Survival on Sand

Model how a changing habitat affects two beetle populations

ZOO.1.5 "Design models to illustrate the interaction between changing environments and genetic variation in natural selection leading to adaptations in populations and differential success of populations."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB As you read, underline the environmental change, circle the inherited color traits, and number the steps that connect bird hunting to changes in the beetle populations.

When the Pond Banks Dried

1. Imagine two groups of ground beetles living beside separate ponds. Each beetle has an inherited shell color that stays about the same throughout its life. Some beetles are tan, and others are dark brown. Both ponds once had thick mats of dead leaves along their banks. The dark beetles blended into this litter, while tan beetles stood out. Birds hunting by sight often caught beetles they could spot easily. At one pond, about four in ten beetles were tan. At the other, about one in twenty were tan. Beetles from the two ponds rarely crossed the dry ridge between them.

2. A long drought dried the leaf mats and exposed pale sand at both ponds. Birds could now see dark beetles more easily, while tan beetles were harder to spot against the sand. A beetle did not turn tan because it needed to hide: its shell color was already set. Some birds still caught tan beetles, and some dark beetles escaped. But in this imagined case, tan beetles survived more often and laid more eggs than dark beetles. Their offspring tended to inherit tan coloring. The change in the banks altered which inherited color helped beetles leave offspring.

3. The groups started with about the same number of beetles, but they did not start with the same mix of colors. Because tan beetles were more common at the first pond, more beetles there were likely to survive the first dry season and reproduce. At the second pond, where tan beetles were rare, birds could catch a larger share before they laid eggs. After several generations of dry banks, tan coloring could become common in both groups, especially if tan beetles survive and reproduce each season. The first group might recover faster, while the second might shrink. Weather alone does not create a useful new color on demand.

2 ANSWER WITH EVIDENCE

Use the passage

1. Write a four-link arrow chain showing how the drought could make tan coloring more common over generations. Include bird hunting and inheritance.

2. Why would the first pond likely have more breeding beetles than the second after the first dry season, even though both groups started at about the same size?

3. If thick, dark leaf litter covered both banks again, how might bird hunting change which color is favored? Use evidence from the passage.

4. A student claims that drought makes individual dark beetles turn tan. What should a model show changing instead?

3 YOUR TURN

Your own words

Draw a two-panel model of two rabbit populations as snow begins covering their grassland for most of the year. In panel 1, give the populations different starting mixes of inherited white and brown fur; in panel 2, use arrows and labels to show fox hunting, offspring, and which population does better over generations, then explain your model in two sentences.

Survival on Sand

PART 1 · READ AND MARK

As you read, underline the environmental change, circle the inherited color traits, and number the steps that connect bird hunting to changes in the beetle populations. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Write a four-link arrow chain showing how the drought could make tan coloring more common over generations. Include bird hunting and inheritance.	**Drought exposes pale sand → birds spot more dark beetles → more tan beetles survive and reproduce → offspring inherit tan coloring, making it more common.**
2	Why would the first pond likely have more breeding beetles than the second after the first dry season, even though both groups started at about the same size?	**The first group started with more tan beetles. Tan beetles were harder for birds to spot on sand, so more were likely to survive and reproduce there.**
3	If thick, dark leaf litter covered both banks again, how might bird hunting change which color is favored? Use evidence from the passage.	**Dark beetles could be favored because they blended into the leaf litter. Birds hunting by sight would be more likely to spot tan beetles.**
4	A student claims that drought makes individual dark beetles turn tan. What should a model show changing instead?	**It should show the population's mix of inherited colors changing as tan beetles survive and leave more offspring.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Panel 1: Population A has 8 white rabbits and 2 brown rabbits; population B has 2 white rabbits and 8 brown rabbits; long-lasting snow begins. Panel 2: Foxes spot more brown rabbits → fewer brown survivors → fewer brown offspring; population A leaves more offspring than population B. White fur becomes more common in both populations because white rabbits are less visible on snow and leave more offspring. Population A does better because it started with more white rabbits.

Accept models with different starting numbers if both populations contain inherited variation and the model links the new conditions to survival, reproduction, and a difference between populations. A response should show population change over generations, not a change in an individual rabbit's fur caused by need.