

### Modeling Meiosis Activity

#### Introduction:

Gregor Mendel made some remarkable discoveries about how traits are passed from parents to their offspring. However Mendel could not explain what was physically happening within cells to pass these traits on because he didn't know anything about chromosomes. This isn't Mendel's fault; microscopes were not good enough when he was alive to see chromosomes. No one knew that DNA was the molecule that contained genes and that it was contained inside chromosomes in cells.

Now that we know that all genes are coded in DNA inside chromosomes, we can explain why genes do all the things Mendel said they did hundreds of years ago. By understanding what happens to the chromosomes when sperm and egg are formed, we can understand why children look a little bit like their parents but are not identical to them.

During this simulation, you will only be looking at what happens to the chromosomes during meiosis; the centrioles, nucleolus, and nuclear membrane also undergo important changes just like in mitosis, but for the sake of simplicity they will not be looked at in this activity. When you draw your pictures, make sure you **color-code** them; this will make it easier to understand what is happening.

#### Procedures:

1. Set up your original cell: *In the center of a piece of blank paper put one short green (or blue) pipe cleaner and one long green (or blue) pipe cleaner; one short red (or pink) pipe cleaner and one long red (or pink) pipe cleaner.* The red (or pink) pipe cleaners came from this cell's Mom; the green (or blue) pipe cleaners came from Dad.

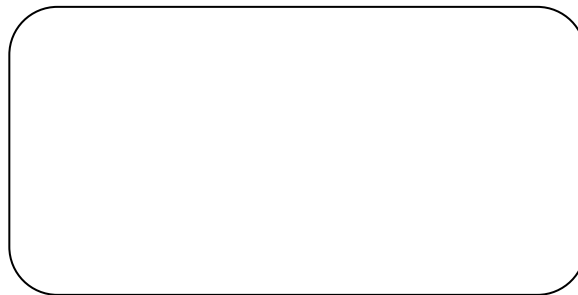
Q1. What is the total number of chromosomes in this cell? \_\_\_\_\_

Q2. This cell is haploid / diploid (circle one).

Q3. How many homologous pairs does this cell have? \_\_\_\_\_

2. During Interphase the DNA replicates and the chromosomes double. *To show this, place the other pipe cleaners next to the ones already in your "cell". Gently twist the pipe cleaners once or twice to show the centromere.*

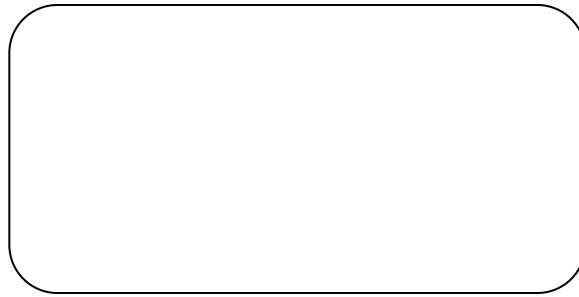
#### Draw your cell in Interphase below:



3. During Prophase, the homologous pairs line up next to each other. They usually get so close that parts of them wrap around each other and exchange pieces (called crossing over). *Put the "homologous" pipe cleaners next to each other, and wrap their tips around each other once.*
4. In Metaphase, the chromosomes line up in the middle of the cell. They line up differently than they do in mitosis, though. *Draw a line down the middle of the blank paper; one doubled chromosome of each homologous pair would be on each side of the line.*

**CHECK THIS ARRANGEMENT WITH YOUR TEACHER BEFORE CONTINUING.**

**Draw your cell in Metaphase I:**



5. In Anaphase I, chromosomes move towards opposite sides of the cell, but the doubled chromosomes stay attached at their centromeres. *Move one pair of homologous chromosomes to opposite side of the paper.*

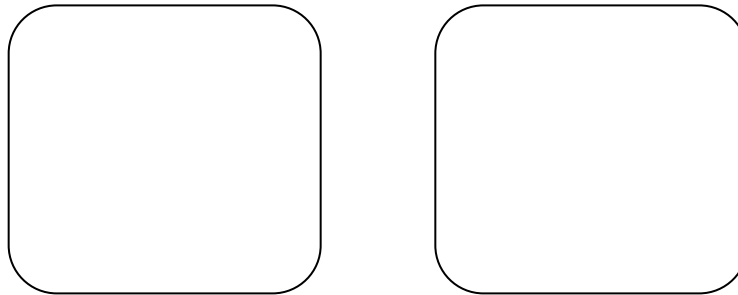
*Q4. How is Anaphase I of meiosis different from Anaphase in mitosis?*

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*Q5. Will the two new cells be genetically identical to one another? Explain why.*

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6. In Telophase I, the chromosomes are at opposite ends of the cell. Just after Telophase I the cell divides. *Show cytokinesis by cutting the blank paper in half along the line you drew in Step 4.* Be sure that each cell has **two homologous chromosomes**.

**Draw your two new cells at the end of Telophase I:**



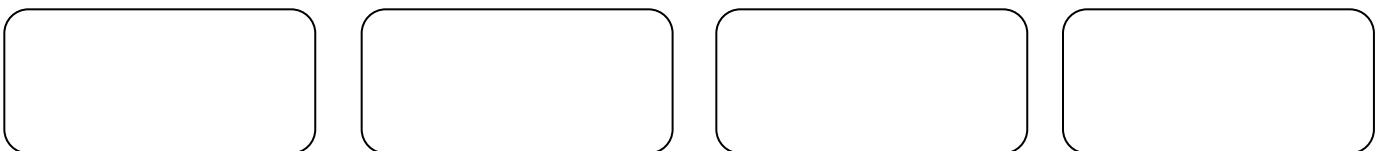
7. The two new cells go through Meiosis II, which is similar to mitosis.

*Q6. Do the chromosomes need to double before the second division? Explain your answer.*

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8. Use the pipe cleaners and your text to continue modeling the steps of Meiosis II: Prophase II, Metaphase II, Anaphase II and Telophase II.

9. *At the end of Telophase II, show cytokinesis by cutting both pieces of paper in half again to produce 4 cells.* Be sure that each cell has **two chromatids**.

**Draw your four new cells at the end of Telophase I:**



*Q7. These cells are haploid / diploid (circle one).*

*Q8. Take the separate page showing the stages of meiosis and cut them out and arrange them onto a piece of paper in the correct sequence. Secure the stages to the paper using glue or tape.*