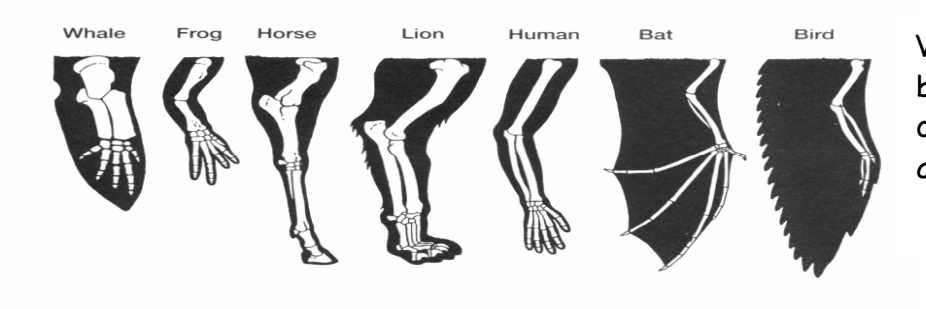
AP Biology Name: Per:

Evolutionary Biology Review

1. Identify each of the following evidences for evolution and describe how it shows relatedness.

a.



Why would a bird wing and a butterfly wing NOT be considered evidence of common ancestry?

b.

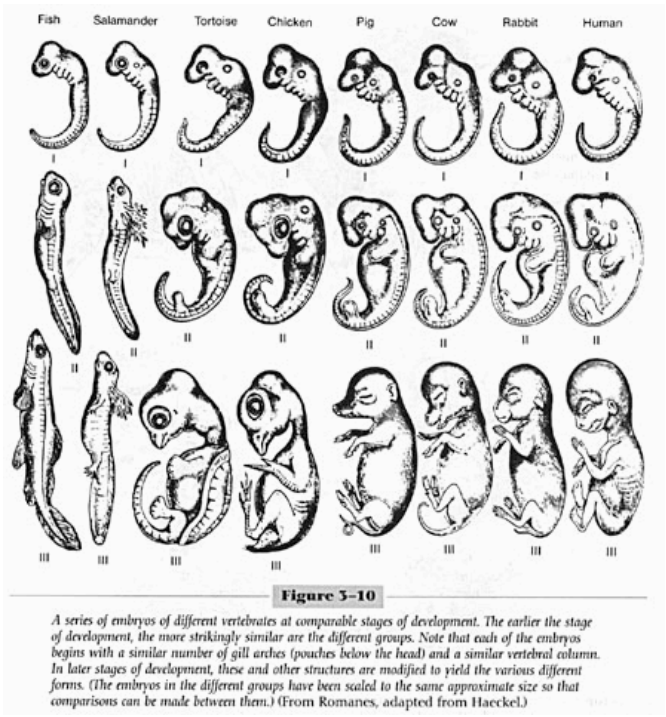
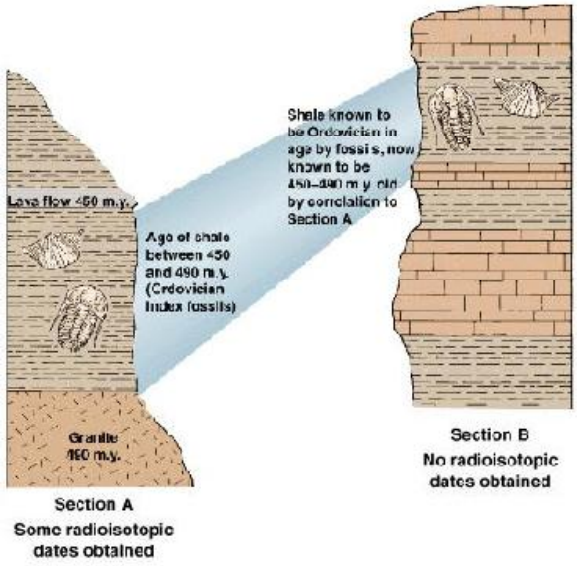


Figure 3–10

A series of embryos of different vertebrates at comparable stages of development. The earlier the stage of development, the more strikingly similar are the different groups. Note that each of the embryos begins with a similar number of gill arches (pouches below the head) and a similar vertebral column. In later stages of development, these and other structures are modified to yield the various different forms. (The embryos in the different groups have been scaled to the same approximate size so that comparisons can be made between them.) (From Romanes, adapted from Haeckel.)

c.



d. The table below shows a segment of the cytochrome c amino acid sequence of humans and the corresponding sequence of 5 vertebrates. The letters identify the specific amino acids.

Human	**Q**	**A**	**P**	**Y**	**S**	**T**	**A**	**K**	**N**	**K**	**G**	**I**	**I**	**G**	**E**	**D**	**T**	**L**	**M**	**E**	**K**	**A**	**T**	**N**	**E**
Chicken	Q	A	E	F	S	T	D	K	N	K	G	I	T	G	E	D	T	L	M	E	D	A	T	S	K
Frog	Q	S	A	F	S	T	D	K	N	K	G	I	T	G	E	D	T	L	M	E	S	A	G	S	K
Shark	Q	A	Q	F	S	T	D	K	S	K	G	I	T	Q	Q	E	T	L	R	I	K	T	A	A	S
Turtle	Q	A	E	F	S	T	E	K	N	K	G	I	T	G	E	E	T	L	M	E	D	A	T	S	K
Monkey	Q	A	P	Y	S	T	A	K	N	K	G	I	I	G	E	D	T	L	M	E	K	A	A	N	E

2. Why were Lyell and Malthus important figures to Darwin?

3. Charles Darwin proposed that evolution by natural selection was the basis for the differences that he saw in similar organisms as he traveled and collected specimens in South America and on the Galapagos Islands.
    a. Explain the theory of evolution by natural selection as presented by Darwin. (I am looking for SIX=6!! Different concepts---thinking about malthus and lyell might help)
    b. Each of the following relates to an aspect of evolution by natural selection. EXPLAIN each of the following.
        i. Natural selection and the formation of insecticide resistant insects or antibiotic resistant bacteria (think about pGLO!!)
        ii. Speciation and isolation (describe both allopatric and sympatric)
        iii. Natural selection and heterozygote advantage

4. Match each statement with an idea. In the blank to the left of each statement write "L" for Lamarckism, "D" for Darwinism, or "B" for both.
    a. _____Adaptive traits make an organism better suited for its environment.
    b. _____Traits accumulated over a single lifetime can be passed on to offspring.
    c. _____Populations are smaller than can be supported by the environment, traits are passed on genetically, and some organisms reproduce more than others.
    d. _____An organism can "will" a change to occur.
    e. _____If Vincent VanGogh had cut his ear off, then had a daughter, the daughter would be born without an ear.

5. If a population IS in Hardy-Weinberg Equilibrium, which of the following IS assumed to be true? CHECK ALL THAT APPLY.
    a. _____The population is large
    b._____Organisms do not select their mates
    c. _____Mutations occur rarely
    d. _____Natrual selection occurs
    e. _____There is no migration

6. What does the Hardy-Weinberg Law predict? What conditions will cause the Hardy-Weinberg Law to fail? Describe what this will do to numbers predicted by the Hardy-Weinberg Equation.

7. Match the following mechanisms of evolution to its correct example.

_____Bottleneck Effect
_____Founder Effect
_____Mutations
_____Fitness
_____Heterzygote Advantage
_____Gene Flow

A. Organisms move into a population changing the allele freq.
B. Certain traits offer a selective advantage over others
C. Changes in DNA seq. result from mistakes in DNA replication
D. Carriers of the sickle cell anemia gene have resistance to malaria
E. A small number of individuals inhabit an island and begin reproducing.
F. A hurricane wipes out a large portion of the population and a few individuals are left to reproduce.

8. As a field researcher you are sent to the Arizona desert to study the prairie dog species C. ludivincianus to determine if the population is in Hardy-Weinberg equilibrium. Specifically, you are studying this population with respect to the gene that determines the coat color in C. ludivincianus. This trait is coded for by a single gene (the NDY6 gene) with two alleles (N, n) and is passed down from one generation to the next.
    a. After sampling 170 of these prairie dogs, you find that the C. ludivincianus population IS basically in Hardy-Weinberg equilibrium for this trait. Your result are as follows: Genotype frequency of n/n = 0.36

    What is the allele frequency of the N allele?
    What is the genotype frequency of N/N?
    What is the genotype frequency of N/n?

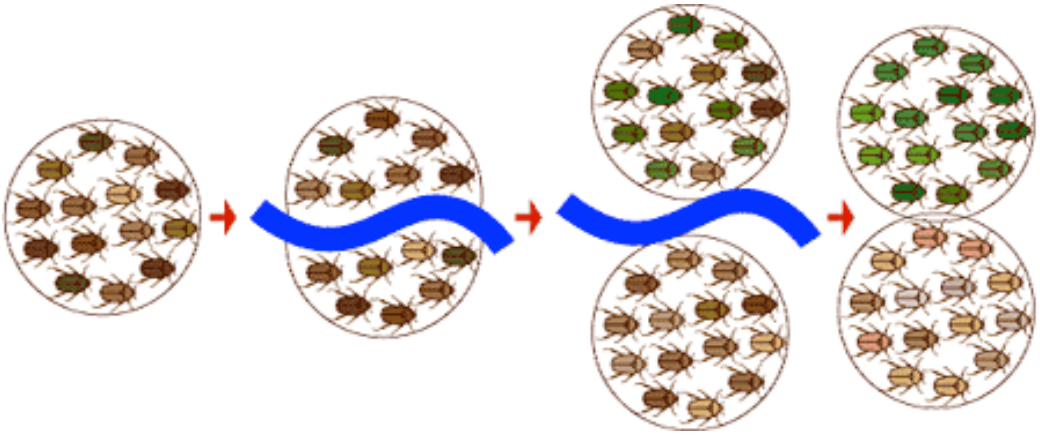
    What conditions must be being satisfied?

9. A population of Daphnia (diploid water fleas) is divided as follows into genotypes for albinism (a recessvie trait). A = dominant allele for dark color a = recessive allele for albinism

Genotype	Number of Daphnia
AA	846
Aa	148
Aa	6

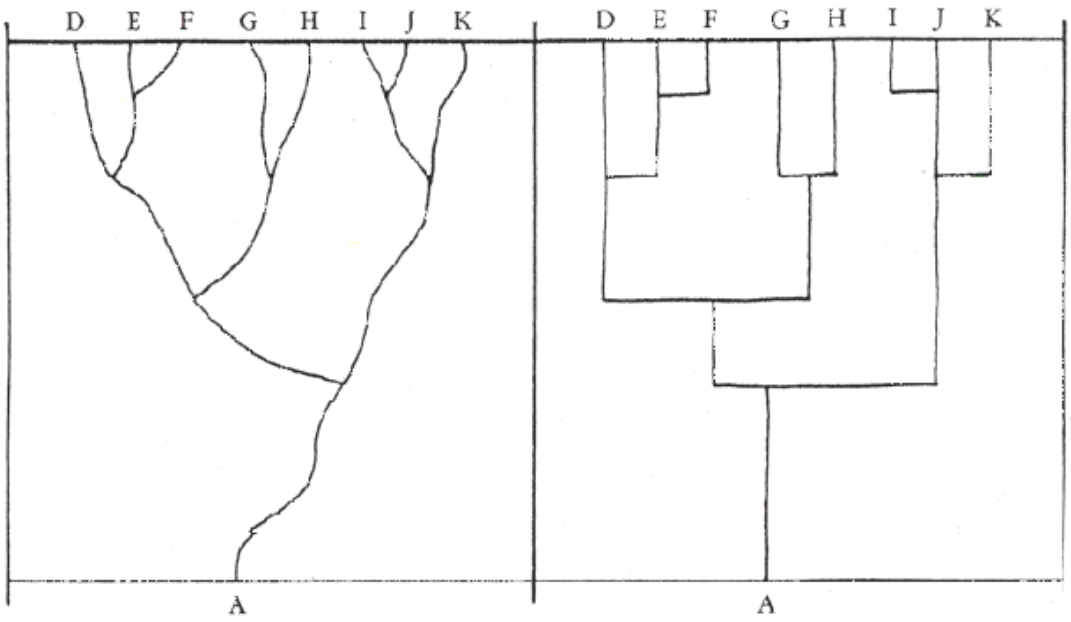
a. How many total alleles are in the population?
b. What is the allele frequency of A?
c. What is the genotype frequency of aa?
d. Using the Hardy-Weinberg equation, calculate the EXPECTED genotype frequency of homozygous recessives.
e. Is this Daphnia population in Hardy-Weinberg equilibrium? Explain your answer.

10. What type of speciation is shown in the picture below? Describe how it leads to the formation of two species. Name and describe at least 4 reproductive barriers that might maintain the gene pool differences.



11. You are a botantist from UC Berkeley who is studying evolution in plants. You have recently begun a project categorizing and analyzing the plant species on the Aragon campus. You are particularly interested in the plants C. donis and C. asterum (two plants commonly found in center court). C. donis has a diploid number of 12 and C. asterum has a diploid number of 16. As you comb through center court you discover a 3rd plant that you call C. plantus growing right in the middle of your C. donis and C. asterum. You wonder…is this a new species?
    a. If this IS a new species of plant, what mechanism was likely responsible for its development? How might this have happened?
    b. If you were to analyze this new plant's cells—what would the diploid number be?

12. The following two charts demonstrate two theories on the rates of evolution.
    a. Underneath each chart write which one represents "Gradualism" and which one represents "Punctuated equilibrium."
    b. Label the correct terms for the y and x axes.



    c. Describe what "gradualism" and "punctuated equilibrium" predict about the tempo of speciation.
    d. Explain how the punctuated equilibrium model could account for the relative rarity of transitional fossils linking newer species to older ones.