

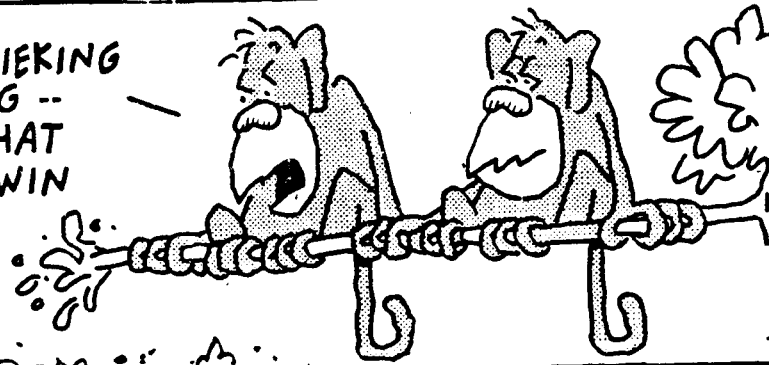
UNIT THREE: EVOLUTION AND CLASSIFICATION

Chapters 12 (omit 12:2 & 12:3), 13, 14 (omit 14:2), and 19 and Pg. 332

1. Explain how early Earth conditions differed from present day Earth.
2. Explain the significance of Miller and Urey's experiment to the origin of the first cells.
- *3. Explain the significance of how plate tectonics has shaped the face of the Earth and led to evolution.
- *4. Explain how the Law of Superposition is used to determine the relative age of fossils.
5. Distinguish between adaptations and variations.
6. Compare and contrast Darwin's and Lamarck's views about how evolution occurs.
7. Describe the following evidence for evolution: fossils, homologous structures, analogous structures, vestigial structures, embryology, biochemistry, and DNA.
- *8. Compare the different modes of speciation including divergent evolution and adaptive radiation.
9. Construct graphs that show stabilizing selection, directional selection, disruptive selection.
10. Describe the system for classifying organisms.
11. Distinguish between organisms classified in each of the five kingdoms.
12. Explain how living things are organized.

Note: * items are NOT in the book.

GO BACK TO SHRIEKING
AND HOOTING --
HERE COMES THAT
BUSYBODY DARWIN
AGAIN.



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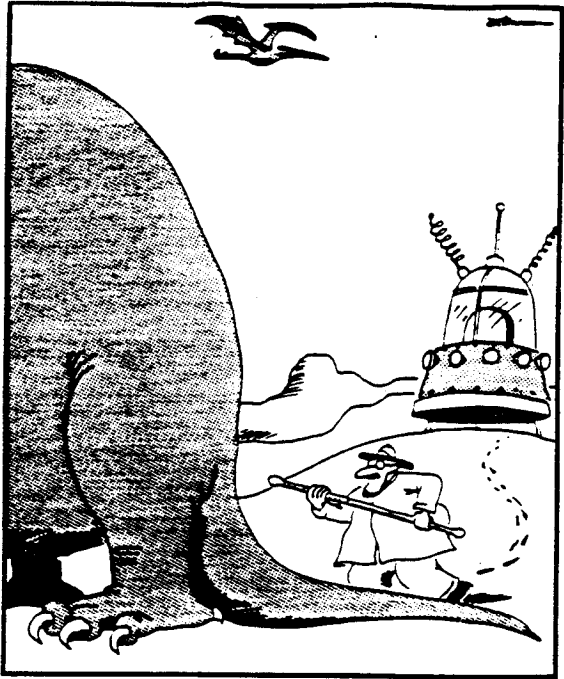
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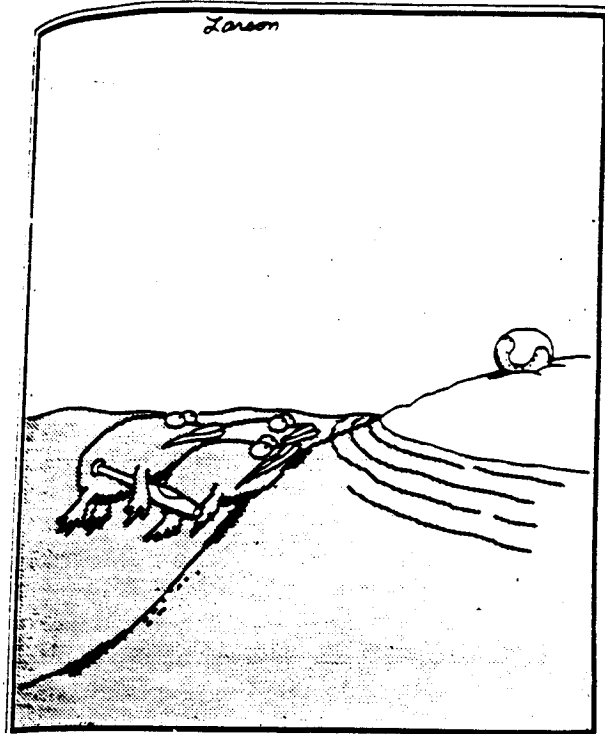
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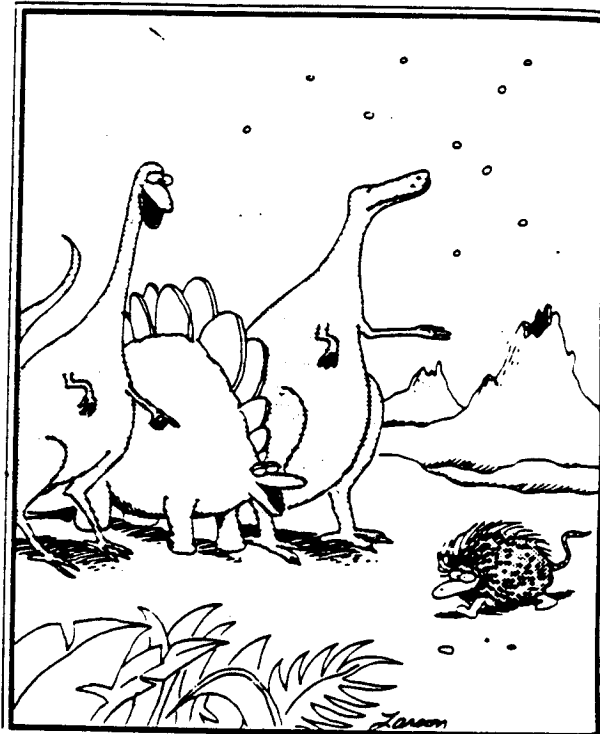
An instant later, both Professor Waxman and his time machine are obliterated, leaving the cold-blooded/warm-blooded dinosaur debate still unresolved.



Great moments in evolution



In the animal self-help section



Variation within a Species Activity

Introduction:

You have probably heard the expression, “as much alike as two peas in a pod.” Well, just how much alike are two peas in a pod, or the heights of people? In a flock of sheep all the individuals look very similar, and humans have a difficult time telling apart the individuals. The lambs, however, seem to have no difficulty in finding their mothers, especially when the lambs are hungry! There are differences in the mother sheep that the lambs use to identify their mother. We don’t notice these differences by simply looking at them.

The differences by which individuals within a species are identified are known as **variations**. It is possible to describe these differences in pictures, words, or as measurements. Probably the best descriptions are made in terms of quantitative measurement.

Purpose:

In this activity you are going to measure various parts of the body to determine if variation exists. You will also need to think about how these differences in variation lead to better survival for the individual.


Pre-Lab:

Construct a data table that includes all the measurements you will need to make during this lab exercise. *Follow rules for how to make a perfect table!*

Procedure:

1. Obtain a tape measure.
2. Measure the distance (in mm; to the tenths place) for your partner from the outer corner of one eye to the outer corner of the other eye. PLEASE be careful to not poke your partner in the eye!!
3. Record this measurement on your partner’s data table.
4. Have your partner repeat step 2 for your eye to eye distance and record your data on your data table.
5. Write both your data and your partner’s data on the class data table.
6. Measure the distance from the top of your partner’s shoulder to the tip of his/her index finger in mm.
7. Record your partner’s data on their data table.
8. Repeat steps 6-7 for your shoulder to arm distance.
9. Record both your data and your partner’s data on the class data table.
10. Measure the circumference (distance around) your partner’s wrist.
11. Record your partner’s data on their data table.
12. Repeat steps 10-11 for the circumference of your wrist.
13. Record both your data and your partner’s data on the class data table.

Graph:

1. Graph the wrist on one side of the graph sheet, then choose one of the other two traits and graph it on the back.
2. The independent variable is the trait’s measurement in mm and the dependent variable is the number of people who have that measurement.
3. Orient your piece of graph paper so the x-axis is longer than the y-axis: 
4. To make our graph easier to interpret, group measurements on the x-axis together i.e.
0-5.0 mm 5.1-10.0 mm 10.1-15.0 mm 15.1-20.0 mm

Analysis Questions: Answered on a separate piece of paper using complete sentences.

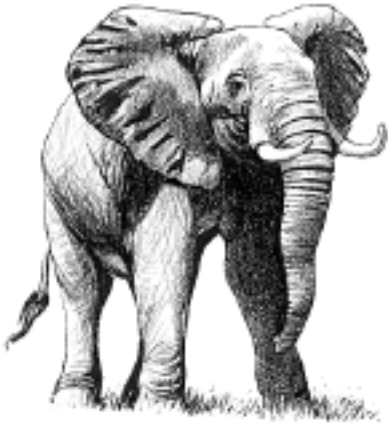
1. a) Were the measurements the same from person to person? b) Why?
2. Was there a specific measurement (eye to eye, shoulder to index finger, wrist circumference) that was most similar between class members?

3. a) What is a variation?
b) Why are variations within species beneficial?
c) What would happen if there was no variation between organisms?
4. What possible advantage is there to any of the variations we measured?
5. Describe the general trend indicated by the graphs.
6. If selective pressure existed within our population that, over the next 500 years, favored having thicker wrists, what effect would that have on a the graph for wrist circumference? Sketch on your graph, in a color different than the color used on your graph, what the wrist circumference graph would look like in 500 yrs.

SCIENCE SKILLS: APPLYING INFORMATION

Darwin stated that evolution occurs through natural selection. The key factor is the environment. The environment “selects” which organisms will survive and reproduce. Traits possessed by organisms successful at survival and reproduction are more likely to be transmitted to the next generation. These traits will, therefore, become common.

Normally, nearly all African elephants, male and female, have tusks. In 1930, only 1 percent of the elephant population in Queen Elizabeth National Park was tuskless because of a rare genetic mutation. Food was fairly plentiful, and by 1963, there were 3,500 elephants in the park. In the 1970s, a civil war began in Uganda. Much of the wildlife was killed for food, and poachers killed elephants for their ivory tusks. By 1992, the elephant population had dropped to about 200. But by 1998, the population had increased to 1,200. A survey in 1998 revealed that as many as 30 percent of the adult elephants did not have tusks. Ugandan wildlife officials also noted a decline in poaching.



The Process of Natural Selection

Principles	Application
All species have genetic variation.	
Living things face many challenges in the struggle to exist.	
Individuals of species often compete with one another to survive.	
Individuals that are better able to cope with the challenges of their environment tend to leave more offspring than those less suited to the environment.	
The characteristics of the individuals best suited to a particular environment tend to increase in a population over time.	

Contrasting Theories of Evolution

Your textbook describes two conflicting theories created by scientists to explain how evolution works. Use your textbook/class notes to help complete the chart below. Then, answer the questions that follow. You do not have the entire class period to complete the activity so work efficiently and cooperatively.

NAME		
TIME		
MAIN IDEA IN THEORY		
KEY POINTS OF THEORY		

QUESTIONS

1. What is the basis for groups of organisms being classified as a species?
2. What is variation? Choose a species and list as many possible variations that exist within that species. What is the main cause of variation in a species?
3. When is a mutation likely to be beneficial to an organism?
4. How is having lots of variation beneficial to a species?
5. Define the term “niche” using the terms variation, adaptation, and species.
6. What environmental conditions define an organisms’ niche?

12. How do changes in the environment effect the population?
13. Draw a normal distribution curve for dog size. Assume that medium-sized dogs are most common while small and large-sized dogs are least common.
14. Draw one graph with two lines that shows how the distribution of peppered moths appeared before and after the industrial revolution. Explain why the distribution changed?
15. List the taxonomic groups in order from largest to smallest.
16. Name the five kingdoms used to classify organisms. Describe the key characteristics of each kingdom and provide several representative organisms that are classified into each kingdom.

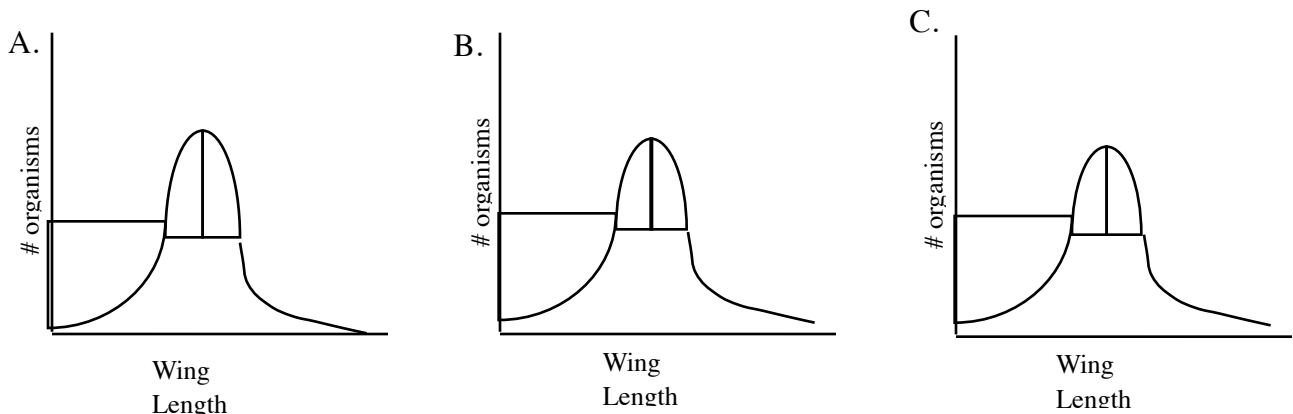
17. Explain how scientific names are expressed when written and when typed.

18. How are physical traits, embryological, biochemical, and DNA used to help classify organisms?

UNDERSTANDING NATURAL SELECTION

Those organisms that are well adapted to their environment live long enough to reproduce. Those that are not well enough adapted die. Each of the three graphs below illustrates the distribution of wing length among a population of flies on an isolated island. The flies compete with each other for food. Those flies with long wings fly at altitudes of 20 meters or higher. Those with intermediate wing length fly at an average altitude of 12 meters and those with short wing length fly at 5 meters or less.

Read the following three cases, each of which indicates some change in the island's environment. Note that each graph is labeled to correspond to each one of the cases. Using a colored pen or pencil, draw a curve on each graph showing how natural selection might effect the distribution of wing length's of flies for this population under different environmental conditions. Then answer the questions that follow.



CASE A: Prevailing wind patterns change, causing a stronger upper wind to blow constantly across the island. The wind blows long-winged flies out to sea where they die.

CASE B: Wind patterns change as in Case A. In addition, a new animal arrives on the island. It eats only flies that are close to the ground.

CASE C: A new species of tree frog is introduced to the island. These frogs only eat those flies that have wings of intermediate size, they fly at levels where the frogs live.

1. Natural selection acts upon _____ in populations.
2. In which case would the average wing length decrease? _____ **Explain your answer.**
3. In which case would the range of possible wing length diminish? _____ **Explain.**

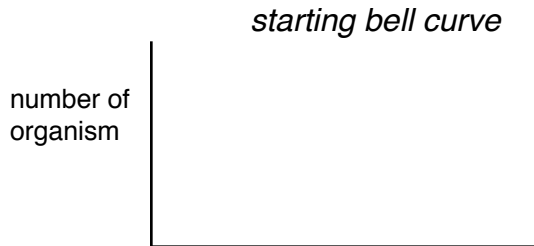
4. If the events of C continue to occur generation after generation, the result would probably be reproductive _____ of the short-winged and long-winged flies. This condition would ultimately result in the creation of a new _____.

TYPES OF SELECTION PRESSURE

Draw examples of standard bell curves on the axes to the left, then change the graph to represent stabilizing selection, directional selection or disruptive selection on the axes to the right. Think of a real example of each type of selection. Be sure to label the x-axis with the trait and range of variation for that trait.

A. **STABILIZING SELECTION:** steady environment

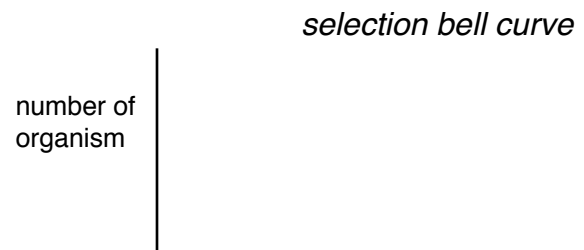
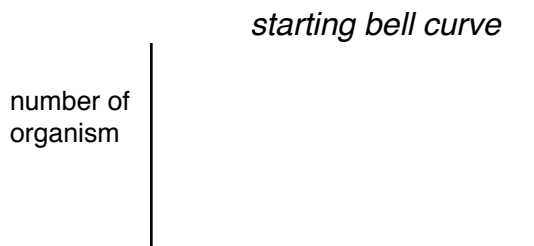
1. Selection is for the norm and against the extremes.



Example:

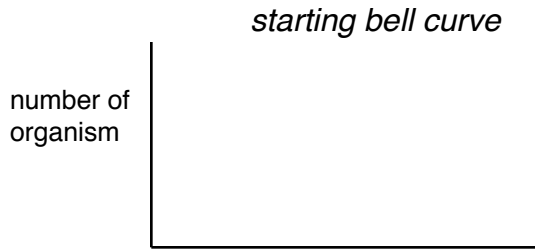
B. **DIRECTIONAL SELECTION:** Changing Environment

1. One extreme is selected for and the norm and the other extreme are selected against.



Example:

- C. **DISRUPTIVE SELECTION:** variety of habitat, patchy environment, new niche created
1. Both extremes are selected for and the norm is selected against.



Example:

NATURAL SELECTION AT WORK-- REAL WORLD EXAMPLES

Natural selection has been occurring on this planet for billions of years. The main idea of natural selection is that there are variations among a population of organisms and some variations allow groups of organisms to be more successful in the environment in which they live. Success means that organisms can live to reproduce, thereby passing on their favorable variations to their offspring.

The purpose of this activity is to apply your knowledge of natural selection for **two** of the examples listed below. More specifically, your group is to determine the following information for each example:

- A. What possible variations existed in the original population of organisms?
- B. What type of selective pressure modified the original group to have the variations we see today? Directional, disruptive, stabilizing, or artificial selection. Explain your answer.
- C. Graph the original population (from part A) as a bell-shaped curve and the current population (part B) as a modified bell-shaped curve.
- D. Explain how natural selection led to the success of one variation over all the others. What might the environmental conditions be to favor such a variation?
- E. Speculate as to how a new species may arise from the group of organisms with favorable variations to its environment.

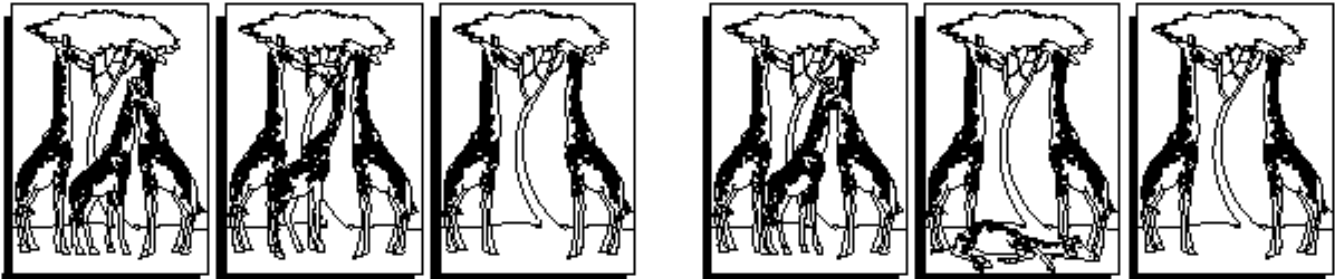
These are the examples to choose from:

1. Resistance of bacteria to antibiotics
2. Tiger's stripes (HINT: White tigers are NOT albino!)
3. Success of sharks whose basic body design hasn't changed in over 450 million years!
4. Extinction of dinosaurs
5. A group of plants competing for sunlight
6. Different breeds of dog (breed = subspecies)
7. Brightly colored feathers of a male cardinal to attract a mate
8. Farmers selecting corn plants that produce the most ears per plant
9. Bats and insects pollinating flowers (coevolution)
10. Lions selecting easy prey organisms such as those that are old, sick, or lame
11. Giraffes having long necks
12. Arctic hares ability to change coat color in winter and summer
13. The large, complex brain of modern humans compared to the smaller, less complex brains of early ancestors
14. Varieties of roses for particular soil types and/or climates.

Interpreting Graphics 10

COMPARING THE THEORIES OF EVOLUTION OF LAMARCK AND DARWIN

LAMARCK'S THEORY	DARWIN'S THEORY
<ul style="list-style-type: none">• Organisms constantly strive to improve themselves and become more advanced.• The effort to improve causes the most used body structures to develop, while unused structures waste away.• Once a structure is modified by use or disuse, the modification is inherited by the organism's offspring.	<ul style="list-style-type: none">• There is variation within populations. Many variations are inherited, and such traits are passed from parent to offspring.• Some variations are favorable, improving the organism's ability to function and reproduce in its environment.• More young are produced in each generation than can survive. Only a few survive long enough to reproduce.• Organisms that survive and reproduce are those with favorable variations. Because the offspring of these individuals will inherit favorable variations, a larger and larger proportion of each new generation will have these variations.• Over enormous periods of time, small changes accumulate, and populations change.



PART A Use the information in the table and diagram to answer the following questions.

1. What is the second part of Lamarck's theory of evolution called?

2. Which part of Darwin's theory of evolution explores natural selection?

3. What is gradualism?

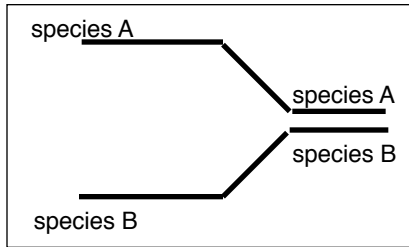
4. Which part of Darwin's theory of evolution includes the idea of gradualism?

5. Millions of years ago, giraffes had necks of different lengths as shown in the first part of each diagram. Explain how giraffes would have developed long necks according to Lamarck's ideas about evolution. Then, explain how giraffes developed long necks according to Darwin's ideas about evolution.

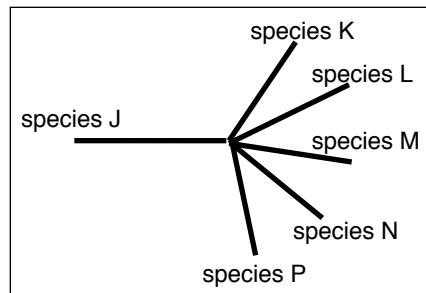
TYPES OF EVOLUTION

Match the types of evolution diagramed below to the items #1-20. There may be more than one correct answer per item. Types of evolution choices must be used more than once.

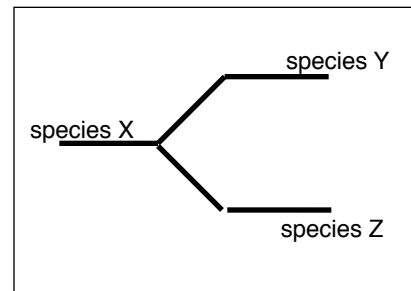
FIGURE A



FIGURE



FIGURE



ASSUME TIME PROCEEDS FROM THE LEFT OF EACH FIGURE (PAST) TO THE RIGHT (PRESENT)

- | | |
|--|--|
| _____ 1. Common ancestor | _____ 18. Insect wings and bats' wings |
| _____ 2. Homologous structures | _____ 19. Must have favorable variation |
| _____ 3. Vestigial structures | _____ 20. Organisms with favorable variation survive to pass variations to offspring |
| _____ 4. Divergent evolution | |
| _____ 5. Convergent evolution | |
| _____ 6. Speciation occurs | |
| _____ 7. Adaptive radiation | |
| _____ 8. Lots of niches available in an environment | |
| _____ 9. Same function of structures | |
| _____ 10. Directional selection | |
| _____ 11. Disruptive selection | |
| _____ 12. Stabilizing selection | |
| _____ 13. Analogous structures | |
| _____ 14. Same solution to environmental pressures as other, non-related organisms | |
| _____ 15. Darwin's finches | |
| _____ 16. Bear ancestor diverges into polar bears and brown bears | |
| _____ 17. Fish and penguins fin structures | |

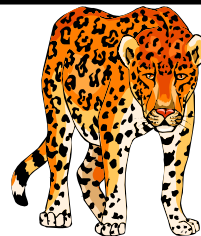
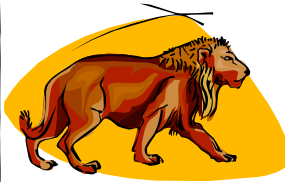
Evolution & Classification Concept Generalizations

Create either concept generalization sentences or concept maps for the following groups of words on a separate piece of paper. **Do not define the words in your paragraph.** Explain how the words are related. Underline the key words used. Try to limit your generalization to four sentences! Be brief and concise yet accurate!

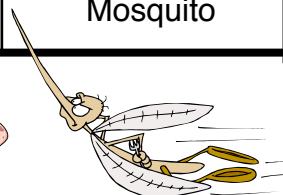
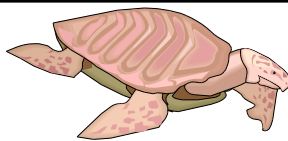
1. SPECIES, VARIATIONS, ADAPTATIONS, BIODIVERSITY, EVOLUTION
2. LAMARCK, ACQUIRED CHARACTERISTICS, DARWIN , NATURAL SELECTION, THEORY, SURVIVAL OF THE FITTEST, POPULATION, EVOLUTION
3. ANALOGOUS STRUCTURES, HOMOLOGOUS STRUCTURES, VESTIGIAL STRUCTURES, SPECIES
4. SPECIATION, DIVERGENT EVOLUTION, CONVERGENT EVOLUTION, COEVOLUTION, ADAPTIVE RADIATION.
5. DISRUPTIVE SELECTION, DIRECTIONAL SELECTION, STABILIZING SELECTION, DIVERGENT EVOLUTION, ENVIRONMENTAL CHANGE, VARIATION
6. TAXONOMY, LINNEUS, CLASSIFICATION, BINOMIAL NOMENCLATURE, KINGDOM
7. PROKARYOTES, EUKARYOTES, EUBACTERIA, ARCHAEBACTERIA, ANIMALS, PLANTS, FUNGI, PROTISTS
8. CLASSIFICATION, PHYSICAL STRUCTURE, HOMOLOGOUS STRUCTURES, BIOCHEMISTRY, EMBRYOLOGY, DNA

Classification of Organisms

Kinadom	Animal	Animal	Animal	Animal
Phylum	Chordata	Chordata	Chordata	Chordata
Class	Mammalia	Mammalia	Mammalia	Mammalia
Orde	Carnivora	Carnivora	Carnivora	Carnivora
Familv	Felidae	Felidae	Felidae	Canidae
Genus	<i>Felis</i>	<i>Felis</i>	<i>Panthera</i>	<i>Canis</i>
Species	<i>domesticus</i>	<i>leo</i>	<i>pardus</i>	<i>lupus</i>
Common	House Cat	Lion	Leopard	Wolf



Kinadom	Animal	Animal	Animal	Plant
Phylum	Chordata	Chordata	Arthropoda	Tracheophyta
Class	Mammalia	Reptilia	Insecta	Angiospermae
Orde	Primate	Chelonia	Diptera	Fagales
Familv	Hominidae	Emydidae	Culicidae	Fagaceae
Genus	<i>Homo</i>	<i>Terrapene</i>	<i>Theobaldia</i>	<i>Quercus</i>
Species	<i>sapiens</i>	<i>carolina</i>	<i>anulata</i>	<i>alba</i>
Common	Human	Turtle	Mosquito	White Oak



The Six Kingdoms of

Characteristic	Archae-		Protist	Funai	Plantae	Animali
Heterotrophic or Autotrophic						
Single-celled or multicellular						
Prokaryotic or Eukaryotic						
Mobile or Sessile						
Marine, Aquatic or Terrestrial						
Other nifty information						
Example organisms <i>Genus species</i>						

Video: Evolution – Why Sex?

1. What are some of the complications of sexual reproduction that females “have to put up with”?
2. Robert Virjenhoek has been studying a little fish call minnows in the pools of Sonora, Mexico. Some of these minnows use sex to reproduce. Others have abandoned sex and are asexual. What is going on here? Why?
3. According to Virjenhoek, what is the advantage of sex?
4. According to the video, why do males and females evolve differently?
5. Darwin saw two strategies at work in the courtship idiosyncricies of different species. What are they?
6. Why does it make sense that females tend to be very “choosey” as to who they mate with?
7. Marion Petrie (University of Newcastle) did experiments with peacocks to see if females do indeed choose a male for mating. What did she find out?
8. Peacocks are a classic case of “evolution operating through sexual selection”. What does that mean?

9. Why is monogamy a social solution to a biological dilemma?
10. Why might “cheating” in otherwise monogamous songbirds be an advantage?
11. Chimpanzees and Bonobos live in similar jungles in equatorial Africa, look like, live in the same size communities and eat similar foods. Violence is a daily part of chimpanzee life but not Bonobos. Why?
12. . a) What did the “T-shirt” study show?

Planet of Life Video

Answer these questions as you watch the video. If you do not get an answer, go back to it after the video. Do not ask others for the answer during the video-- you may miss something else!

1. How long ago was the Earth formed?
2. Describe the early atmosphere.
3. What is described as the "greatest event in earth's history"?
4. What structure was formed by this event?
5. What caused DNA to form and cells to be created?
6. Can life exist at 200° F?
7. What type of molecules does DNA code for?
8. What kind of life lives in the deep ocean?
9. What is the food of deep ocean bacteria?
10. Minerals and CO_2 combined to release what gas?
11. Why did the Earth cool?
12. Cyanobacteria are also known as _____ - _____ algae.
13. These organisms performed _____ to make their own food.
14. How did some bacteria survive in the presence of O_2 ?

15. What organelle formed from bacteria who joined together?

16. How did the mitochondria develop?