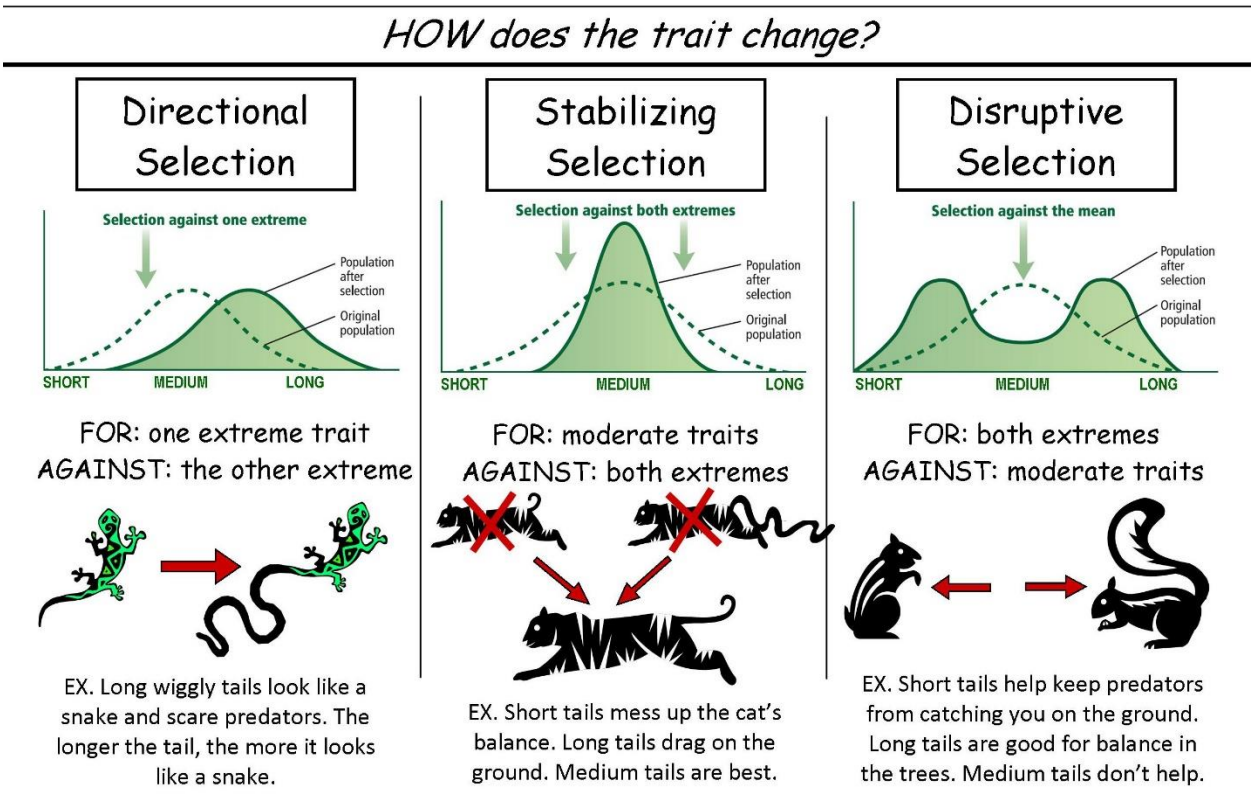
Types of Natural Selection

Have you ever wondered why the appearance of a species may look slightly different when found in different areas? Environmental pressures may cause populations to change over time due to their environment but not enough to form a new species. This is because an organism's ability to survive in its current environment to adulthood and reproduce will be the one to pass on its genes. And their genes will become more prevalent. Below are three different types of Natural Selection. Study the images and descriptions.



<u>Directional</u> favors one extreme of the population
<u>Stabilizing</u> favors the average in the population
<u>Disruptive</u> favors opposite extremes of the population (this can eventually lead to the development of two separate species).

If you start with a population of mice that have approximately the same number of solid black, solid gray and solid white mice but at the end of two years there are mostly black mice left, what type of selection occurred?

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What type of selection occurred if at the end of two years there are very few gray but many solid black and solid white mice left in the population?

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What type of selection occurred if there were mostly gray mice left after two years and only a few solid white and solid black?

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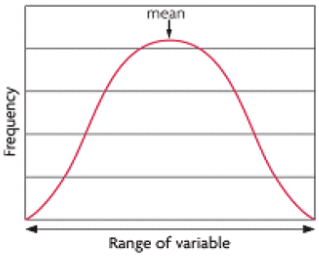
Patterns of Evolution



***Background**: Natural selection acts on distribution of traits an normally produces a range of phenotypes. The "**bell curve**" to the right illustrates the normal distribution of traits within a population. Environmental conditions can change and a certain phenotype may become an advantage. Natural selection can change distribution of a trait along 3 paths (**Directional, stabilizing**, or **disruptive** selection.*

***Directional Selection**- causes shift in a populations phenotypic distribution*

- *An extreme phenotype that was once rare is now more common*
- *Mean value of a trait shifts in direction of the more advantageous phenotype*

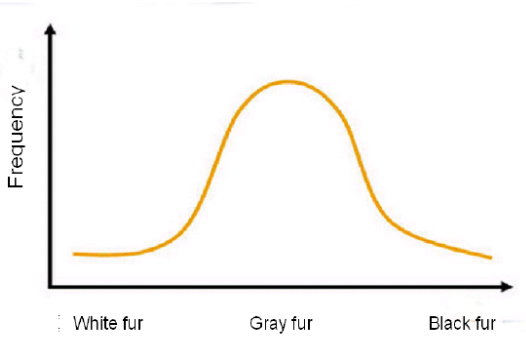
***Stabilizing Selection**- the intermediate phenotype is favored and becomes more common.*

- *Decreases genetic diversity*
- *Extreme phenotypes may be lost*

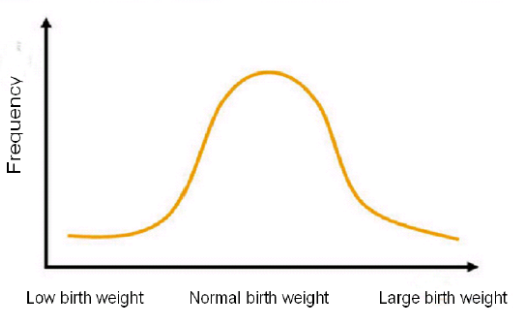
***Disruptive Selection-** occurs when both extremes are favored and intermediate are selected against*

- *Intermediate forms selected against*
- *Can lead to formation of new species*

Scenario #1: Suppose there is a population of rabbits. The color of the rabbits is governed by two incompletely dominant traits: black fur represented by "B" and white fur represented by "b". A rabbit with the genotype of "BB" would have a phenotype of black fur, a genotype of "Bb" would have gray fur (a display of both black and white) and a genotype of "bb" would have a phenotype of white fur. What type of selection would occur if this population migrated to an area that had very dark rocks as well as white colored stone?

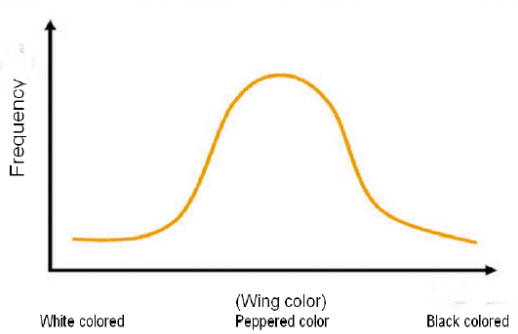


Scenario #2: In humans, birthweight can be represented by a typical bell curve. Babies of low weight lose heat more quickly (surface to volume ratio) and get ill from infectious disease more easily, whereas babies of large body weight are more difficult to deliver through the pelvis. Which type of selection would most likely occur?



Scenario #3: The evolution of the peppered moth over the last two hundred years has been studied in detail. Originally, the vast majority of peppered moths had light colouration, which effectively camouflaged them against the light-coloured trees and lichens upon which they rested. However, due to widespread pollution during the Industrial Revolution in England, many of the lichens died out, and the trees which peppered moths rested on became blackened by soot, causing most of the light-coloured moths to die off due to predation. At the same time, the dark-coloured moths flourished because of their ability to hide on the darkened trees. Since then, with improved environmental standards, light-colored peppered moths have again become common, but the dramatic change in the peppered moth's population has remained a subject of much interest and study

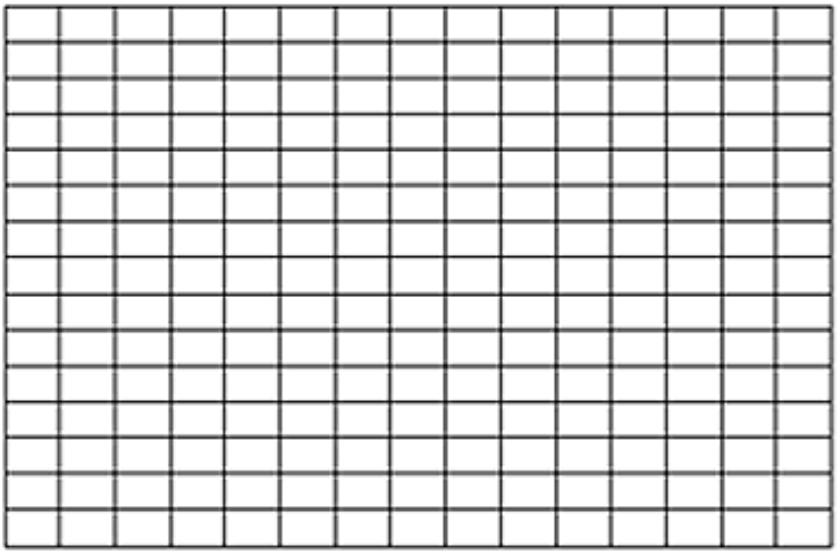
Which type of selection is illustrated by the peppered moth's during the Industrial Revolution?



A group of worms were all placed into environments that had differing selective pressures. Read the data tables below and graph each worm in its environment. From the graph, determine what type of selection is being portrayed: directional, stabilizing or disruptive.

1. Worms placed on an island where there are two predators that eat worms.

Number of Worms at Each Length						
		2 cm	4cm	6 cm	8 cm	10 cm
Year	1980	2	14	18	12	4
	1984	4	12	8	9	8
	1988	10	6	3	6	14



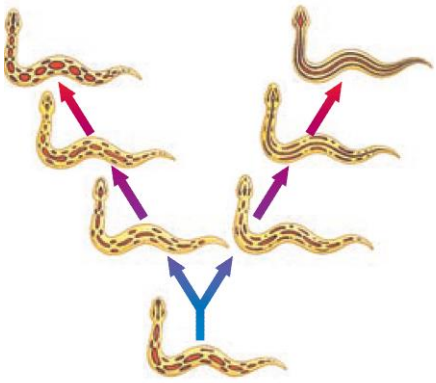
Type of Selection:

Summarize what happened to the worms.

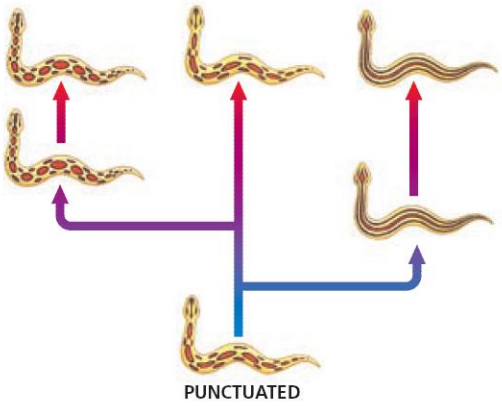
Types of Evolution: Punctuated Equilibrium vs Gradualism

Use the information below AND YOUR NOTES to answer the questions that follow. READ the information before attempting to do the work. You may need to refer to this information often.

GRADUALISM

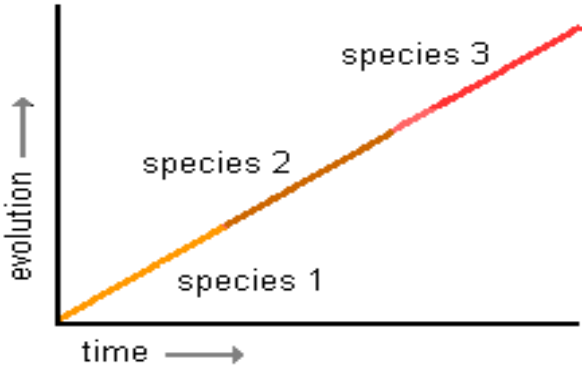


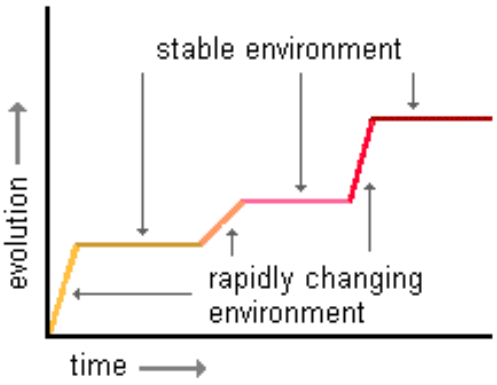
PUNCTUATED EQUILIBRIUM

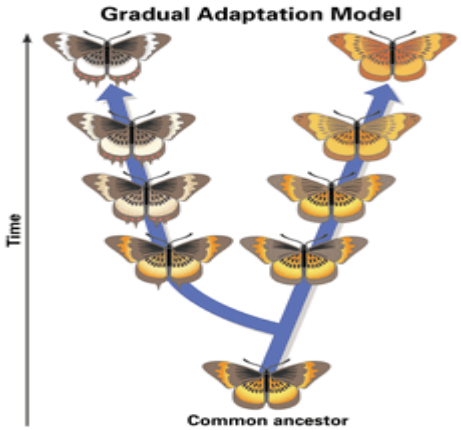


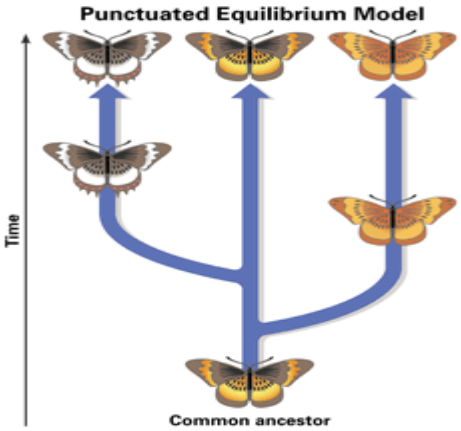
Gradualism - Natural selection gradually changes the average features of a species. This process continues for long enough for a species to change into a new species and the original species becomes extinct.

Punctuated Equilibrium - periods of rapid speciation followed by long periods of stasis –no change.

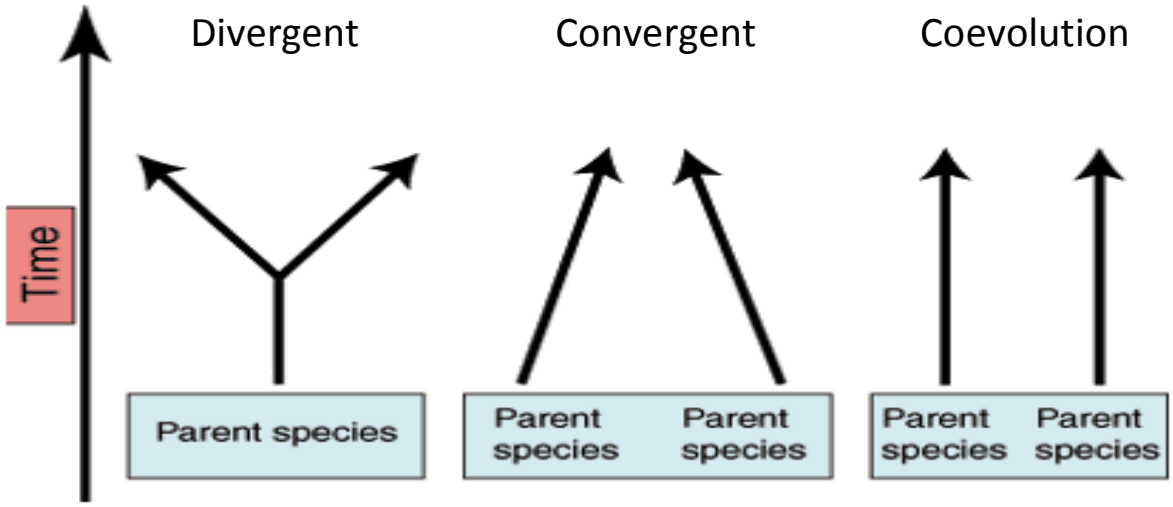






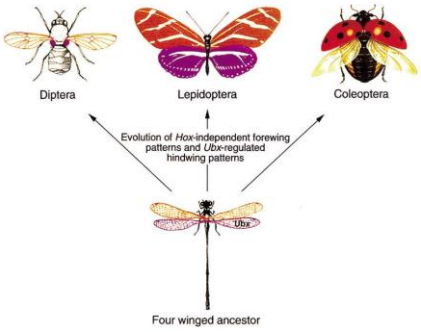


Types of Evolution: Divergent, Convergent & Coevolution



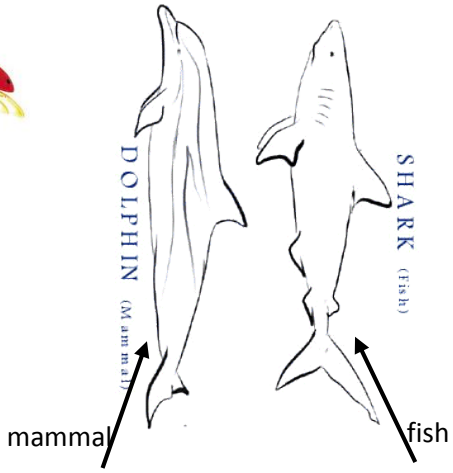
Divergent – ONE species evolves into two different species.
Convergent – TWO separate species in different areas evolve to look or behave in a similar manner
Coevolution – TWO species that have a partnership or symbiotic relationship evolve together to continue the relationship

DIVERGENT



Results in
Homologous Structures

CONVERGENT



Results in
Analogous Structures

COEVOLUTION

As the flower evolved over time, the pollinating partner the fly, evolved along with it to maintain the relationship.

TYPES OF EVOLUTION

Directions: Read each description below and choose which of the four types of evolution it is by placing an X under the correct answer for each description.

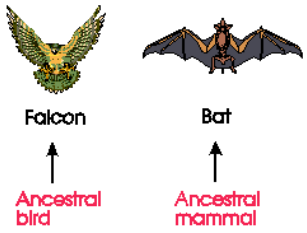
For convergent evolution and divergent evolution ONLY, use the key to record if the scenario is describing a homologous, vestigial, or analogous structure. Record in the box under the "X".

H = Homologous structure V = Vestigial structure A = analogous structure

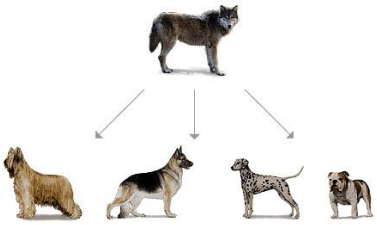
	Description	*Convergent evolution*	*Divergent evolution*	*Coevolution*	*Punctuated equilibrium*
1	In the ocean surrounding Antarctica, there are fish that survive the cold water by using a molecule made of glycoproteins that circulates the blood and keeps it from freezing. Certain kinds of worms that live in the Arctic ocean also make antifreeze proteins that help them live in icy water.				
2	Horse evolution shows long stable periods of little evolution interrupted by brief periods of rapid change.				
3	The Galápagos tortoises share a common ancestor, but have necks of different lengths to best reach different food in their environment.				
4	This kind of evolution is proven by DNA analysis and results in organisms with different ancestors becoming more alike as they adapt to similar environments.				
5	Abrupt appearance of new species in the fossil records				
6	Ants are the correct size and weight needed to open the flowers for the peony plant. The peony plant provides food for the ant and the ant fertilizes the peony's flowers				

Label each image below with the following terms:

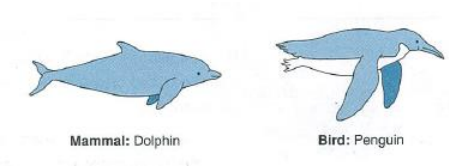
Divergent Convergent Coevolution



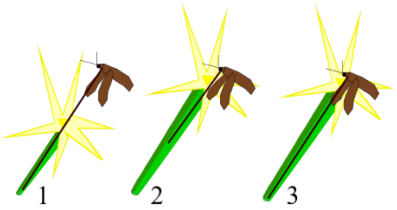
1 _____



2 _____



3 _____



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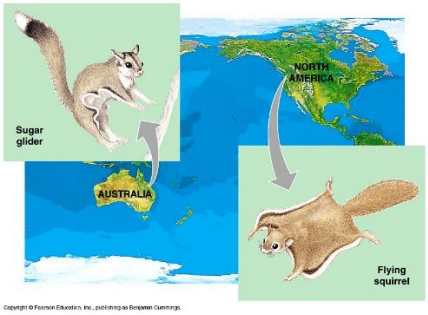

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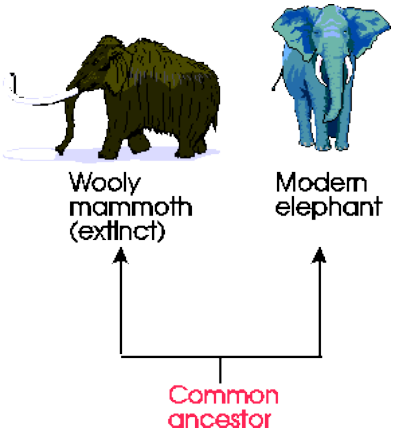
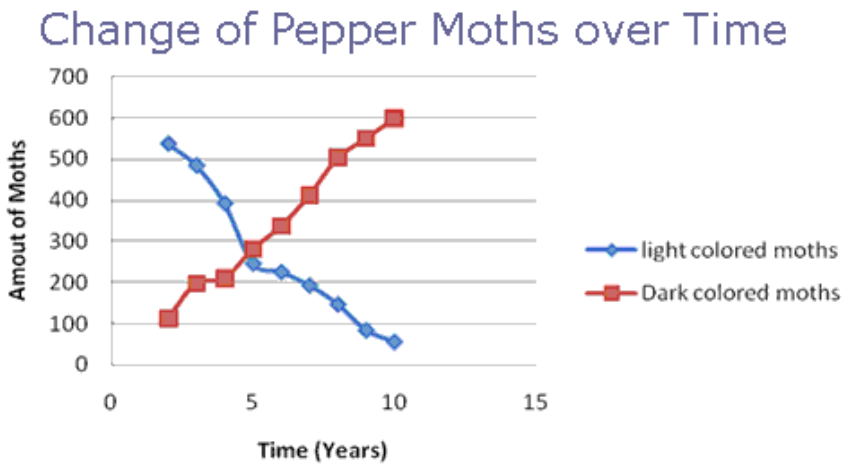


6 _____

Use the graph below to answer the questions that follow.



1. What adaptation proved to be beneficial for the population of Pepper Moths over the last 10 years?

2. Explain what likely happened to cause the results shown in this graph.

Below are images of finches Darwin studied in the Galapagos islands. Each finch was found on a different island but all evolved from a common ancestor.

I. Large Ground Finch	II. Large Tree Finch	III. Warbler Finch	IV. Small Ground Finch	V. Cactus Finch
				
large strong crushing beak	strong sharp beak for grabbing and cutting	small pointed beak for probing into cracks	strong crushing beak	long tough beak for probing

Write the Roman numeral in the space above the food item to match the correct finch to the food it eats.

A. Small insects in cracks and crevices. 	B. Large hard seeds. 	C. Cactus seeds and nectar. 	D. Large insects such as beetles. 	E. Small hard seeds. 

Describe how competition and limited resources aided speciation in the Galapagos Island finches.

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_____

_____

Get checked off before moving on. _____