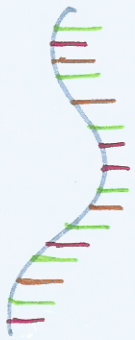
2.6 STRUCTURE OF DNA AND RNA

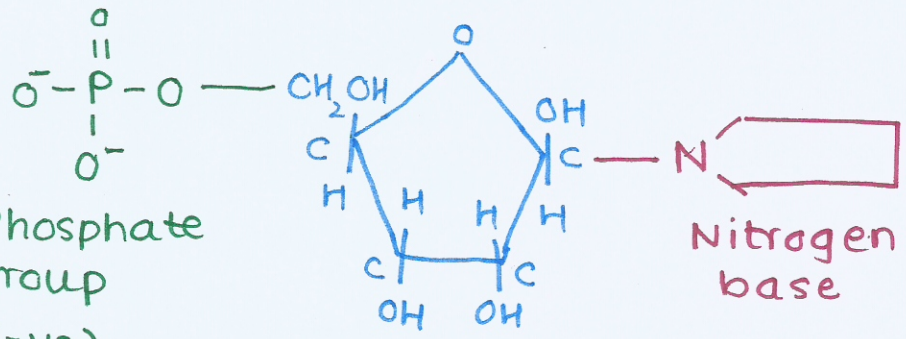
Nucleic acids and nucleotides

Types of nucleic acids

- DNA
  De-oxyribose Nucleic Acid
- RNA
  Ribose Nucleic Acid



- Multiple nucleotides link together to form a nucleic acid.
- It consists of 3 parts



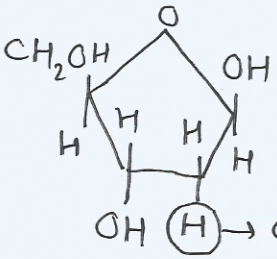
To link nucleotides together, covalent bonds are formed between phosphate of one nucleotide and the pentose sugar of the next nucleotide.

Creates a strong backbone for the molecule of alternating sugar & phosphate groups with bases linked to each sugar.

DIFFERENCES BETWEEN DNA AND RNA

DNA

▷ The sugar in DNA is deoxyribose.



→ oxygen isn't present.

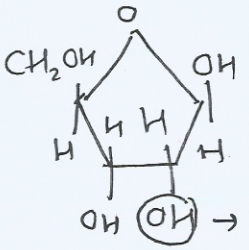
▷ There are 2 polymers of nucleotides in DNA.

▷ 4 bases in DNA are:

Adenine
Thymine
Cytosine
Guanine

RNA

▷ The sugar in RNA is ribose.



→ oxygen is present.

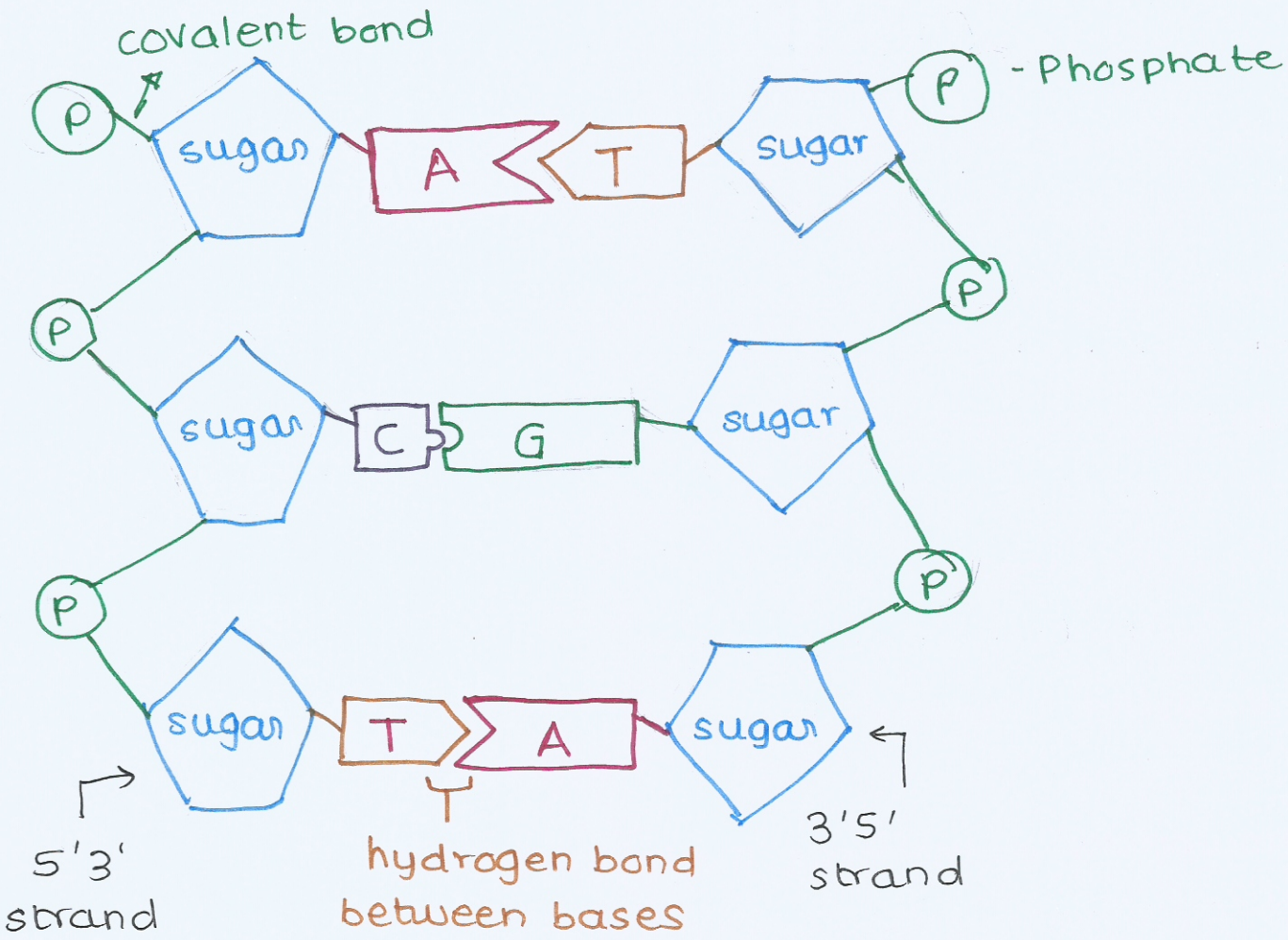
▷ There is only 1 polymer of nucleotide in RNA.

▷ 4 bases in RNA are:

Adenine
Uracil → it is present instead of thymine.
Guanine
Cytosine

Structure of DNA

▶ DNA is a double helix made of 2 anti-parallel strands of nucleotides linked by hydrogen bonding between complementary base pairs.



▷ Each strand of nucleotides is linked together by covalent bonds.

▷ The 2 strands are parallel but run in opposite directions ∴ they are anti-parallel.

▷ The two strands wound together to form a double helix.

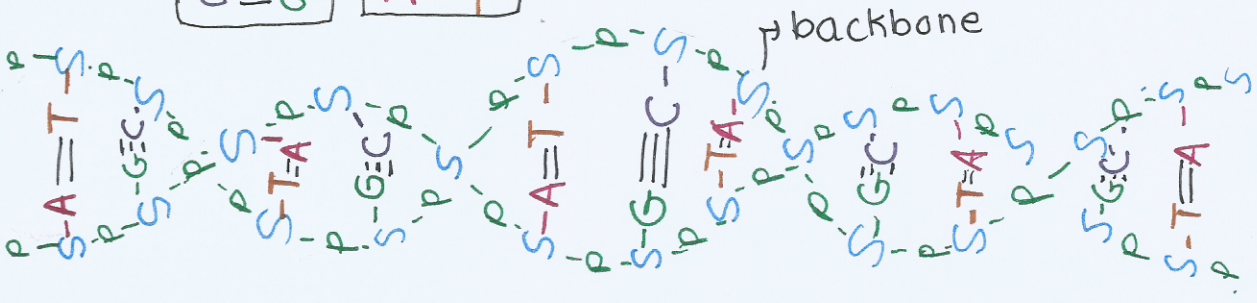
▷ Complementary base pairing:

→ Adenine is always paired with Thymine.

→ Guanine is always paired with cytosine.

There are hydrogen bonds present between the bases.

C≡G A=T



WATSON AND CRICK

James watson and Francis crick proposed the correct DNA model in 1953.

Their model was based on some key discoveries by other people:

- Phoebus Levene - DNA is composed of nucleotides made up of phosphate, sugar and base.
- Erwin Chargaff - DNA is composed of equal number of bases (A+G) and (C+T).
- Rosalind Franklin - DNA is organized into a helical structure.

Drawbacks of the first model:

→ Triple helix
→ Nitrogen bases were not complementary.
→ Bases on the outside and sugar-phosphate in the centre.

Final model:

→ DNA strands are antiparallel
→ Forms a double helix
→ Outer edges remained exposed.
→ complementary base paining (A=T) (G≡C)