

## Thinking Through the Concepts

1. Define the following terms: *species*, *speciation*, *allopatric speciation*, and *sympatric speciation*. Explain how allopatric and sympatric speciation might work, and give a hypothetical example of each.

*Species are all the populations of organisms capable of interbreeding under natural conditions, which are reproductively isolated from members of other populations. Speciation is the formation of new species through evolution. Allopatric speciation is speciation that occurs when two populations are geographically separated from each other. This may occur if the two isolated populations diverge genetically due to different selective pressures or genetic drift and are no longer able to interbreed. Sympatric speciation is speciation that occurs when two populations share the same geographical area. Speciation may occur if environmental change results in two different habitats that lead to genetic divergence of organisms living in each, resulting in reproductive isolation.*

2. Many of the oak tree species in central and eastern North America hybridize (interbreed). Are they “true species”?

*By the definition of a species given in the text, naturally interbreeding species are not technically “true species.”*

3. Review the material on the possibility of sympatric speciation in *Rhagoletis* varieties that breed on apples or hawthorns. What types of genotypic, phenotypic, or behavioral data would convince you that the two forms have become separate species?

*Convincing data to support the conclusion that the two forms of fruit flies are separate species would be the inability to reproduce between the two types.*

4. A drug called colchicine affects the mitotic spindle fibers and prevents cell division after the chromosomes have doubled at the start of meiosis. Describe how you would use colchicine to produce a new polyploid species of your favorite garden flower.

*Apply colchicine to the developing flowers and pollinate them. Pollen and ovules should contain diploid sperm and eggs that will fuse in fertilization to produce a tetraploid.*

5. What are the two major types of reproductive isolating mechanisms? Give examples of each type and describe how they work.

*Premating isolating mechanisms include geographical isolation, ecological isolation, temporal isolation, behavioral isolation, and mechanical incompatibility. Postmating isolating mechanisms include gametic incompatibility, hybrid inviability, and hybrid infertility.*