

Microevolution Simulation: Mutation, Genetic Drift, and Natural Selection

Scenario 1: Genetic Drift Only

A new mutation has arisen in a population. Set up 9 light beans and 1 dark bean to start. Carry out the reproduction and competition stages, recording the number of light and dark beans in each generation.

	Generation 1	Generation 2	Generation 3	Generation 4	Generation 5	Generation 6
Dark	1					
Light	9					

- 1) New mutations arise frequently due to chance errors in DNA replication. In this scenario, the new mutation caused a new trait: dark colour (instead of light colour). Explain the relationship between mutations and the variation that is required for natural selection to occur.

Scenario 2a: Natural Selection

The new mutant has a small selective advantage over the old variant.

	Generation 1	Generation 2	Generation 3	Generation 4	Generation 5	Generation 6
Dark	1					
Light	9					

Scenario 2b: Natural Selection, Cont.

The new mutant has a significant selective advantage over the old variant.

	Generation 1	Generation 2	Generation 3	Generation 4	Generation 5	Generation 6
Dark	1					
Light	9					

- 2) In scenarios 2a and 2b, which organism has a higher fitness: light-colour, dark-colour, or neither? Explain briefly.
- 3) Why might it be expected that evolution by natural selection would occur more quickly in scenario 2b than in scenario 2a? Explain briefly.

- 4) What is *more likely* to occur: light colour becoming most common, or dark colour becoming most common in the population? Explain, using the word ‘fitness’ in your answer.
- 5) Look at your answer for the previous question. Is it *possible* for the opposite to occur? Explain.

Scenario 3: Fertility Differences

Competitive abilities are the same, but one variant reproduces faster than the other.

	Generation 1	Generation 2	Generation 3	Generation 4	Generation 5	Generation 6
Dark	1					
Light	9					

- 6) What is *more likely* to occur: light colour becoming most common, or dark colour becoming most common in the population? Explain, using the word ‘fitness’ in your answer.
- 7) Look at your answer for the previous question. Is it *possible* for the opposite to occur? Explain.

Scenario 4: Colonizing a New Environment

A small number of individuals breaks off and forms a new colony in a new environment.

	Generation 1	Generation 2	Generation 3	Generation 4	Generation 5	Generation 6
Dark	1					
Light	2					

- 8) The competition rules for this scenario were identical to Scenario 2b. Yet, the evolution progressed differently. Use your findings from Scenario 4 to describe how colonizing a new environment can cause deleterious (harmful) alleles to remain in a population.