After the Fire

Trace how inherited variation can change a population.

GEN.5.2 "Explain how natural selection acts upon genetic variability within a population and may lead to changes in allelic frequencies over time and evolutionary changes in populations."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the sentences that describe inherited shell-color variation, circle words that describe the conditions affecting survival, and number the steps from survival to offspring to a change in allele frequency.

Beetles on Burned Ground

1. After a wildfire, the soil beneath a stand of pines is nearly black. Ground beetles living there vary in color: some have black shells, while others have tan shells. In this population, the color difference is inherited. A beetle receives two copies of a shell-color gene, one from each parent. The B allele is dominant, so BB and Bb beetles look black. Beetles with two copies of the b allele look tan. The wildfire does not turn a tan beetle black or replace the alleles it inherited from its parents.

2. In the first spring after the fire, birds hunt beetles on the exposed soil. A tan beetle is easier for a bird to spot against the black ground. Black beetles are less likely to be eaten before they reproduce, although many factors besides color affect each beetle's fate. The survivors mate, and their young inherit alleles from their parents. Because black beetles tend to leave more offspring in this setting, the proportion of B alleles in the next generation can rise. This difference in reproductive success is natural selection acting on inherited variation.

3. Years later, students studying the beetles find a larger share of B alleles than their earlier records show. The population has evolved: its allele frequencies have changed across generations, even though individual beetles did not change their genes to match the soil. The b allele may still be present in black Bb beetles, so a black-looking population does not prove that b has vanished. If plants regrow and cover the dark soil, the advantage of black shells could shrink or disappear. Natural selection depends on which inherited traits help organisms leave offspring in their current environment.

2 ANSWER WITH EVIDENCE

Use the passage

1. Which beetles provide the inherited color variation that selection can act on after the fire? Explain using their alleles.

2. How can birds hunting on black soil cause the proportion of B alleles to rise over generations?

3. Why might the b allele remain in the population even if most beetles look black?

4. If plants cover the dark soil, why might the trend toward more B alleles slow or stop?

3 YOUR TURN

Your own words

Imagine wildflowers with a deep-root allele (D) and a shallow-root allele (d). Plants with DD or Dd have deep roots, while dd plants have shallow roots. A long drought begins. In four sentences, explain how this variation could affect survival and seed production, predict how allele frequencies could change over generations, and explain why an individual plant does not change its alleles to adapt.

After the Fire

PART 1 · READ AND MARK

Underline the sentences that describe inherited shell-color variation, circle words that describe the conditions affecting survival, and number the steps from survival to offspring to a change in allele frequency. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Which beetles provide the inherited color variation that selection can act on after the fire? Explain using their alleles.	**BB and Bb beetles have black shells, while bb beetles have tan shells. These inherited allele combinations produce the color variation.**
2	How can birds hunting on black soil cause the proportion of B alleles to rise over generations?	**Birds spot tan beetles more easily. Black beetles are more likely to survive and reproduce, passing B to more offspring. Over generations, B can make up a larger share of the population's alleles.**
3	Why might the b allele remain in the population even if most beetles look black?	**Black Bb beetles carry a b allele, which they can pass to offspring.**
4	If plants cover the dark soil, why might the trend toward more B alleles slow or stop?	**Black shells may no longer give beetles the same survival advantage. If black beetles no longer leave more offspring because of their color, selection may no longer increase the frequency of B.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The wildflowers already vary because some have the D allele and others have only d alleles. During the drought, deep-rooted plants may reach more water and survive more often than shallow-rooted plants. If they produce more seeds, the D allele could become more common over generations. An individual plant keeps the alleles it inherited rather than changing them because it needs water.

Accept other accurate explanations that connect inherited variation, differences in reproductive success, and a possible change in allele frequency. A prediction must be conditional because the drought does not guarantee which plants will leave the most offspring.