Introduction to Meiosis

Meiosis is a process of cell division in which haploid gametes (cells containing 1 chromosome of each size) are produced by diploid organisms (cells containing 2 chromosomes of each size). The stages of meiosis are similar to those of mitosis except that during meiosis, cells divide twice after replicating the DNA once.

Using the pop-it bead models, hypothesize the events which occur during meiotic cell division and the final outcome of the process. Use colored pencils to draw accurate representations in the circles provided. Answer the following questions on a separate sheet of paper as you move through meiosis.

1. We are diploid organisms. How many chromosomes of each size do our cells have? How many total chromosomes do we have? How many different sizes of chromosomes do we have?

2. Briefly describe the events in interphase that lead up to the first meiotic division.

1st meiotic division

3. In our model (pop-it beads) how many chromosomes are there? How many pairs of homologous (same size) chromosomes are there? Where did each chromosome in a homologous pair come from?

4. During *prophase I*, homologous chromosomes pair up side by side. In our model, this would be represented by a red homolog next to and overlapping its yellow homolog. Use the pop-it bead model to represent your hypothesis of how chromosomes appear in the cell during *prophase I*. Check your hypothesis. Draw the correct representation in the circles provided.

5. While paired, homologous chromosomes exchange corresponding pieces of DNA in a process called crossing over, creating a "striped" red/yellow pattern in each chromosome. Why might crossing over be beneficial to sexually reproducing organisms?

6. In *metaphase I* sister chromatids do not split. The cell arranges its chromosomes so each new cell will get half the original number of chromosomes. Use the model to represent your hypothesis of how chromosomes line up in *metaphase I*. Check your hypothesis. Draw the correct representation.

7. Describe the events that occur in *anaphase I*. Use the model to represent your hypothesis. Check your hypothesis. Draw the correct representation.

8. Describe the events that occur in *telophase I*. Use the model to represent your hypothesis. Check your hypothesis. Draw the correct representation.
How many chromosomes does each cell contain? Are the centromeres still intact? How many homologous pairs of chromosomes does each cell contain? Are these cells haploid or diploid in chromosome number?

2nd meiotic division

The second meiotic division is much like mitosis in that the number of chromosomes in the cell now remains constant, but the genetic material is divided equally between the daughter cells.

9. Describe the events that occur in *prophase II*. Remember, chromosomes are not replicated after the 1st meiotic division. Use the model to represent your hypothesis. Check your hypothesis. Draw the correct representation.

10. Describe the events that occur in *metaphase II*. Use the model to represent your hypothesis. Check your hypothesis. Draw the correct representation.

11. Describe the events that occur in *anaphase II*. Use the model to represent your hypothesis. Check your hypothesis. Draw the correct representation.

12. Describe the events that occur in *telophase II*. Use the model to represent your hypothesis. Check your hypothesis. Draw the correct representation.

RE-MAKE YOUR CHROMOSOMES SO THEY ARE THEIR ORIGINAL, UNIFORM COLOR & SIZE!!!

Analysis Questions

13. How many cells are produced by the end of meiosis? How many chromosomes are in one cell? How many chromosomes were in the original cell before meiosis began? Are the resulting cells haploid or diploid in chromosome number? How can you tell?

14. What two kinds of cells are produced by meiosis?

15. What is the importance of these cells having half the number of chromosomes as the rest of our cells?