

Name: _____

Period: _____

Mitosis – Pipe Cleaner Activity

Introduction – Multicellular organisms, like you, begin as a single cell. In this activity, you explore how a cell reproduces (divides) to form two new cells. In this activity, you model each stage of mitosis using pipe cleaners to represent chromosomes. Your somatic cells (body cells) have 46 chromosomes. For this simulation, you will use 2 chromosomes for simplicity.

Materials:

- scissors
- 2 pieces of yarn
- pipe cleaners
- spaghetti
- colored pencils, pens, or crayons (same colors as pipe cleaners if possible)

Procedure:

Step 1: Take the longer yarn and create a circle. This is your cell membrane. Use one smaller piece of yarn to represent the nuclear membrane. Place 2 pipe cleaners (1 of each color) in the center circle. This represents a cell with 2 uncopied chromosomes in **Interphase – (right before) S Stage**.

- Draw a picture of this cell on your Data Report.
- Draw a nuclear membrane around these chromosomes to show the nucleus.

Step 2 part 1: Group 2 pipe cleaners of the same color and length next to each other. Twist each pair together by one turn at the midpoint. Each “X” represents a duplicated chromosome. The two different colors indicate that one chromosome came from the father and one chromosome came from the mother. Chromosomes duplicate (are copied), through the process of DNA replication. The copying of DNA occurs before mitosis, in the S phase of Interphase.

Step 2 part 2: Put these duplicated chromosomes in the inner circle and remove the smaller piece of yarn. Use the spaghetti noodles to represent the spindle fibers. This is a cell with 2 copied chromosomes in Prophase. Using colored pencils, draw a picture.

- **Add & label** spindle fibers, centromeres, and sister chromatids to your picture!!!

Step 3: Line up the chromosomes in a single line in the middle of the cell. Use the spaghetti noodles to represent the spindle fibers holding them in place.

- Draw a picture of this cell. This represents a cell in **Metaphase**.

Step 4: Now separate each duplicated chromosome by untwisting them. Leave them side by side on the midline that runs through the center of the plate. Next, move one single chromosome to the left side of the cell and one to the right. Use the spaghetti noodles to represent the spindle fibers pulling them apart.

- Draw a picture of this cell. This represents a cell in **Anaphase**.
- **Add** spindle fibers to this picture.

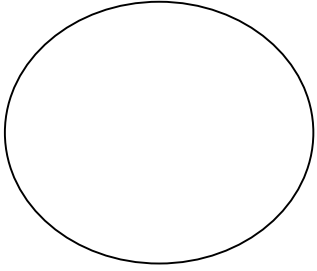
Step 5: Take the large yarn (2m) and close each half around the two sets of chromosomes. This represents the new cell membrane forming for each new cell. Place an inner circle of yarn (1m pieces) around each set of chromosomes. This represents the nuclear membrane reforming. Each daughter cell should look identical to each other and to the original parent cell.

- Draw a picture. This represents **Telophase and Cytokinesis**

Step 6: Towards the end of **telophase**, the last phase of mitosis, cytokinesis begins. The cytoplasm is divided up & the sides of the membrane pinch in forming a cleavage furrow if it's an animal cell.

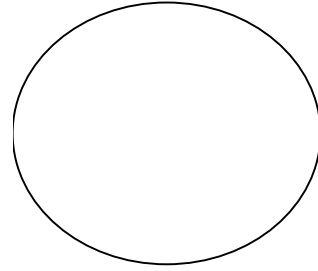
- Draw the chromosomes unwinding back to chromatin form & nuclear membranes reforming around the DNA.
- The spindle fibers and centrioles disappear at the end of telophase.
- **Label** the cleavage furrow.

Data Report

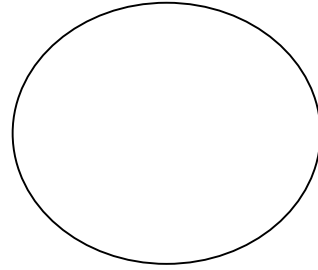


Interphase (right before)
S Stage - Drawing for Step 1.

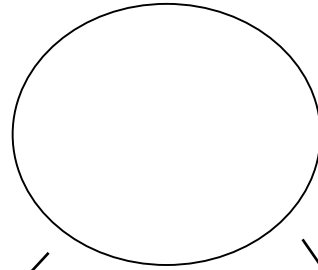
Prophase - Drawing for
Step 2.



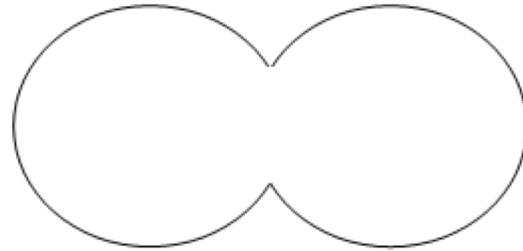
Metaphase - Drawing for
Step 3.



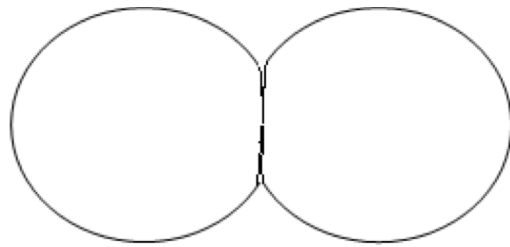
Anaphase - Drawing for
Step 4.



Telophase - Drawing for
Step 5.



Telophase (continued)-
Drawing for Step 6.

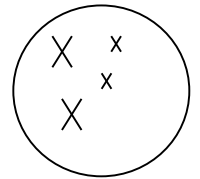


Conclusion Questions

1. Compare the chromosome number of the parent cell (original cell) with that of each daughter cell (new cell).

2. Compare the genetic information of the parent cell with that of each of the two daughter cells.

3. The following cell divides to form 2 daughter cells. Draw what **a daughter cell** would look like when it is in metaphase of mitosis.



4. You have 46 chromosomes in each of your somatic cells. If you cut your arm, how many chromosomes would be in each newly formed skin cell?

5. Why must your cells undergo mitosis?

6. Name three scenarios where mitosis is happening frequently (think of situations where a lot of new cells are needed).

a.

b.

c.

7. What stage do cells most likely spend their time: interphase, prophase, metaphase, anaphase, or telophase? Why?