Coats and Consequences

Use evidence to explain the effects of genetic variants.

7.13.b "Construct an explanation from evidence of how genetic variants may result in harmful, beneficial, or neutral effects on the structure and function of an organism."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each DNA change and circle the coat color it produces. Number the clues that show how each coat color affects a mouse's chance of being seen.

Mice on the Lava

1. Rock pocket mice live among stones in dry parts of the southwestern United States. Their coats can be dark or pale. Owls hunt them from above, so a mouse that stands out against the ground is easier to spot. Genes carry instructions for making proteins, and some proteins help produce pigment in fur. A genetic variant is a difference in DNA instructions. A variant can change a protein, which may change a body structure such as coat color. The effect depends partly on where the mouse lives.

2. On a black lava field, picture three young rock pocket mice with different variants in a pigment gene. In one mouse, a changed protein leads to more dark pigment, making its coat nearly black. In another, a different change leads to much less pigment, making its coat very pale. Both mice can run at the same speed, but their colors differ against the lava. From above, an owl would have a harder time seeing the dark mouse and an easier time seeing the pale one.

3. The third mouse has a DNA change that still gives the same instructions for building its pigment protein. Its coat is dark, like the coat produced by the original instructions. In this model, that change does not affect how well its coat hides it from owls. Now move the first two mice to pale sand. The nearly black coat would stand out, while the very pale coat would blend in. A variant's effect on survival can change with the surroundings, even when the DNA stays the same.

2 ANSWER WITH EVIDENCE

Use the passage

1. How could the first mouse's variant benefit it on black lava? Trace the effect from protein to coat color to survival.

2. Why could the second mouse's variant be harmful on black lava, even though it can run as fast as the first mouse?

3. Why is the third mouse's DNA change neutral for hiding from owls in this model?

4. On pale sand, how would the effects of the first two variants differ from their effects on black lava? Use coat color as evidence.

3 YOUR TURN

Your own words

Choose an organism other than a rock pocket mouse and invent a genetic variant. Explain how it changes a body structure, how that affects a function, and whether the effect would be harmful, beneficial, or neutral in a specific setting.

ANSWER KEY

Coats and Consequences

GRADE 7 · 7.13.b

PART 1 · READ AND MARK

Underline each DNA change and circle the coat color it produces. Number the clues that show how each coat color affects a mouse's chance of being seen. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How could the first mouse's variant benefit it on black lava? Trace the effect from protein to coat color to survival.	**Its changed protein leads to more dark pigment and a nearly black coat. The coat makes it harder for owls to see against black lava, which may improve its chance of surviving.**
2	Why could the second mouse's variant be harmful on black lava, even though it can run as fast as the first mouse?	**The variant leads to much less pigment and a very pale coat. The coat stands out on black lava, making the mouse easier for an owl to spot.**
3	Why is the third mouse's DNA change neutral for hiding from owls in this model?	**The DNA change gives the same protein instructions and leaves the coat dark, so it does not change how well the coat hides the mouse.**
4	On pale sand, how would the effects of the first two variants differ from their effects on black lava? Use coat color as evidence.	**The first mouse's nearly black coat would stand out on pale sand, making that variant harmful for hiding there. The second mouse's very pale coat would blend in, making its variant beneficial for hiding there.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

In a cold forest, an invented variant changes a protein involved in a rabbit's fur growth, giving the rabbit a thicker coat. Thicker fur slows heat loss, helping the rabbit stay warm in winter. The variant could be beneficial in that setting because staying warm may help the rabbit survive.

Accept other plausible organisms and invented variants when the explanation connects the variant to a structure, a function, and an effect in a stated setting. For question 3, neutral refers specifically to hiding from owls in this model.