DNA Replication
Replication in prokaryotes cont.

- As the two DNA strands separate and the bases are exposed, the enzyme DNA polymerase moves into position at the point where synthesis will begin.
- The start point for DNA polymerase is a short segment of RNA known as an RNA primer.
- The very term "primer" is indicative of its role which is to "prime" or start DNA synthesis at certain points.
Addition of bases

DNA polymerase is described as being "template dependent" in that it will "read" the sequence of bases on the template strand and then "synthesize" the complementary strand.

The template strand is **ALWAYS** read in the 3'--> 5' direction (that is, starting from the 3' end of the template towards the 5' end of the template).

As a result, the new DNA strands can **grow only in the 5' to 3' direction**, and strand growth must begin at the 3' end of the template.
DNA Replication is Semi-conservative

- When the replication process is complete, two DNA molecules - identical to each other and identical to the original - have been produced.
- Each strand of the original molecule has remained intact as it served as the template for the synthesis of a complementary strand.
- This mode of replication is described as semi-conservative: one-half of each new molecule of DNA is old; one-half new
Semi-conservative nature

1. Semiconservative Model
2. Conservative Model

original strand
newly synthesized strand
Speed of replication: Eukaryotes

- The average human chromosome contains $3.0 \times 10^9$ nucleotide pairs which are copied at about 50 base pairs per second.

- The process would take a month but there are many places on the eukaryotic chromosome where replication can begin (many origins).

- As replication nears completion, "bubbles" of newly replicated DNA meet and fuse.
Post-Replication Modification of DNA

- One of the major post-replicative reactions that modifies the DNA is methylation.

- The sites of natural methylation of eukaryotic DNA is always on cytosine residues that are present in C-G dinucleotides.

- However, not all C-G dinucleotides are methylated at the C residue.

- This methylation serves a structural as well as a regulatory function.