

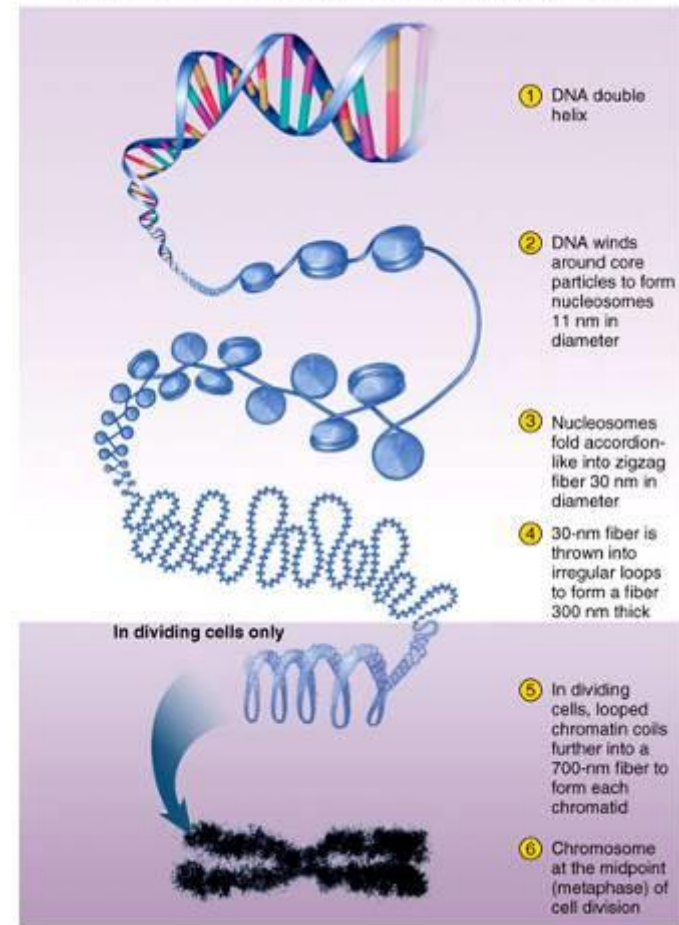
Nucleic Acid Structure & Function

Assist. Prof. Dr. Usama H. Ramadhan

Organization of the Chromatin

- Threadlike chromatin = chromosomes = 46 DNA molecules and associated proteins
- Nondividing state = DNA molecules compacted
 - coiled around core particle (histone protein)
 - zig-zagged, looped and coiled onto itself
- Preparing to divide
 - DNA copies itself to form 2 parallel sister chromatids

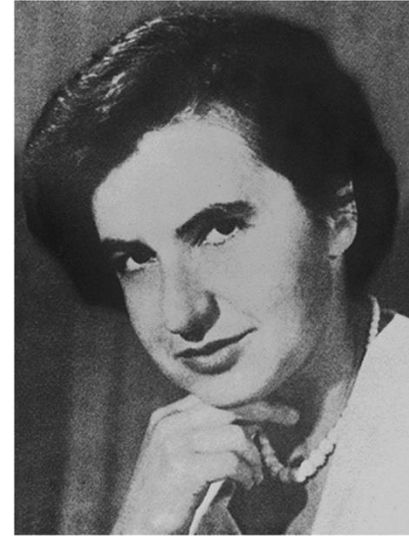
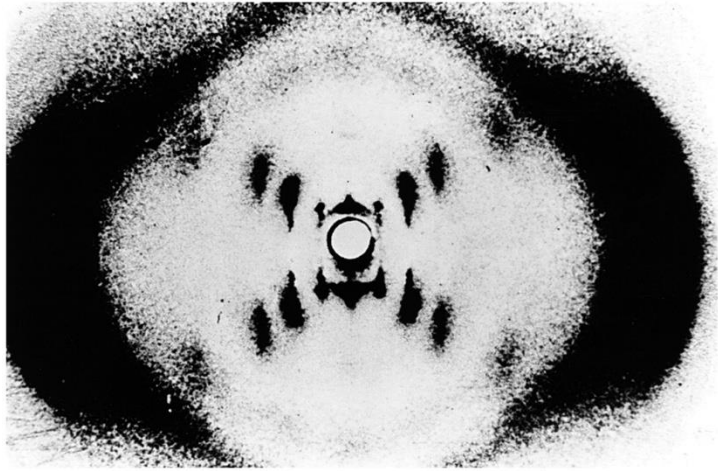
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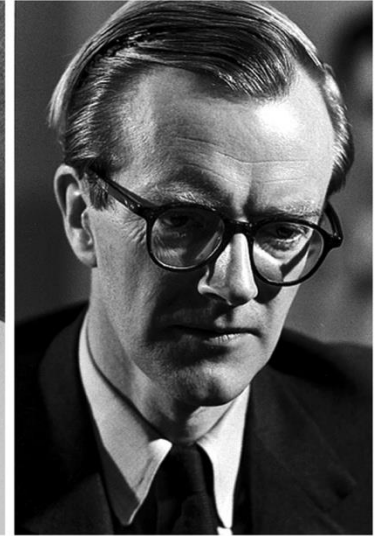
(b)

That requirement, together with x-ray diffraction data from the DNA molecule and the observation of Chargaff that in DNA molecules the concentration of deoxyadenosine (A) nucleotides equals that of thymidine (T) nucleotides ($A = T$), while the concentration of deoxyguanosine (G) nucleotides equals that of deoxycytidine (C) nucleotides ($G = C$), led Watson, Crick, and Wilkins to propose in the early 1950s a model of a double- stranded DNA molecule.

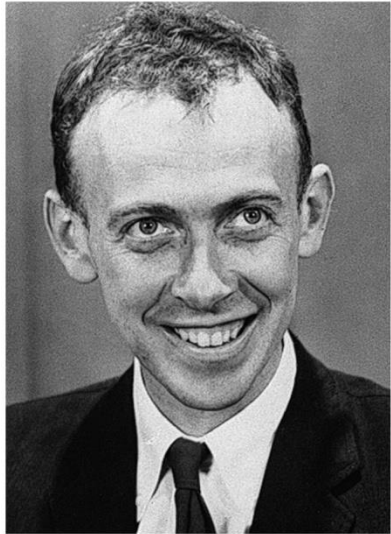
DNA structure determination



Rosalind Franklin,
1920–1958



Maurice Wilkins

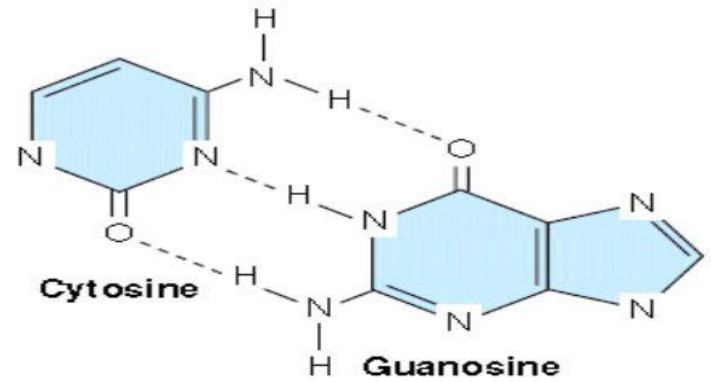
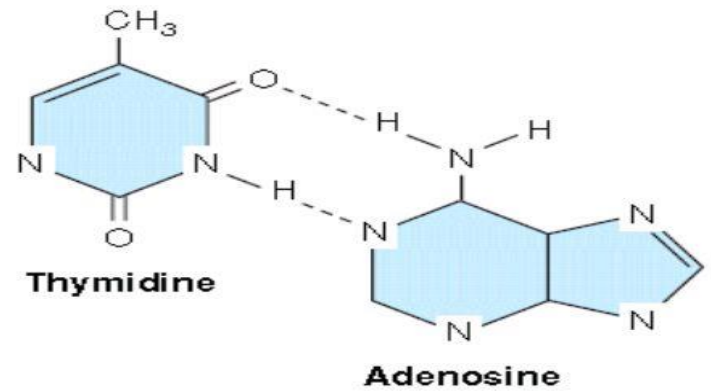
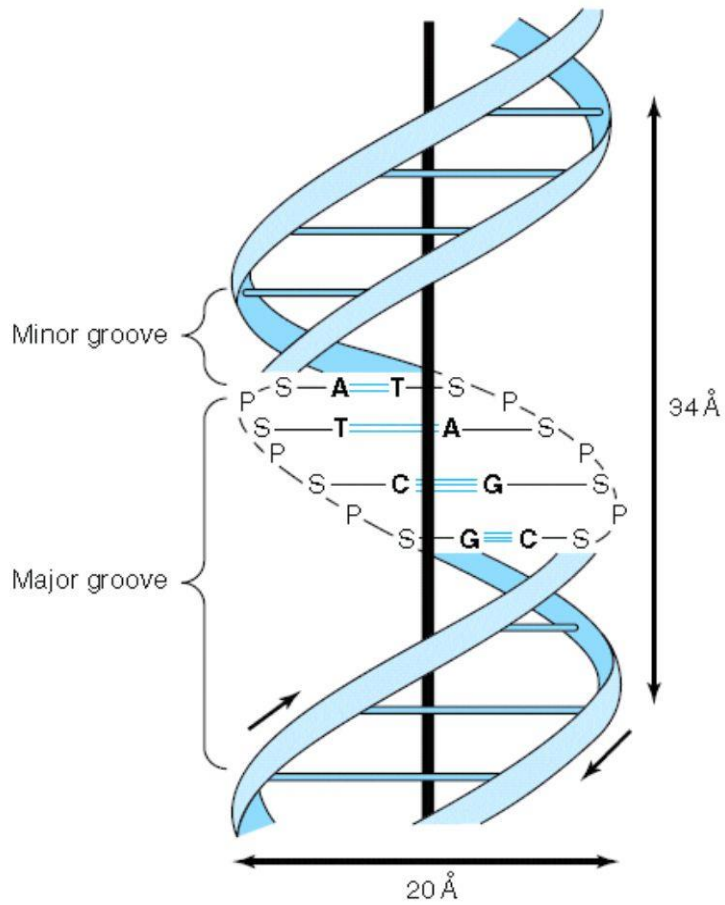


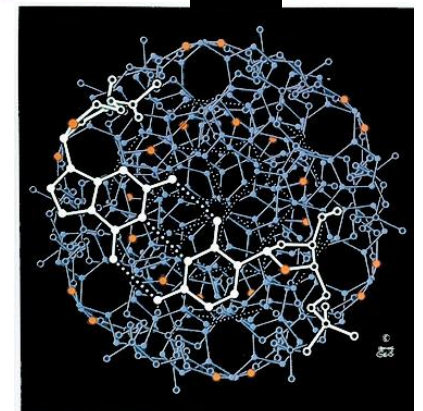
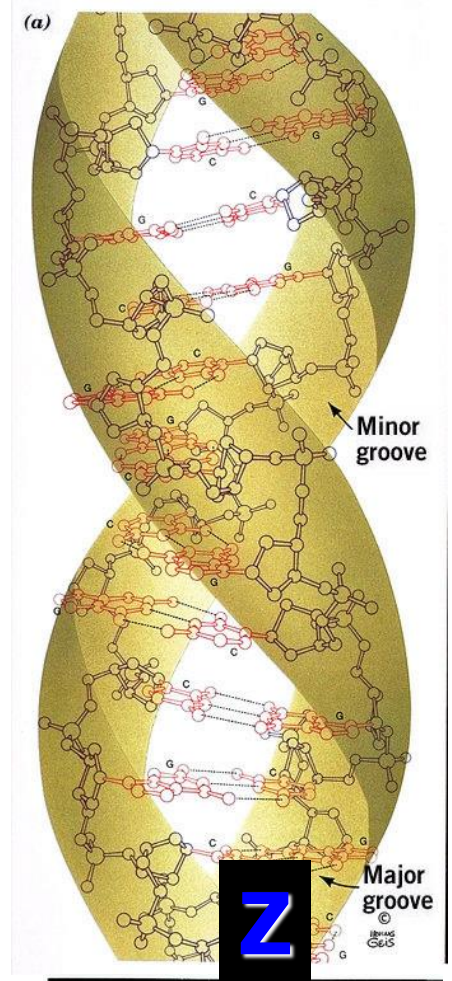
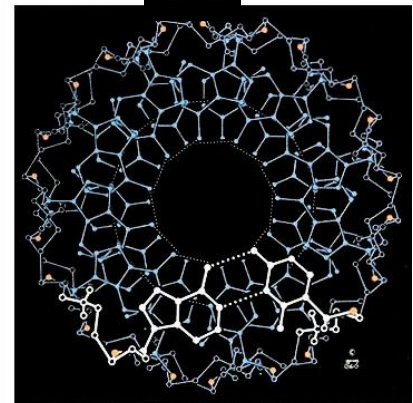
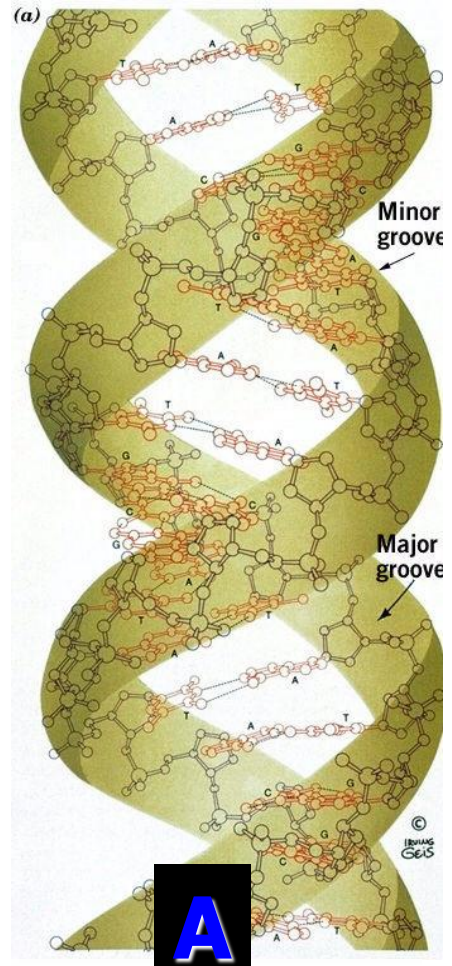
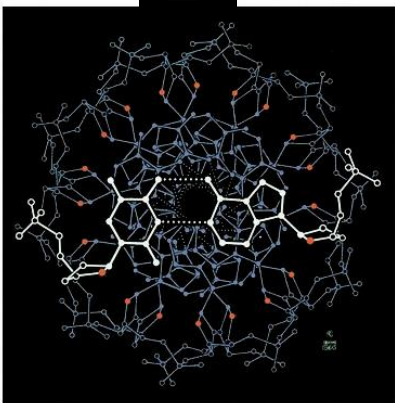
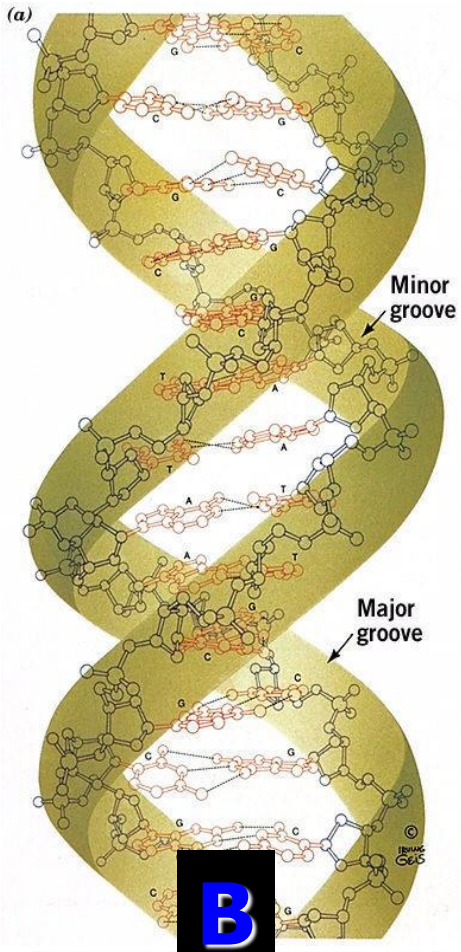
James Watson



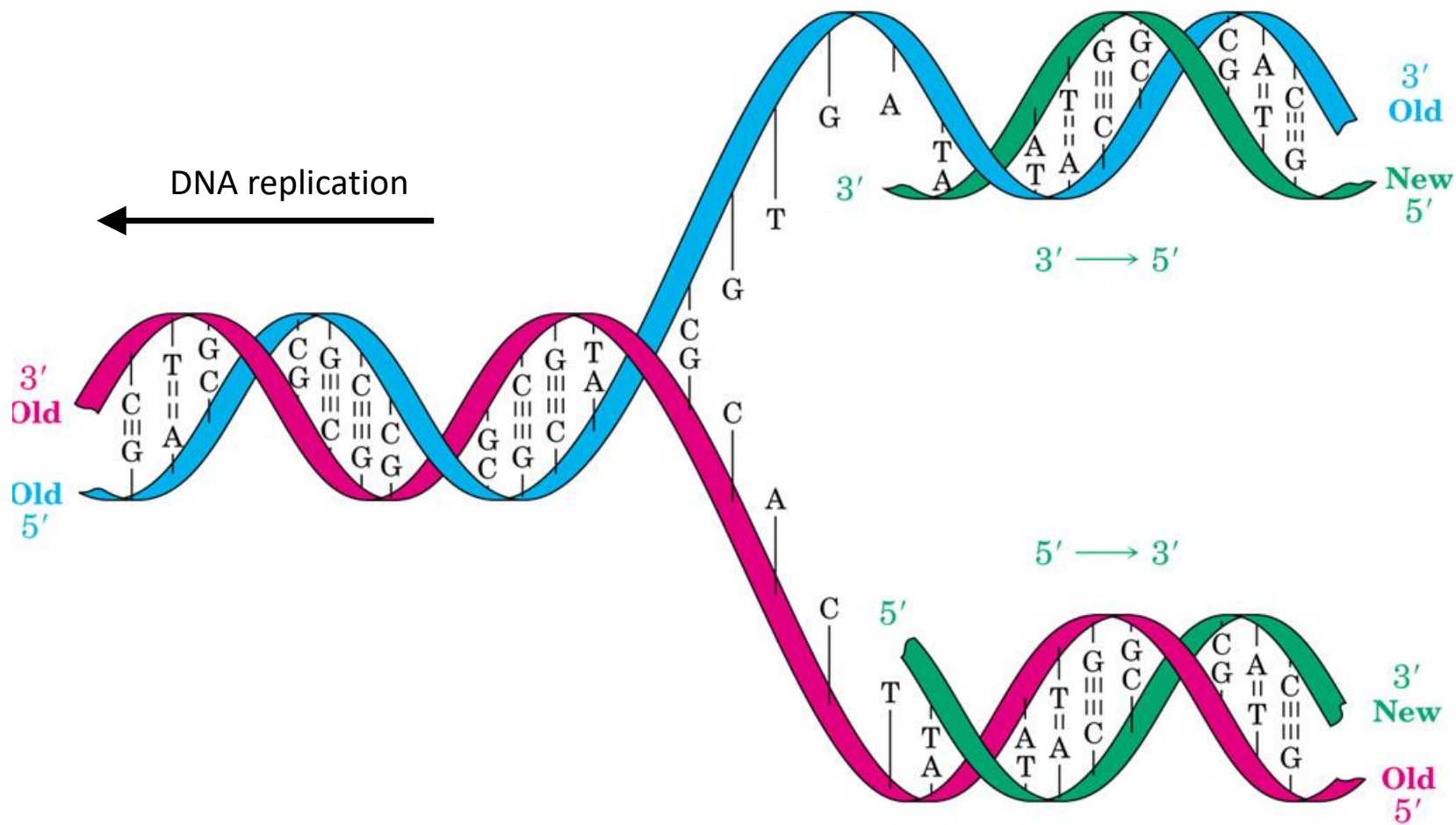
Francis Crick

- Franklin collected x-ray diffraction data (early 1950s) that indicated 2 periodicities for DNA: 3.4 Å and 34 Å.
- Watson and Crick proposed a 3-D model accounting for the data.



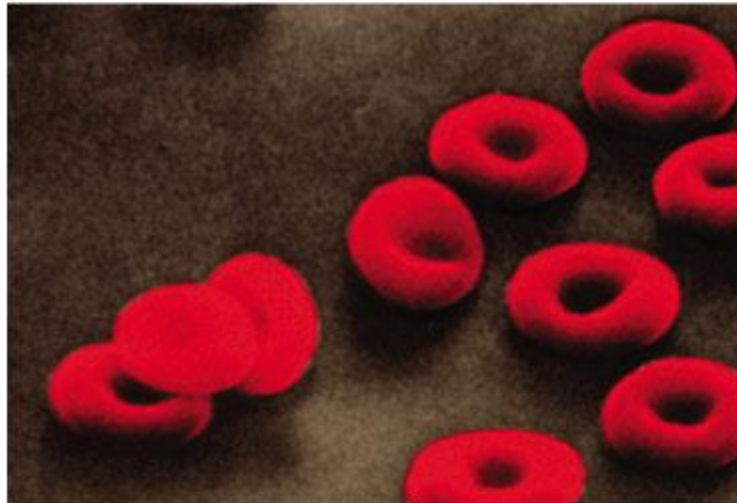


Unwinding of DNA by helicases expose the DNA bases (replication fork) so that replication can take place. Helicase hydrolyzes ATP in order to break the hydrogen bonds between DNA strands

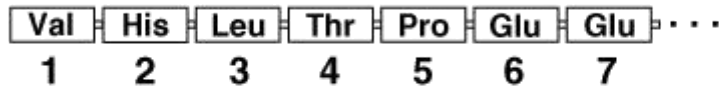


Mutations

A single amino acid substitution in a protein causes sickle-cell disease



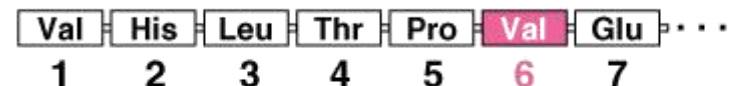
10 μ m



(a) Normal red blood cells and the primary structure of normal hemoglobin



10 μ m



(b) Sickled red blood cells and the primary structure of sickle-cell hemoglobin

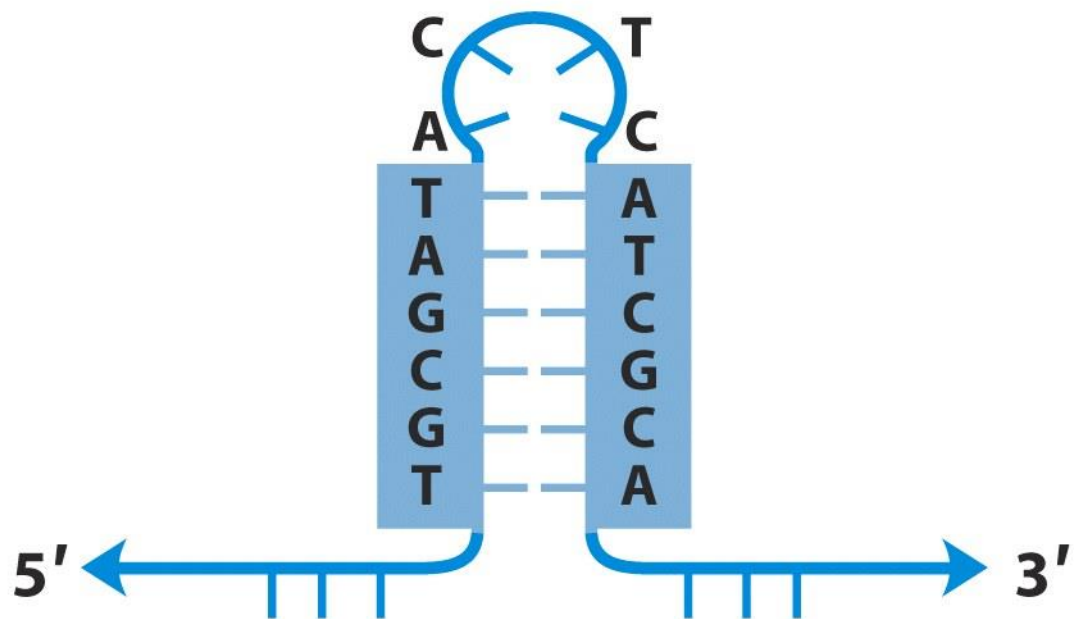
DNA

RNA

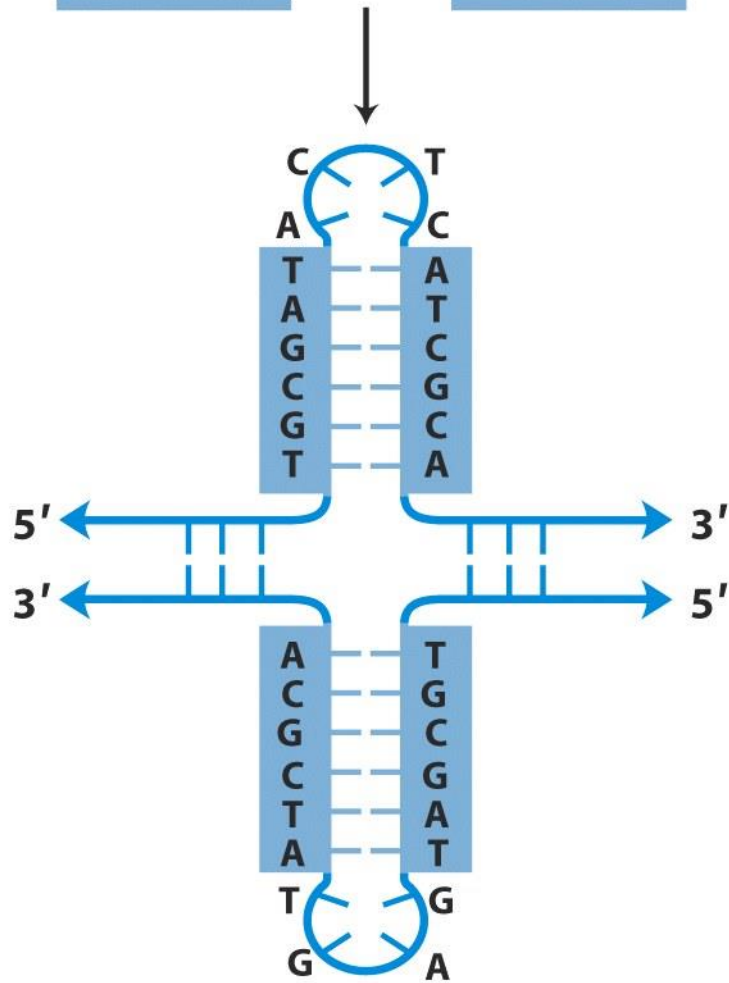
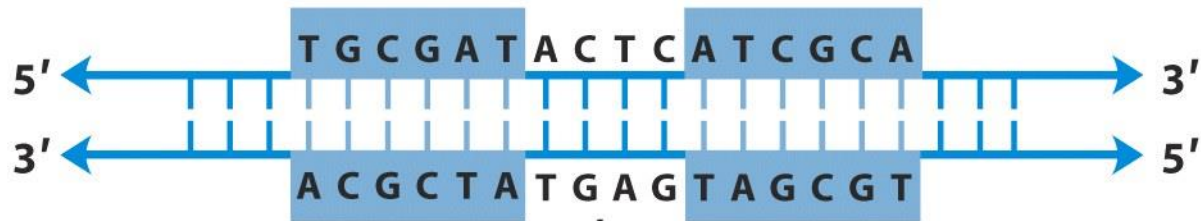
Mutations

Amino acids, protein structure

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Hairpin



Cruciform

Any Questions