

DNA Replication

-happens in SPhase
- proceeds bidirectional

-copying a DNA molecule

-semiconservative

-DNA unwinds and unzips 2 strands

- Daughter DNA

parent strand and newly synthesized

-unzip = supercoiling

SUPERCOILING

DNA -enzyme topoisomerase

Gyrase -creates a nick to relieve torsional strain and release

Helicase -Destabilizing protein
-promotes unwinding by binding to RF

SSB -stabilize single stranded regions

DNA POLYMERASE

-polymerization at 5' to 3'

-requires template to copy
-complementary strand

Types of dNTPs

dATP, dGTP, dCTP, dTTP

Primer

Organisms RNA, DNA in some organisms

Viruses Protein

DNTP - deoxynucleotide triphosphate
adenine (dATP), cytosine (dCTP), guanine (dGTP), and thymine (dTTP)

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Models of DNA Replication

SemiConservative **Conservative** **Dispersive**

-parent & new synthesis
-both original and new strands
-mosaic/hybrid

-unwind each other
-rebase pair

Theta Replication

-present in bacteria (prokaryotic)
- circular form

LAGGING AND LEADING STRAND

Lagging Strand **Leading Strand**

-3' to 5' -5' to 3'

-discontinuous -continuous

-okazaki fragments -no short fragments

-each fragments requires its own set of primers - requires only one primer

-requires DNA ligase -no DNA ligase

LAGGING AND LEADING STRAND (cont)

-grows away from RF
-grows in direction of RF

-synthesis of new strands SLOW
-synthesis of new strands FAST

RF - Replication Fork

REPLICATION ORIGINS

-unique DNA segments contains multimeric origin-binding protein

-ATrich stretch less energy to melt A-T bp due to Hbonds

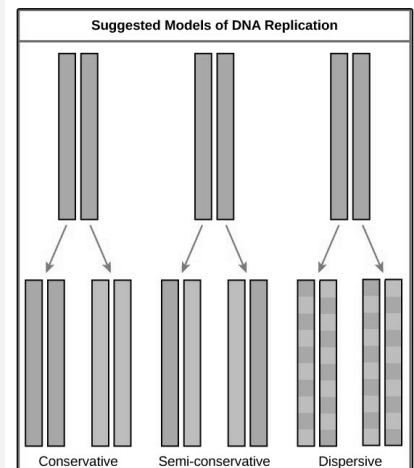
PROKARYOTIC DNA POLYMERASE

DNA polymerase I -RNA primer removal, DNA repair

DNA polymerase II -DNA repair

DNA polymerase III -Chromosome replication

MODELS OF DNA REPLICATION



PROTEINS INVOLVED IN DNA REPLICATION

Protein	Activity
DNA Polymerase	-initiates -add nucleotide at 3' end
DNA Helicase	-unzip/unwind DSDNA -separates DNA strands
SSBS	-stabilizer -preventing bp from reforming before lagging strand is replicated
DNA Topoisomerase	-reseal -unravel twists in DNA -reduce torsional strain & positive supercoil
Sliding Clamp	-keeps DNA polymerase attached to template
Clamp Loader	-lock sliding clamp to DNA (uses ATP hydrolysis)
Primase	-synthesis RNA primers in lagging strand
DNA Ligase	-sealed/connect okazaki
SSBS - Single Strand DNA Binding Protein DSDNA- Double Strand DNA	



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