Names: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Block: \_\_\_\_\_\_

**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 |  |  |  |  |  |

1. In scenarios 2a and 2b, which organism has a higher fitness: light-colour, dark-colour, or neither? Explain briefly.
2. Why might it be expected that evolution by natural selection would occur more quickly in scenario 2b than in scenario 2a? Explain briefly.
3. 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.
4. 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 |  |  |  |  |  |

1. 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.
2. 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 |  |  |  |  |  |

1. 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.