

Meiosis Model

Preparation: To illustrate or model the process of meiosis you will need beads and thread or twine (for stringing the beads together) or "pop beads" that snap together. You will need a total of four strands of six beads--two strands of red and two strands of blue. You will also need magnets or similar objects to represent centromeres and a flat work surface you can draw on such as a chalkboard or large piece of dark paper.

The table below lists suggested steps for creating your model, once you have everything set up. Don't forget to snap a photo of each phase before moving on to the next phase.

Phase	Suggestions
Interphase	Use a piece of chalk or other removable marker to draw a line around the edge of your work surface to represent the border of the cell. In the center, draw a circle to represent the nuclear envelope. Inside the nucleus, place one strand of blue beads to represent the paternal chromosomes, and one strand of red beads to represent the maternal chromosomes.
Prophase I	Take apart and reassemble the strands of beads to represent the crossing over of genetic material that causes genetic variation. (You should end up with two pairs of beads that are not identical in terms of bead color and patterns of color.) Be sure to remove the circle that represents the nucleus, since the nuclear envelope breaks down during this phase.
Metaphase I	Position the sister chromatids in the middle of the circle on the table. Draw a dotted line to represent the metaphase plate, and place the two pairs of homologous chromosomes on the plate. Draw spindle fibers from the centromeres of the chromatids to the poles of the cell.
Anaphase I	During this phase, the homologous chromosomes separate and are pulled to the opposite sides of the cell by the spindle fibers. Move the paternal sister chromatids to one pole of the cell and the maternal sister chromatids to the other.
Telophase I and Cytokinesis	Erase the spindle fibers, and draw two circles to represent nuclei within the border of the cell. Now each half of the cell has one pair of sister chromatid strands. Draw a cleavage furrow around the two nuclei containing the two sister chromatids. Then draw the pinching off action. You should now have two daughter cells each containing a pair of sister chromatids. Note that the chromatids are no longer identical pairs.
Prophase II	Erase the original cell border. In the new cells, draw spindle fibers that connect the centromeres of the sister chromatids.

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Metaphase II	Draw metaphase lines within each of the two cells. In each cell, position the paternal and maternal sister chromatids on the metaphase plate just as you did during meiosis I.
Anaphase II	During this phase, the proteins connecting the sister chromatids break, allowing the strands to separate. Separate the strands by detaching the magnets that represent the centromeres. After you separate the strands, move the strands toward opposite poles of the cell. You should now have two daughter cells, each containing two separate strands of chromosomes.
Telophase II and Cytokinesis	Draw metaphase lines in each daughter cell. Then draw two nuclei in each cell and erase the spindle fibers. Draw the cleavage furrow and the pinching off action, creating two new cells from each original cell. You should now have four daughter cells, each with one chromosome strand. You have successfully modeled meiosis.
