

CP Biology Activity: Pipe Cleaner Mitosis

Mitosis and meiosis are the cells ways of passing on their genetic material. This activity is designed to help you model the movement of chromosomes in these processes using pipe cleaners and string. As you go through this activity you should draw the stages in your book so you can remember them.

Materials

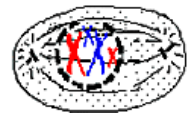
8 pieces of pipe cleaner (2 short green, 2 short red, 2 long green, 2 long red)

Procedure:

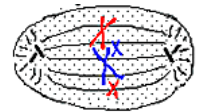
- On a piece of paper draw a large circle that is going to be your cell and a smaller circle that represents the nuclear envelope. Draw these in pencil! Place 4 (1 of each color and size) pieces of pipe cleaner (representing DNA) in the nucleus.

- During the S part of the cell cycle the cell replicates the DNA. Place the remaining pipe cleaners onto the nucleus near their partners. You now have double the genetic material.

- During prophase the DNA condenses and the two chromatids are joined. To represent a double chromosome, wrap your pairs of pipe cleaners around each other so that they look like an X. This is what we can see during prophase when the nuclear envelope disappears. You now need to erase your circle that is the nuclear envelope.



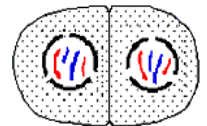
- During metaphase the chromosomes align at the metaphase plate (down the middle) and the spindle forms. Line up your chromosomes from the top of the nucleus to the bottom. Draw in the spindle fibers with pencil or chalk. You should end up with something that looks like this:



- The next phase is anaphase. Unwrap your pipe cleaners and lay them next to each other on the spindle fibers. Move one of each chromatid (pipe cleaner) to the side of the nucleus along the spindle fiber. You have just separated your chromosomes.



- The final stage is telophase. This is where the nuclear envelope reforms around the chromosomes. Take away your spindle fibers and draw a circle around the chromosomes on the left of your cell and a circle around the chromosomes on the right.



- The very last thing that happens when cells divide is called cytokinesis. This is not a part of mitosis but is an important step after it. In cytokinesis the cytoplasm divides so that you are left with your two new daughter cells. For this step you may either cut down the middle of your piece of paper or you can just draw a line down to show your two new cells.

Analysis: Answer the following questions on a separate sheet of paper. Answers must be in complete sentences and restate the question.

1. In this model what do the pipe cleaners represent?
2. Draw and label a pair of chromosomes.
3. Why did we need to double the pipe cleaners before cell division?
4. How many chromosomes were there in prophase? How many chromatids were there in prophase?
5. In what stage did the chromosomes line up on the metaphase plate?
6. What was the function of the spindle fibers in mitosis?
7. How do the 2 daughter cells at the end of mitosis compare to the original parent cell at the beginning of mitosis?
8. In what kinds of cells does mitosis occur (give at least 2 specific examples)?

Procedure: Meiosis

Meiosis produces cells with half the number of chromosomes. We call this the haploid number. The way meiosis halves the chromosomes is by having two divisions called meiosis 1 and meiosis 2. Your

teacher will go through the steps of meiosis with you as a class. Remember to draw each in your book as you make your models.

Questions:

1. What type of cells does meiosis produce?

2. What is the difference between mitosis and meiosis?

3. Why does meiosis have two divisions?

4. What is crossing over and why does it occur?

5. If an animal has a diploid number of 36 how many chromosomes will each cell have after meiosis 2 is complete?
