NAME _____ **HR**_____

Theories on Origin and Change Outline

Change Over Time

- Most scientists agree that organisms have changed over a long period of time – from _____ to _____.
- Scientists do not know how life first began or how evolutionary changes occurred.
- To explain these events, scientists have proposed various theories.
- Some theories have been totally rejected because of lack of supporting evidence.
- Other theories have been modified (changed) based on new evidence.

Spontaneous Generation

- An Early attempt to explain the origin of life.
- The concept that living things come from _____ things.
- People believed, for example, that toads came from mud, flies came from the rotting bodies of animals, and mice came from cheese.
- This theory was widely accepted until the late 1800's when it was disproved by _____.
- Today, we know that life comes from other living things although some scientists believe the first cell must have come from nonliving materials.

Theory of Use and Disuse

- In the early 1800's _____ presented this theory.
- He thought that organisms were able to develop new structures because they _____ the structures.
- He also believed that the size of an organ is determined by how much the organ is used.
    - According to this theory, ballet dancers have big, strong muscles because they use their muscles a lot.
    - When a dancer stops using a certain muscle, the muscle gets smaller and weaker.

Inheritance of Acquired Characteristics

- _____ also stated that the useful traits an individual developed during its lifetime can be _____ on to its offspring.
- An _____ is a trait that is produced during an individual's lifetime.
    - Lamarck would have said that the children of dancers would inherit strong muscles.
- Lamarck's theories were widely accepted for a long time.
- As time went on, scientists began to challenge his theories by showing that there was no data to support his hypothesis.

Disproving Lamarck's Theory

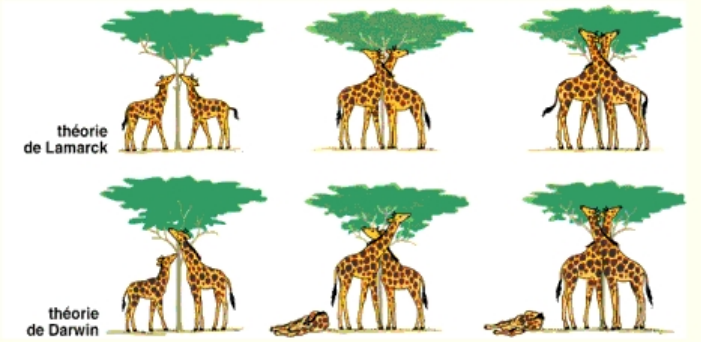
- The idea that acquired traits could be inherited was officially disproved in the late 1800s by the experiments of _____.
    - Weismann _____ the tails from mice.
    - He then _____ the tailless mice.
    - He did this for many generations.
    - The offspring of the tailless mice were always born with _____.
    - This experiment proved that acquired traits are _____ inherited by offspring.

Darwin's Theory

In the 1850's the theory of _____ was proposed by _____.

In his travels he noticed that a certain species in one geographic area was different from the same species in another area.

His theory of evolution was developed to explain the _____ change in species.



Alfred Wallace

_____ (The environment) acts as the selecting agent of an organism's traits.

Darwin believed organisms better adapted to the environment survive and reproduce more successfully than organisms not as well adapted.

Natural Selection suggests that _____ that help an organism survive in a changing environment are _____ on to the next generation.

Although Darwin is given credit for the theory of natural selection, another scientist, _____, proposed a theory of evolution that was quite similar to Darwin's Theory.

Darwin's Theory of Natural Selection

1.<u>Overproduction</u>:

- For example: a fish must lay millions of eggs to reproduce a small number of new fish.

2.<u>Competition</u>:

3.<u>Variations</u>:

- Differences in structure, size, and color are examples of variations.

4.<u>Natural Selection</u>:

5.<u>Survival of the Fittest</u>:

•In a woodland environment, brown fur color would be a helpful variation and white fur color would not be helpful.

6.<u>Inheritance of Variations</u>:

7.<u>Evolution of New Species</u>:

Mutation Theory

- In 1901, _____, suggested that inherited mutations caused _____.
- He believed that _____ (changes in genetic material) occurred randomly and those mutations that were favorable were _____ by offspring.
- DeVries based his theory on his reproduction experiments with the evening primrose plant.

Modern Theory of Natural Selection

- The genes of inherited variations that give an organism a better chance for survival tend to be passed on from _____ to _____.
- These favorable genes tend to _____ in numbers within a population.
- _____ for traits with _____ survival value _____ in numbers from generation to generation.
- If the _____ changes, genes that previously were neutral or had low survival value may become _____ and increase in numbers.

Evolution In Our Time

- *Staphylococcus* bacteria
  - When the antibiotic was first used, these bacteria had _____ that made them _____ to antibiotics.
  - When the use of antibiotics became widespread, these _____ increased in numbers, producing a _____ of bacteria that was not _____ by antibiotics.
  - Today, scientists continuously develop new _____ because the bacteria population _____ and produces new antibiotic-resistant strains.
  - Mutations are ***not caused*** by environmental change. Mutations occur _____.
  - Mutations with _____ survival value allow organisms to be better _____ to their _____.
  - The _____ selects those variations, or adaptations, that may have _____ value.

- English Peppered Moth
  - Peppered moths have two basic colors: light color with dark markings or dark color with light markings.
  - Before the industrial revolution, most peppered moths were light colored. This enabled them to blend with their light-colored environment, such as the trunks of trees and the side of buildings.
  - By blending with the environment, the light-colored moths were almost invisible.
  - Insect eating birds could not see them.

- The soot and other air pollutants from the industrial revolution gradually changed the environment from light to dark.
- The light-colored moths became visible and were eaten by birds.
- The dark-colored moths could not be seen against the dark background. These moths reproduced more dark moths and the population shifted from light to dark-colored.
- Recently, as a result of environmental pollution laws, the moth population is slowly changing back to light-colored moths.

Artificial Selection

- Sometimes plant and animal breeders purposely _____ organisms by mating plants and animals that have certain desirable traits.
- By selective breeding, _____ may cause evolution.
  - Example: racehorses and greyhounds have been produced that are faster than their predecessors.

Geographic Isolation

Occurs when a population is physically separated into smaller populations by _____.

- Mountain ranges, deserts, oceans, rivers, other bodies of water, big expressways, or shopping malls.

Changes may occur in these separated populations that, over a long period of time may result in the production of different species. The production of a _____ species is known as _____.

_____ occurs when members of the _____ population and the _____ populations can no longer interbreed, even if the barriers are removed.

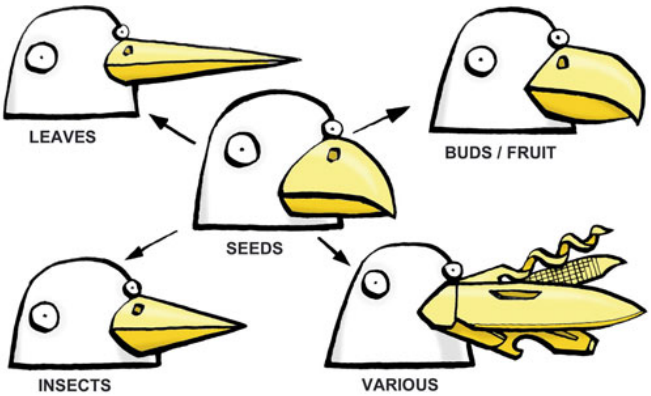
Adaptive Radiation

The process by which _____ _____

The new species evolve and fill different environmental _____ where there is less _____.

Organisms move into new _____ in the environment through chance _____ that have _____ adaptive _____.

A _____ adaptation would be one that allows an organism to live successfully in a new _____. If there is little _____ in the niche, the organism has a better chance to _____ and _____.



Rate of Change

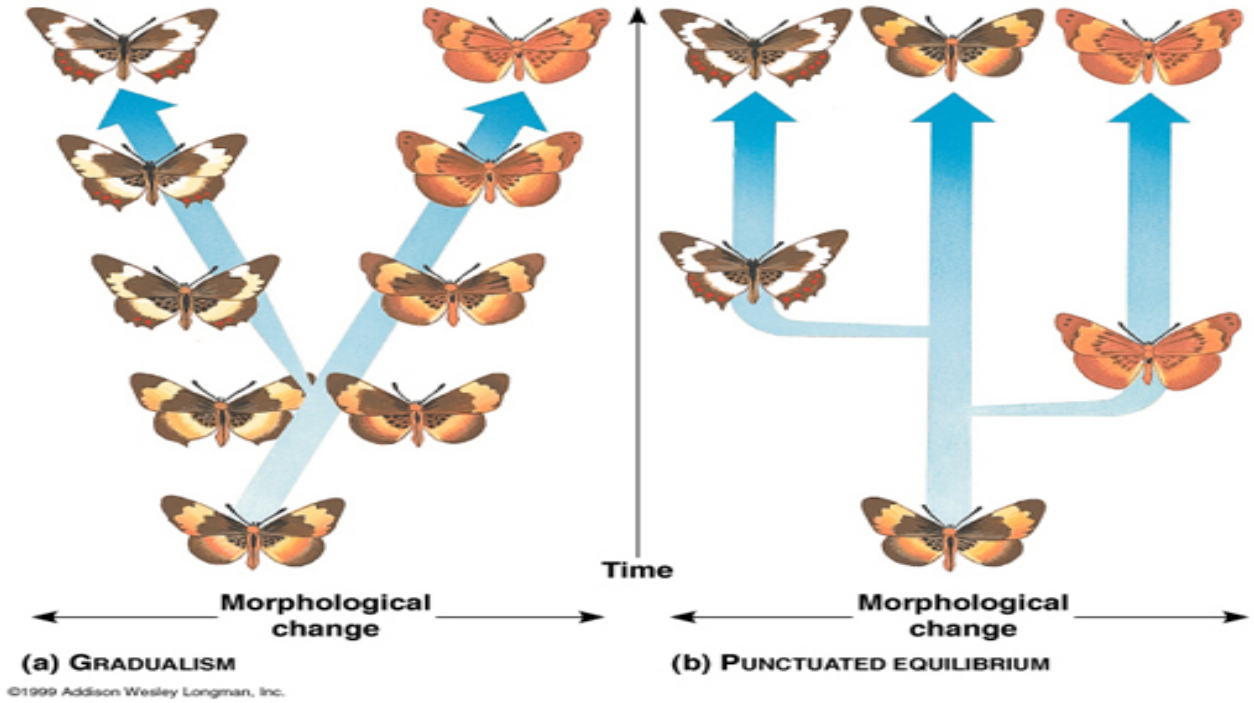
<u>Gradualism</u>

A theory that evolutionary change is slow, gradual, and continuous.

- New species would arise by the very gradual collection of minor changes in a population.

Punctuated Equilibrium

- A theory that species are relatively stable for long periods of time (several million years).
- This stability is interrupted by brief periods during which major changes occur. These changes result in the evolution of new species.
- The minor changes that occur in a population over time might produce new varieties of an existing species, but not a new species.



Heterotroph Hypothesis

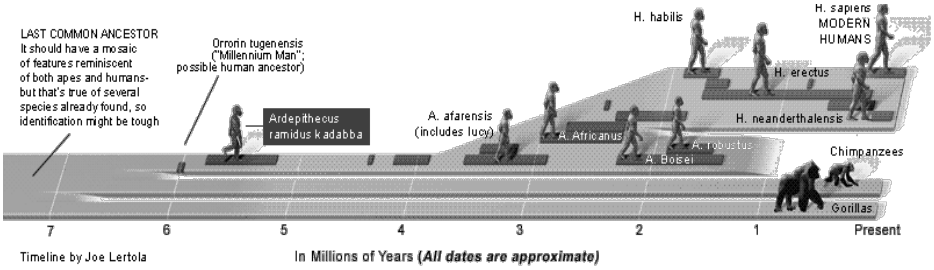
- This theory, proposed by A.I. Oparin in the late 1930's, stated that groups of organic molecules were formed from the chemical elements in the Earth's primitive ocean.
- These organic molecules combined, using energy from heat, lightning, solar radiation, and radioactive materials in the rocks.
- The first living things were thought to be heterotrophs. Since no free oxygen gas existed in the atmosphere, these forms of life carried on anaerobic respiration.
- They used the free organic molecules in the sea for food.
- Over time, genetic changes occurred in the first organisms.
- As a result of the genetic changes, photosynthetic forms of life evolved.
- These organisms, Autotrophs, released oxygen into the atmosphere.
- Aerobic forms of life evolved from the anaerobic forms.

Human Evolution

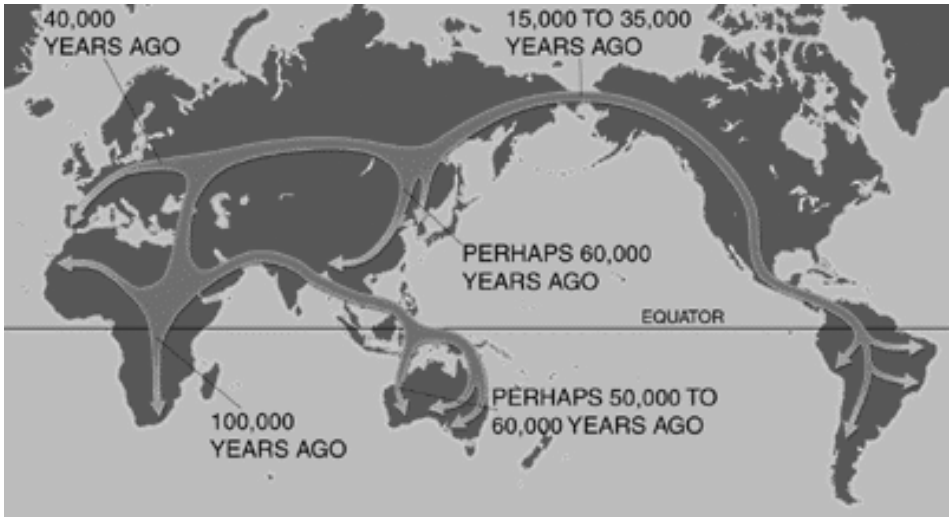
- Scientists know very little about human evolution, because there is very little _____.
- Some people incorrectly think that Darwin proposed that humans evolved from apes.
- Darwin only suggested that humans, along with other mammals, could have shared a _____.

There is no evidence that humans are the direct descendants of organisms living today.

Some human-like fossil forms have been discovered.
Their exact place in human ancestry has yet to be determined.



Out of Africa Theory



Human Evolution

Modern scientists assume that human evolution, like evolution in other animals, is continuing.
Because of their superior reasoning ability, _____ are able to control their _____.
Because of this, the evolutionary effect of natural selection is _____ as in other organisms.

Factors That May Affect Human Evolution

Medical Knowledge – permits the survival of individuals with genetic traits such as diabetes, hemophilia, and PKU. Without medical knowledge these people would die and the genes for these diseases would decrease in number in the population. With modern medicine the number of genes are maintained or increased.
Modern Transportation – humans are less affected by the evolutionary force of geographic isolation.
Advanced Technology – gives humans better nutrition and greater control over their reproductive process. It has also increased the number and kinds of mutagenic agents in the environment.
Genetic Engineering – may possibly lead to the appearance of new traits and the elimination of others.