

10.1 Meiosis

Meiotic Processes

State the purpose of meiosis

Meiosis is the process by which sex cells (gametes) are made in the reproductive organs

It involves the reduction division of a diploid germline cell into four genetically distinct haploid nuclei

Explain how independent assortment and crossing over give rise to genetic variety

Independent Assortment:

During Metaphase I, homologous pairs line up in a random orientation, meaning there is an equal chance of a gamete containing either the maternal or paternal copy of a given chromosome

As humans have a haploid number of 23, there are 2^{23} gamete combinations (over 8 million combinations)

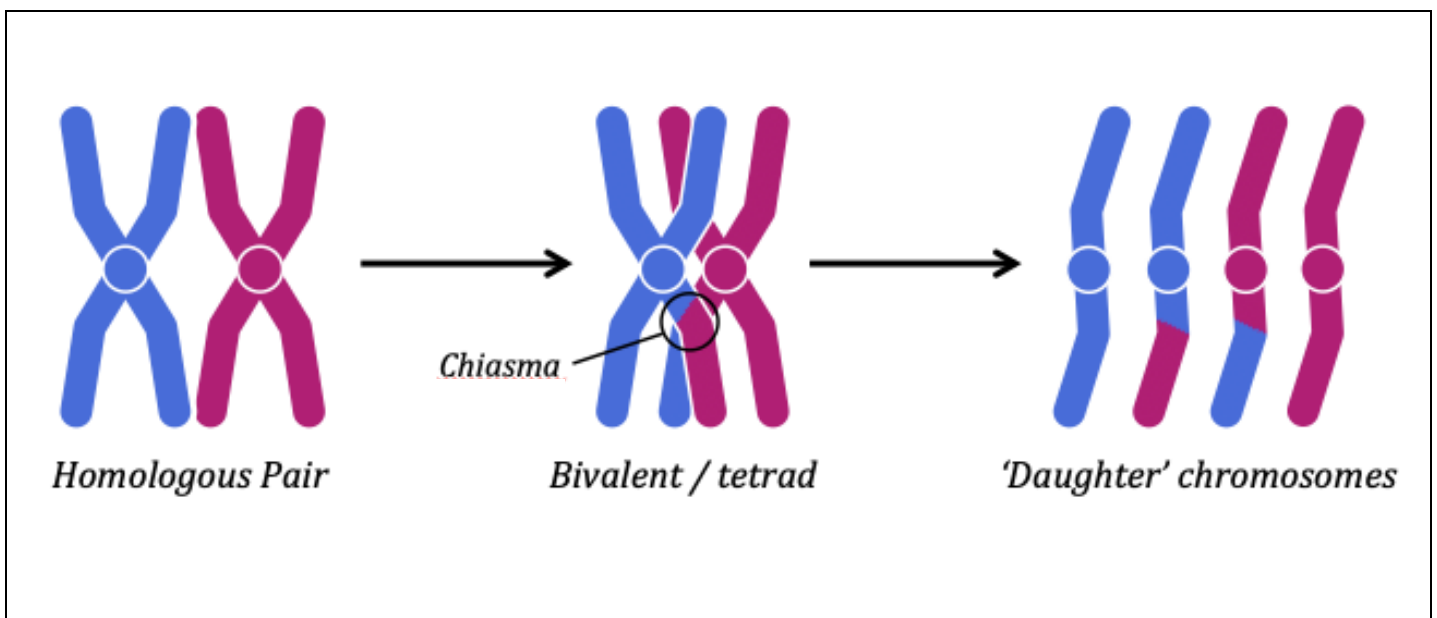
Crossing Over:

During Prophase I, homologous pairs of chromosomes connect via chiasmata (between non-sister chromatids) in a process called synapsis - the resulting complex is called a bivalent

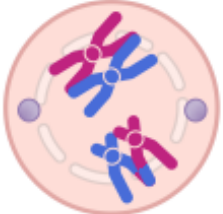
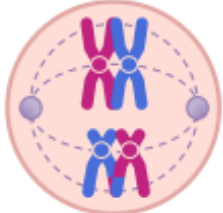
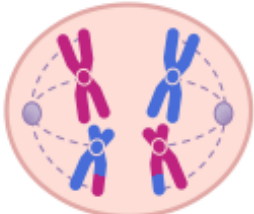
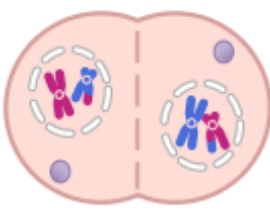
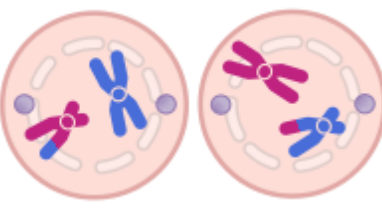
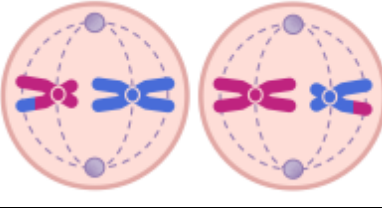
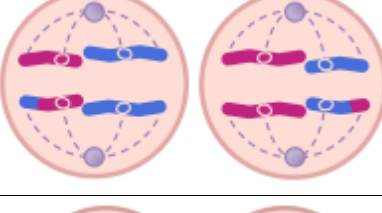
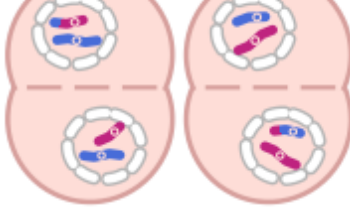
Chiasmata represent the points where genetic information has been exchanged (forming recombinants)

Recombination through gene exchange produces new combinations of alleles

Draw a diagram to show the recombinants formed via crossing over



Describe the stages of meiosis

Stage	Diagram	Description
Prophase I		<p>Chromosomes condense, nuclear membrane dissolves, homologous chromosomes form bivalents, crossing over occurs</p>
Metaphase I		<p>Spindle fibres from opposing centrosomes connect to bivalents (at centromeres) and align them along the middle of the cell</p>
Anaphase I		<p>Spindle fibres contract and split the bivalent, homologous chromosomes move to opposite poles of the cell</p>
Telophase I		<p>Chromosomes decondense, nuclear membrane may reform, cell divides (cytokinesis) to form two haploid daughter cells</p>
Prophase II		<p>Chromosomes condense, nuclear membrane dissolves, centrosomes move to opposite poles (perpendicular to before)</p>
Metaphase II		<p>Spindle fibres from opposing centrosomes attach to chromosomes (at centromere) and align them along the cell equator</p>
Anaphase II		<p>Spindle fibres contract and separate the sister chromatids, chromatids (now called chromosomes) move to opposite poles</p>
Telophase II		<p>Chromosomes decondense, nuclear membrane reforms, cells divide (cytokinesis) to form four haploid daughter cells</p>