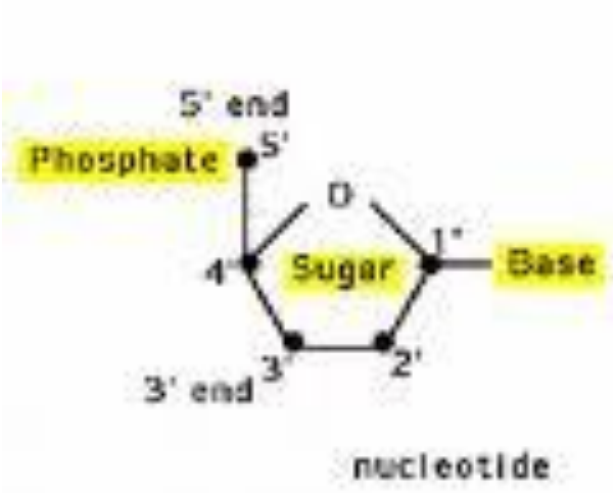
Nucleic acids

Nucleic Acids

- Contain carbon, hydrogen, oxygen and phosphorus.
- Building blocks for genetic material DNA and RNA most common.
- Made of monomers called nucleotides.
- Nucleotides consist of a sugar, phosphate group and base.



What biological molecules contain nucleic acids

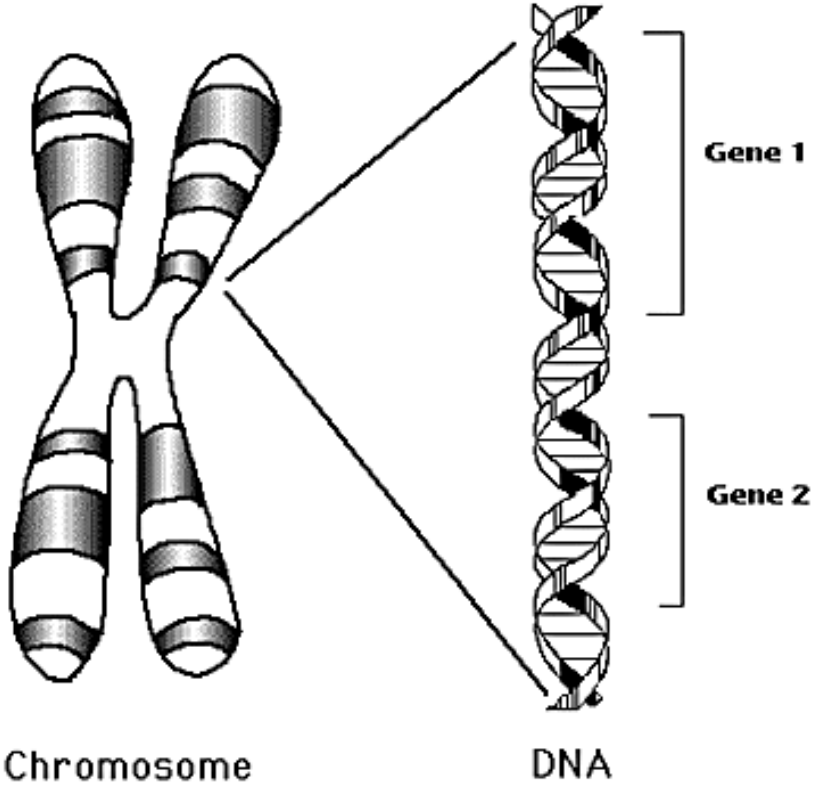
- DNA - deoxyribonucleic acid
- RNA – ribonucleic acid
- ATP – Adenosine triphosphate
- ADP –Adenosine diphosphate

DNA

- DNA was first discovered in 1869, but it was not until 1944 that it was shown that genes were composed of this chemical.

DNA

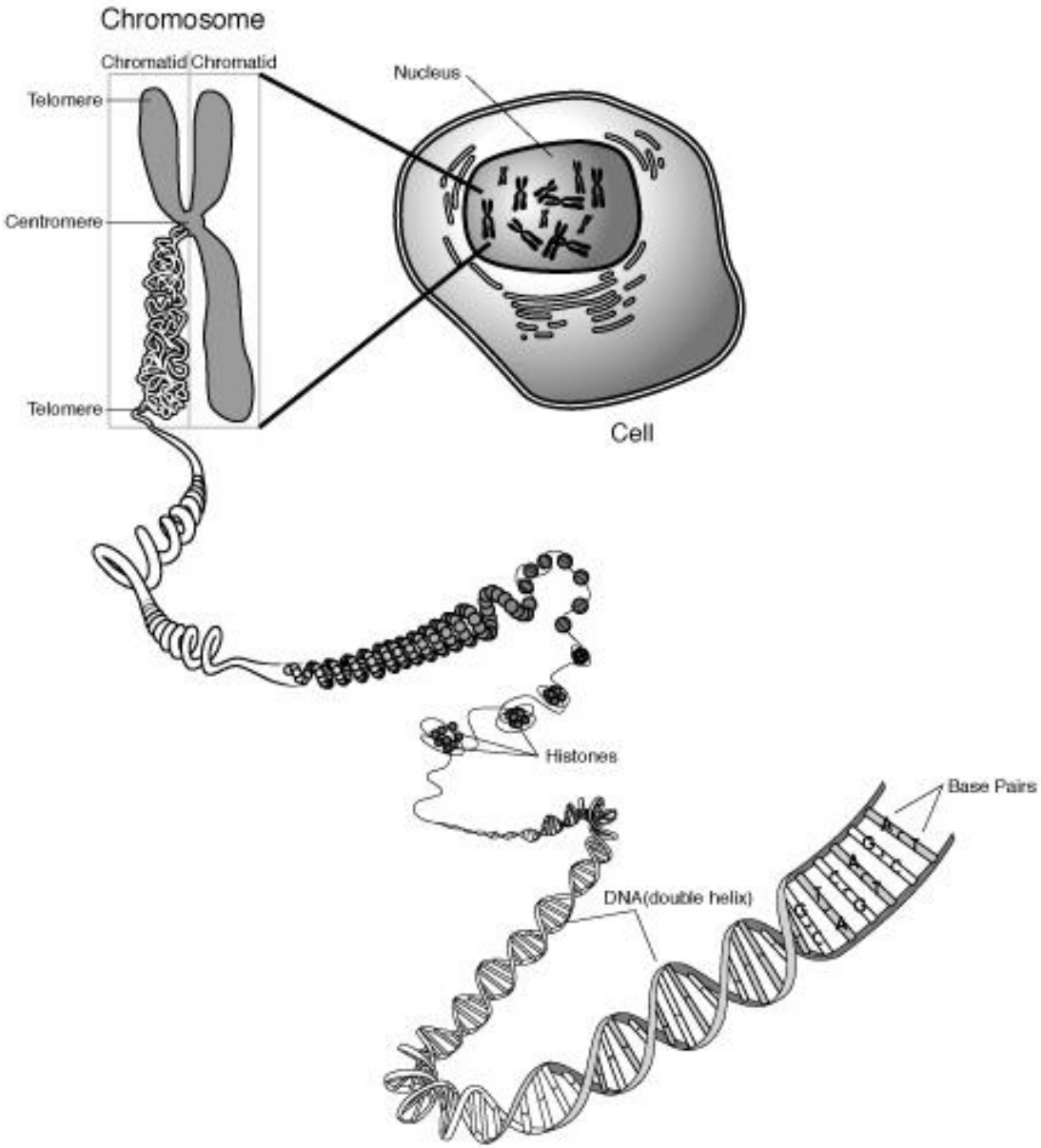
- **DNA:** a molecule that forms the ‘backbone’ of a chromosome.
- The DNA in each chromosome is a single, long, thin continuous molecule in which the genes form part of the molecule.



Genes

The diagram above shows the region of genes on a chromosome.

A gene is a region of DNA that controls characteristics that are inherited.



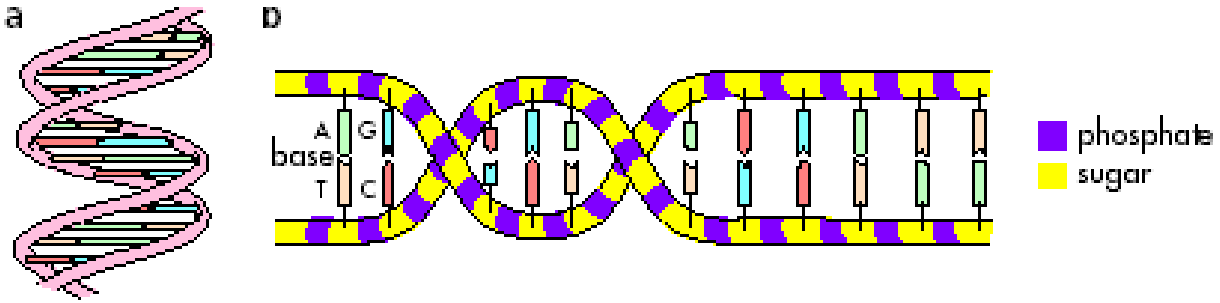
http://www.accessexcellence.org/AB/GG/chromosome.html

- Genes are carried by chromosomes in the cell nucleus and are arranged in a line along each chromosome.
- Genes exert their effects through the molecules they produce.

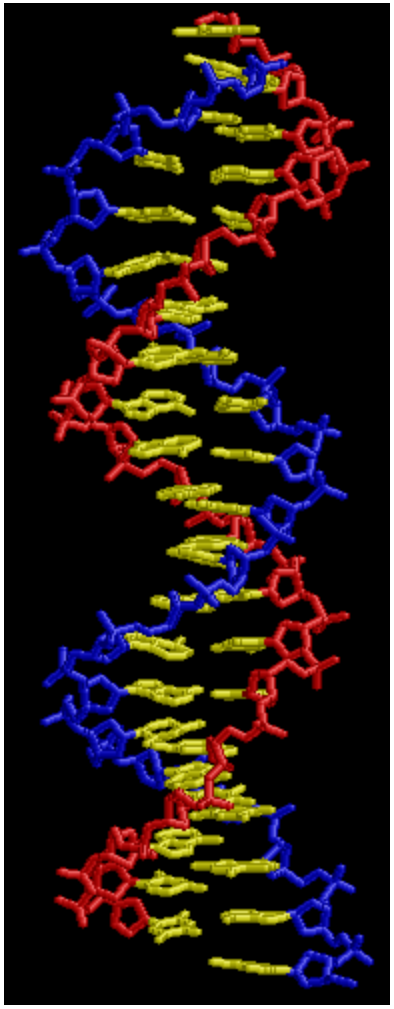
- The DNA molecule has a **double helix** shape, which was identified by Watson and Crick.

FIGURE 7.5 James Watson and Francis Crick with their model of the double helix DNA molecule.

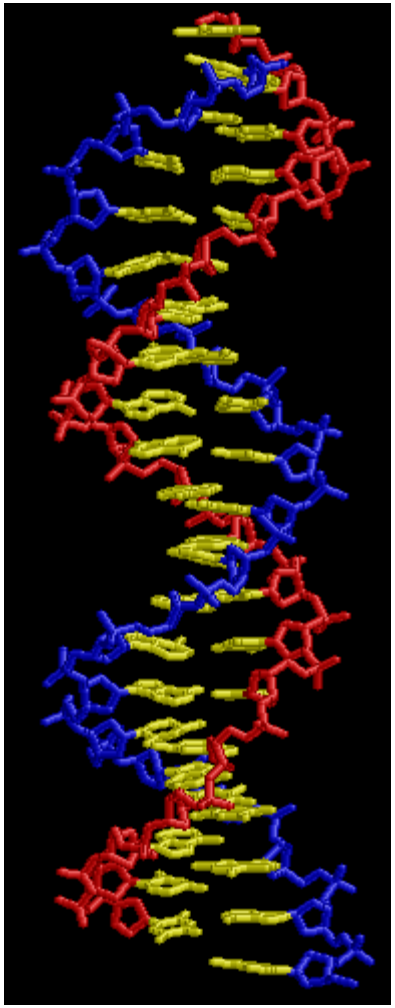
- They showed that DNA was like a long spiral staircase with two handrails. Each ‘hand rail’ is composed of alternating sugar and phosphate units.



- DNA is made up of two strands (red and blue).
- These strands form the backbone of the molecule and are made up of sugar and phosphate groups.
- Phosphate groups give DNA their negative charge.
- They are held together by nitrogen bases. (yellow)



DNA



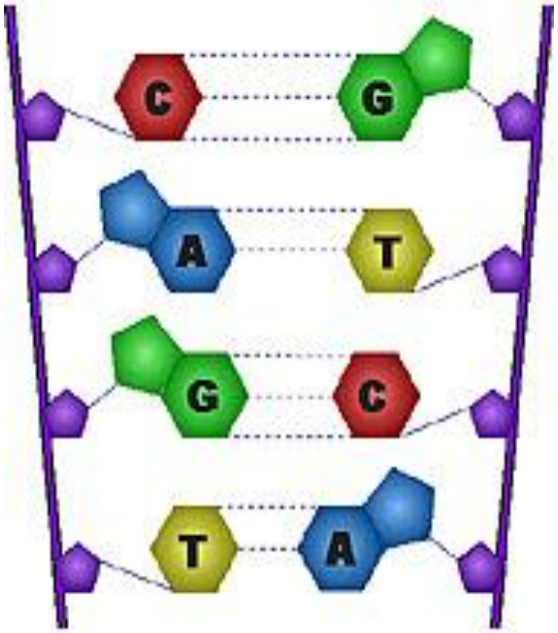
DNA is made up of two strands (shown here in blue and red). The strands are held together by nitrogen bases (shown here in yellow)

There are four nitrogen bases:

Cytosine, Guanine, Adenine and Thymine

What pairs with C?

What pairs with A?



http://academy.d20.co.edu/kadets/lundberg/dnapic2.html

http://www.tokyo-med.ac.jp/genet/picts/dna.jpg

- The steps are made of paired chemical units or bases. There are four different nitrogen bases:
- Adenine (A)
- Guanine (G)
- Cytosine (C)
- Thymine (T)

- **A** only pairs with **T**
- **G** only pairs with **C.**
- This kind of pairing is called ‘complimentary base pairing’.
- So if you know the bases for one DNA strand you can work out the other strand.

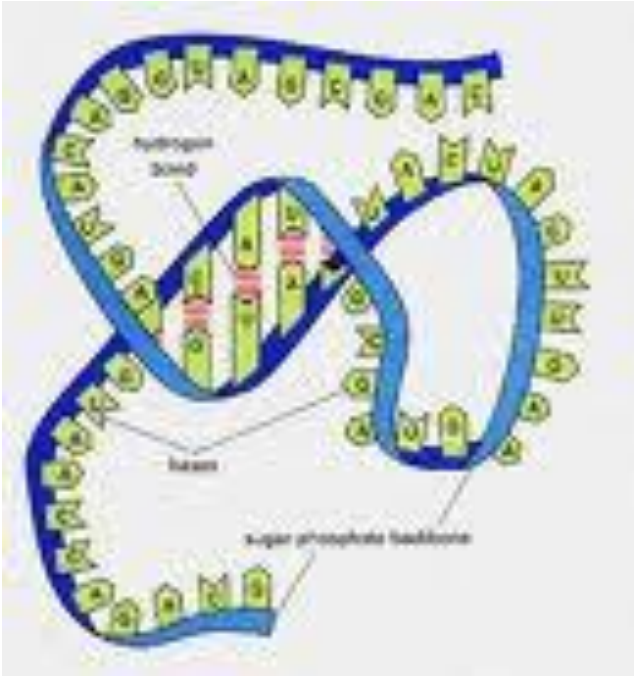
- What is the complimentary base pair of the following DNA strand:

A	T	G	C	T	A	C
T	A	C	G	A	T	G

- A single DNA molecule can be made of over 100 000 bases (large number of possible combinations).
- Even small differences in sequences will results in different genes being formed.

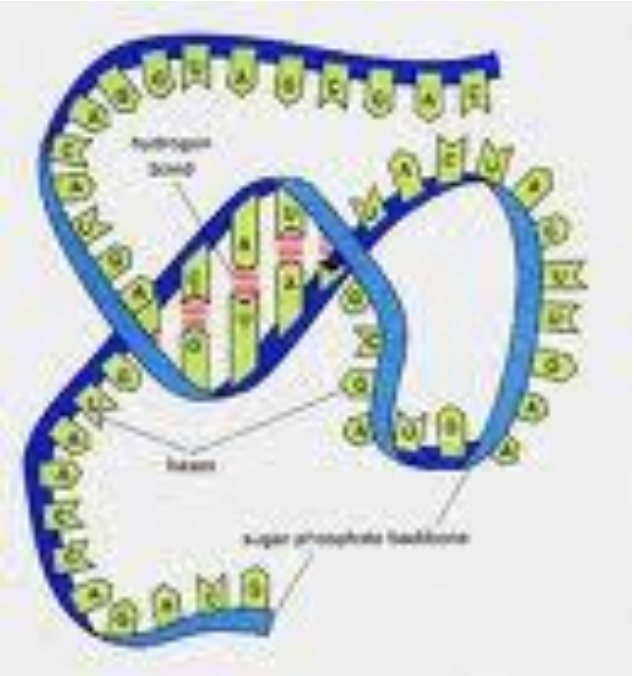
RNA

- RNA is a single stranded molecule.
- The strand consists of nucleotides linked together.
- A nucleotide consists of a phosphate group , a sugar and a base.
- Like DNA the bases are cytosine, guanine, and adenine
- Unlike DNA the fourth base is Uracil instead of thymine.



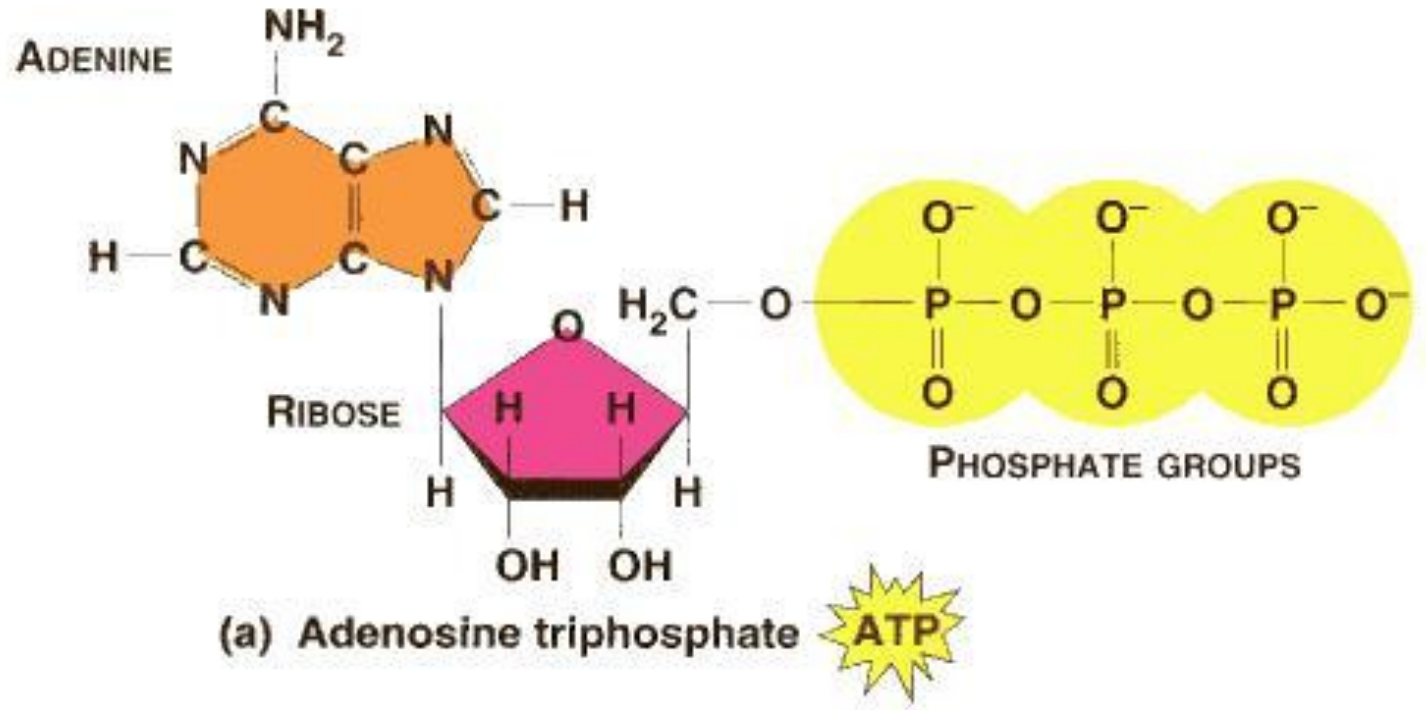
RNA

- RNA is involved in the reading of the information in DNA and the synthesis of proteins.
- You can have several types of RNA such as :
  - Messenger RNA (mRNA)
  - Transfer RNA (tRNA)



ATP

- ATP is a single nucleotide



Difference between ATP and ADP