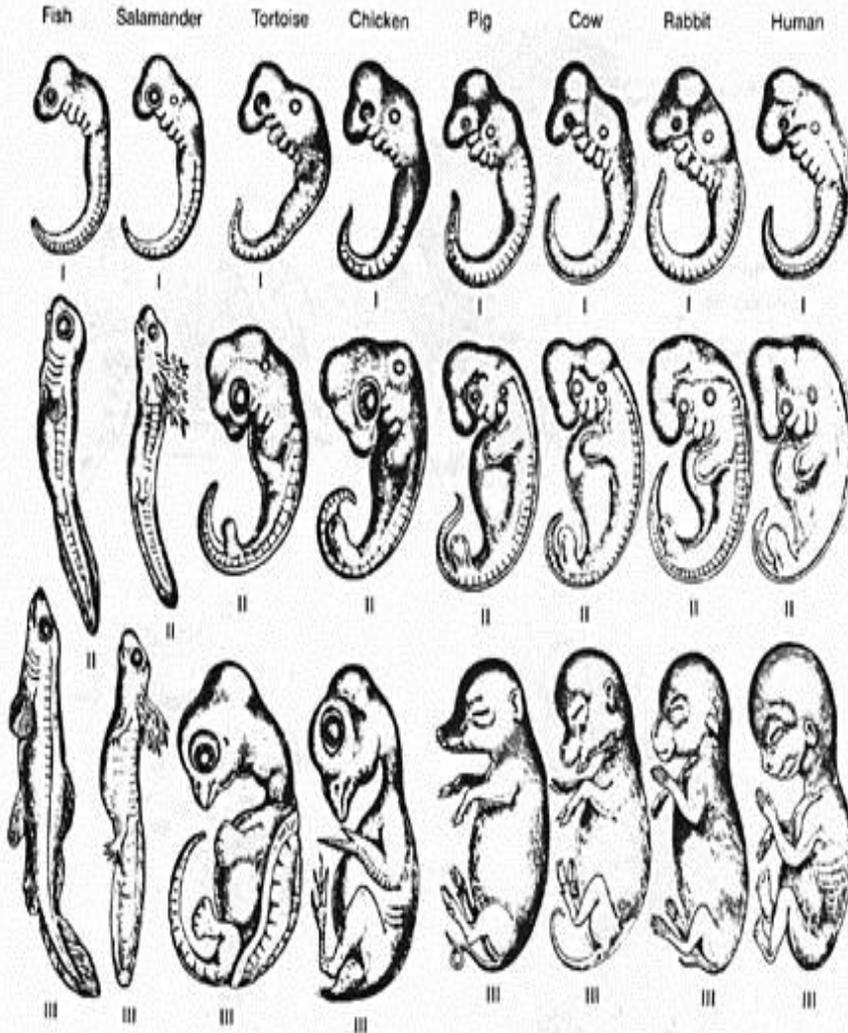


Other EVIDENCE scientists use to study evolution include:

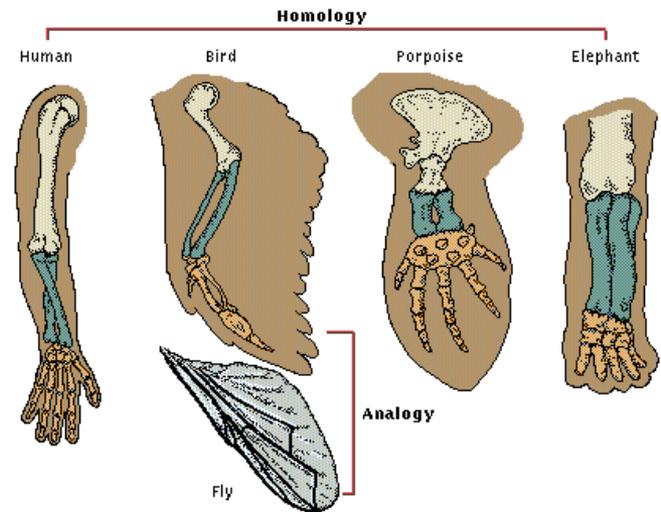
- Embryo development, Fossil Record, Anatomy, Protein sequence, DNA sequence

Fossil Record

Embryology



Comparative Anatomy



Question #5:

Thousands of years ago, giraffes with short necks were common within giraffe populations. Nearly all giraffe populations today have long necks. This difference is due to:

- A. Giraffes stretching their necks to keep their heads out of the reach of predators
- B. Giraffes stretching their necks so they could reach food higher in the trees
- C. A mutation in the gene that controls neck size occurring in some skin cells of a giraffe
- D. A mutation in the gene that controls neck size occurring in the reproductive cells of a giraffe



Question #6:

“It is likely that ducks developed webbed feet because ducks that had webbed feet were able to survive better than ducks without webbed feet, therefore the trait was passed on to the next generation.” This attempt to explain the development of webbed feet in ducks matches the theory proposed by:

- A. Jean Lamarck
- B. Charles Darwin
- C. Gregor Mendel
- D. Thomas Malthus



Question #7:

Which two processes result in variations that commonly influence the evolution of sexually reproducing species?

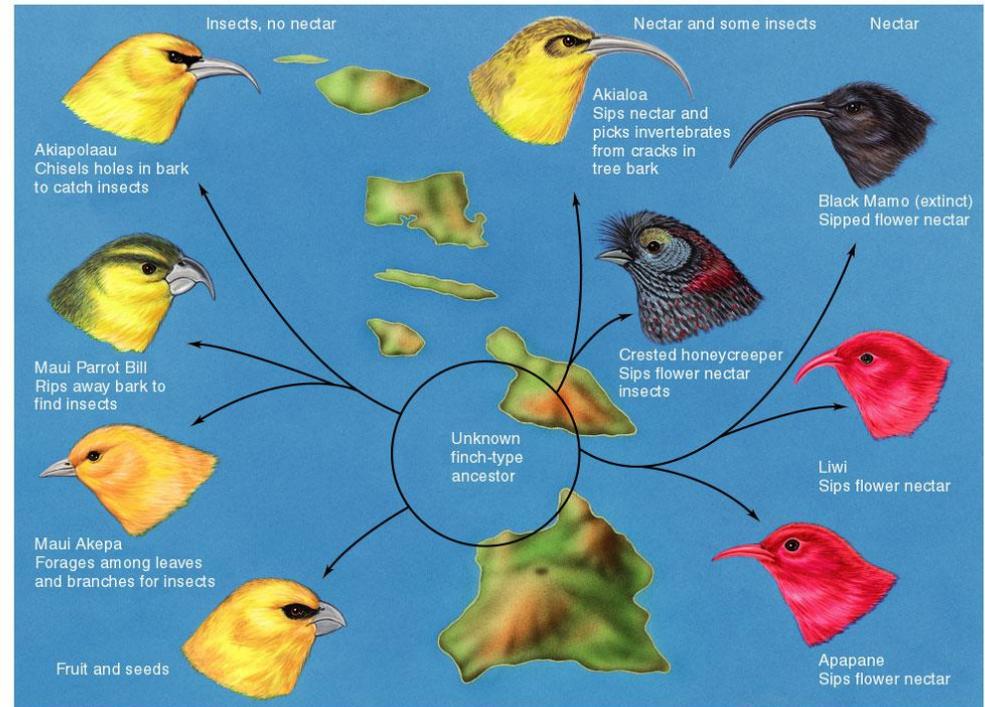
- A. mitosis and natural selection
- B. extinction and gene replacement
- C. mutation and genetic recombination
- D. environmental selection and selective breeding



Question #8:

The differences in the species are most likely a result of:

- A. Length of mating season
- B. population size
- C. color of feathers
- D. available food source



Question #9:

Two closely related species of birds live in the same tree. Species A feeds on ants and termites, while species B feeds on caterpillars. The two species coexist successfully because they:

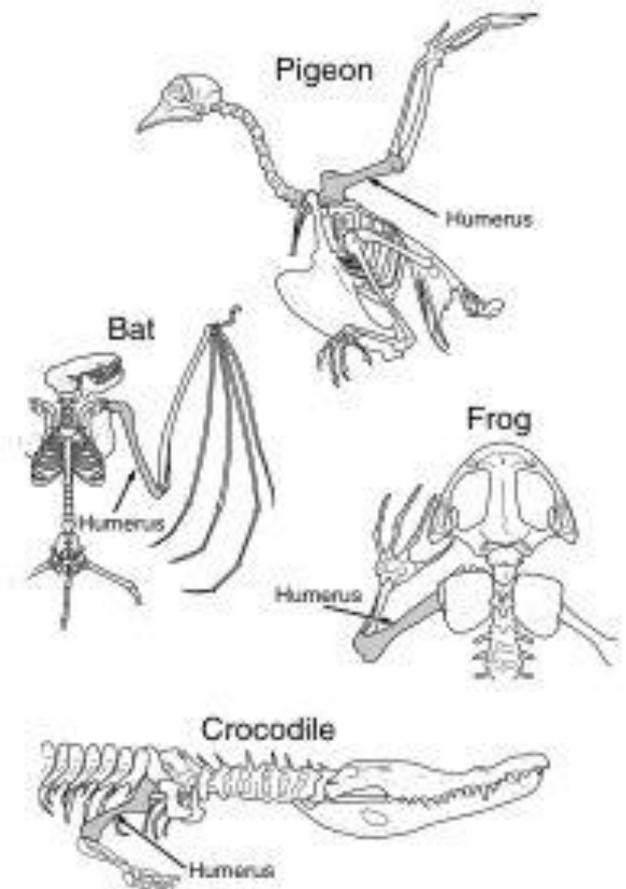
- A. Interbreed
- B. Compete less for food
- C. Share the same food
- D. Use different methods of reproduction



Question #10:

All the organisms shown above belong to the Phylum Chordata. The structural similarity in the organisms suggests that:

- A. The humerus is attached to the skeleton by immovable joints
- B. Only animals that walk on 4 legs need the humerus
- C. The humerus is the same size in all chordates
- D. Chordates have common ancestors



Question #11:

Scientists found the fossilized remains of a canine's jaw and leg. What information must first be obtained before the scientist can place the fossils in the ancestral time line of the dog?

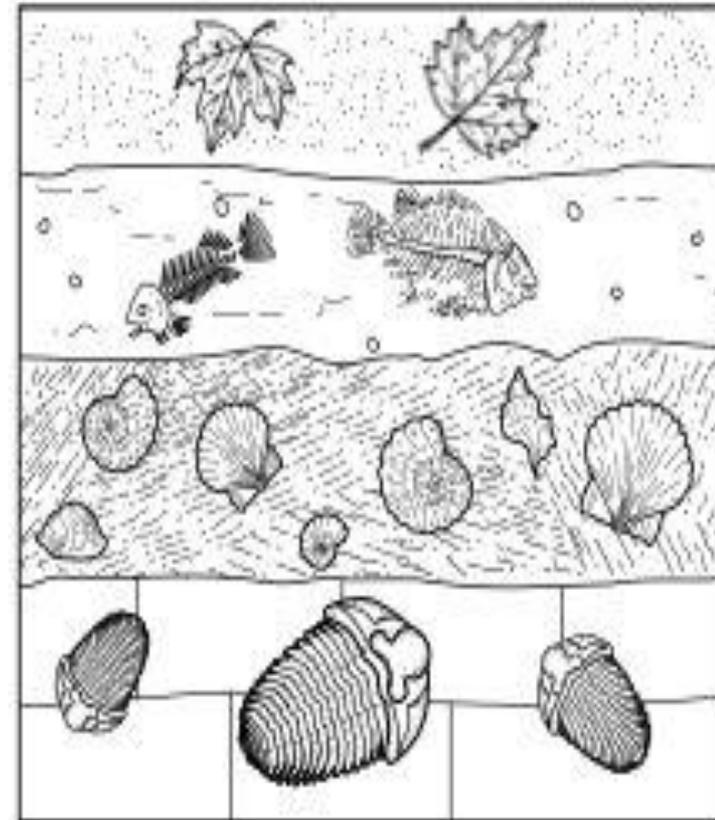
- A. The continent where the fossils were found
- B. The population trends for the species
- C. The rest of the skeleton
- D. The age of the fossils



Question #12:

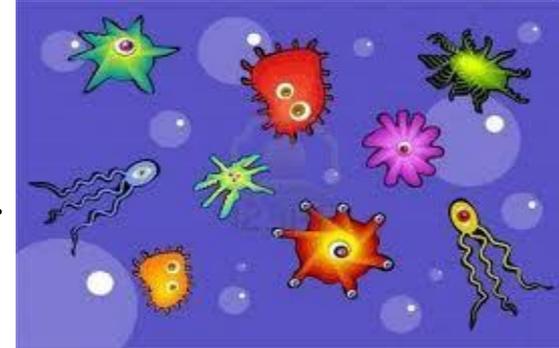
The diagram shows undisturbed sedimentary rock strata containing fossils. Which statement best summarizes the history of this area?

- A. The area was once a forest and was replaced by a freshwater lake.
- B. The area was once a freshwater lake and was replaced by a saltwater sea.
- C. The area was once a saltwater sea and later was replaced by a marshland.
- D. The area was once a saltwater sea and later was replaced by a forest.



Question #13:

A new antibiotic developed to treat bronchitis (a bacterial infection) has become widely prescribed by doctors to patients with lung infections. Over time, the number of patients infected with an antibiotic resistant form of the bacteria is rising.



Which of these is most likely true about this strain of bacteria?

- A. The surviving strain has learned how to become resistant to the antibiotic.
- B. The drug company did not properly test the antibiotic
- C. The surviving strain was able to avoid the antibiotic.
- D. Those few bacteria that were genetically resistant survived and reproduced, making this strain of bacteria more common.

Ecology

Important Terms

- BIOTIC – all living parts of an environment (humans, plants, mushrooms, mold, bacteria, algae, birds, etc)
- ABIOTIC – all nonliving parts of an environment (water, soil, climate, temperature, air, shell, pencil)
- BIOSPHERE – broadest level of organization
 - Physical space where ALL living organisms are found
- ECOSYSTEM – particular area in biosphere
 - Includes all biotic and abiotic factors of the area
- COMMUNITY – all biotic factors in a particular ecosystem
 - BIODIVERSITY – many different species living in the community
- POPULATION – all members of one species in the ecosystem

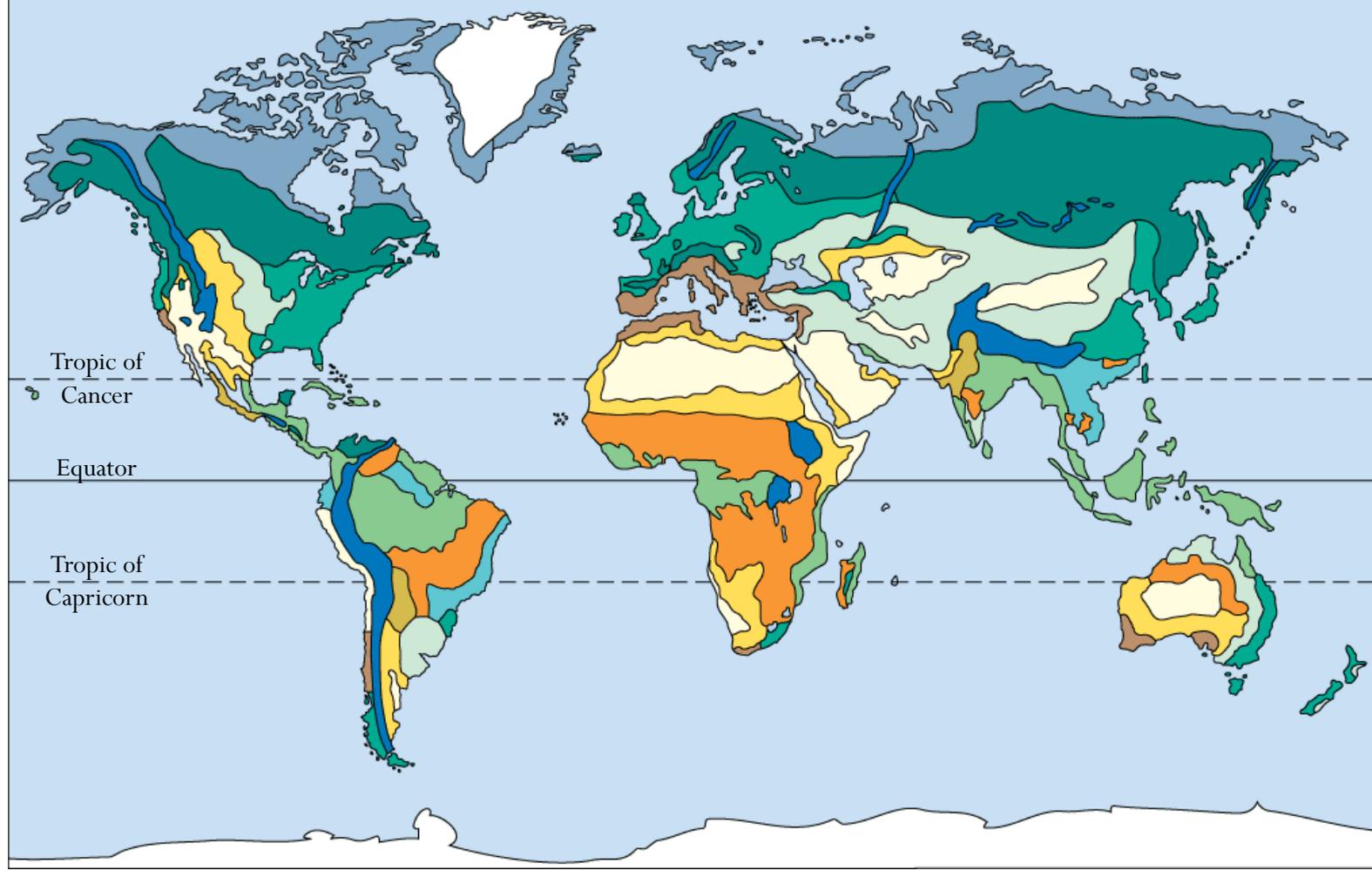
- Living organisms interact & are dependent on their physical environment
 - As the enviro changes, living organisms need to adapt to survive
 - Behavioral Adaptation – affects the individual
 - This adaptation is due to behavioral changes. The individual may move to a new location, change feeding habits, change migration patterns.
 - Genetic Adaptation – affects the species, not the individual
 - This adaptation occurs due to random DNA mutations passed on to the offspring. If the mutation is beneficial, the offspring will survive and pass on the mutation to their offspring.



- Living organisms can cause changes to their physical environment
 - *Ex:* worms burrowing, beaver dams, plants releasing oxygen
 - Humans are the primary cause of environmental change. Humans affect the balance of natural cycles in the enviro.
 - Humans can cause such changes in the physical environment that many species are becoming threatened, endangered or extinct.
- Living organisms are dependent (directly or indirectly) on all other living organisms in the environment.
 - Living organisms living in the same area form biological communities (Ecosystems)

Types of Terrestrial Biomes

- Biomes are classified by the type of plants that grow in the area. The types of plants that can grow in the area is determined by the abiotic factors of the environment, such as amount of rain and temperature.
 - Tundra – cold, very little precipitation; vegetation includes mosses, lichens, small plants
 - Taiga (Coniferous Forest) – cold, some precipitation; vegetation includes evergreen trees
 - Deciduous Forest – mild temps, more precipitation than taiga and grassland; vegetation includes large trees such as maple and oak; shrubs
 - Grassland – mild temps, some precipitation, experiences very wet seasons and very dry seasons; vegetation includes grasses
 - Desert – hot, very little precipitation; vegetation includes cacti and some grasses
 - Tropical Rain Forest – hot, a lot of precipitation; vegetation includes large trees such as teak and mahogany, highest biodiversity



- | | | | | | |
|---|--|--|---|---|------------------------------|
|  | Arctic tundra (polar grasslands) |  | Desert |  | Semidesert, arid grassland |
|  | Taiga, (coniferous forest) |  | Tropical rain forest, tropical evergreen forest |  | Mountains (complex zonation) |
|  | Temperate deciduous forest |  | Tropical deciduous forest |  | Ice |
|  | Temperate grassland |  | Tropical scrub forest | | |
|  | Dry woodlands and shrublands (chaparral) |  | Tropical savanna, thorn forest | | |

Types of Ecosystem Relationships

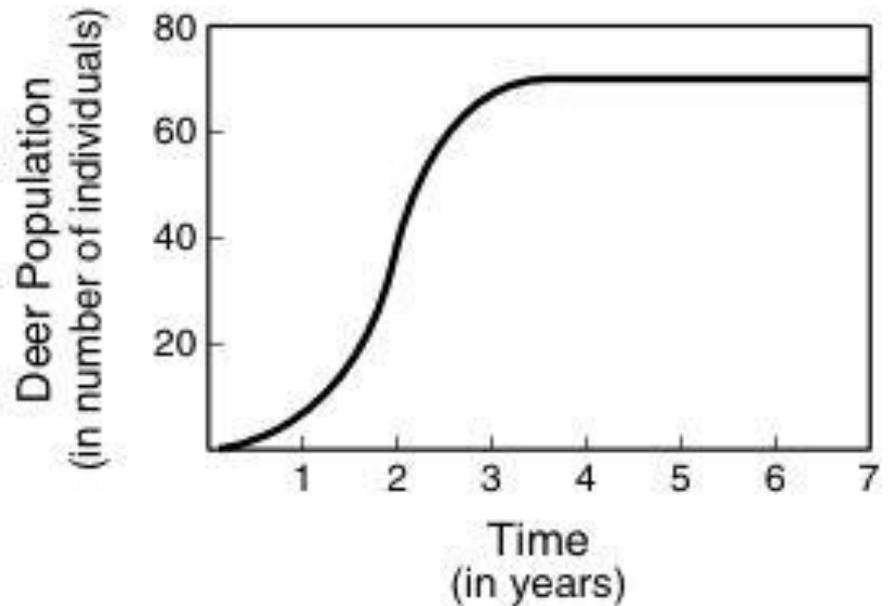
- Predation – one benefits, the other is harmed
 - Predators and Prey
 - Herbivores and Plants
- Parasitism – one benefits, the other is harmed
 - Ectoparasite – external parasite, live on host
 - Endoparasite – internal parasite, live in host
- Competition – has a negative effect on both
- Mutualism/Symbiotic – both benefit
- Commensalism – one benefits, the other is not harmed



Question #14:

In the graph below, what is the population of deer at the carrying capacity of the environment?

- A. 10
- B. 30
- C. 50
- D. 70



Question #15:

Cutting down a rain forest and planting agricultural crops, such as coffee plants, would result in:

- A. a decrease in erosion
- B. a decrease in biodiversity
- C. an increase in the amount of photosynthesis
- D. an increase in the amount of energy recycled



Question #16:

The island of Aldabra lies 400 km off the coast of Africa and is home to the Aldabra Rail, the last surviving species of flightless bird in the area. The Aldabra Rail is much different from Rails living on the mainland.

This bird became a distinctly different species through:

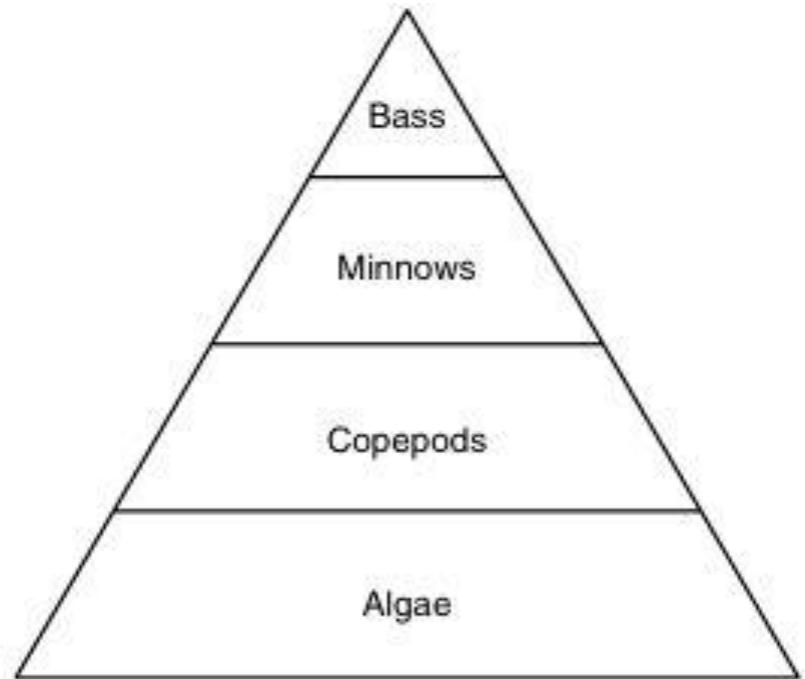
- A. Reproductive isolation
- B. Adaptive radiation
- C. Convergence
- D. Geographic isolation



Question #17:

Which level of this food pyramid represents the largest biomass?

- A. Bass
- B. Minnows
- C. Copepods
- D. Algae



Question #18:

Scientists hypothesize that oxygen began to accumulate in Earth's atmosphere after the appearance of living things with the ability to:

- A. Breathe air
- B. Form tissues
- C. Photosynthesize
- D. Reproduce sexually

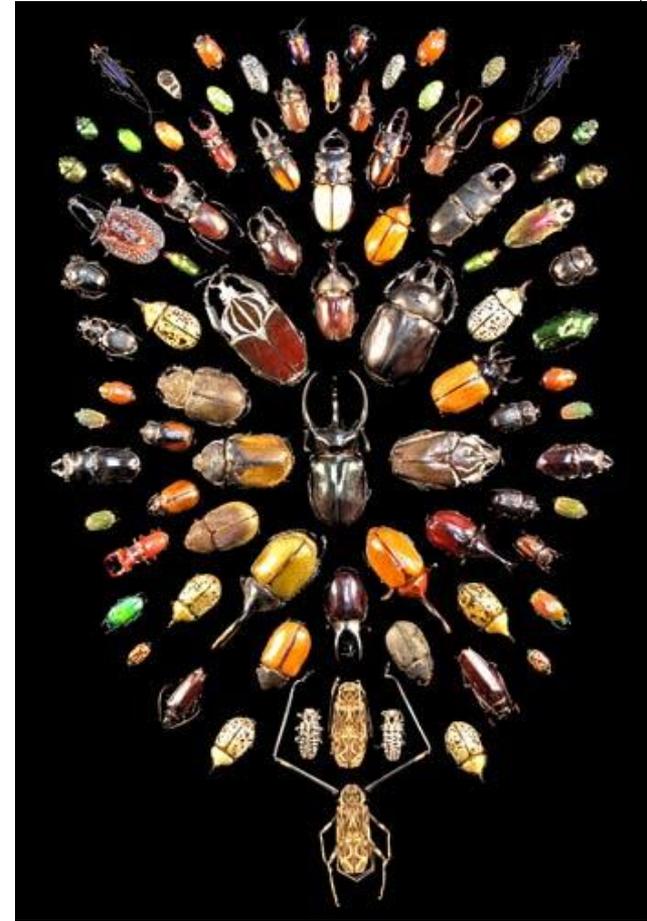


Question #19:

Rainfall in a tropical region is below average for 10 consecutive years. Insect species adapted for dry conditions are much more plentiful at the end of the 10 years.

Which of the following statements explains the increase in the population of the insects?

- A. Biodiversity in the region has increased due to the dry conditions
- B. Insects with a high tolerance for dry conditions have migrated out of the region
- C. Natural selection has favored insect species with a high tolerance for dry conditions
- D. Natural selection has selected against insect species that are adapted for dry conditions



Question #20:

There are fewer than 3,000 manatees (*Trichechus manatus*) left in the world.



Which would probably cause the extinction of the species?

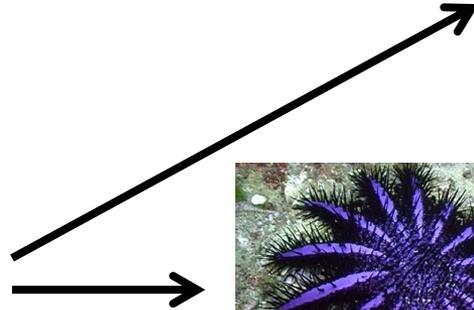
- A. A sudden freeze in the northern range of the manatees
- B. Increases in the range of the manatees
- C. Spread of disease that reduced the reproduction rate of the species
- D. Increases in noncompeting species in the manatees' habitat

Question #21:



Brain Coral

(*Diploria labyrinthiformis*)



Parrot Fish

(*Sparisoma viride*)



Crown-of-thorns Sea Star

(*Acanthaster planci*)



Giant Triton

(*Charonia tritonis*)

Humans sometimes kill giant tritons in order to collect their attractive spiral shells. If humans kill most of the giant tritons in a coral reef, the coral population will most likely:

- A. Decrease due to a decrease in the parrot fish population
- B. Increase due to an increase in the parrot fish population
- C. Increase due to a decrease in the crown-of-thorns sea star population
- D. Decrease due to an increase in the crown-of-thorns sea star population

Question #22:

All of Earth's water, land, and atmosphere within which life exists is known as:

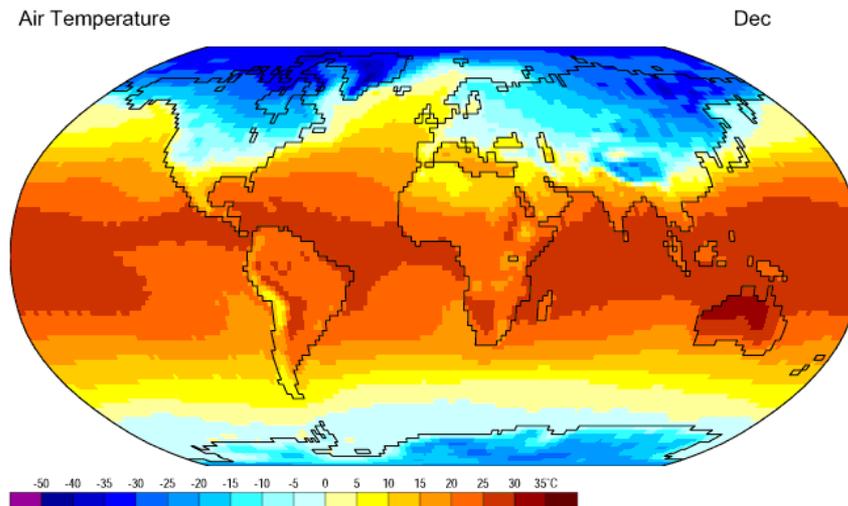
- A. Population
- B. Community
- C. Biome
- D. Biosphere



Question #23:

One possible reason for the rise in the average air temperature at Earth's surface is that:

- A. Decomposers are being destroyed
- B. Deforestation has increased the levels of O_2 in the atmosphere
- C. Industrialization has increased the amount of CO_2 in the air
- D. Growing crops is depleting the ozone shield



Question #24:

A rocky island appears as oceanic waters recede. Which of the following forms of vegetation would probably appear first on the bare rocks?

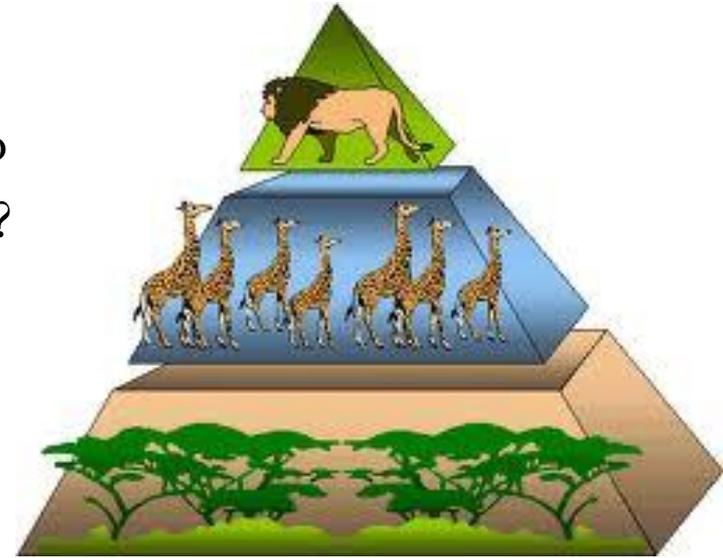
- A. lichens
- B. weeds
- C. shrubs
- D. pioneer trees



Question #25:

Which best explains why a pyramid is used to represent energy flow within an ecosystem?

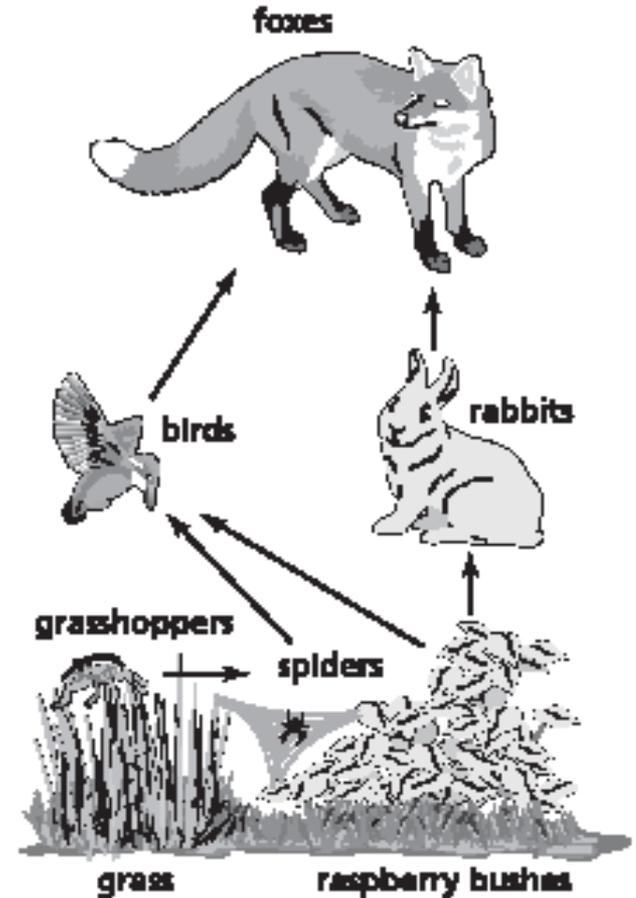
- A. Available energy increases when moving up an energy pyramid.
- B. Available energy decreases when moving up an energy pyramid.
- C. The size of the organism decreases when moving up an energy pyramid.
- D. The population size of the organisms increases when moving up the energy pyramid.



Question #26:

What would most likely happen if the rabbit population decreased as a result of another predator being introduced to the food web?

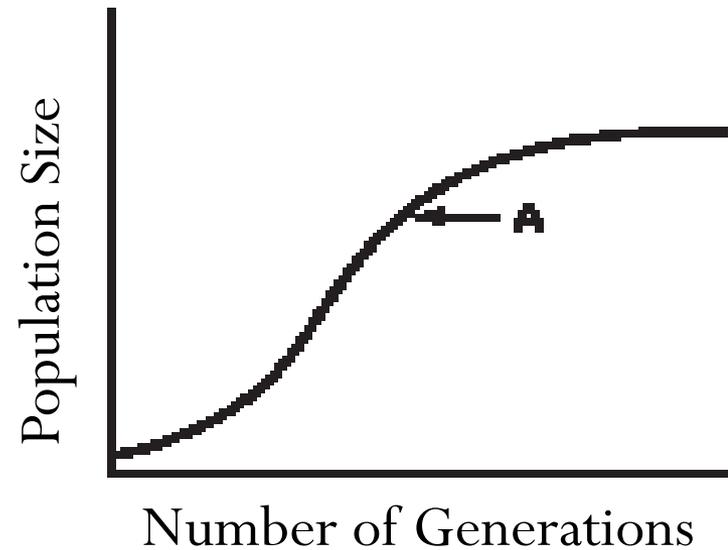
- A. The fox population would decrease
- B. The food web would not be affected
- C. The bird population would increase
- D. The spider population would decrease



Question #27:



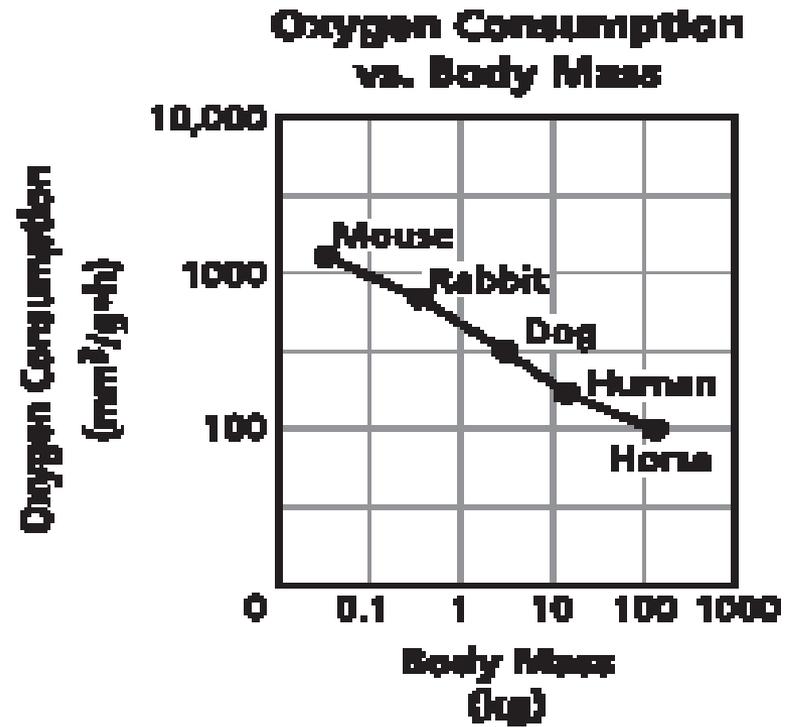
Crab Growth on a Coral Reef



What statement best explains what is happening at Point A?

- A. Population growth decreases as individual crabs get older.
- B. The population is stabilizing as it approached carrying capacity.
- C. Destruction of habitat is causing a decline in the crab population
- D. The introduction of a new predator is causing a decline in the population growth of the crabs.

Question #28:



Which statement is supported by the information shown in the graph?

- A. The oxygen consumption of an organism is one-half its body mass.
- B. The oxygen consumption of an organism is not related to its body mass.
- C. As the body mass of an organism increases, oxygen consumption decreases.
- D. As the body mass of an organism decreases, oxygen consumption decreases.