

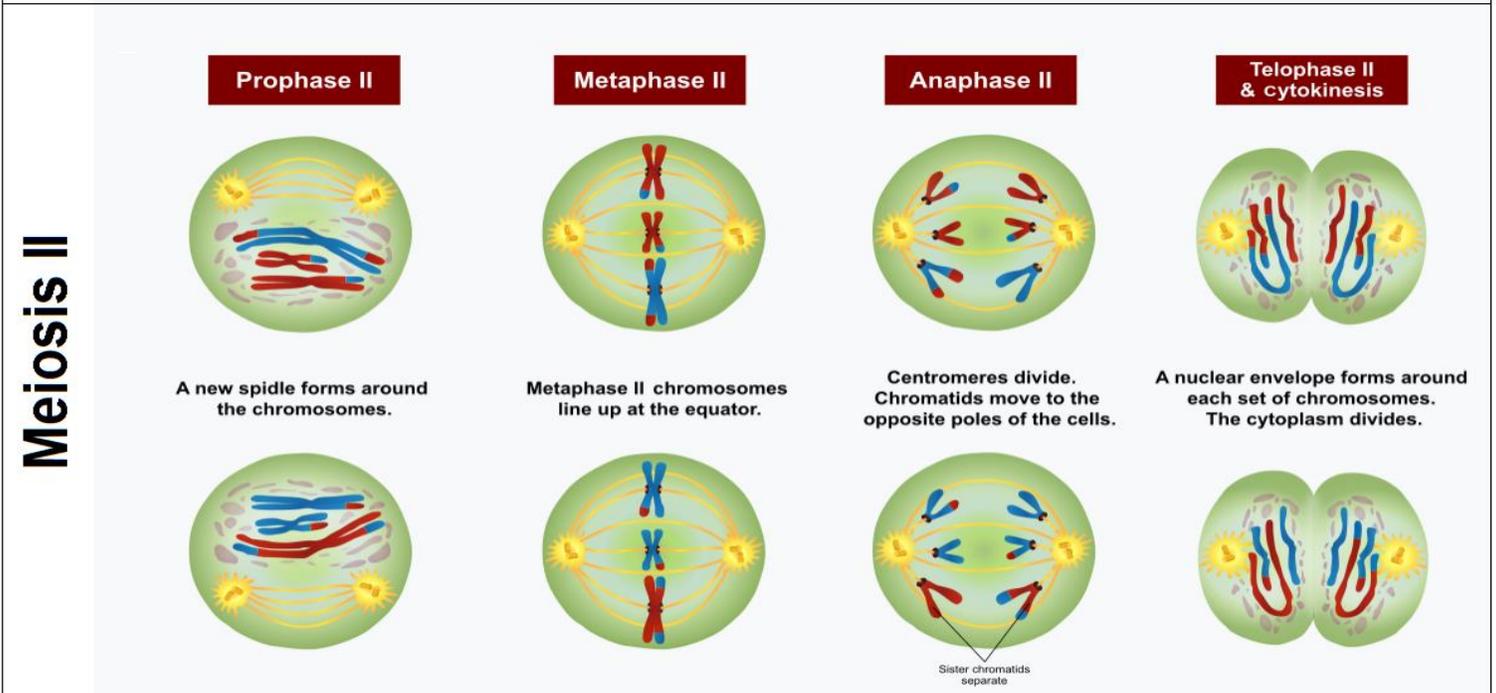
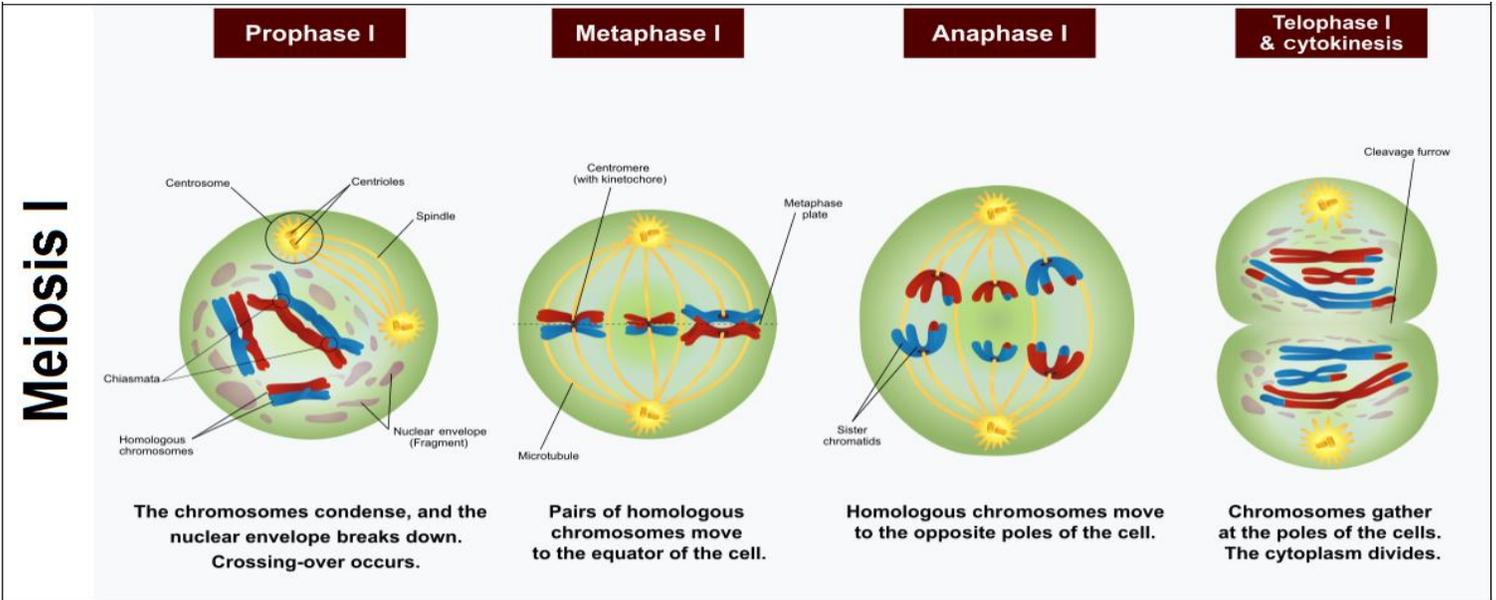
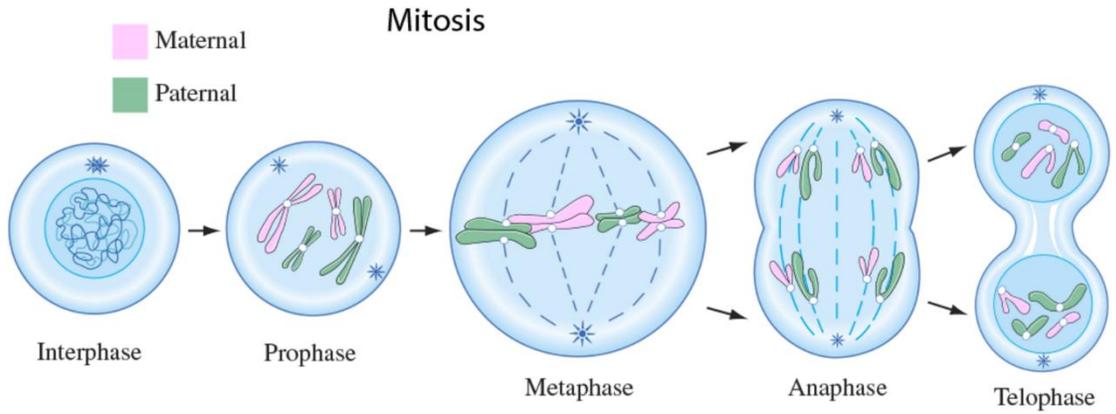
CLASS COPY

ACTIVITY: Modeling Meiosis with Pop Beads

Introduction

As we have studied, mitosis is the division of the nucleus of somatic (normal body) cells with the intent of making two exact copies of the parent cell.

Meiosis is also a type of cell division – a **reduction division** of the nucleus of a germ cell because it reduces the amount of DNA in a cell by half to create unique sex cells (gametes). This process is similar to going through mitosis twice but with a few key differences.



During this activity we will be using pop beads and magnets to simulate the chromosomes and the dry erase board will represent the rest of the cell during meiosis.

Materials

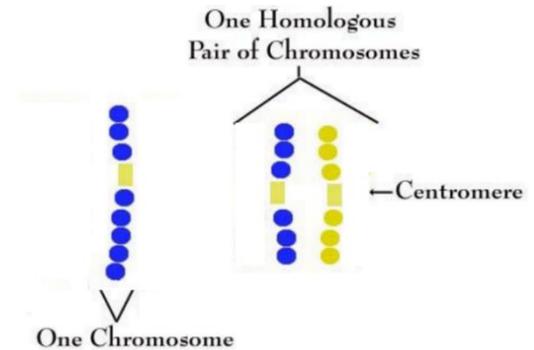
- | | | |
|-----------------|--------------------------|------------------|
| 60 red beads | 4 magnetic “centromeres” | Dry erase marker |
| 60 yellow beads | Dry erase board/desk | Eraser |

Procedure: ANSWER ALL QUESTIONS IN YOUR JOURNALS PLEASE!!

1. Create four homologous chromosomes using the red beads for the paternal chromosome and the yellow beads for the maternal chromosome. Make a long chromosome and a short chromosome of each color.

? **Homologous chromosomes** (below) are:

2. Place your homologous chromosomes on the dry erase board and draw a nuclear envelope (membranes) around them. Then draw a cell membrane for the cell. This is the cell in **G1 phase** of interphase.



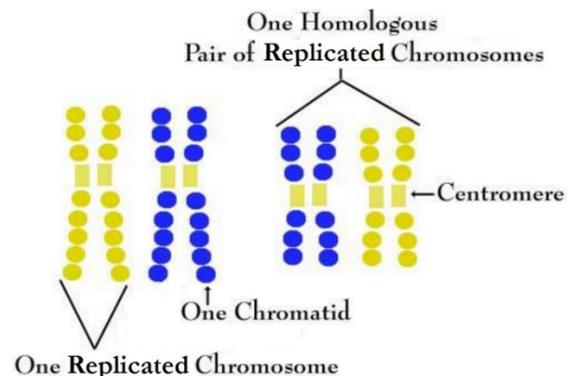
? What is the cell doing at this stage?

3. If the cell’s cyclin concentration is high enough, the cell will enter **S phase**.

? What is the cell doing in this stage?

? Comparing the diagram below to the one above, what is the difference between a chromosome and a **replicated chromosome**?

4. Once the DNA replication has completed and the cell has prepared for meiosis during **G2 phase**, it checks to ensure the DNA has been copied correctly. If everything has worked, the cell enters meiosis.



Meiosis reduces a cell’s chromosome number from **diploid** to **haploid**.

? What does this mean?

Meiosis produces **four daughter cells**. These types of cells depend on the sex of the organism undergoing meiosis.

? What is the name of the process that produces these cells in **males**? What type of cells and how many of each are produced by males?

? What is the name of the process that produces these cells in **females**? What type of cells and how many of each are produced by females?

During meiosis, there are processes that create **variation in the genetic combinations** that are passed on to the offspring.

? **Crossing over** occurs in ___ and is when:

? **Independent assortment** occurs in ___ and ___, and is when:

5. Use one pair of homologous chromosomes to simulate **crossing over**. **Draw this process in YOUR JOURNAL.**

6. Create each of the stages of **meiosis I** using the pop beads and the dry erase materials. When you're sure of each stage, check it with another lab pair. Once you have it correct, **RECREATE THE CHART BELOW AND DRAW EACH OF THESE STAGES** in YOUR JOURNAL.

FOR QUESTION #6

<u>Prophase I</u>	<u>Metaphase I</u>
<u>Anaphase I</u>	<u>Telophase I</u>

FOR QUESTION #7

<u>Prophase II</u>	<u>Metaphase II</u>
<u>Anaphase II</u>	<u>Telophase II</u>

? How is this process similar to mitosis? How is this process different from mitosis?

7. Create each of the stages of **meiosis II** using the pop beads and the dry erase materials. When you're sure of each stage, check it with another lab pair. **RECREATE THE CHART BELOW AND DRAW EACH OF THESE STAGES** in YOUR JOURNAL.

? How is this process similar to mitosis? How is this process different from mitosis?

Analysis and Conclusion: ANSWER IN YOUR JOURNALS

- What type of cells generally undergo mitosis? What type of cells undergo meiosis?
- For a human cell, $2N = 46$. How many chromosomes will there be in a daughter cell produced from mitosis in humans? How many chromosomes will there be in a human gamete?

Mitosis daughter cell = _____ Meiosis daughter cell = _____
- Why is it crucial that gametes reduce their number of chromosomes by half?
- Why do homologous chromosomes separate during meiosis (as opposed to randomly dividing the chromosome number in half)?
- How does crossing over increase genetic diversity?
- Do you see any places in meiosis where problems could arise? Explain.