When Division Goes Wrong

Trace possible outcomes of errors in mitosis and meiosis.

FB.3.7 "Enrichment: Research and orally communicate the possible outcomes of a failure of mitosis (cancer) or meiosis (nondisjunction)."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Read the passage. Underline what goes wrong in each type of division, circle a possible outcome, and number the steps that connect each error to its outcome.

Two Paths from a Division Error

1. Imagine a small patch of skin after a sunburn. Its cells replace damaged neighbors through mitosis, which makes two cells with matching chromosome sets. Before division, a cell copies its DNA. If DNA damage affects genes that control growth, a cell may keep dividing when it should stop. The National Cancer Institute explains that cancer develops when changes in genes disrupt normal controls on cell growth and division. A growing mass of abnormal cells can become a tumor. Some tumors invade nearby tissue or spread to other parts of the body. Still, many damaged cells repair themselves or die, so one error does not guarantee cancer.

2. Now imagine a different error during the formation of an egg or sperm. Meiosis normally produces reproductive cells with one copy of each chromosome. In nondisjunction, chromosomes fail to separate as they should. A reproductive cell may receive an extra chromosome or be missing one. If an egg with an extra chromosome 21 joins a sperm with the usual number, the resulting embryo may have three copies of chromosome 21. MedlinePlus Genetics identifies this as a common cause of Down syndrome, which can affect learning and physical development. Other chromosome imbalances may cause pregnancy loss, and some reproductive cells with an imbalance never form an embryo.

3. These two errors happen in different cell lineages. A mistake in a skin cell's mitosis can affect that person's body, but it does not by itself change the chromosomes in an egg or sperm. A mistake in meiosis can change a reproductive cell's chromosome number and may affect an embryo after fertilization. When you explain either pathway aloud, identify what went wrong, trace a possible result, and avoid saying the result is certain. Use the National Cancer Institute or MedlinePlus Genetics to check claims, then ask what evidence would clarify a remaining question. An accurate explanation separates a possible outcome from an inevitable one.

2 ANSWER WITH EVIDENCE

Use the passage

1. If damage disrupts growth-control genes in a dividing skin cell, how could that lead to harm? Why is harm not certain?

2. An egg has an extra chromosome 21 after meiosis. What could happen if it joins a sperm with the usual number of chromosomes?

3. Why would an error in a skin cell's mitosis not directly give an embryo an extra chromosome? Compare the cells involved in each type of division.

4. A speaker says, “Any nondisjunction causes Down syndrome.” Use the passage to correct the claim, and name a source you would check.

3 YOUR TURN

Your own words

A friend says, “One division mistake always causes disease.” Write a 70 to 95 word script to say aloud about a dividing liver cell, applying the passage's mitosis explanation. Describe a possible outcome, explain why it is not certain, cite a source named in the passage, and end with a new question you would research.

ANSWER KEY

When Division Goes Wrong

PART 1 · READ AND MARK

Read the passage. Underline what goes wrong in each type of division, circle a possible outcome, and number the steps that connect each error to its outcome. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	If damage disrupts growth-control genes in a dividing skin cell, how could that lead to harm? Why is harm not certain?	**The cell may keep dividing, forming a tumor that could invade tissue or spread. Harm is not certain because damaged cells may repair themselves or die.**
2	An egg has an extra chromosome 21 after meiosis. What could happen if it joins a sperm with the usual number of chromosomes?	**The embryo may have three copies of chromosome 21 and develop Down syndrome.**
3	Why would an error in a skin cell's mitosis not directly give an embryo an extra chromosome? Compare the cells involved in each type of division.	**Skin-cell mitosis affects cells in that person's body. Meiosis forms eggs or sperm, whose chromosome numbers can affect an embryo after fertilization.**
4	A speaker says, "Any nondisjunction causes Down syndrome." Use the passage to correct the claim, and name a source you would check.	**Nondisjunction can affect chromosomes other than chromosome 21, and some imbalances lead to pregnancy loss or never form an embryo. Check MedlinePlus Genetics.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

A mistake during mitosis in a liver cell does not automatically mean cancer. If damage changes genes that control when the cell divides, the cell might keep multiplying and form a tumor. A tumor could harm nearby tissue, but the damaged cell might also repair itself or die instead. The National Cancer Institute explains how gene changes can disrupt normal growth controls. To learn more, I would research this question: What kinds of evidence show whether a liver tumor is likely to invade other tissues?

Accept accurate cause-and-effect explanations that distinguish a possible outcome from a certain one. For the script, look for a liver-cell application, an appropriate source, and a researchable new question.