Metaphase

Metaphase is the second phase of cell division and is characterized by the alignment of chromosomes or homologous chromosomes at the center of the cell. Microtubules extend from the spindle apparatus and centrioles to attach to chromosomes in preparation for separation of genetic material. Chromosomes are aligned at the metaphase plate which is equidistant from each centriole. In meiosis I metaphase, homologous chromosomes are paired at the metaphase plate, such that tetrads span the metaphase plate. Each cell gets a sister chromatid set. This allows for each cell to get one copy of the chromosomes, such that neither cell has a copy of chromosomes from both the original parents. In mitosis and meiosis II metaphases, sister chromatids are aligned at the metaphase plate. This means that each cell will only get one chromatid. The centromere is the site of connection for sister chromatids, and the kinetochore is a protein structure on the centromere that serves as the binding site for microtubules.

PLAY PICMONIC

Characteristics

Microtubules Extend from Centrioles' Spindles
Globular-ropes from Cent-trolls' Spindles
Microtubules from the spindle apparatus connect to the kinetochores of chromosomes.

Centromere
Cent-mirror
The centromere is part of the chromosome that links sister chromatids together. The spindles attach to centromeres through kinetochores.

Kinetochore
K-apple-core
The kinetochore is a protein structure on the chromatids where the spindle fibers attach to pull sister chromatids apart (or homologous chromosomes in the case of meiosis I).

Meiosis I Tetrads Aligned at Metaphase Plate
Mouse-rose (1) Wand with Tetris-chromosomes at Meat Plate
In meiosis I, homologous chromosome pairs, or tetrads, are lined up at the metaphase plate ready to be split such that each daughter cell gets one of the chromosomes from a homologous pair. Thus, each daughter cell gets one of the parent's chromosomes for each chromosome (1-23), but not both parent's genetic information.

Meiosis II Sister Chromatids Aligned at Metaphase Plate
Mouse-rose in (2) Tutu with Sister Chrome-kids at Meat Plate
In meiosis II, sister chromatids are lined up at the metaphase plate but may not be exactly genetically identical due to crossing over that occurred during meiosis I.

Mitosis Sister Chromatids Aligned at Metaphase Plate
Mitt-toes with Sister Chrome-kids at Meat Plate
In mitosis, sister chromatids are lined up at the metaphase plate and are ready to be separated into individual chromatids (that are genetically identical).