DNA replication

- DNA replication occurs during synthesis phase of the cell cycle, when all DNA in a cell is copied/doubled
- There are two types of molecules that are particularly important for the process
  - Enzymes
    - *Helicase*
    - A group of enzymes called *DNA polymerase*
  - Free nucleotides found in the nucleoplasm
- The two DNA strands must first get separated
  - Separation of the double helix into two single strands
    - The enzyme *helicase* breaks the hydrogen bonds between the nitrogenous bases
      - It begins at point in or at the end of a DNA molecule and moves one complementary base pair at the time
      - It moves from 3' to 5' carbon
- The unpaired nucleotides on each of these single strands can now be used as a template for the formation of two new strands identical to the original

Formation of two strands

- The nucleus contains free nucleotides able to form complementary pairs with the single stranded molecules
  - It happens in order and not randomly
    - A free nucleotide goes at one open end and a second one joins the first
- The formation of a covalent bond between two adjoining nucleotides is catalysed by one of the DNA polymerase enzymes
- DNA polymerase can only work in the 3' to 5' direction
  - One strand is replicating in the same direction as helicase is moving and the other strand is replicating in the opposite direction
- Two identical copies of DNA are produced from one original
  - The original double stranded molecule was separated and complementary nucleotides bonded to its own
- No DNA molecule is ever completely new
  - DNA replication is described as *a semi-conservative process*
    - Because half of the pre-existing DNA molecule is always conserved
  - It was proved by the scientists *Meselson and Stahl*