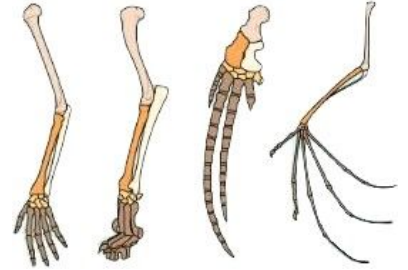


# MCAS REVIEW 4: EVOLUTION AND BIODIVERSITY!

## Evidence for Evolution

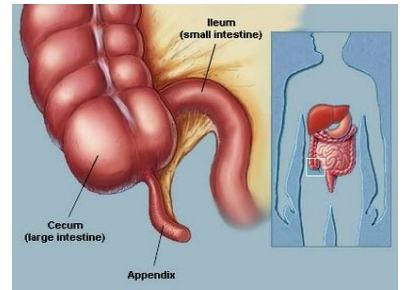


- **Fossils**
  - Preserved remains of ancient organisms
  - shows how organisms are related/change over time

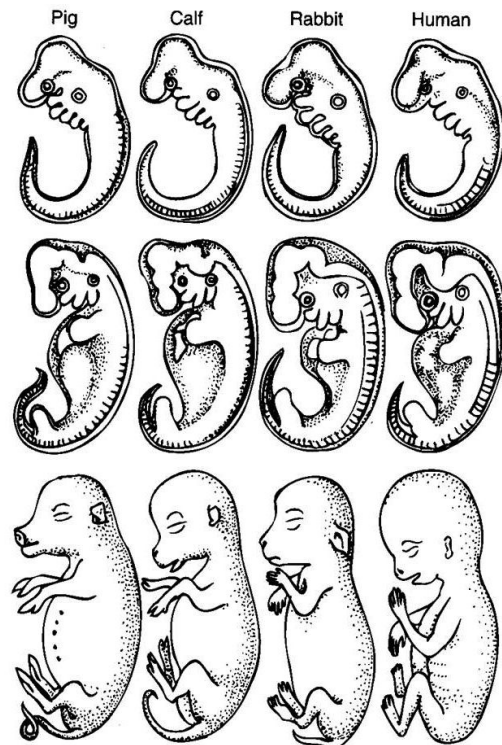


- **Homologous Structures**
  - Structures with different forms in different species, but came from a common ancestor
  - Example: human arm, dog leg, bird wing, whale fin

- **Vestigial Structures**
  - An organ that no longer serves a useful function, but did in an evolutionary ancestor
  - Example: Appendix, tailbone



- **Similar Embryos**
  - The early stages of many different organisms look very similar to each other.
  - This means our cells develop similarly



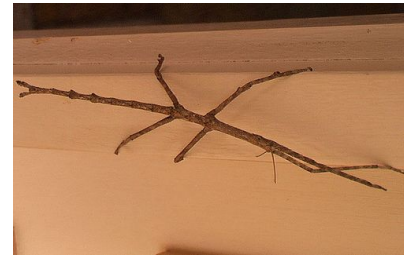
- **Geographic Distribution of Living Things**
  - Similar organisms develop in similar environments in different areas

- **Natural Selection**
  - “Survival of the Fittest”
  - The species that are best fitted to **survive** and **reproduce** in their environment will dominate their environment

# Key Evolution Topics

## - Adaptation

- Changes, **usually due to mutation**, in a species that allow it to be more “fit” in its environment
- Example: camouflage, giraffes with long necks, etc...
- Organisms adapt **OVER MANY GENERATIONS**
  - ... often through **natural selection**



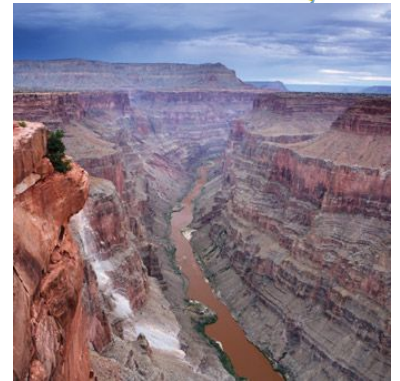
## - Molecular Biology and Genetics

- The more similar two species’ genetic sequences or DNA are, the more closely they are related evolutionarily!



## - Reproductive Isolation

- The inability of species to mate and produce fertile offspring
- Example: Geographic Isolation = members of the same species are isolated by a river, mountain, natural disaster etc... and can no longer mate and produce fertile offspring. They are now new, separate species.



## - Extinction = a species dying out

## - Endangered = a species in danger of becoming extinct

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# Classification

## - Species = can mate and produce fertile offspring

<b>Most general</b>	<b>Kingdom</b>	<b>King</b>
	<b>Phylum</b>	<b>Phillip</b>
	<b>Class</b>	<b>Came</b>
	<b>Order</b>	<b>Over</b>
	<b>Family</b>	<b>For</b>
	<b>Genus</b>	<b>Grape</b>
<b>Most specific</b>	<b>Species</b>	<b>Soda</b>

## - Scientific name = *Genus species*

## - There are six kingdoms

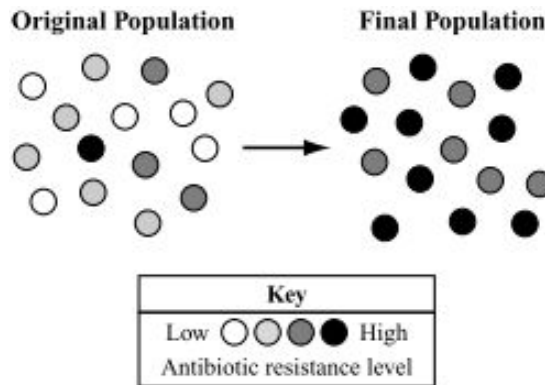
- ***Archaeobacteria*** = bacteria that live in extreme environments
- ***Eubacteria*** = typical bacteria (the ones that cause disease)
- ***Protista*** = mostly unicellular, eukaryotes, some are photosynthetic
- ***Fungi*** = mostly multicellular, eukaryotes, heterotrophs, sexual reproduction
- ***Plantae*** = multicellular, eukaryotes, autotrophs (photosynthetic), sexual reproduction
- ***Animalia*** = multicellular, eukaryotes, heterotrophs, sexual reproduction

# Practice Questions

\_\_\_\_\_ 1. About 70 years ago, cane toads were introduced to Australia. The toads are toxic to some species of snakes, such as *Dendrelaphis punctulatus*. The longer an individual snake is, the greater its chance of survival after eating a cane toad. Which of the following did scientists **most likely** observe in the *D. punctulatus* snake population as a result of the presence of the cane toads?

- a. The entire population was killed by the toads
- b. The entire population became resistant to the toads
- c. The average body length in the population increased
- d. The average body length in the population decreased

\_\_\_\_\_ 2. Antibiotic resistance can vary within a population of bacteria. The diagram below represents the changes in a population of bacteria as a result of exposure to an antibiotic over time.



The changes in the population are **most likely** the result of which of the following?

- a. Exponential growth
- b. Genetic crosses
- c. Immigration
- d. Natural selection

\_\_\_\_\_ 3. The fossil record supports which of the following descriptions of the evolution of life on Earth?

- a. Life first appeared with the diversity found today.
- b. The importance of natural selection diminished over time.
- c. Complex organisms evolved from more simple organisms.
- d. Large organisms appeared before single-celled organisms.

\_\_\_\_\_ 4. Which of the following statements gives the **most likely** explanation for the presence of two very similar species of squirrels living on opposite sides of the Grand Canyon?

- a. One squirrel traveled across the canyon and started a new population on the other side.
- b. One squirrel traveled across the canyon and interbred with a different population on the other side.
- c. Members of a single squirrel species were geographically separated by the formation of the canyon.
- d. Members of two different squirrel species migrated from two different places to opposite sides of the canyon.

\_\_\_\_\_ 5. The Asian shore crab invaded parts of the eastern coast of the United States about 15 years ago. The Asian shore crab preys on blue mussels. In the time since the Asian shore crab arrived, the average shell thickness has increased in the blue mussel population. Which of the following is the **most likely** reason that this increase in shell thickness has occurred?

- a. Blue mussels with thick shells attract more crabs than mussels without thick shells.
- b. Blue mussels with thick shells grow in larger colonies than mussels without thick shells.
- c. Blue mussels with thick shells catch more food per day than mussels without thick shells.
- d. Blue mussels with thick shells survive and reproduce more successfully than mussels without thick shells.

\_\_\_\_\_ 6. A species of parasitic fly follows the sounds that male crickets make with their wings. The flies deposit their larvae in the crickets' bodies. As the larvae develop and emerge from the crickets' bodies, the crickets die. Researchers have discovered a genetic mutation in some crickets that changes their wing structure and makes them silent. The crickets with silent wings are found among crickets with normal wings when it is time to mate.

According to evolution by natural selection, which of the following will **most likely** occur in the cricket population, based on the selection pressure from the flies?

- a. Male crickets with silent wings will increase in frequency.
- b. The frequency of the silent wing mutation will stay the same.
- c. Male crickets with normal wings will learn to make new sounds.
- d. A new mutation will create spikes on the crickets' wings to keep the flies away.

\_\_\_\_\_ 7. In humans, the appendix is small and is not needed for digestion. In rabbits, the appendix is well developed and is used in the digestion of plant fibers.

Which of the following provides the **best** scientific explanation for the presence of the appendix in both humans and rabbits?

- a. Rabbits and humans live in environments with similar conditions.
- b. Rabbits and humans are both eukaryotes with similar cell structures.
- c. The appendix is evolving into a new type of organ in rabbits and humans.
- d. The appendix is inherited from a common ancestor of rabbits and humans

\_\_\_\_\_ 8. Lemur body types can vary widely. In addition to fossils and comparative anatomy, which of the following types of evidence can scientists reliably use to study the evolution of the variety of lemur body types?

- a. Lifespan
- b. Population size
- c. DNA sequences
- d. Male-to-female ratio

\_\_\_\_\_ 9. Lobsters and spiders are both classified in the phylum Arthropoda. Lobsters and spiders are therefore also classified in the same

- a. Class.
- b. Family.
- c. Genus.
- d. Kingdom.

\_\_\_\_\_ 10. The rock pipit and the water pipit are two types of birds found in the United Kingdom and other areas of Europe. The rock pipit and the water pipit have similar appearances and their habitat ranges overlap.

Which of the following observations most likely caused scientists to classify the birds as separate species?

- a. The rock pipit is not able to produce fertile offspring with the water pipit.
- b. The rock pipit population in the United Kingdom is larger than the water pipit population.
- c. The rock pipit eats insects, fish, and seeds, but the water pipit eats only insects and larvae
- d. The rock pipit remains in the United Kingdom year-round, but the water pipit only overwinters there.

\_\_\_\_\_ 11. In a population of moths, wing color became darker over time. Which of the following is the **best** evidence that the change in wing color was an evolutionary change?

- a. The size of the moth population changed.
- b. The average length of the moths' dark wings increased.
- c. The number of eggs that females laid during each breeding season increased.
- d. The frequencies of the alleles for dark wing color in the moth population changed.

\_\_\_\_\_ 12. Which of the following statements **best** explains why geographic isolation can lead to speciation?

- a. Physical separation of populations reduces competition for each group.
- b. Physical separation of populations prevents interbreeding and mixing of gene pools.
- c. Physical separation of populations provides more space for each group's size to increase.
- d. Physical separation of populations stresses the organisms and causes mutations in their genetic code.

\_\_\_\_\_ 13. Which of the following provides the **most conclusive** evidence that organisms of two different species share a common ancestor?

- a. They live in the same ecosystem.
- b. They reproduce at the same time.
- c. They have similar DNA sequences.
- d. They have similar body movements.

\_\_\_\_\_ 14. Snakes such as boa constrictors and pythons have tiny leg bones buried in their muscles. These leg bones are vestigial structures that have little or no known function in snakes.

Which **best** explains the presence of these vestigial structures in snakes?

- a. Snakes evolved from organisms with legs
- b. Snakes are developing legs for walking on land
- c. Snakes born with an extra set of DNA develop legs as they mature.
- d. Snakes have only one copy of the allele for legs in their chromosomes.

\_\_\_15. Fossils typically provide evidence for evolution because...

- a. They are millions of years old
- b. They exist in all rock types
- c. They provide good samples of RNA
- d. They show patterns of biological change







\_\_\_16. A scientist is trying to determine how closely related two species of plants are. Which of the following would be **most** useful for the scientist to compare?

- a. the root depths of the plants
- b. the leaf structures of the plants
- c. the genetic sequences of the plants
- d. the nutrient requirements of the plants

\_\_\_17. Placental mammals are one group of mammals. Using DNA evidence, scientists have concluded that the ancestor of placental mammals diverged from other mammal groups about 160 million years ago. The analysis of which of the following types of evidence would **best** verify this conclusion?

- a. Behaviors
- b. Cells
- c. Diets
- d. Fossils

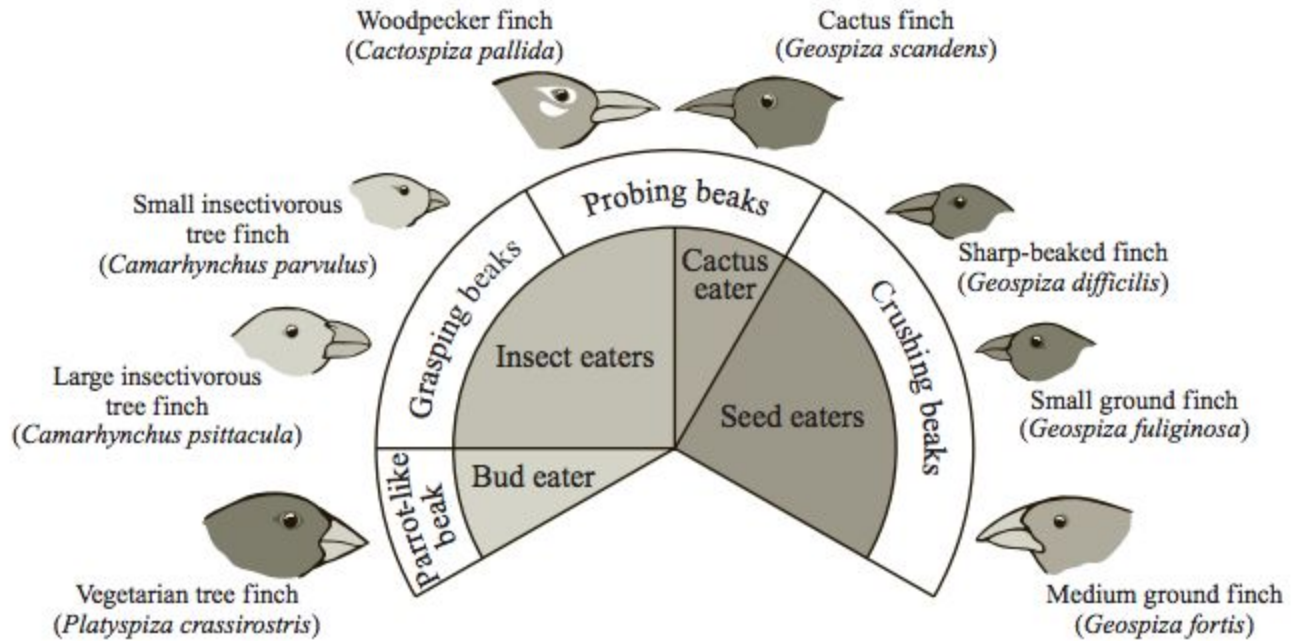
\_\_\_18. Images of the embryo and adult stages of three different organisms are shown below.

Organism	Embryo	Adult
grasshopper		
spider		
centipede		

Which of the following is the best conclusion that can be drawn from this evidence?

- a. Having similar embryos indicates that these organisms eat the same types of food
- b. Having similar embryos indicates that these organisms live in a similar environment.
- c. Having similar embryos indicates that these organisms share a recent common ancestor
- d. Having similar embryos indicates that a certain protein controls how many legs the adult organisms will have.

19. The Galápagos Islands are home to a group of bird species known as Darwin’s finches. The diagram below shows eight of these finch species, organized according to the type of beak they have and their main source of food as adults.



Darwin’s finches provide a classic example of the processes of evolution. Scientists have concluded that Darwin’s finches evolved from a South American ancestor. The Galápagos Islands are located approximately 1000 km west of South America. These islands were never connected to the South American mainland or to each other. Scientists think that a small number of birds from the ancestral species must have either gotten lost or been blown to the islands by a storm. This original population then evolved on the islands, where there are many different niches and food sources.

After studying the finch diagram, a student concluded that the cactus finch, sharp-beaked finch, small ground finch, and medium ground finch are more closely related to each other than to the other four finch species shown.

a. Describe the evidence from the diagram the student used to come to this conclusion.

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The student hypothesized that the sharp-beaked finch, small ground finch, and medium ground finch are more closely related to each other than to the cactus finch.

b. Identify one type of scientific evidence, other than physical characteristics, that would help the student evaluate the hypothesis, **and** describe specifically how that evidence could support the hypothesis.

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