

Code to Color

Follow how DNA instructions can affect a visible trait.

LS.10.a "DNA has a role in making proteins that determine organism traits;"

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline phrases that show how DNA instructions can affect fur color. In the margin, number the cause-and-effect steps in the order the passage gives them.

Why a Hare's Fur Can Look White

- ① Every cell in a snowshoe hare contains DNA, a molecule that stores instructions. A section of DNA called a gene holds the code for making one protein. To use a gene, the cell first makes an RNA copy of its code. Ribosomes read the RNA code and join amino acids in a particular order. The finished chain folds into a protein. Protein shape helps determine what job it can do in the cell and tissue.
- ② In autumn, many snowshoe hares grow white fur. Hair cells use genes to make proteins involved in producing pigment, the color material in hair. One protein may help a cell make dark pigment. When less dark pigment is placed in a growing hair, the hair can appear lighter. The hare's fur color is a trait, an observable feature. DNA does not turn white itself. Instead, DNA instructions guide cells as they make proteins that affect pigment and fur color.
- ③ A change in a DNA sequence is called a mutation. Some mutations do not change a protein, but others change an amino acid in its chain. A changed amino acid can alter the protein's shape or how it works. For example, if a pigment-related protein works less well, a hair cell might place less dark pigment into hair. This could produce lighter fur. Whether that fur helps a hare survive depends on its environment, such as whether snow covers the ground.

2 ANSWER WITH EVIDENCE Use the passage

1 What does a cell make before ribosomes can read the instructions from a gene?

2 How can a protein that works less well lead to lighter hare fur?

3 Why is it incorrect to say that DNA itself turns a hare's fur white?

4 Describe the possible chain of effects from a mutation in a pigment-related gene to a change in fur color.

3 YOUR TURN Your own words

Invent a beetle with a visible trait. In exactly 3 sentences, explain how DNA instructions in one gene lead to a protein and the trait, then describe how one mutation could change the protein and the trait.

PART 1 • READ AND MARK

Underline phrases that show how DNA instructions can affect fur color. In the margin, number the cause-and-effect steps in the order the passage gives them. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	What does a cell make before ribosomes can read the instructions from a gene?	The cell makes an RNA copy of the gene's code.
2	How can a protein that works less well lead to lighter hare fur?	A less effective pigment-related protein may cause a hair cell to place less dark pigment into growing hair, making the hair look lighter.
3	Why is it incorrect to say that DNA itself turns a hare's fur white?	DNA stores instructions. Cells use those instructions to make proteins that affect pigment and fur color.
4	Describe the possible chain of effects from a mutation in a pigment-related gene to a change in fur color.	A mutation can change an amino acid, which can change a protein's shape or function. If the protein places less dark pigment in hair, the fur can become lighter.

PART 3 • YOUR TURN (SAMPLE ANSWER)

In a made-up beetle, a gene contains DNA instructions for a protein that helps make black pigment in wing spots. The protein helps give the beetle dark spots on its wings. A mutation could change the protein so it makes less pigment, causing the beetle to have lighter spots.

Accept any scientifically plausible DNA to gene to protein to trait explanation. The mutation should be described as possibly changing a protein's amino acid sequence, shape, or function and therefore possibly changing the trait.