

Chromosomes replicate in interphases before meiosis

Meiosis follows period of interphase with cell cycle phases of G1, S, and S2; in the S phase, DNA is replicated so each chromosome has two chromatids

Initially, chromosomes condense and are visible as two chromatids called sister chromatids

Pairing of the sister chromatids, also called synapsis, occurs where they align beside each other; this combination is called a tetrad (because of four chromatids) or a bivalent (because of two pairs)

In many eukaryotic cells, a protein based structure forms in between the bivalent called synaptonemal complex

Crossing over is the exchange of DNA material between non-sister homologous chromatids

During prophase I, breaks within the DNA occur; then, a set of chromatids "invade" a homologous sequence on a different set of chromatids and bind in the region of the breaks

Once the crossing over occurs, the first set of chromatids continue to adhere even after crossing over; this connection point is called chiasmata or a chiasma

Chiasmata formation between non-sister chromatids in a bivalent can result in an exchange of alleles

2 consequences of chiasmata formation:

- Increased stability of bivalents at the chiasmata

- Increased genetic variability if crossing over occurs

Results in an exchange of DNA between maternal and paternal chromosomes; can decouple linked combinations of alleles and lead to independent assortment

Can occur multiple times and between different chromatids within the same homologous pair
