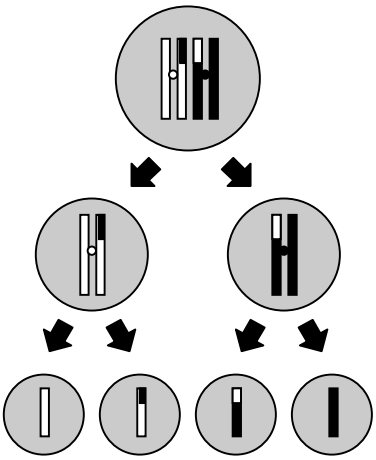
Meiosis (4.2)

Outline the process of meiosis (4.2.1 / 4.2.3)

- Meiosis is the reduction division of a diploid nucleus to form haploid nuclei
- It involves 2 divisions; each consisting of prophase, metaphase, anaphase & telophase

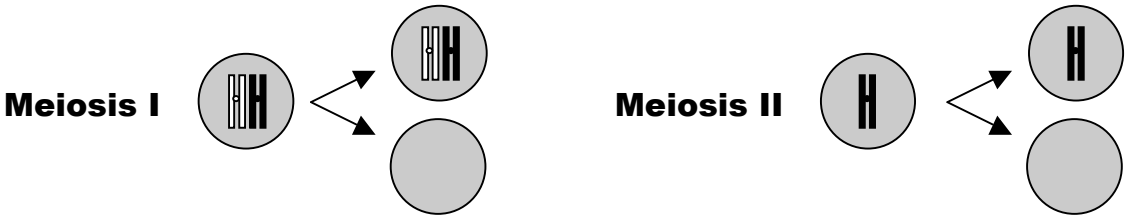
Key Events

- Homologous chromosomes form bivalents (P1)
- Crossing over occurs between non-sister chromatids (P1)
- Homologous chromosomes line up (M1) & split apart (A1)
- 1st division is a reduction division (chromosome # is halved)
- In meiosis II (2nd division), sister chromatids are separated
- Chromosomes line up (M2) & sister chromatids split (A2)
- The final product is 4 distinct haploid cells (called gametes)
- Meiosis produces genetic variation in gametes by:
  - Crossing over (P1) & random orientation of bivalents (M1)



Explain how non-disjunction leads to aneuploidy (4.2.4)

- Non-disjunction refers to the failure of the chromosomes to separate properly, either via:
  - Failure of the homologues to separate in meiosis I *(2 cells = n + 1 ; 2 cells = n - 1)*
  - Failure of sister chromatids to separate in meiosis II *(2 cells = n ; 1 cell = n + 1 ; 1 cell = n - 1)*
- An incorrect number of chromosomes in a cell is called aneuploidy
- Down syndrome is caused by trisomy 21 *(three copies of chromosome 21 in cells)* Meiosis is



Karyotypes (4.2.5 - 4.2.7)

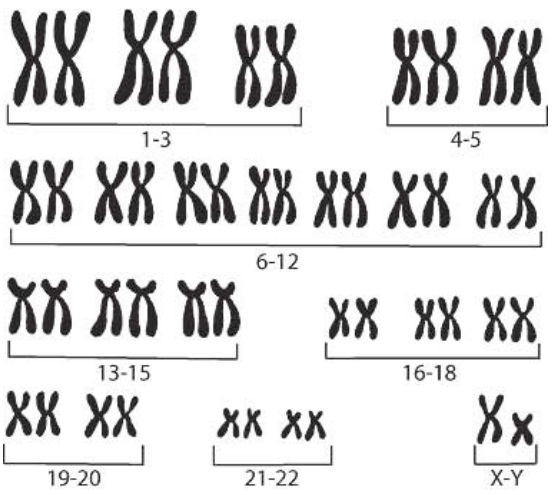
- A karyotype is a visual profile of chromosomes in a cell
- They can be arranged in pairs based on size, structure and banding patterns (when stained)
- It involves taking white blood cells or fetal cells, stimulating mitosis and halting division in metaphase
- It is often used pre-natally to determine gender and test for chromosomal abnormalities

Chorionic villi sampling

- Cells taken from placenta at 11-12 weeks
- Slightly higher risk of miscarriage (~1-2%)

Amniocentesis

- Cells taken from amniotic fluid at ~16th week
- Lower risk of miscarriage (~0.5%)



Normal male karyotype (46, XY)