When Cells Split

Trace how a mitosis error can affect new cells.

7.3.a "Ask questions and communicate information regarding how errors in mitosis may affect cell division."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline where a mitosis error begins, circle what changes in the daughter cells, and number two possible later effects 1 and 2.

A Scrape and a Cell Division

1 After a scrape, skin cells divide to help replace damaged cells. Before mitosis, a cell copies its DNA. The copies form paired structures called sister chromatids. During mitosis, the cell lines them up and pulls one copy of each chromosome toward each end. Then the cell splits into two daughter cells. Each daughter cell should receive a complete set of chromosomes. Chromosomes carry instructions for making proteins and running the cell. If a daughter cell lacks some instructions, it may not work as it should.

2 Suppose one pair of chromatids does not separate. Both copies may move toward the same end instead of opposite ends. After the cell splits, one daughter cell may receive an extra copy of that chromosome, while the other may be missing a copy. This is an error in mitosis, not a change to every cell in the body. Because the two daughter cells now have different chromosome sets, they may grow or work differently. Some cells with missing or extra chromosomes stop dividing or die.

3 Cells have checkpoints that can delay mitosis when chromosomes are not attached correctly to the fibers that pull them apart. This gives the cell time to fix problems, but checks do not catch every error. If an altered skin cell survives and keeps dividing, its new cells may also carry the unusual chromosome set. Such cells might help repair a scrape less effectively. One mistaken division will not necessarily change the patch of skin. To study the error, a scientist could compare chromosome sets in the daughter cells and watch whether they keep dividing.

2 ANSWER WITH EVIDENCE

Use the passage

1. How could chromatids moving to the same end change the chromosome sets in the two daughter cells?

2. If a scientist suspects this separation error happened, what difference should the scientist look for in the daughter cells?

3. How could a daughter cell missing a chromosome affect repair of the scrape?

4. Write a question about how a checkpoint could change the effect of an attachment error on daughter cells.

3 YOUR TURN

Your own words

A cell in a growing bean root has one chromosome copy that stays near the center instead of moving toward an end. Write one question about how this error could affect the new cells, then write two sentences explaining a possible result and its effect on root growth. Do not claim that every error harms the whole root.

ANSWER KEY

When Cells Split

GRADE 7 · 7.3.a

PART 1 · READ AND MARK

Underline where a mitosis error begins, circle what changes in the daughter cells, and number two possible later effects 1 and 2. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How could chromatids moving to the same end change the chromosome sets in the two daughter cells?	**One daughter cell may get an extra copy of a chromosome, while the other may be missing a copy.**
2	If a scientist suspects this separation error happened, what difference should the scientist look for in the daughter cells?	**The scientist should compare their chromosome sets and look for an extra copy in one cell and a missing copy in the other.**
3	How could a daughter cell missing a chromosome affect repair of the scrape?	**It may lack instructions it needs, stop dividing or die, and help repair the scrape less effectively.**
4	Write a question about how a checkpoint could change the effect of an attachment error on daughter cells.	**Could a checkpoint delay mitosis while an attachment error is fixed, helping both daughter cells receive complete chromosome sets?**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Could a chromosome left near the center cause a new root cell to lack that chromosome? That cell might lack instructions it needs and stop dividing. If many cells had similar errors, root growth could slow, although one error might not change the whole root.

Accept questions that connect the root cell's separation error to a possible change in its new cells. Explanations should describe a plausible effect on growth without treating that effect as certain.