

**CONCEPTS IN ACTION**- Review the process of meiosis, observing how chromosomes align and migrate, at [this site](#).



## Meiosis II

In meiosis II, the connected sister chromatids will be split and separated into four haploid cells. Let's take a closer look at the events of meiosis II, which begins with prophase II.

### *Prophase II – Prometaphase II*

In prophase II, if the chromosomes decondensed in telophase I, they condense again. If nuclear envelopes were formed, they once again break down. The centrosomes once again move away from each other toward opposite poles, and new spindles are formed. In prometaphase II, the nuclear envelopes are completely broken down, and the spindle is fully formed. Each sister chromatid's kinetochore attaches to microtubules from the opposite poles (Figure 8.28).

### *Metaphase II – Anaphase II*

In metaphase II, the sister chromatids are completely condensed and align on the metaphase plate. In anaphase II, the sister chromatids are pulled apart by the spindle fibers and move toward opposite poles (Figure 8.28).

### *Telophase II – Cytokinesis II*

In telophase II, the chromosomes, now in the unduplicated state, arrive at opposite poles and begin to decondense. Nuclear envelopes now form around the chromosomes. Cytokinesis II separates the two cells into four genetically unique haploid cells (Figure 8.27). At this point, the newly produced cells are haploid and genetically unique because of the crossing over and independent assortment.

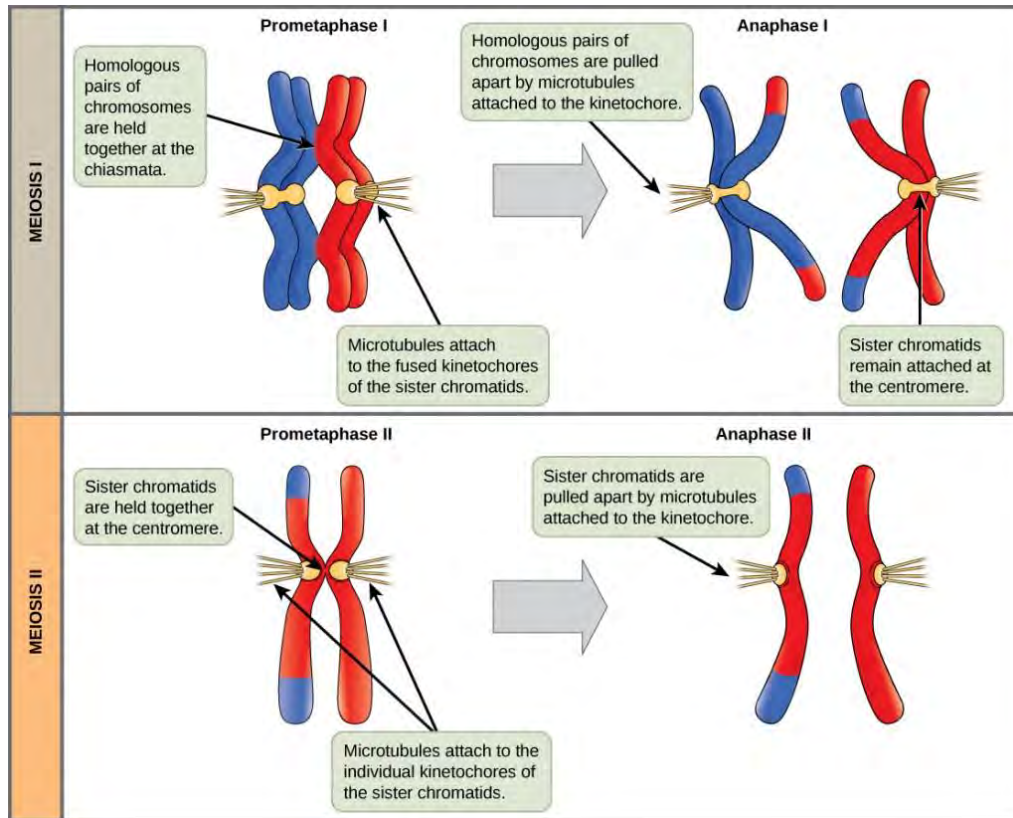


Figure 8.28 In prometaphase I, microtubules attach to the fused kinetochores of homologous chromosomes. In anaphase I, the homologous chromosomes are separated. In prometaphase II, microtubules attach to individual kinetochores of sister chromatids. In anaphase II, the sister chromatids are separated. (credit: Clark et al./ [Biology 2E OpenStax](https://openstax.org/))

## Comparing Meiosis and Mitosis

Mitosis and meiosis are both necessary processes of the eukaryotic cell cycle. These processes share some similarities, but also exhibit several important and distinct differences that lead to very different outcomes (Figure 8.29). Mitosis is a process where one single diploid cell divides and produces two new genetically identical daughter cells.

On the other hand, meiosis is a process that begins with one diploid cell, which then goes through two rounds of chromosome divisions. The four daughter cells produced at the end of meiosis are genetically unique because of processes like crossing over and independent assortment. Each of the daughter cells produced during meiosis is haploid. Keep in mind haploid cells each contain only one chromosome set, which is half of the original chromosome number.

In humans, cells produced by mitosis will function in different parts of the body and are essential for growth and/or replacing dead or damaged cells. Cells produced by meiosis are used for organismal reproduction.

### Check your knowledge

In the following list, decide if the event occurs in mitosis, meiosis, or both.

- Crossing over
- One DNA replication
- End in haploid cells
- Nucleus degrades
- Cytokinesis
- Homologous chromosomes align on the metaphase plate

*Answers: Meiosis only, Both, Meiosis only, Both, Both, Meiosis only*