DNA Replication :

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DNA must be copied before any cell can reproduce using mitosis, or before sex cells can be made during meiosis. Its also important to safeguard against errors in copying, otherwise the protein molecule any gene codes for might be changed.

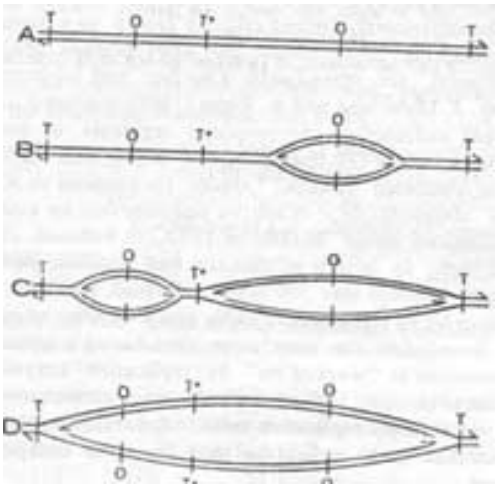
Making copies of DNA involves an original DNA molecule to be copied, and several other chemicals that act on it in four stages....

- Initiation
- Elongation
- Termination
- Proofreading and correction

All stages can happen at the same time at different sites of a DNA molecule.

What we now believe about the process is called the "semi-conservative" model.....

One strand (half) of the original DNA molecule will be included into each copy. This helps guard against copying mistakes / changes / mutations.



In simple prokaryotes having double stranded DNA....

1. Helicases open up the double helix, creating "replication bubbles" and "replication forks"

2. DNA polymerases begin matching complementary nucleotides

3. This process gets bigger and bigger until the whole length of the DNA has been opened and a complementary strand made for each side.....producing TWO identical DNA molecules before cell division can happen.

In higher eukaryotic cells.....

Replication involves....

1. DNA helicases unwind and unzip a segment of DNA, exposing the bases in the middle. (creating a replication bubble with 2 replication forks.

2. A DNA primer (built by DNA primase) attaches onto the leading strand, and begins organizing complementary bases in a 5' to 3' direction. Work on this side proceeds smoothly.

On the lagging strand, DNA is constructed in the opposite direction in short segments (100's to thousands of nucleotides) called Okazaki fragments. A new DNA primer must be built and attach at the beginning of each fragment.

In both cases, DNA polymerase is responsible for lining up complementary bases (according to correct chemical bonding)

The DNA primer for each fragment must then be removed, but in doing so, exposes a short area of DNA for which there is no nucleotide. The cell must them fill in one of these for each primer used. At the ends of the DNA strands however, this cannot be done, so the DNA could be eroded away as a result of each replication cycle (genetic erosion of about 100 nucleotides).

DNA ligase will be responsible for bonding these Okazaki fragments together.