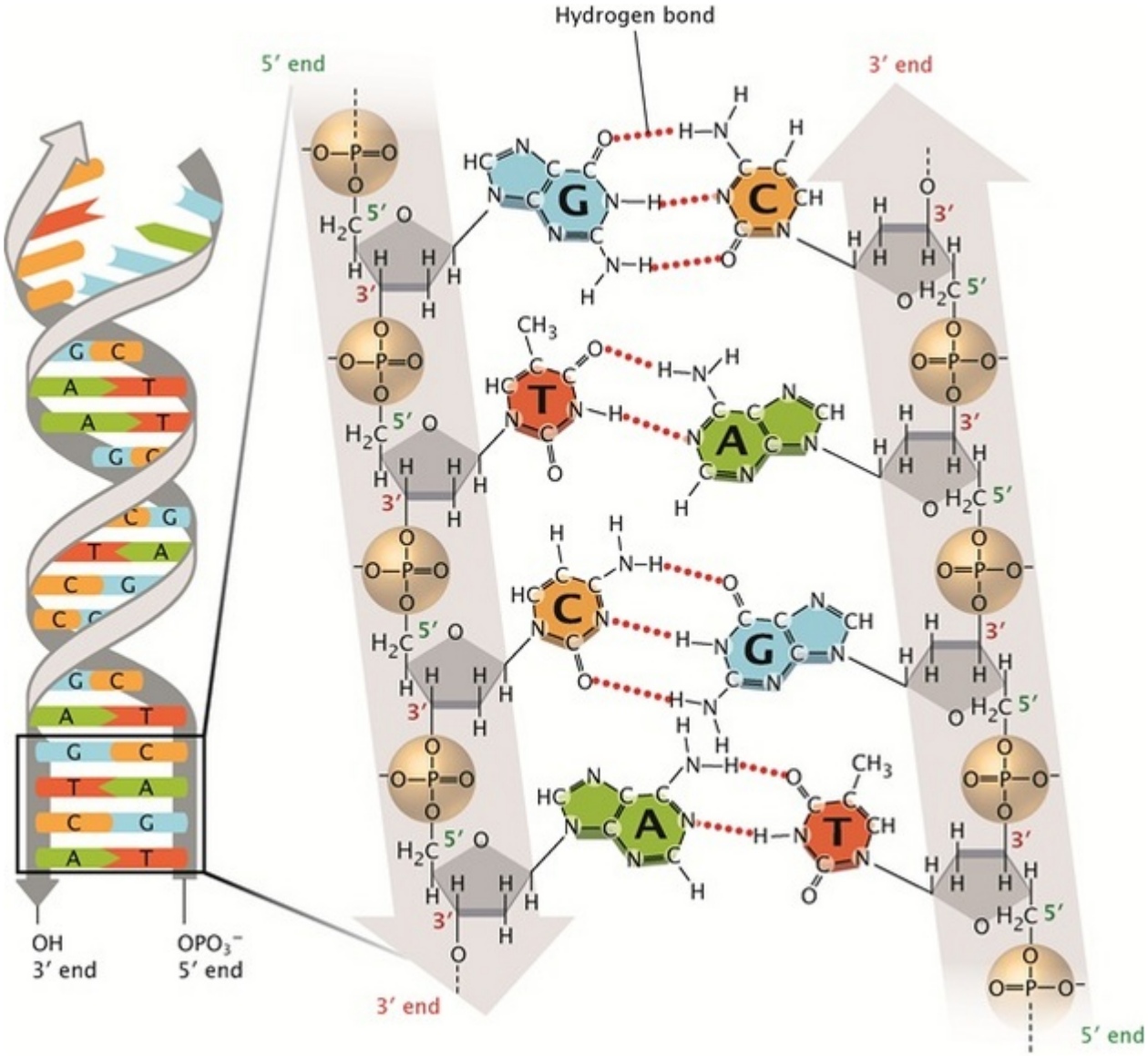
DNA

DNA

Types of DNA:

Double Stranded DNA



- In the deoxyribose sugar,
  - 1' carbon is connected to the Nitrogen Base
  - 2' is not connected to a hydroxyl moiety
  - 5' is connected to a phosphate group
  - 3' is connected to hydroxy moiety to which the phosphate below attaches to.
- The phosphate-sugar-phosphate makes up the "backbone" of the DNA
- Due to it's 5' phosphate and 3' hydroxl moieties at the end we can define a polarity to a strand of DNA.
- The sequence of the bases is what makes the difference between two different person's DNA.
- Two nucleotides are connected by a Phosphodiester Bond (PDE)

Properties of dsDNA

- DNA is Antiparallel, meaning that 5' phosphate is base paired with 3' hydroxyl at an end.
- DNA is also Complimentary, meaning that A's always base pair with T's and G's always pair with C's

Different bonds in DNA

- A's and T's bond with *two* hydrogen bonds.
- G's and C's bond with *three* hydrogen bonds.
- Hence, the G-C bond is stronger than the A-T bond.
- Therefore, dsDNA with more G-C bonds would take more energy to melt and therefore have higher melting points.

Convention to read

- We read DNA from 5' to 3'
- For example, in this image, we would read it as 5'-GTCA-3'
- It could be also read as 5'-GpTpCpAp-3' where the P's stand for the phosphates in between the sugars.
- If you wanted to read it from 3' to 5' you would read it as 3'-ACTG-5'
- All three mentioned above represent the same DNA.

Chargaff's Rules

The amount of A's would be equal to the number of Ts(Us) and the number of G's are equal to the number of C's
The number of purines and pyrimidines are equal

Example

Suppose a sample of dsDNA has 35% of A. What is the % of C?

Ans: 15%

If A is 35% then T has to be 35%, so together they make 70% and the remaining 30% has to be G and C together, since G and C are equal, both G and C have to be 15% each.

Tip

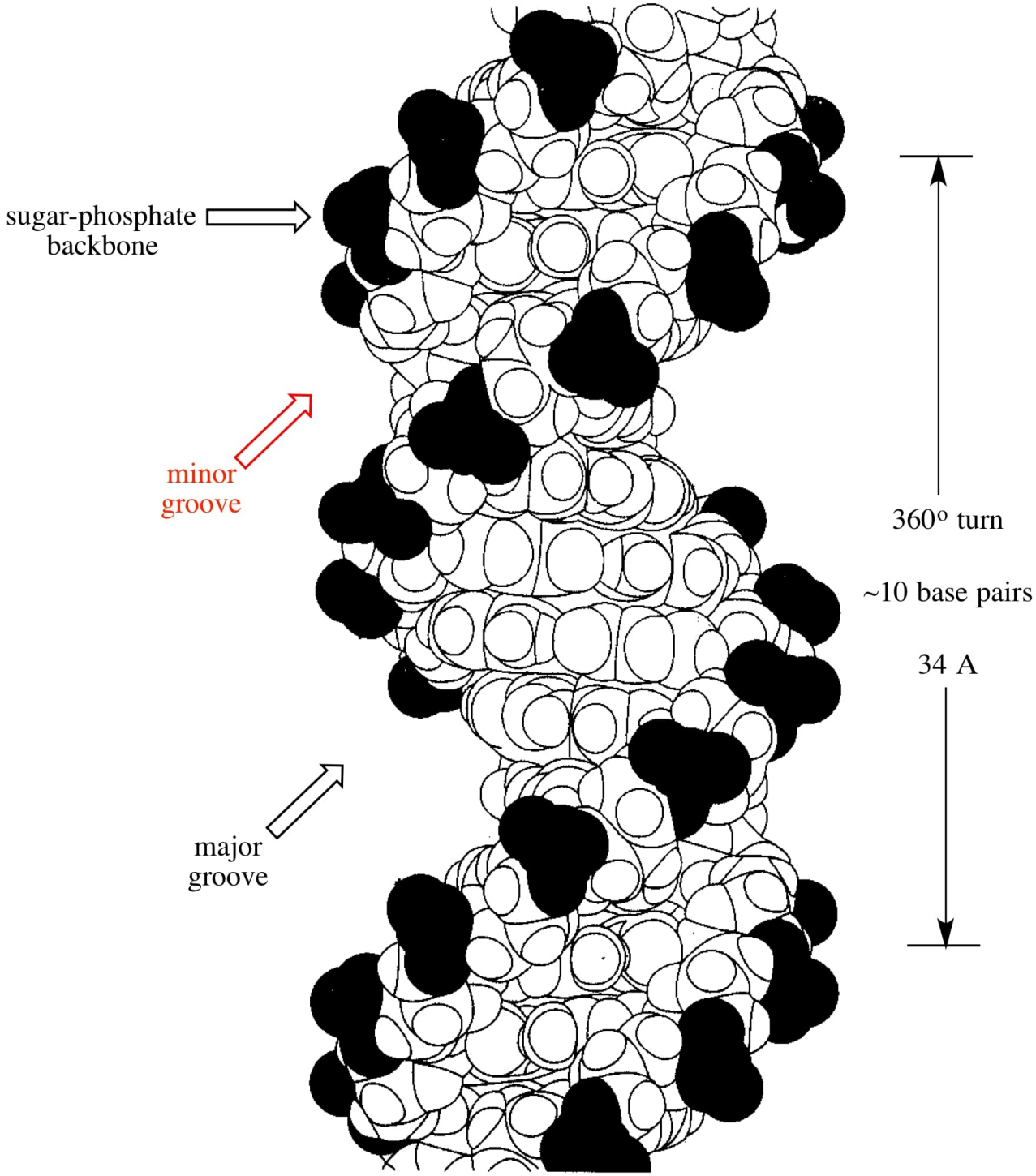
A shortcut to problems like this is to multiply the given %, subtract it from 100 and divide it by 2.

Attention

If you can't seem to apply Chargaff's rules to a strand of DNA. It may be ssDNA you're dealing with.

DNA and it double-helix structure

- Most DNA in our body is B-DNA which means it is Right-handed DNA.



- It has two grooves named Major Groove and Minor Groove
- 10 bases make up one complete turn which measures 34 A
- There are enzymes that can change how many bases make up a turn, i.e. relax or compress the DNA.
- The stacking of the DNA causes hydrophobic interactions between the adjacent base pair hydrogen bonds resulting in greater stability.

DNA Denaturation

- The cleavage of the strands of a dsDNA to create two seperate ssDNA strands is called DNA Denaturation
- Denaturation is caused through Heat.
- Renaturation or Annealing is caused when seperated strands of complimentary DNA are allowed to cooldown causing them to bond again. Yep.