Now that the conservative theory was ruled out (due to all the DNA sitting in the middle of the 14N and 15N benchmarks), Meselson and Stahl sought to discover whether the DNA followed semiconservative or dispersive replication:

- So, they heated up the hybrid strands to form single stranded DNA molecules
- They then centrifuged these strands on the caesium chloride gradient
  - This produced a single light band and a single dark band, thereby confirming that DNA reproduced via semiconservation

DNA can replicate faithfully due to the bases on each strand. This is because each base only pairs to their counterpart

- The new strand created is complementary to the template strand

One of the main enzymes involved in this replication is DNA polymerase

- This is involved in the polymerisation of deoxyribonucleotide triphosphates (dNTPs) (see below)
  - The N can be adenine, cytosine, guanine or thymine
  - The polymerase can only add dNTPs to the 3’ end of the new growing DNA strand
  - Hence, the synthesis is 5’ to 3’
- The two furthermost phosphates are removed before the nucleotide is added to the 3’ end of the strand via the catalysis of the covalent linkage between the two nucleotides
  - A pyrophosphate is released

The DNA polymerase makes an error roughly every 10^7 nucleotides

- Fortunately, the polymerase recognises this, changes shape and allows another active site on the enzyme to excise the faulty addition
  - Every nucleotide is checked
  - A mistake that goes unrecognised will produce a mutation

To begin the synthesis of a new strand of DNA, an initiator protein must bind to the replicator origins

- These replicator regions are specific sequences of DNA
- The initiator proteins pull the two strands apart
  - Less energy is required to pull a few base pairs apart than to pull the entire helix apart
  - This produces two replication forks (see right)
    - The forks move in opposite directions

This produces a problem however, if the strands run antiparallel and the polymerase only works in the 5’ to 3’ direction

- The leading strand that runs 5’ to 3’ is synthesised continuously
- The lagging strand is synthesised discontinuously