Seeds and Secrets

Use evidence to explain how chromosomes pass gene alleles to offspring.

S7L3.a "Construct an explanation supported with scientific evidence of the role of genes and chromosomes in the process of inheriting a specific trait."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline two statements that give evidence about inherited seed color, and circle two phrases that explain what chromosomes do in inheritance.

Why Pea Seeds Differ

1. Gregor Mendel studied pea plants with yellow or green seeds. Each plant had a gene that influenced seed color, and the gene came in different forms called alleles. In his crosses, yellow was the dominant allele, written Y, and green was the recessive allele, written y. A plant with YY or Yy produced yellow seeds, while a plant with yy produced green seeds. These patterns gave Mendel evidence that offspring receive genetic information from both parents.

2. Genes are segments of DNA located on chromosomes. Pea plants have pairs of chromosomes, one member of each pair inherited from each parent. A chromosome in a pair can carry the Y allele while its partner carries y. When reproductive cells form, the chromosome pairs separate, so each cell receives one allele for seed color. Fertilization joins one reproductive cell from each parent, restoring a pair in the offspring. This chromosome movement explains how alleles can be passed on.

3. To test this explanation, Mendel crossed two yellow-seeded plants that each carried Yy. The parents made reproductive cells carrying either Y or y. The possible offspring were YY, Yy, Yy, and yy, so the model predicted about three yellow-seeded offspring for every one green-seeded offspring. Mendel repeatedly observed many more yellow seeds than green seeds in this kind of cross. The repeated pattern supported the idea that chromosome separation and fertilization distribute alleles in predictable ways.

2 ANSWER WITH EVIDENCE

Use the passage

1. How does a cross between two Yy plants support the claim that an offspring receives one allele from each parent?

2. Explain how chromosome separation helps a reproductive cell receive an allele for seed color.

3. A green-seeded plant has the genotype yy. Explain why it must have received a y allele from each parent.

4. A student says, "Chromosomes determine seed color, but genes do not." Revise this claim using evidence from the passage.

3 YOUR TURN

Your own words

In a model bean-plant population, pod stripes are controlled by allele S, which is dominant over s. A striped Ss plant is crossed with a plain ss plant, and 9 of 18 offspring have striped pods. Write four sentences that explain how genes and chromosomes could produce this result, using the evidence.

ANSWER KEY

Seeds and Secrets

GRADE 7 · S7L3.a

PART 1 · READ AND MARK

Underline two statements that give evidence about inherited seed color, and circle two phrases that explain what chromosomes do in inheritance. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How does a cross between two Yy plants support the claim that an offspring receives one allele from each parent?	**Each Yy parent can make reproductive cells carrying Y or y. Fertilization combines one allele from each parent, producing YY, Yy, or yy offspring.**
2	Explain how chromosome separation helps a reproductive cell receive an allele for seed color.	**When chromosome pairs separate as reproductive cells form, each cell receives one chromosome from the pair and therefore one seed-color allele.**
3	A green-seeded plant has the genotype yy. Explain why it must have received a y allele from each parent.	**The plant has two y alleles. Because fertilization joins one reproductive cell from each parent and each cell carries one allele, each parent must have contributed y.**
4	A student says, "Chromosomes determine seed color, but genes do not." Revise this claim using evidence from the passage.	**Chromosomes carry genes, and the seed-color gene has Y and y alleles. The allele combination an offspring receives on its chromosomes influences whether its seeds are yellow or green.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Pod pattern is influenced by a gene with S and s alleles located on matching chromosomes. When chromosome pairs separate to form reproductive cells, the Ss parent can pass S or s, while the ss parent can pass only s. Offspring that receive S from one parent and s from the other are Ss and have striped pods, while ss offspring are plain. Nine striped offspring out of eighteen supports the prediction that about half of the offspring would inherit Ss.

Accept explanations that correctly connect genes and alleles to a trait, chromosomes to allele movement, and evidence to a claim. For the open response, accept equivalent wording that explains the approximately one-half striped result from an Ss × ss cross.