

## Self-Study Problems #2: Speciation and Mendelian genetics - Answers

1. Macroevolution is

*Evolution that creates new species.*

2. According to the biological species concept, what allows species to remain different from each other, or evolve further apart?

*Reproductive isolation between the species OR Lack of gene flow between the species OR There is no exchange of genes between the species*

3. According to the ecological species concept, what is the key process that allows species to remain different from each other?

*Stabilizing selection (“Natural selection” is also technically correct, since stabilizing selection is one kind of natural selection, but this answer would not make it clear that you understand the process.)*

4. According to the ecological species concept, how does the process you named in question 3 keep species different from each other?

*It weeds out any hybrids or individuals with intermediate characteristics, because they are less successful than individuals that are typical of each of the two species. This keeps the species from blending together and keeps their characteristics distinct from each other. OR The common type of each species survives and reproduces better than any hybrids or intermediate types. ETC.*

5. A chronospecies (or paleospecies) is

*An arbitrary division of a lineage of a single population that evolved over time [OR that experienced anagenesis]. OR In a population or species that has been evolving, a kind of organism different enough from its ancestors to be considered a separate species.*

6. Describe the situation required for allopatric speciation to occur.

*Two populations that are geographically isolated from each other and experience different conditions, so that one or both change enough to become a species distinct from the other. OR Two populations that live in different territories, preventing gene flow between them.*

7. What is meant by punctuated equilibrium?

*A pattern of changing rates of evolution in which species evolve slowly or not at all for long periods of time (periods in which they are in “equilibrium” with their conditions), but occasionally evolve rapidly to a new equilibrium state (a “punctuation” event).*

8. Fill in the blanks. Mendel's "particles" of inheritance are now called genes which often come in two or more variant forms called alleles.
9. The ability to roll one's tongue is thought to be a simple Mendelian trait, like pea seed color. About 70% of Europeans can roll their tongue; about 30% cannot. Based on this, you can infer that the allele for tongue-rolling is (circle one):

dominant

recessive

codominant

can't tell

10. In humans, free-hanging earlobes (F) are dominant, and attached earlobes (a) are recessive. Mr. Smith is homozygous dominant.

a. Mr. Smith's genotype (with regard to earlobes) is FF.

b. Mr. Smith's phenotype (with regard to earlobes) is Free-hanging.

c. Mrs. Smith is heterozygous. Fill in and fully label the Punnett square below to represent the gametes that Mr. and Mrs. Smith produce, and the genotypes and phenotypes of the offspring they could have.

	<i>Mr Smith's gamete could be F</i>	<i>Mr Smith's gamete could be F</i>
<i>Mrs. Smith's gamete could be F</i>	<i>Offspring Genotype: FF Phenotype Free-hanging</i>	<i>Offspring Genotype: FF Phenotype Free-hanging</i>
<i>Mrs. Smith's gamete could be a</i>	<i>Offspring Genotype: Fa Phenotype Free-hanging</i>	<i>Offspring Genotype: Fa Phenotype Free-hanging</i>

- d. Mrs. Smith gives birth to a son with attached earlobes. What can you conclude?

*Mr. Smith is not the biological father.*

- e. The Smiths' neighbors, Mr. and Mrs. Jones, both have free-hanging earlobes. Can they have a child with attached earlobes? Explain.

*Yes. They would both have to be heterozygotes (Fa). Both would have free-hanging earlobes because they have one copy of the dominant F allele. The offspring could get the recessive a allele from each parent, resulting in a genotype of aa. With only the recessive alleles, the offspring would express the attached earlobe trait.*