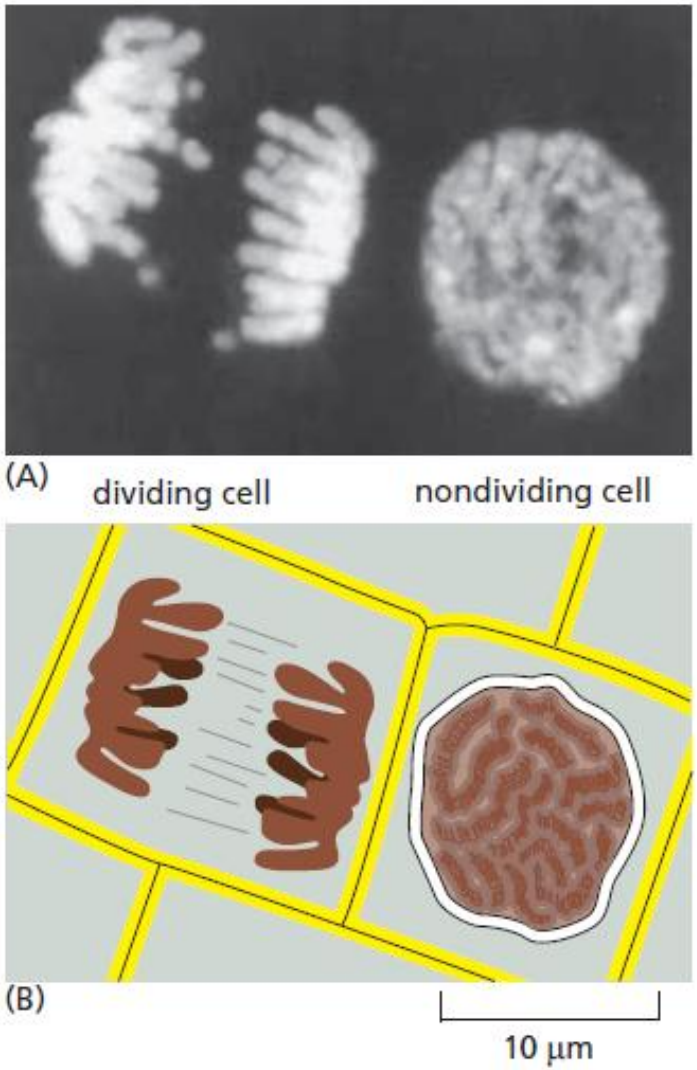
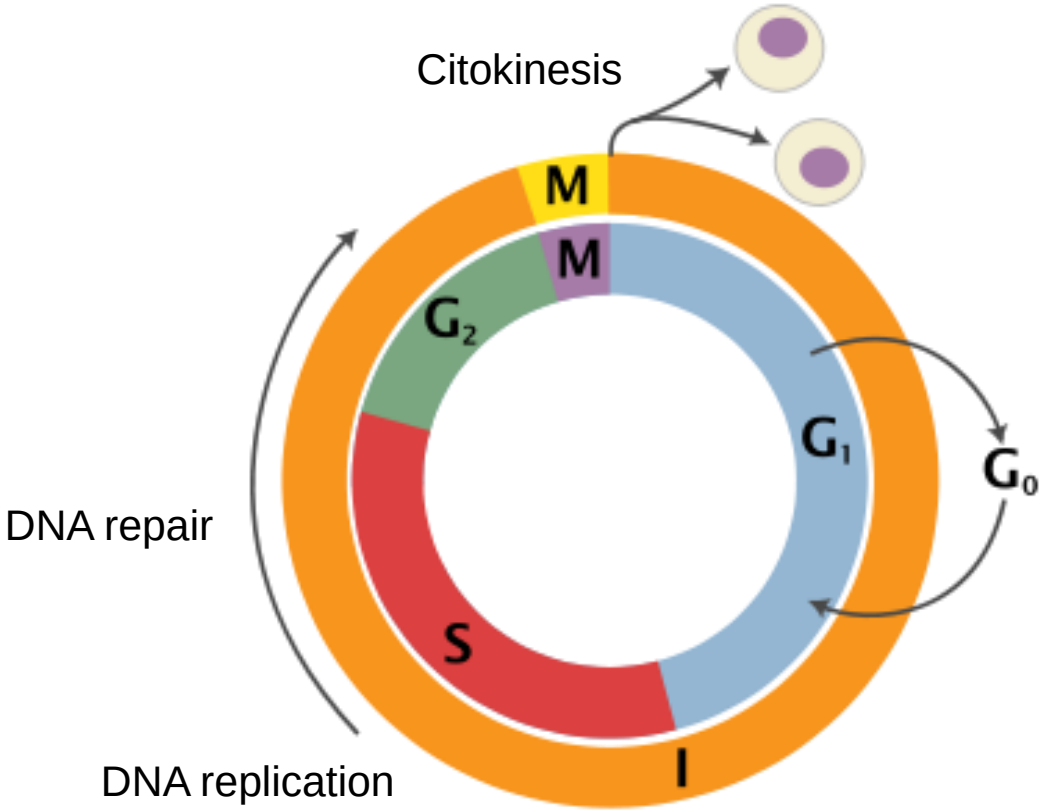
Chemical aspects of the cell

DNA-RNA-protein synthesis

Part 1 – DNA replication

Chromosomes in a cell



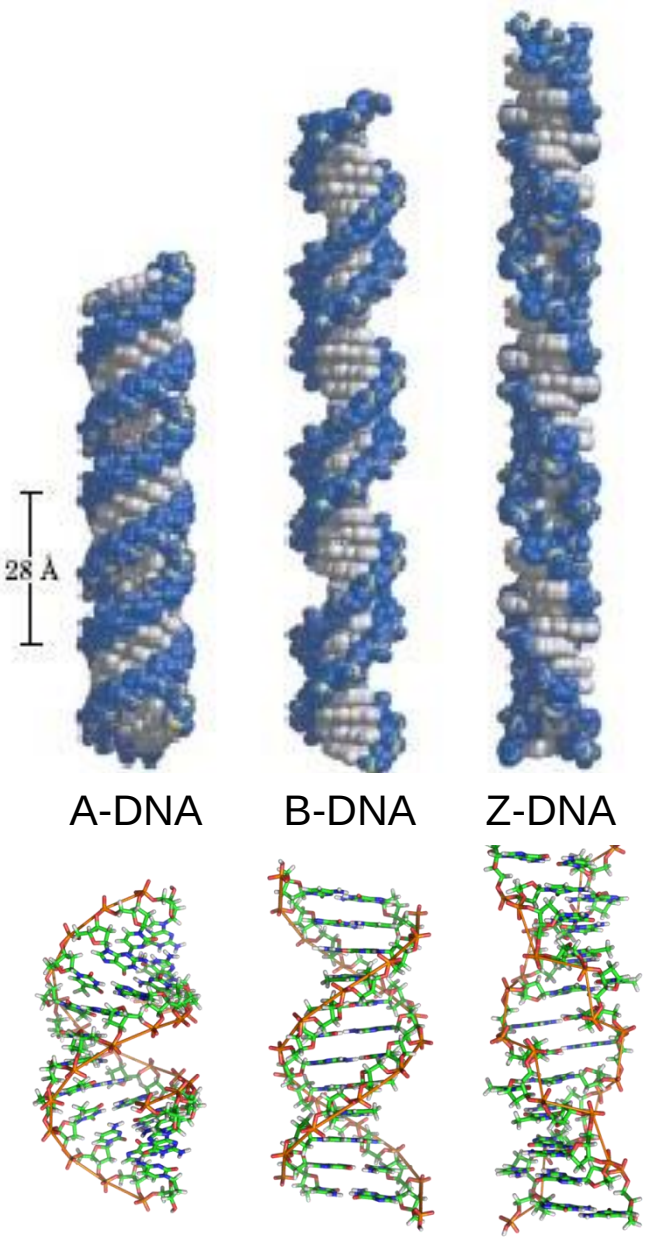


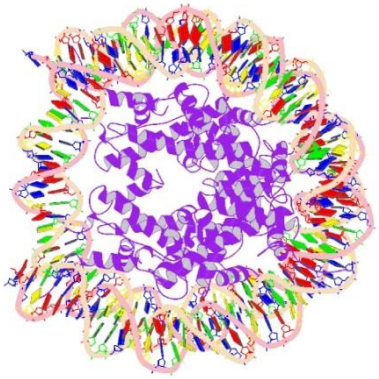
M: mitotic phase
I: interphase

Cell division: microscopy (A) and schematics (B)

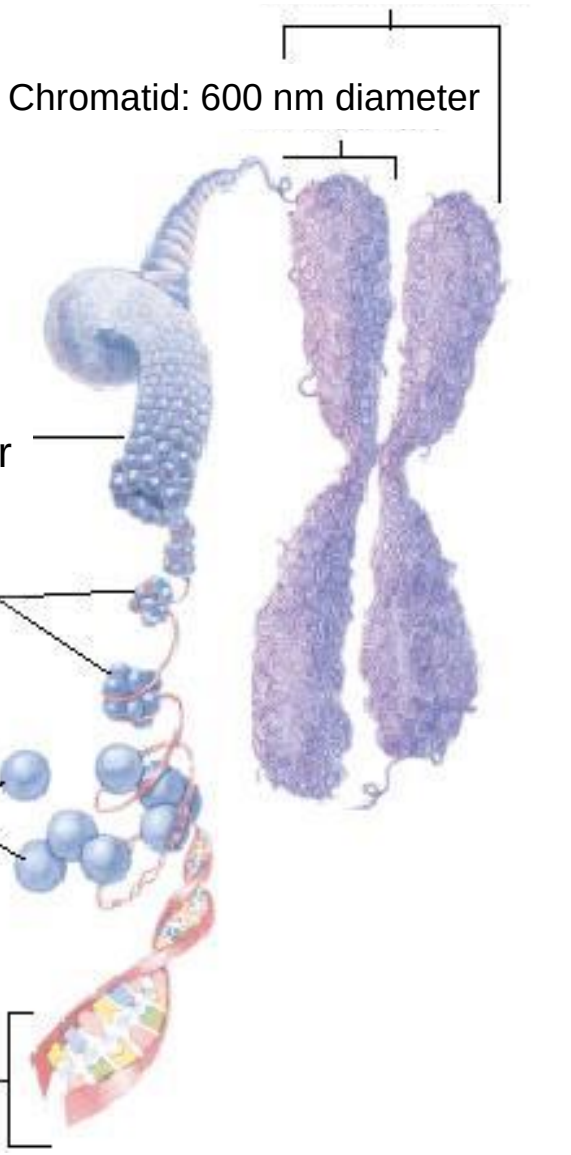
Figure 4.1 – Molecular Biology of the Cell

Structure of the supercoiled DNA

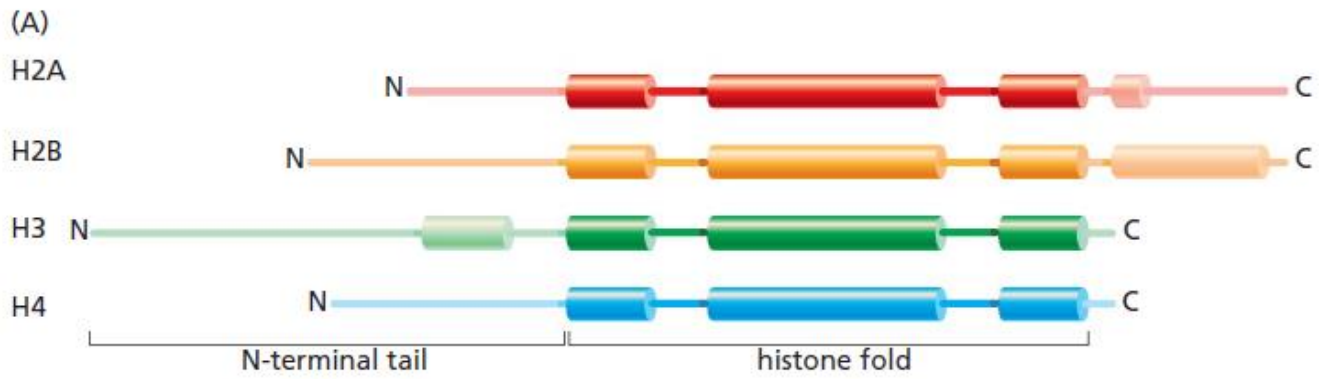


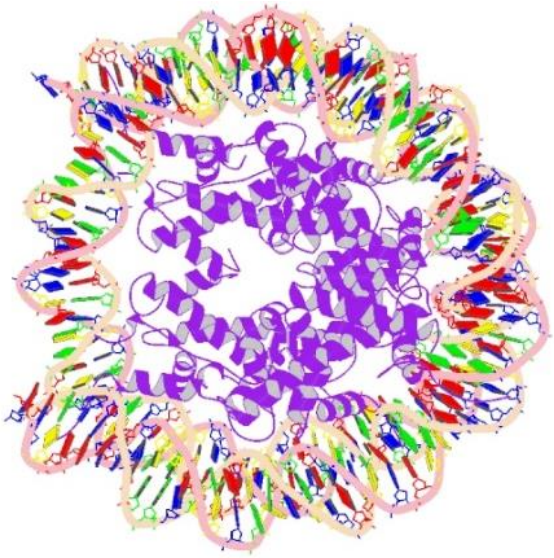


5GXQ

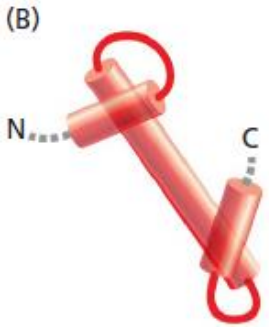


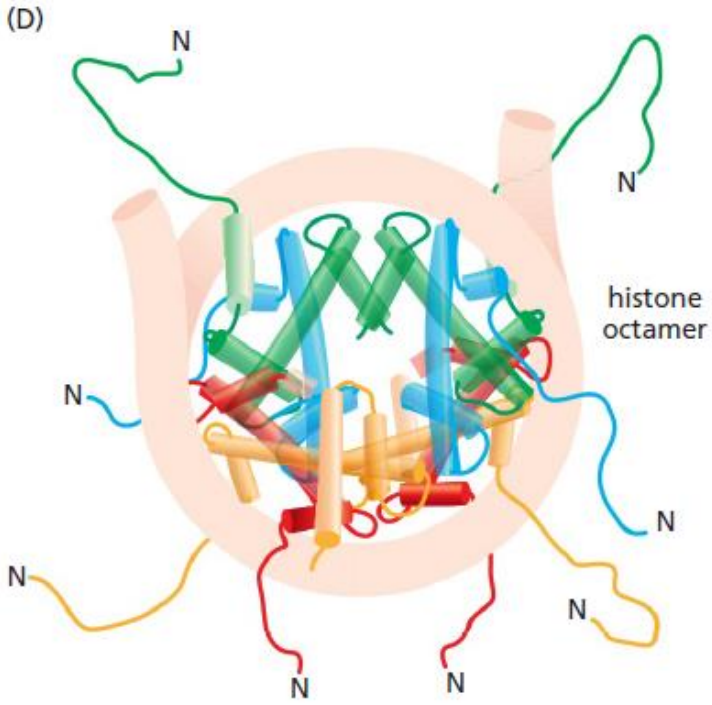
Structure of the supercoiled DNA





5GXQ





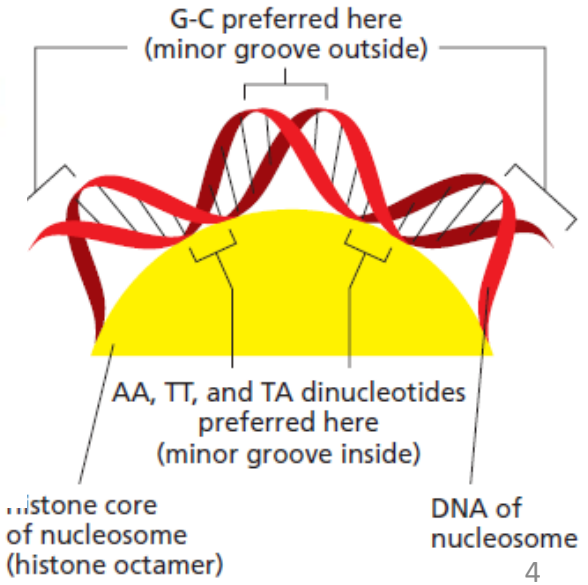


Figure 4–24 The overall structural organization of the core histones.

Sliding

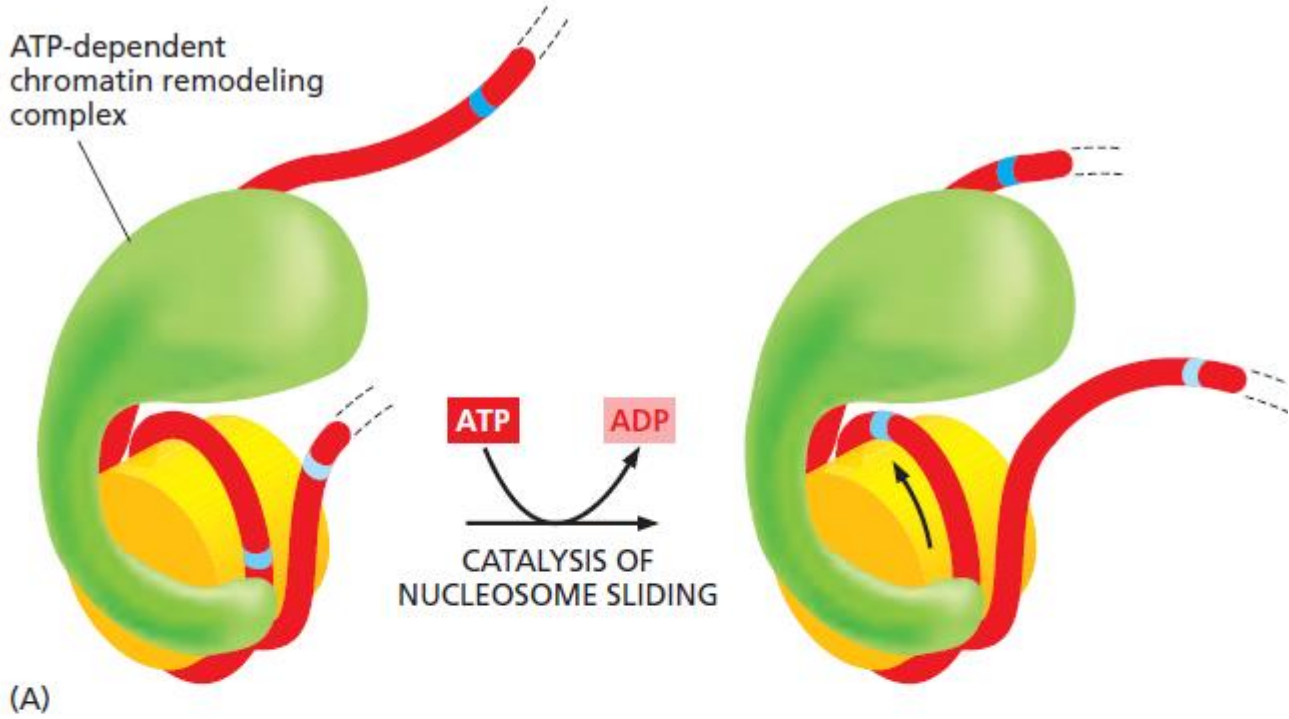
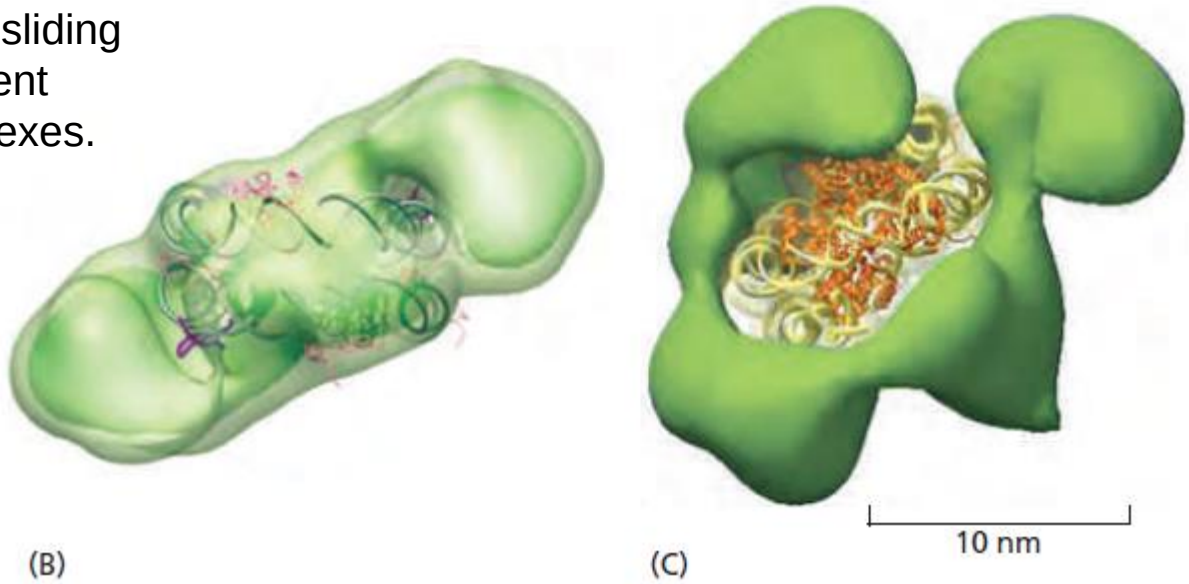


Figure 4-26. The nucleosome sliding catalyzed by ATP-dependent chromatin remodeling complexes.



Nucleosome and the chromosome

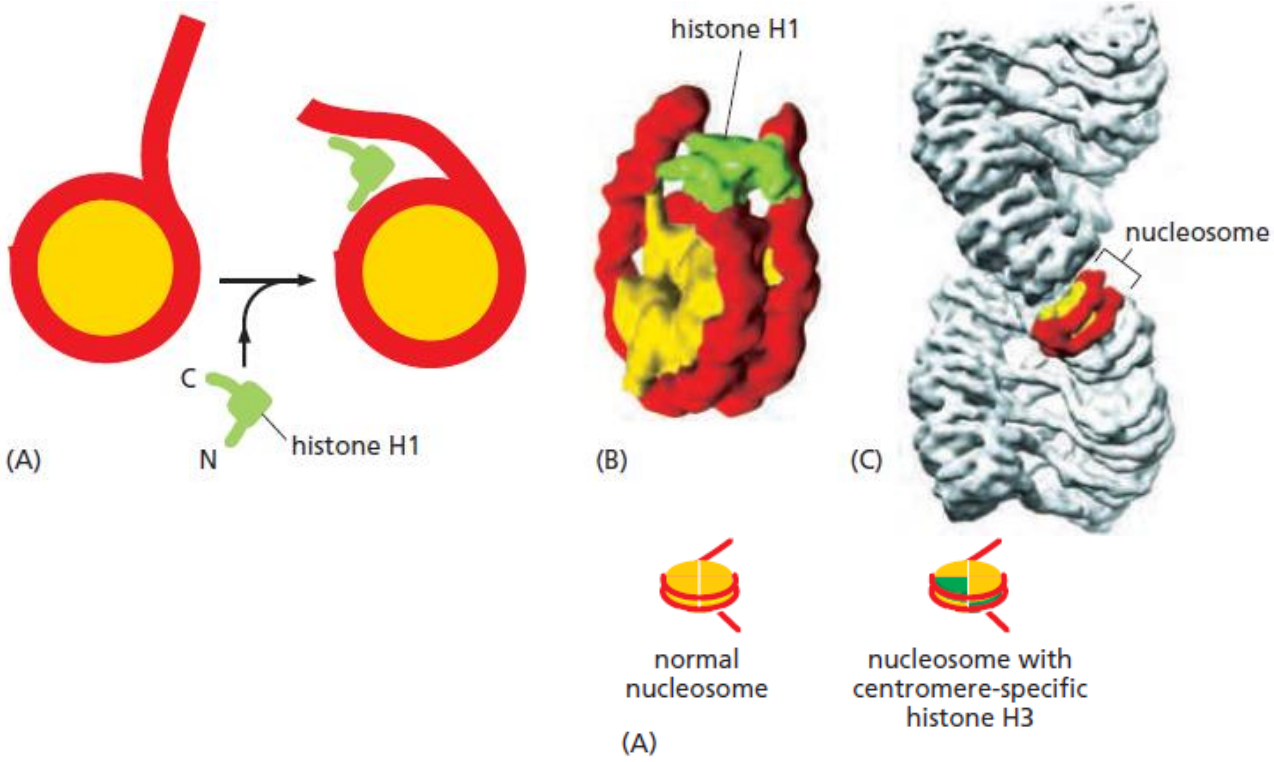


Figure 4–30 How the linker histone binds to the nucleosome

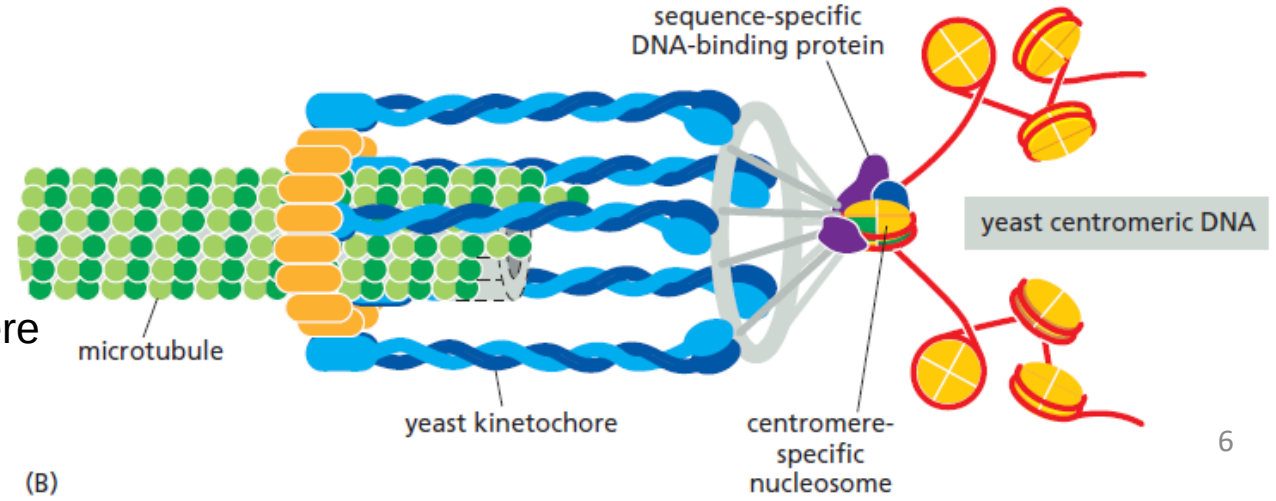


Figure 4–42 A model for the structure of a simple centromere

Structure of DNA

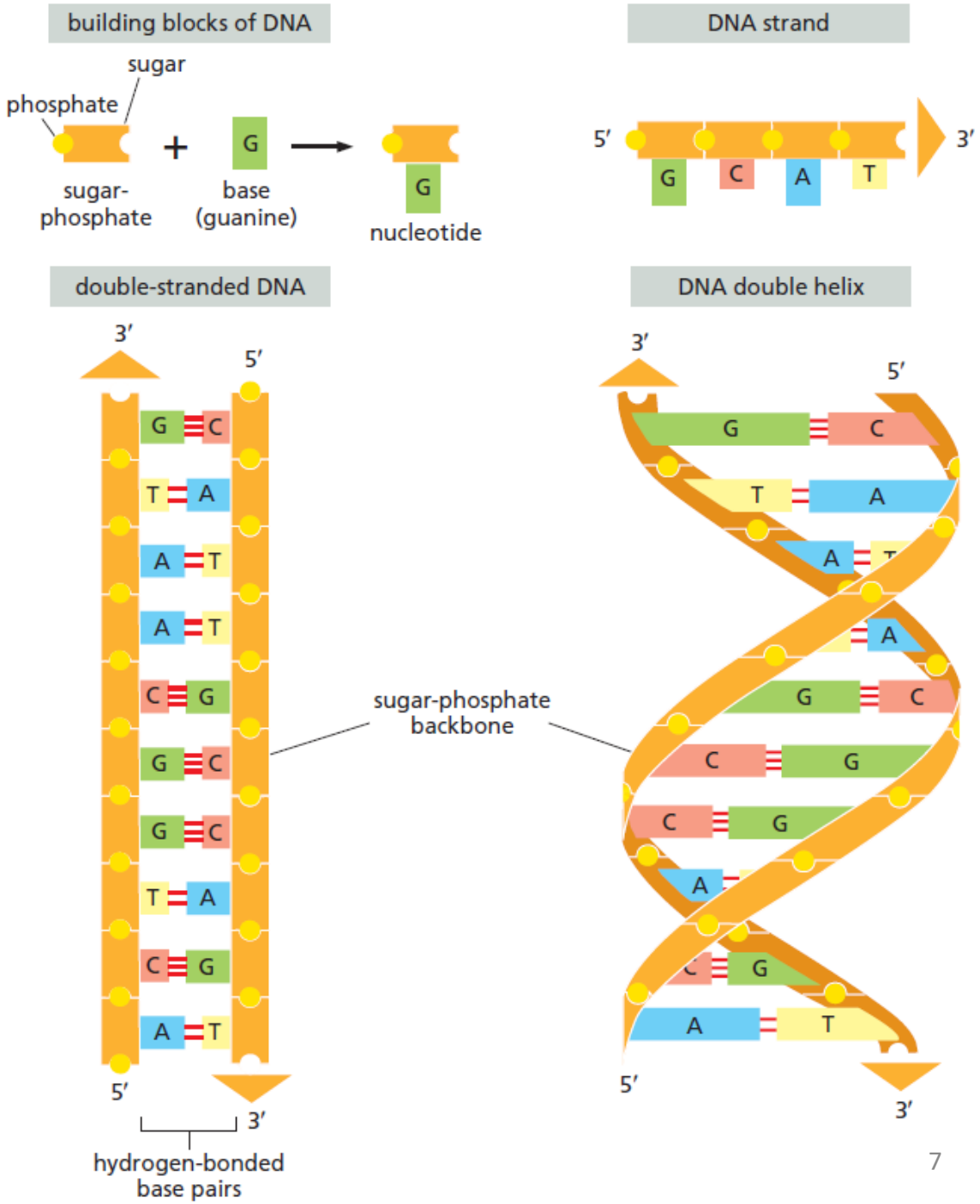
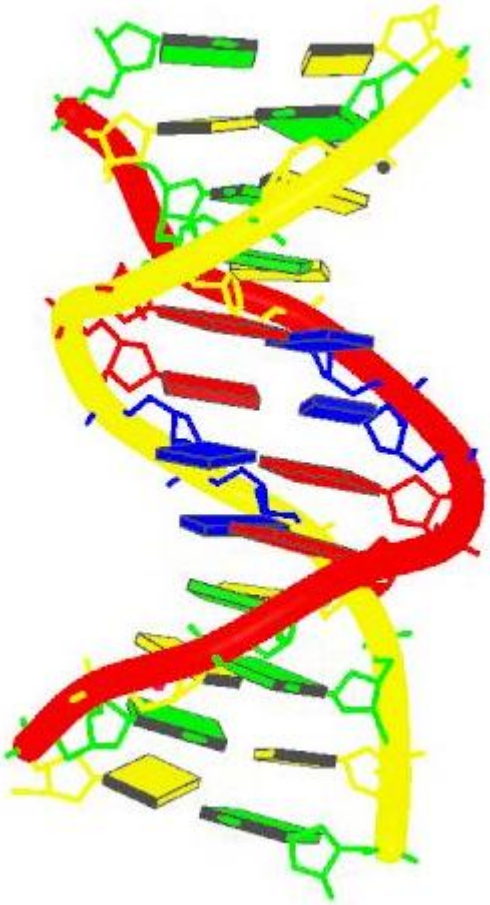
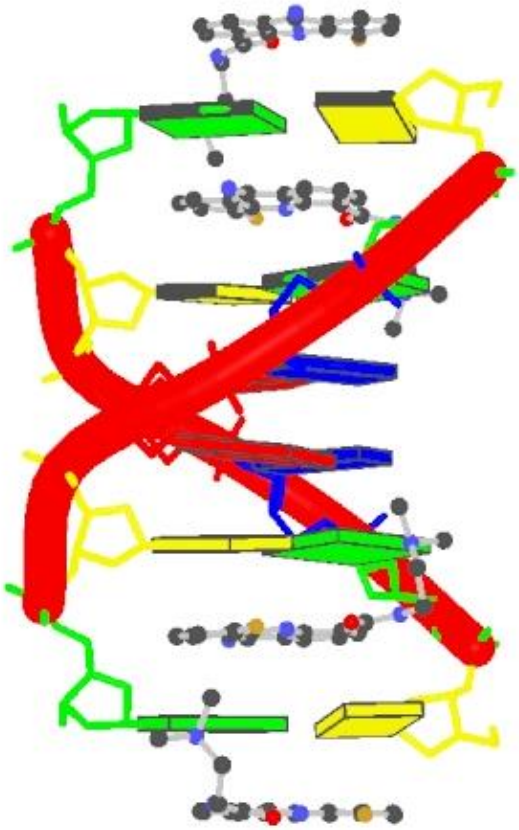


Figure 4.3 – Molecular Biology of the Cell

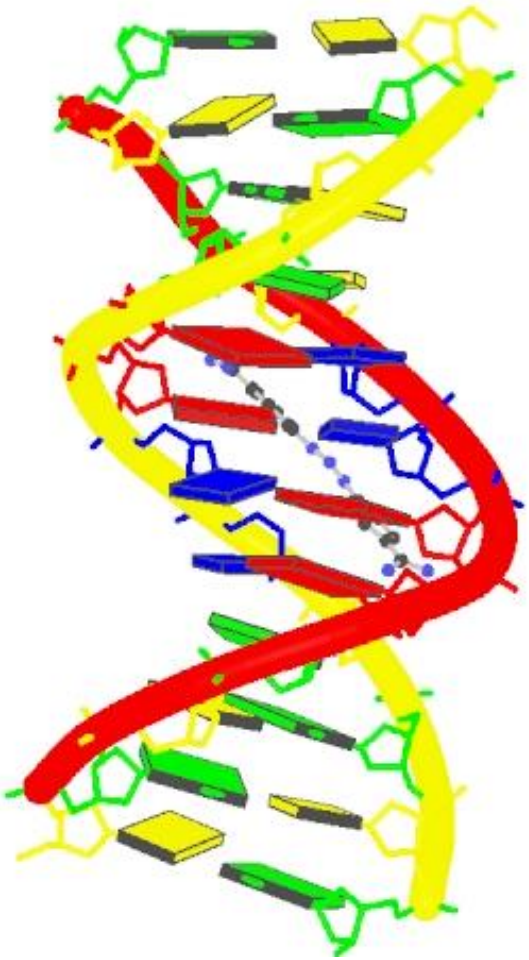
B-DNA structure and binders



1FQ2
B-DNA

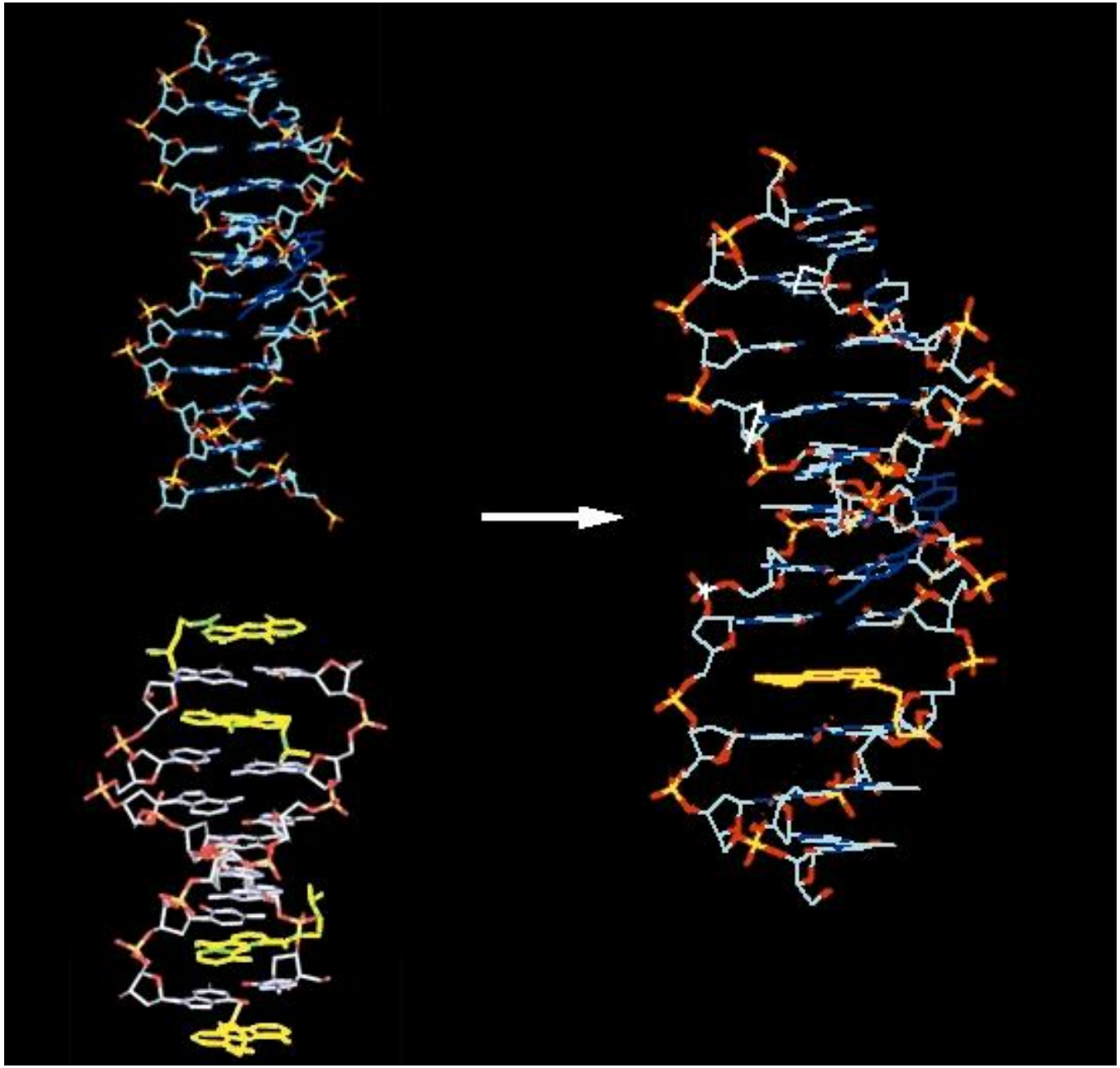


1DLO
DNA
intercalant binder



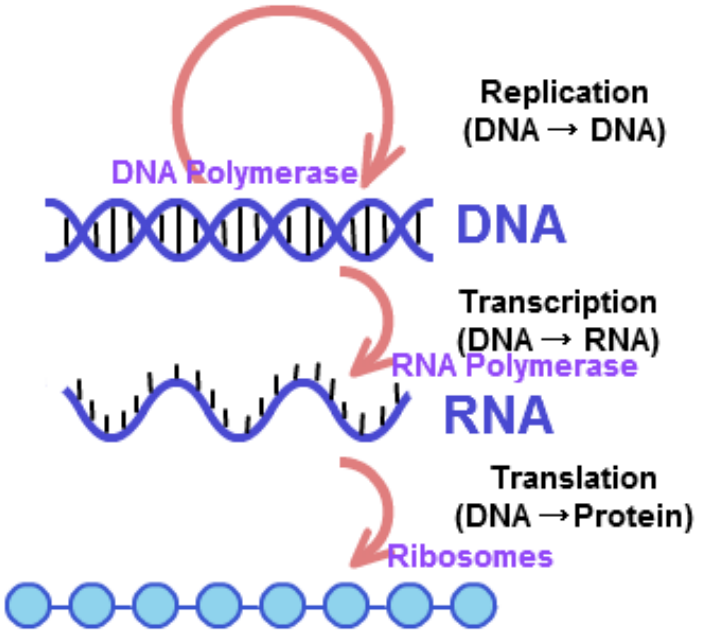
2DBE
DNA
minor groove binder

B-DNA binders



DNA Replication, Repair, and Recombination

DNA replication



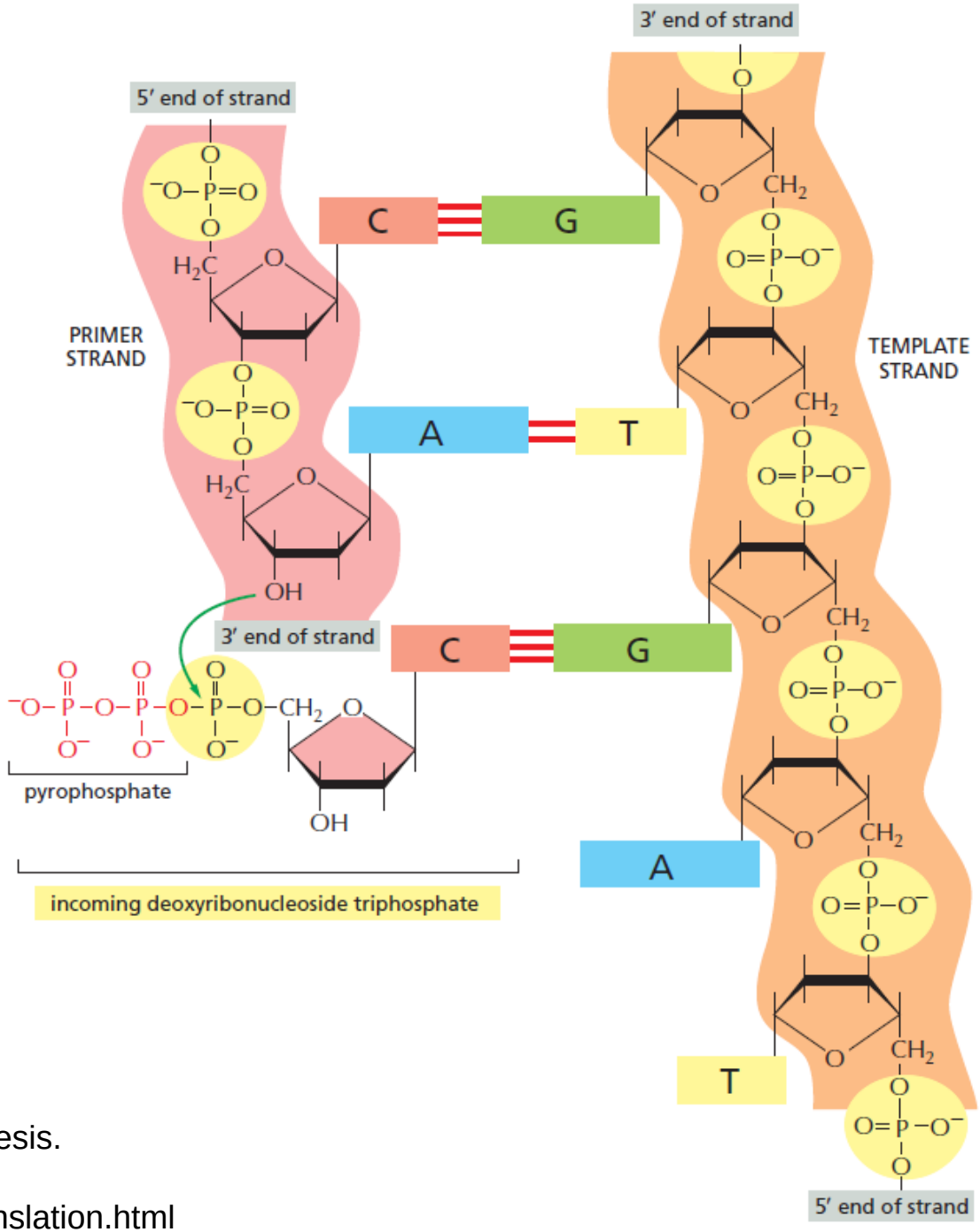


Figure 5–3 The chemistry of DNA synthesis.
Molecular Biology of the Cell.
http://biology.tutorvista.com/cell/dna-translation.html

DNA synthesis

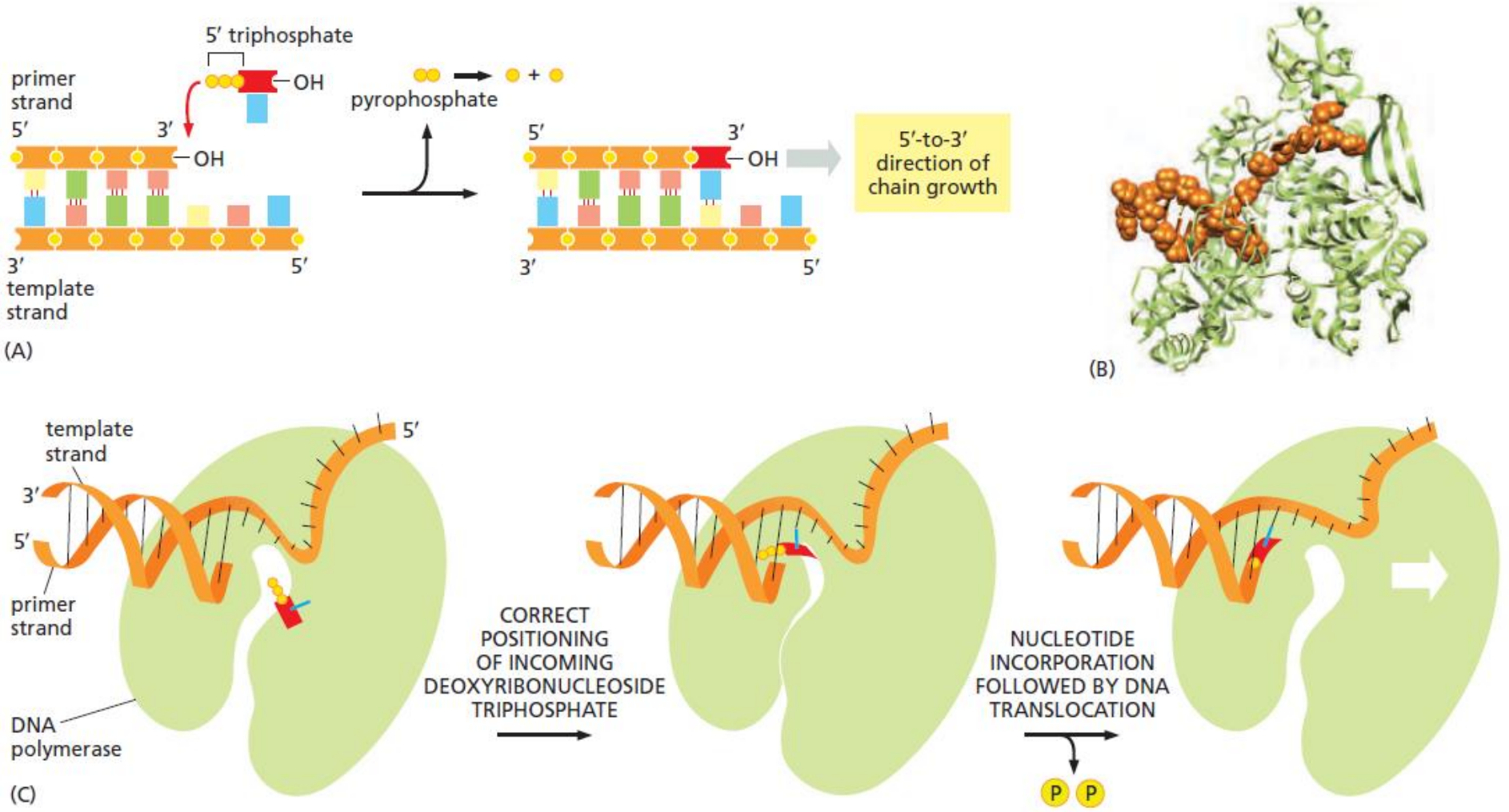


Figure 5–4 DNA synthesis catalyzed by DNA polymerase.
Molecular Biology of the Cell.

DNA replication

Helicase: opens the double helix at replication forks by disrupting the hydrogen bonds that hold the two strands together

Single-strand bonding protein (SSB): binds to single strands of DNA and prevents the helix from reforming before it can be used as a template for replication

Topoisomerase: breaks one or both DNA strands, preventing excessive coiling during replication, and then rejoins them in a more relaxed configuration

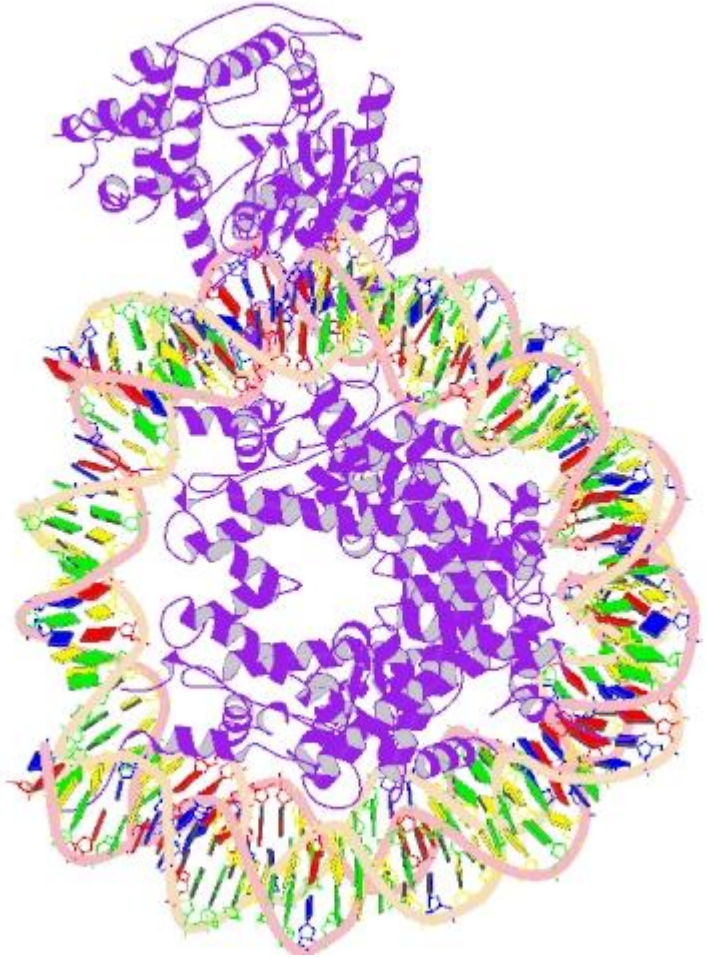
DNA polymerase: links nucleotide subunits to form a new DNA strand from a DNA template

DNA primase: synthesizes short RNA primers on the lagging strand; begins replication of the leading strand

DNA ligase: links Okazaki fragments by joining the 3' end of the new DNA fragment to the 5' end of the adjoining DNA

https://quizlet.com/98854024/proteins-involved-in-dna-replication-chart-flash-cards/

DNA helicase and topoisomerase



5X0X: Complex of Snf2-Nucleosome complex with Snf2 bound to position +6 of the nucleosome

4J3N
Human Topoisomerase II beta in complex with DNA

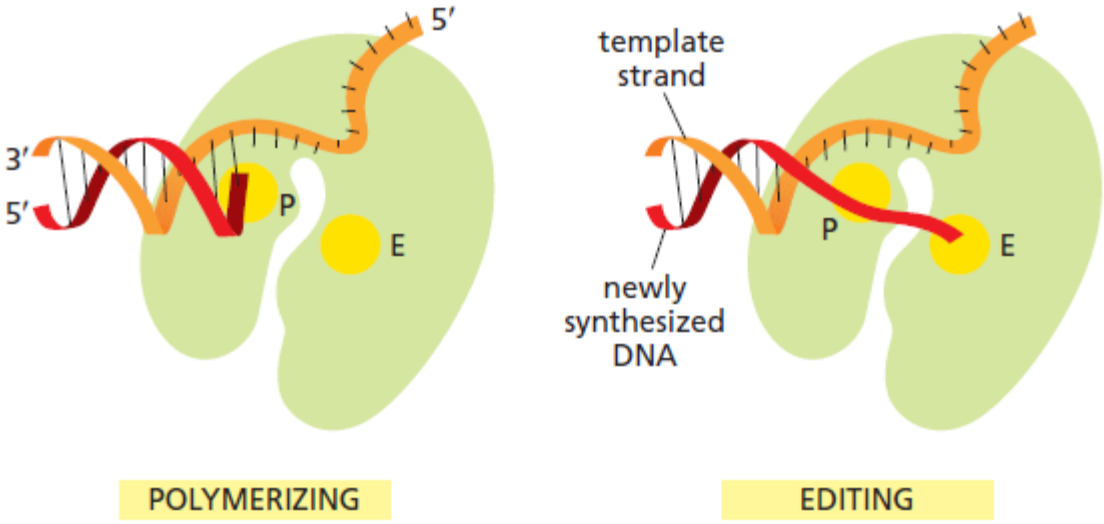
DNA polymerase

Family	Types of DNA polymerase	Species	Examples
A	Replicative and Repair Polymerases	Eukaryotic and Prokaryotic	T7 DNA polymerase, Pol I, and DNA Polymerase γ
B	Replicative and Repair Polymerases	Eukaryotic and Prokaryotic	Pol II, Pol B, Pol ζ, Pol α, δ, and ε
C	Replicative Polymerases	Prokaryotic	Pol III
D	Replicative Polymerases	Euryarchaeota	Not well-characterized
X	Replicative and Repair Polymerases	Eukaryotic	Pol β, Pol σ, Pol λ, Pol μ, and Terminal deoxynucleotidyl transferase
Y	Replicative and Repair Polymerases	Eukaryotic and Prokaryotic	Pol ι (iota), Pol κ (kappa), Pol η (eta), Pol IV, and Pol V
RT	Replicative and Repair Polymerases	Viruses, Retroviruses, and Eukaryotic	Telomerase, Hepatitis B virus

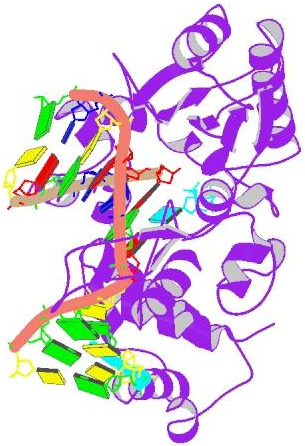
Wikipedia

DNA polymerase

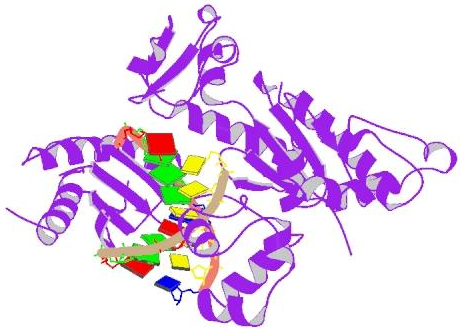
Figure 5–9 Editing by DNA polymerase. DNA polymerase complexed with the DNA template in the polymerizing mode *(left)* and the editing mode *(right).*



5HHH
DNA polymerase beta



5IIM
DNA polymerase lambda



5ULX
DNA polymerase iota