

Mitosis: Modeling Cell Division

Overview:

Students use the chromosome model to investigate the mechanics of cell division and mitosis.

Materials:

- Mitosis poster board
- Colored pipecleaners (chromosomes)

Background Information:

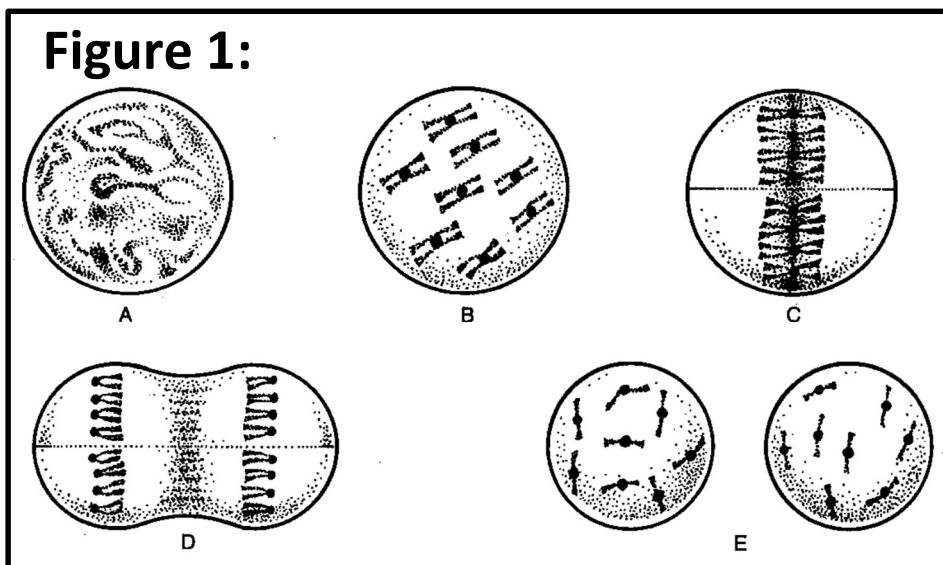
- Every cell in your body has the same genetic information (genes). You started out as one cell, but you have grown into trillions of cells. How can that happen? In our model, you start with one cell containing 4 chromosomes and end up with 2 cells, both with 4 chromosomes and both with the same genetic information, but how?
- Key Vocabulary:
 - **Chromosomes** – contained in the nucleus of cells; made up of many genes linked together (represented by the pipecleaners; pink = from mom (egg), blue = from dad (sperm)).
 - **Genes** – genetic information or instructions that control physical traits passed from parents to offspring.
 - **Trait** – physical characteristic such as eye color, hair color, etc.
 - **Daughter Cells** – cells that are produced after the original cell undergoes division.
 - **Cell Membrane** – outside boundary of the cell (represented by the circle).
 - **Nuclear Membrane** – outside boundary of the nucleus, which contains the chromosomes (represented by the plastic bag).
 - **Centromere** – place where the chromosome and its copy are connected together (represented by the magnets).
 - **Spindle** – threads that pull apart the chromosomes to opposite ends of the cell (represented by your hands).
 - **Mitosis** – process by which a cell makes an exact copy of itself.
- Cells have a way of dividing into two. We will go through each step, and as we do, we will discuss what is happening while we model the process. **As you proceed through the lab, answer the questions in bold in your Science Notebook.**

Procedure:

(The lettered steps refer to what is happening at each lettered picture in Figure 1 to the right.)

- A. Scramble the 4 pipecleaners so that the colors are all mixed. Place them inside circle A as shown in Figure 1.

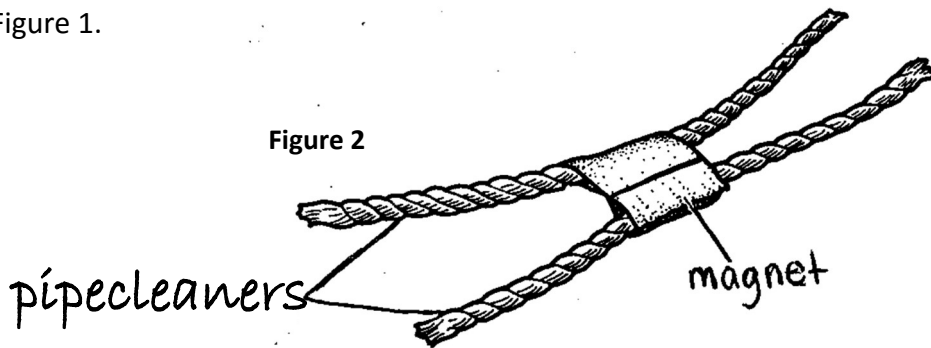
1. **What do the pipecleaners represent in this model?**
2. **How many chromosomes are in the model to start?**



3. Based on the materials you have, can the starting cell be divided into two cells with the exact same genetic information? Why or why not?

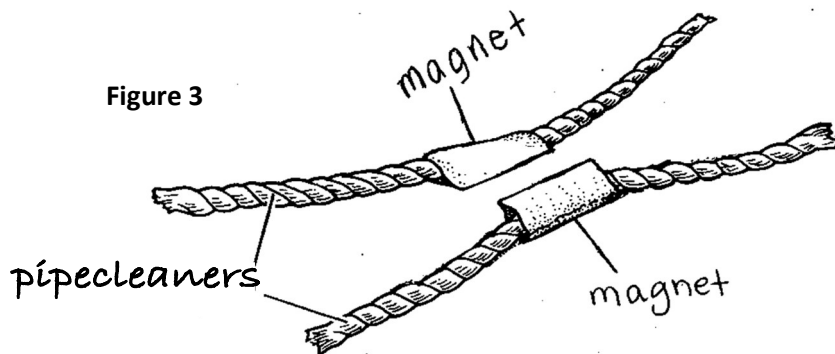
4. What needs to happen in order for the starting cell to be divided into two identical cells?

- B. Make identical pairs of pipecleaners, according to both the color and size of the chromosomes. Connect the pairs with the magnets, as shown in Figure 2. Place each colored pair in circle B as shown in Figure 1.



5. After replication, how many chromosomes are in the cell now?

- C. Line up the pairs of pipecleaners along the dotted line in circle C as shown in Figure 1. The order of the chromosomes doesn't matter, as long as the magnets are along the dotted line.
- D. Carefully pull apart each pipecleaner pair, as shown in Figure 3. Your hands act as the spindle, pulling each identical set of chromosomes to opposite ends of the cell. As you separate the magnets, move each half of the pair to opposite ends of the oblong shape D, shown in Figure 1.



- E. Move one set of pipecleaners from each end of the oblong shape, D, into each of the two circles labeled E, shown in Figure 1. You should have exactly the same number, color, and size of chromosomes in each circles labeled E.

5. At the end of mitosis, how many daughter cells are there?

6. How many chromosomes are in each daughter cell?

7. How do each of the daughter cells compare to the original cell (include the number, color, and size of chromosomes in your description).

8. How do your daughter cells (especially the chromosomes) compare to other groups' daughter cells?