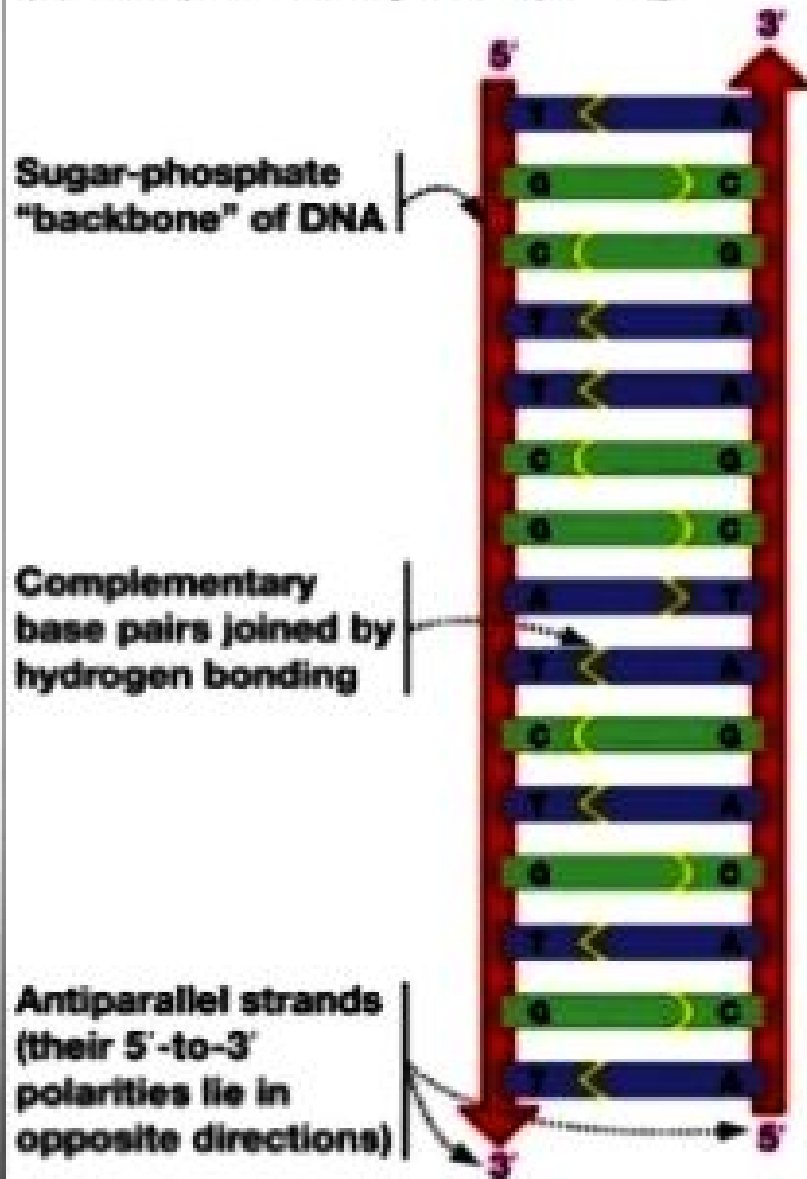


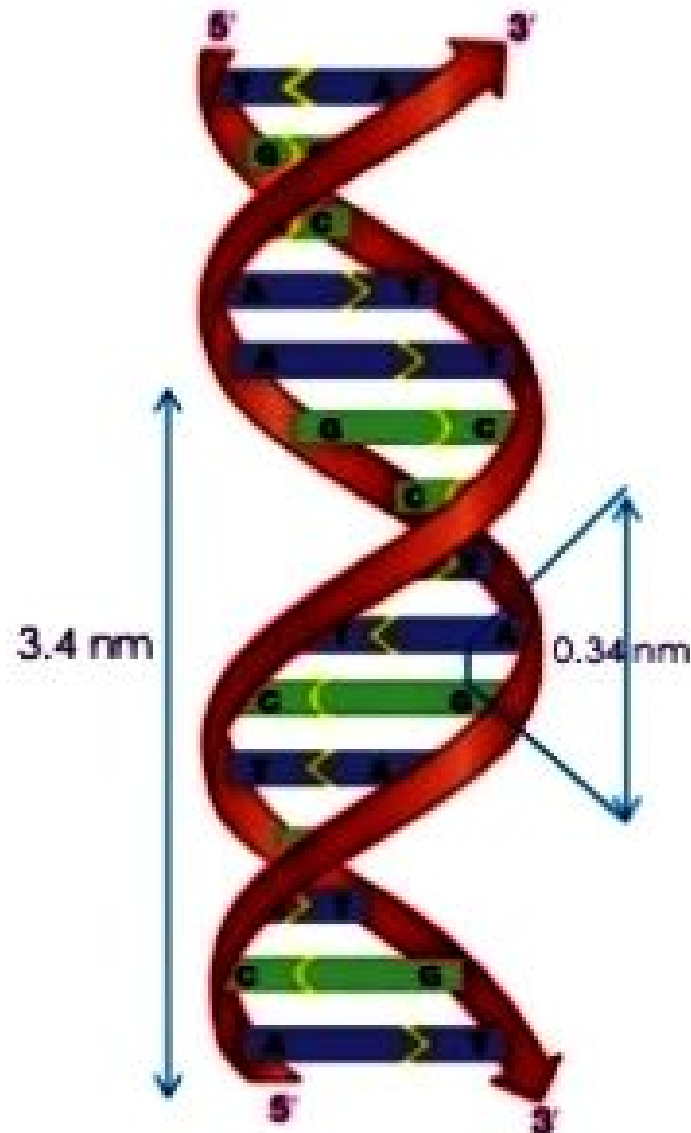
❖ DNA Double Helix & Hydrogen bonding

- The two strands are coiled in a **right-handed fashion (Clockwise)**. The pitch of the helix is **3.4 nm** (a nanometer is one billionth of a meter, that is 10^{-9} m) and there are roughly **10 bp** in each turn. Consequently, the distance between a bp in a helix is approximately equal to **0.34 nm**.
- The plane of one base pair stacks over the other in double helix. This, in addition to H-bonds, confers stability of the helical structure.

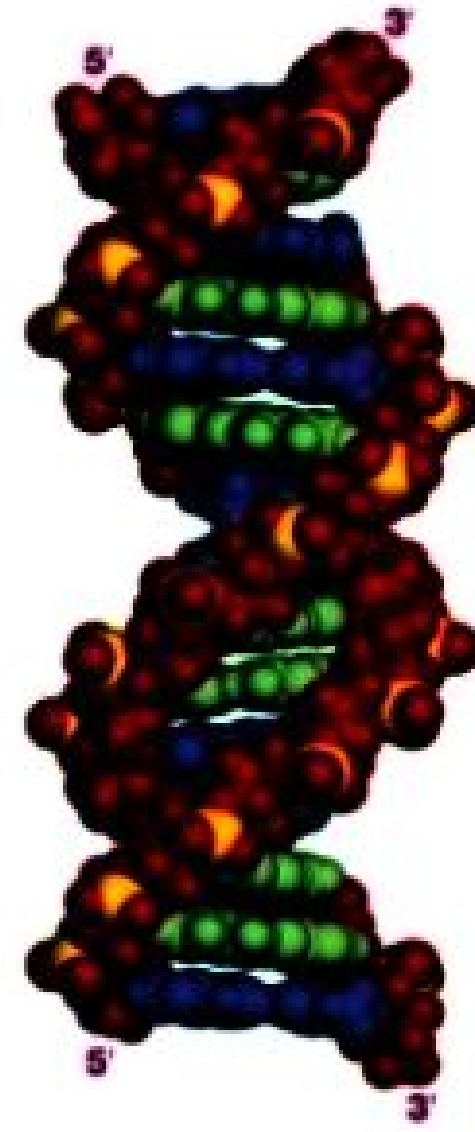
(a) Complementary base pairing



(b) The double helix



(c) A space-filling model

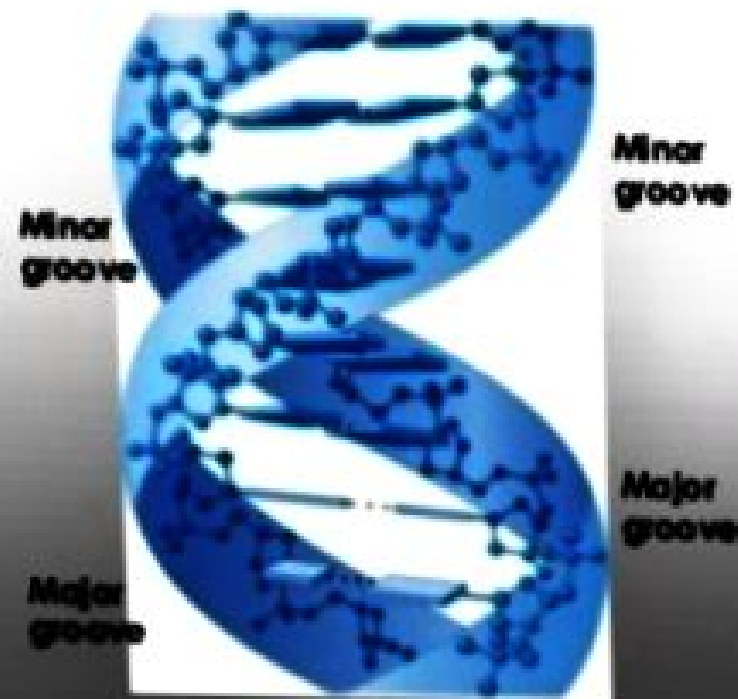


❖ DNA Double Helix & Hydrogen bonding

- There are two asymmetrical grooves on the outside of the helix:
 - a) Major groove
 - b) Minor groove

Groove:- any furrow (slight depression in the smoothness of a surface) or channel on a bodily structure or part.

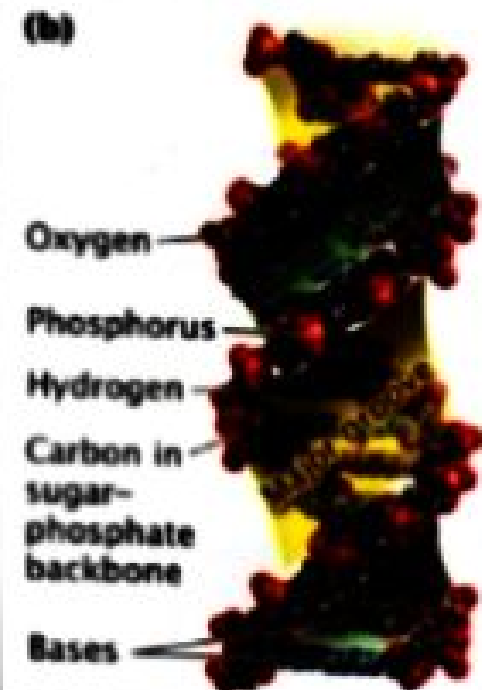
- ✓ Certain proteins can bind within these groove
 - ✓ They can thus interact with a particular sequence of bases.



(a) Ball-and-stick model of DNA



(b) Space-filling model of DNA



❖ Structure of Double-helix

➤ Three major forms:

- ✓ B-DNA
- ✓ A-DNA
- ✓ Z-DNA

❖ B-DNA

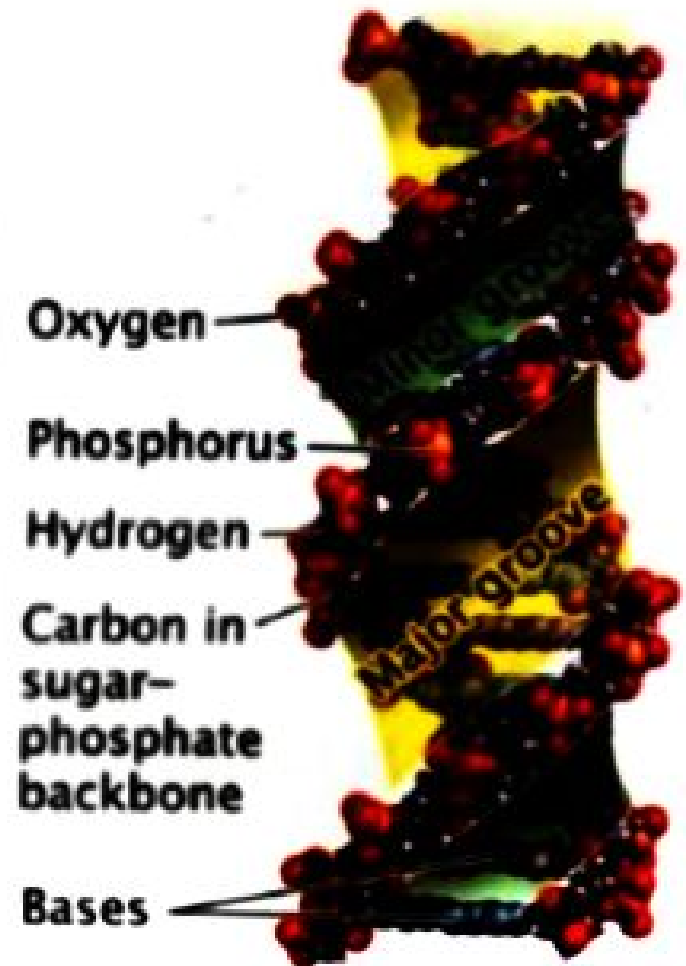
is biologically THE MOST COMMON

- ✓ It is a α -helix meaning that it has a Right handed, or clockwise, spiral.
- ✓ Complementary base pairing
 - A-T
 - G-C
- ✓ Ideal B-DNA has 10 base pair per turn (360° rotation of helix)
- ✓ So each base is twisted 36° relative to adjacent bases.
- ✓ Base pair are 0.34 nm apart.
- ✓ So complete rotation of molecule is 3.4 nm.
- ✓ Axis passes through middle of each basepairs.



❖ B-DNA

- ✓ Minor Groove is Narrow, Shallow.
- ✓ Major Groove is Wide, Deep.
- ✓ This structure **exists** when **plenty of water** surrounds molecule and there is no unusual base sequence in DNA-Condition that are likely to be present in the cells.
- ✓ B-DNA structure is most stable configuration for a random sequence of nucleotides under physiological condition.



❖ A-DNA

- ✓ Right-handed helix
- ✓ Wider and flatter than B-DNA
- ✓ 11 bp per turn
- ✓ Its bases are tilted away from main axis of molecule
- ✓ Narrow Deep major Groove and Broad, Shallow minor Groove.
- ✓ Observed when less water is present. i.e. **Dehydrating condition.**
- ✓ A-DNA has been observed in two context:
 - Active site of DNA polymerase (~3bp)
 - Gram (+) bacteria undergoing sporulation



❖ Z-DNA

- ✓ A left-handed helix
- ✓ Seen in Condition of **High salt concentration.**
- ✓ In this form sugar-phosphate backbones zigzag back and forth, giving rise to the name Z-DNA(for zigzag).
- ✓ 12 base pairs per turn.
- ✓ A deep Minor Groove.
- ✓ No Discernible Major Groove.
- ✓ Part of some active genes form Z-DNA, suggesting that Z-DNA may play a role in regulating gene transcription.

