

Where Variation Begins

Use evidence to trace three sources of inheritable genetic variation.

HS-LS3-2 "Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication..."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each claim about a source of inheritable variation. Circle the evidence or condition that supports or limits each claim.

Evidence for Genetic Variation

- ① Genetic variation is a difference in DNA sequence or in the combination of alleles an organism carries. A variation can be inherited only when it is present in a cell that contributes to an offspring, such as a gamete. Scientists link observations or data to a possible source of variation and recognize that one result may not prove it.
- ② During meiosis, each gamete receives one allele from each chromosome pair. Which maternal and paternal chromosome versions enter a gamete can differ among gametes. Fertilization joins two gametes, producing new allele combinations in offspring. DNA replication can also create variation. Most copying errors are repaired, but a rare error that remains and does not prevent survival can become viable variation.
- ③ To test an environmental cause, researchers exposed fruit fly germ-cell cultures to ultraviolet light, then used the cells to produce offspring. They sequenced offspring DNA. The table shows more offspring with a new DNA change after ultraviolet exposure than after shielding. This pattern supports the claim that ultraviolet light can cause mutations that could be inherited.

OFFSPRING DNA RESULTS

Germ-cell treatment	Offspring sequenced	Offspring with a new DNA change
Shielded from ultraviolet light	200	2
Exposed to ultraviolet light	200	18

2 ANSWER WITH EVIDENCE Use the passage

- 1 Explain how meiosis and fertilization can produce new allele combinations in offspring.

- 2 What makes a replication error a viable variation instead of a repaired or harmful error?

- 3 Use the table to defend the claim that ultraviolet light can cause mutations. Include numbers from both treatments.

- 4 Does the table prove that every new DNA change will be inherited? Explain using a limit described in the passage.

3 YOUR TURN Your own words

A plant with genotype RrTt is crossed with a plant with genotype rrtt. Among 80 offspring, 19 are RrTt, 21 are Rrtt, 20 are rrTt, and 20 are rrtt. Write a claim about meiosis and defend it with evidence from these results.

PART 1 • READ AND MARK

Underline each claim about a source of inheritable variation. Circle the evidence or condition that supports or limits each claim. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	Explain how meiosis and fertilization can produce new allele combinations in offspring.	Different gametes can receive different maternal and paternal chromosome versions during meiosis. Fertilization joins two gametes, creating new allele combinations in offspring.
2	What makes a replication error a viable variation instead of a repaired or harmful error?	The copying error must remain after repair and must not prevent survival.
3	Use the table to defend the claim that ultraviolet light can cause mutations. Include numbers from both treatments.	Eighteen of 200 offspring from ultraviolet-exposed cells had a new DNA change, compared with 2 of 200 from shielded cells. The higher number after exposure supports the claim that ultraviolet light can cause mutations.
4	Does the table prove that every new DNA change will be inherited? Explain using a limit described in the passage.	No. The results support that ultraviolet light can cause mutations that could be inherited, but they do not show whether a changed offspring will survive and reproduce.

PART 3 • YOUR TURN (SAMPLE ANSWER)

I claim that meiosis in the first plant produced different allele combinations in its gametes. The cross produced 19 RrTt, 21 Rrtt, 20 rrTt, and 20 rrtt offspring. Because the second plant always supplied r and t, the four offspring types show that the first plant supplied RT, Rt, rT, and rt combinations.

Accept claims that accurately connect varied offspring genotypes to different allele combinations in gametes. For evidence-based claims, accept qualified language such as supports or is consistent with, rather than proves, when the data cannot establish every step of inheritance.