Paths to Traits

Read, mark, and map how genes affect traits

L.8.2C.1 "Communicate through diagrams that chromosomes contain many distinct genes and that each gene holds the instructions for the production of specific proteins..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each gene name, circle the protein it helps make, and number each matching gene and protein with the same number. Use your marks to trace each path from a chromosome to a trait.

More Than One Path

1. Imagine zooming in on one of your cells. Inside its nucleus, chromosomes carry long strands of DNA. A chromosome is not a single instruction for the whole body. It contains many distinct sections called genes. Each gene holds instructions for making a particular protein. Proteins do different jobs in cells, so their actions can affect different traits. A trait might be visible, such as hair color, or less obvious, such as how your body handles a food. These links can be shown as separate paths from genes to proteins to traits.

2. Chromosome 11 carries many genes, including TYR and HBB. The TYR gene holds instructions for tyrosinase, a protein that helps make the pigment melanin. The amount of melanin in hair affects its color. The HBB gene holds instructions for beta-globin, a protein that becomes part of hemoglobin in red blood cells. Hemoglobin helps these cells carry oxygen, which affects how the body gets oxygen to its tissues. These are two different genes on the same chromosome, linked to different proteins and different traits.

3. On chromosome 2, the LCT gene holds instructions for lactase. This protein helps break down lactose, a sugar found in milk. The ability to digest lactose is another trait, and it can change as a person grows older. Gene versions can differ among people, and many traits also depend on other genes or the environment. A useful diagram shows which protein belongs with each gene instead of mixing their paths. It shows a connection, not a promise that one gene alone completely decides a trait.

2 ANSWER WITH EVIDENCE

Use the passage

1. Draw a labeled arrow path from chromosome 11 through TYR to a hair-color trait. Include the protein and what it does.

2. A diagram places tyrosinase after HBB and beta-globin after TYR. Which protein belongs after each gene, and what trait should each path reach?

3. Draw a labeled arrow path from chromosome 2 to the ability to digest lactose. Include the gene and protein.

4. A classmate draws TYR and HBB as one gene with one path to both hair color and oxygen transport. How would you revise the diagram? Show the two paths with arrows.

3 YOUR TURN

Your own words

Invent a fictional organism with two traits. In the box, draw one chromosome containing two distinct genes, then draw a separate arrow path from each gene to a specific protein and the trait that protein helps affect. Label both proteins and their jobs, and write one sentence explaining why the paths stay separate.

ANSWER KEY

Paths to Traits

GRADE 8 · L.8.2C.1

PART 1 · READ AND MARK

Underline each gene name, circle the protein it helps make, and number each matching gene and protein with the same number. Use your marks to trace each path from a chromosome to a trait. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Draw a labeled arrow path from chromosome 11 through TYR to a hair-color trait. Include the protein and what it does.	**Chromosome 11 → TYR gene → tyrosinase → helps make melanin → amount of melanin in hair affects its color.**
2	A diagram places tyrosinase after HBB and beta-globin after TYR. Which protein belongs after each gene, and what trait should each path reach?	**TYR → tyrosinase → hair color. HBB → beta-globin → how red blood cells carry oxygen to tissues.**
3	Draw a labeled arrow path from chromosome 2 to the ability to digest lactose. Include the gene and protein.	**Chromosome 2 → LCT gene → lactase → helps break down lactose → ability to digest lactose.**
4	A classmate draws TYR and HBB as one gene with one path to both hair color and oxygen transport. How would you revise the diagram? Show the two paths with arrows.	**Draw TYR and HBB as separate genes on chromosome 11. Chromosome 11 → TYR → tyrosinase → hair color; chromosome 11 → HBB → beta-globin → oxygen transport.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Fictional shell climber. One chromosome contains two distinct genes, A and B. Gene A → pigment-making enzyme → helps make dark shell pigment → darker shell. Gene B → claw-strengthening protein → helps stiffen claws → firmer claws. The paths stay separate because each gene holds instructions for a different protein with a different job.

Accept arrows or clearly connected labels that show the correct gene, protein, and trait relationships. For the open task, accept plausible fictional traits if both genes appear on one chromosome and each has its own labeled protein and trait path.