

A 3D grid of spheres on a blue background. The spheres are arranged in a regular, repeating pattern, creating a perspective effect that recedes into the distance. The spheres are light blue and connected by thin, light blue lines, forming a lattice structure. The background is a solid, medium blue color.

# Biomolecules

● What is an organic compound?

● Compounds containing C, H, O and often N, P, & S.

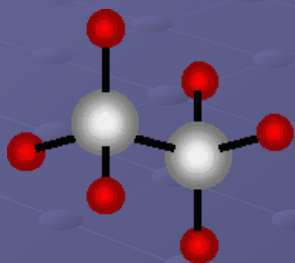
● Organic compounds make up all living things and are necessary for life.

● What is so special about Carbon?

● It can combine to form long chains which act as the backbone of large molecules.

● Macromolecules – giant molecules.

● How does carbon bond?

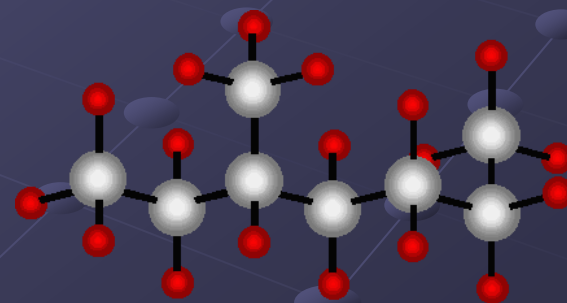
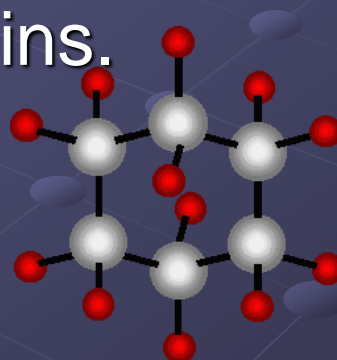
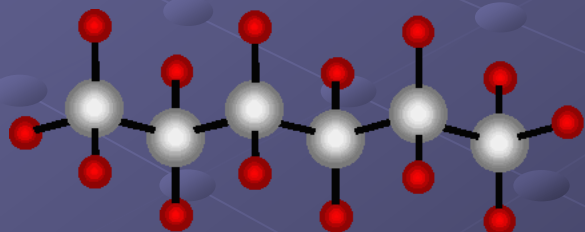


● Carbon needs to bond 4 times to fill its outer shell.

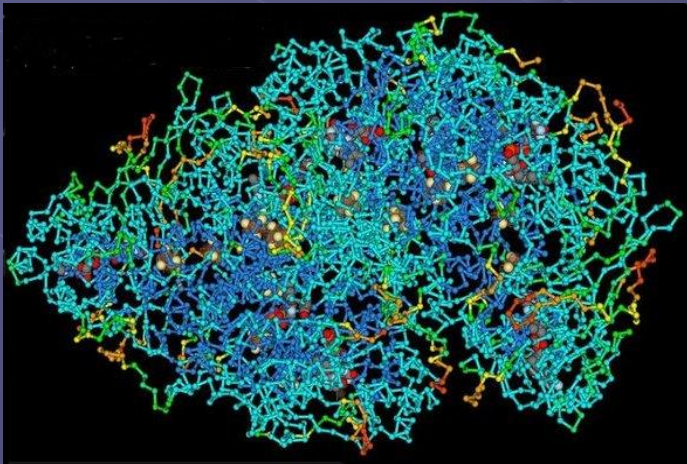
● It can form single, double or triple covalent bonds.



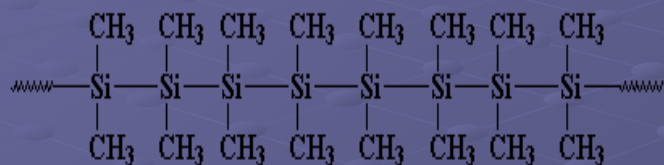
● Carbon can form straight chains, rings or branched chains.



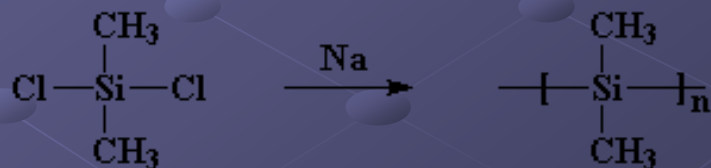
- Very large molecules.
- Carbon compounds can vary greatly in size. Some contain just one or two C atoms, others can have 10 or even 1000 C atoms.
- Macromolecules form when many smaller molecules bond together.



● What is a polymer?



● What is a monomer?



● A molecule made up of many smaller molecules.

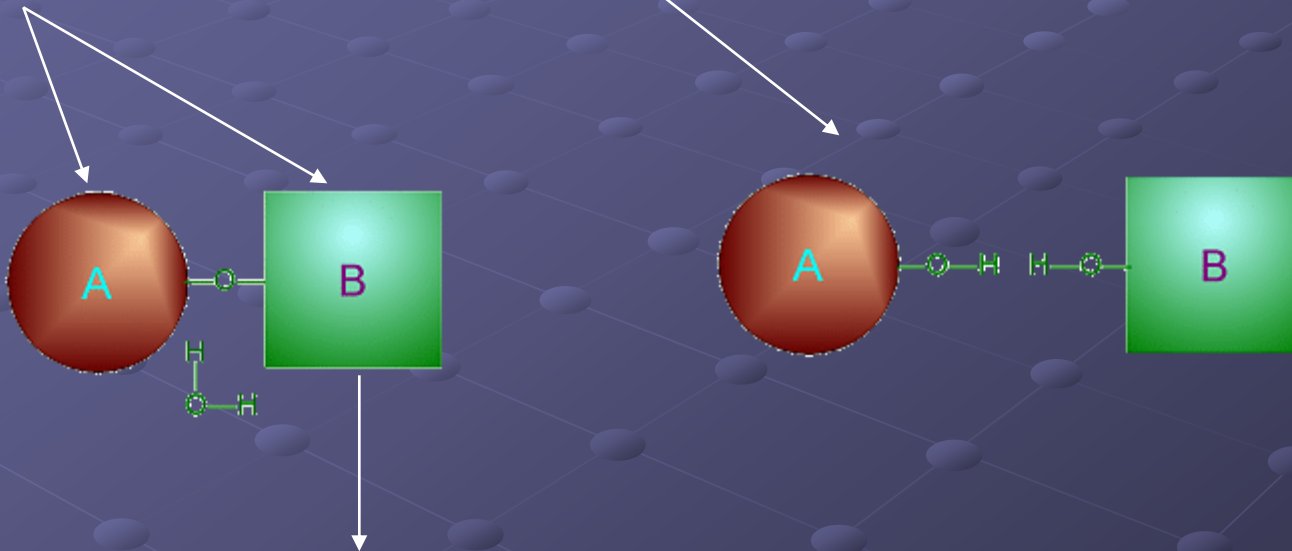
● Formed by a reaction called dehydration synthesis – which means water must be removed to bond them together.

● The building block of a polymer. Varies depending on the type of molecule being built

● How are polymers broken down?

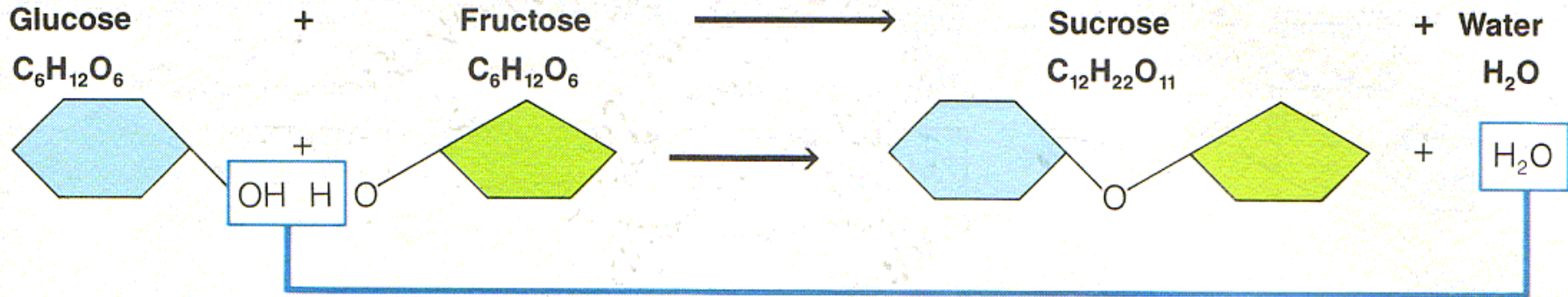
● By a chemical reaction known as hydrolysis. Water is added back in and the monomers separate.

Monomers

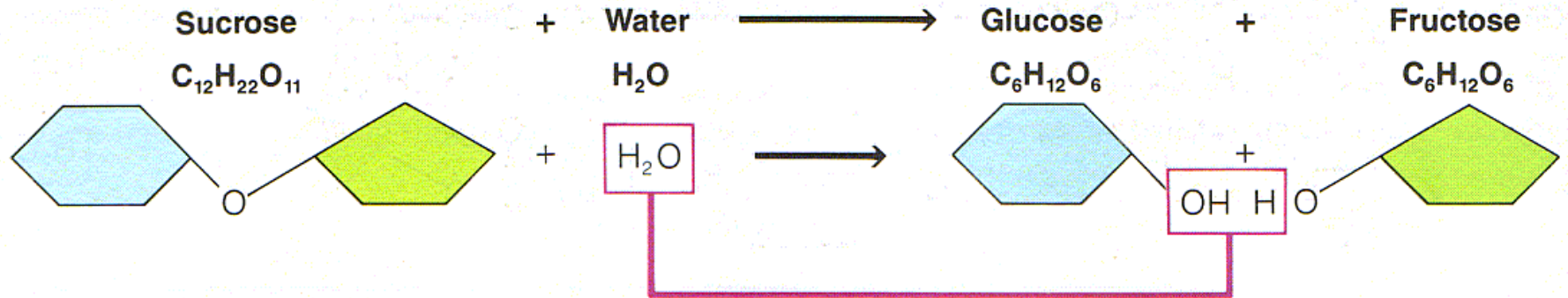


● This is dehydration synthesis

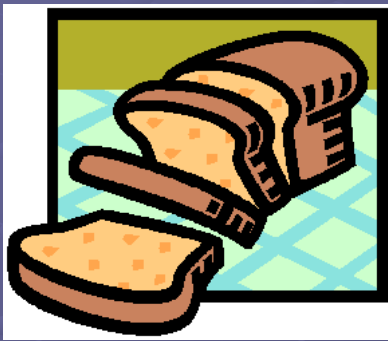
## DEHYDRATION SYNTHESIS



## HYDROLYSIS



● What is a carbohydrate?



● Organic compound composed of C, H, & O in a 1:2:1 ratio



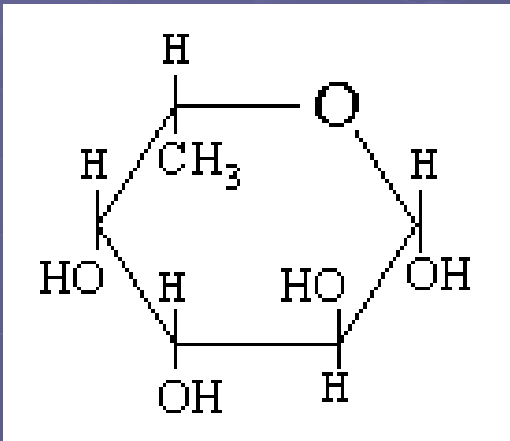
● 3 types – monosaccharides, disaccharides and polysaccharides.

● Function: main source of energy for all living things.

● Some structure (ex plant cell walls)



● What is a monosaccharide?



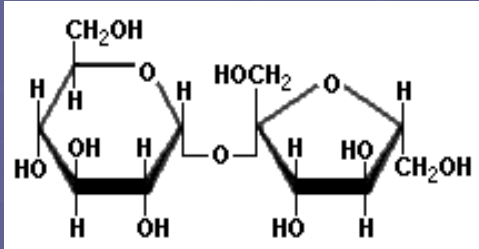
● Simple sugar – only one sugar.

● Contains 3 – 7 carbon atoms in their skeleton.

● Can take ring form or straight chain form.

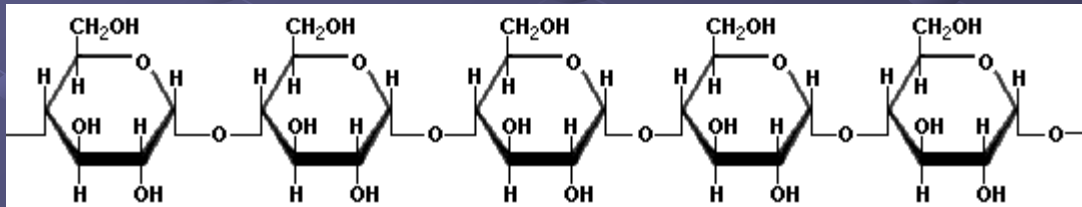
● \*\* monosaccharides are the building blocks for all larger carbs \*\*

- What is a disaccharide?



- What is a polysaccharide?

- Two monosaccharides combined minus water.
- Sucrose = glucose + fructose
- When many monosaccharides combine to form a large carbohydrate.
- Have no fixed size, but must be broken down into simple sugars to be used by the cell.
- Ex. Starch and cellulose



## ● Summary – 3 Types of Carbohydrates

- 1. monosaccharides – single sugar.
  - Ex. Glucose, fructose, galactose
  - Aka – simple sugars
- 2. Disaccharide: 2 simple sugars
  - Ex. Sucrose (table sugar) maltose
- 3. polysaccharides: 3 or more sugars (complex carbs)
  - Ex. Cellulose – used in cell walls
  - Starch stores energy in plants
  - Glycogen – stored energy in animals

● What are lipids?

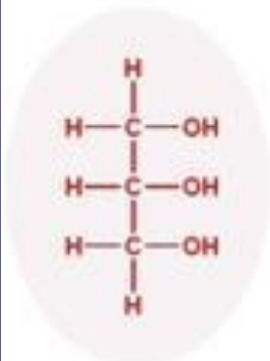
● Organic compounds made up of C, H, & O, but not in any fixed ratio.

● The building blocks of lipids are fatty acids.

● Usually 3 fatty acids combine with one glycerol to form a triglyceride.

● properties of fats and oils are determined by the fatty acids that make them up.

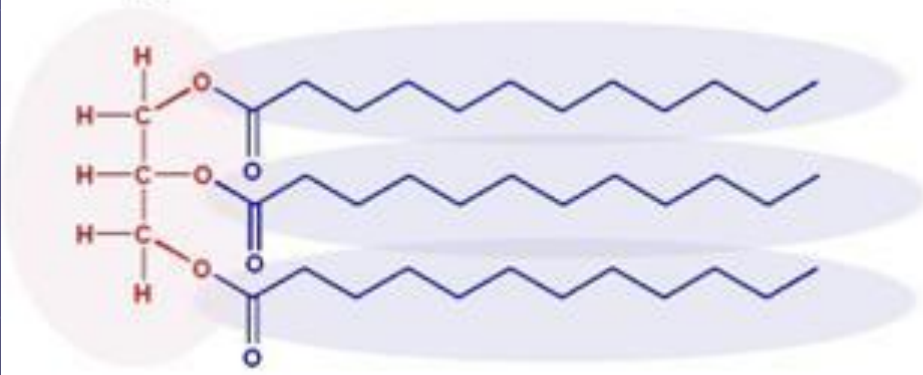
### *Glycerol*



### *A "free" Fatty Acid*



### *Triglyceride*



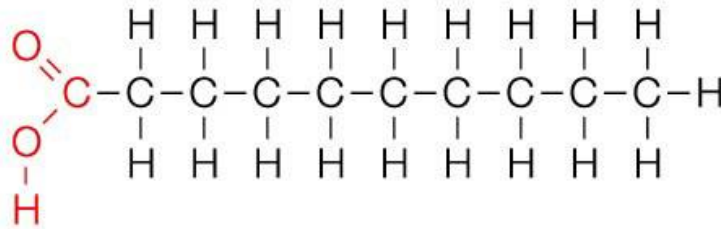
● What is a saturated fat?

● All the carbon atoms are joined by single bonds (usually solid fats)

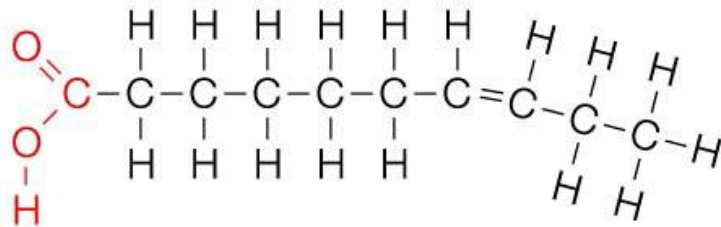
● What is an unsaturated fat?

● The carbon chain contains double or triple bonds (usually oils)

### Saturated



### Unsaturated

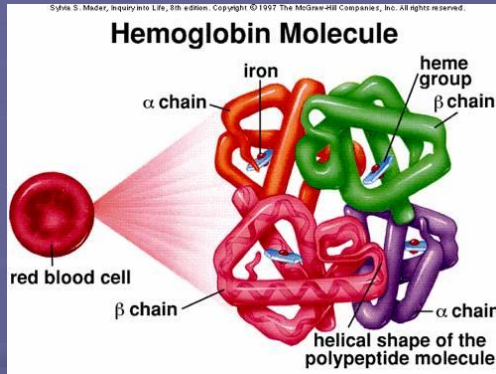


● What is the function of lipids?

● Lipids are often called fats or oils, but are large macromolecules with 2 primary functions:

- 1. long term energy storage
- 2. building cell membranes.

# ● What are proteins?



● Organic compounds that contain C, H, O & N.

● Every cell contains protein.

● Functions of protein:

- Used in structural components.
- Messengers and receptors on the cell membrane
- Defend against disease
- Act as facilitators for chemical reactions (ENZYMES)

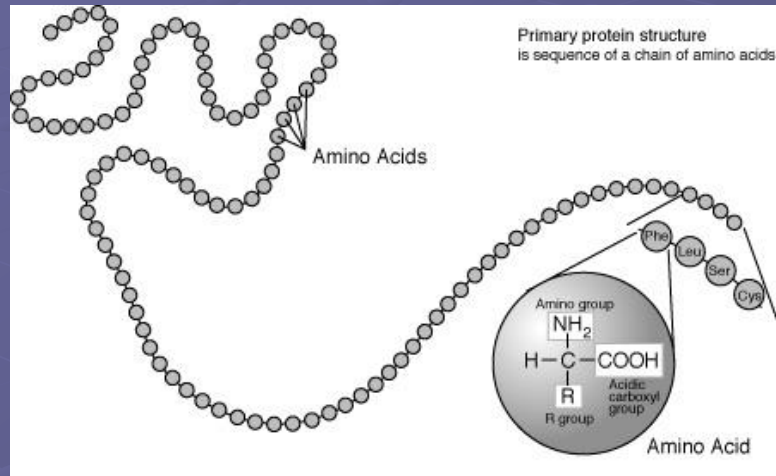


● What are amino acids?

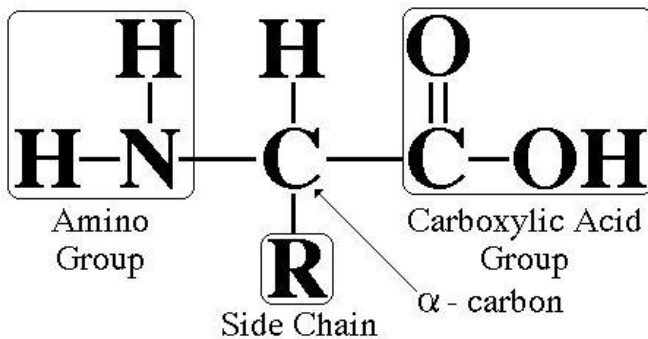
● Amino acids the building blocks of proteins!!

They consist of a central carbon atom with a H, a –COOH, a NH<sub>2</sub> and a “R” group attached.

The “R” group is different for each of the 20 different amino acids.

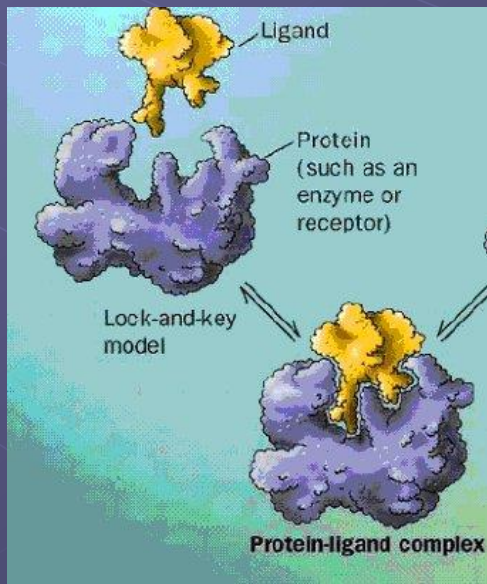


## Amino Acid Structure



- What is a peptide bond?
- The bond that holds together amino acids into a large macromolecule called a polypeptide.
- Longer polypeptides are called proteins and can be made up of 50 – 300 amino acids.

- The order of amino acids give a protein its shape. The shape determines the protein's function.
- Even one amino acid out of place will prevent a protein from doing its job.
- Proteins that speed up the rate of chemical reactions
- Without enzymes chemical reactions would occur too slowly for life to exist.





primary structure  
(amino acid sequence)



secondary structure  
( $\alpha$ -helix)



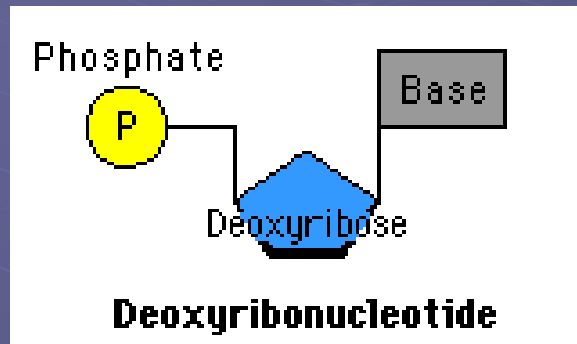
tertiary structure  
(folded individual peptide)



quaternary structure  
(aggregation of two or more peptides)

- What are nucleic acids?
- Organic molecule made up of C,H,O,N,& P
- Nucleic acids are passed from parent to offspring, you get one copy from each parent for a total of 2 complete sets.
- Nucleic acids dictate amino acid sequence in proteins which in turn control all life processes.
- DNA forms the genes or units of genetic material that determine your characteristics.

● What is a nucleotide?



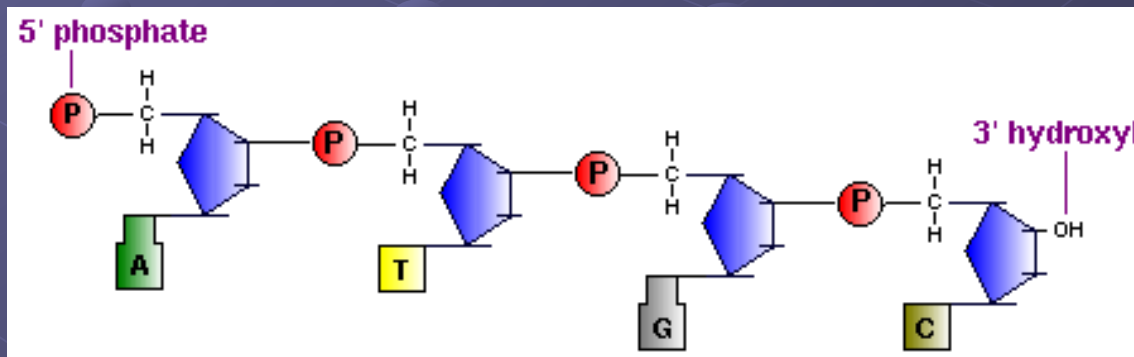
● Nucleotides are the building blocks of Nucleic acids.

● Each nucleotide is made up of 3 parts:

- A 5 Carbon sugar (deoxyribose or ribose)
- A phosphate group
- A nitrogen base ( a ring containing C, H, & N)

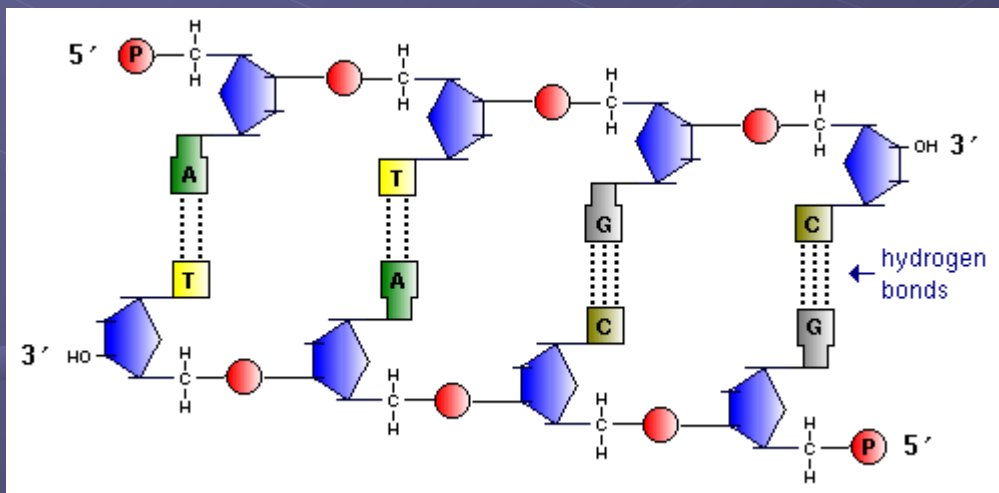
● What are the different types of nucleotides?

- Adenine, guanine, cytosine, thymine, and uracil.
- Thymine is only in DNA, uracil is only in RNA.
- Adenine pairs with thymine (uracil)
- Guanine pairs with cytosine.
- Nucleotides link together between sugars and phosphates, nitrogen bases stick out.



## ● What is DNA?

- Deoxyribonucleic acid
- Contains the sugar deoxyribose.
- The molecule of heredity.
- Double stranded, sugar and phosphates form the back bone, paired nitrogen bases hold the two strands together.
- The shape is called a double helix.





● What is RNA?

● Ribonucleic acid

● Contains the sugar ribose, uracil replaces thymine.

● Single stranded.

● 3 types each with a different function

- Ribosomal

- Transfer

- messenger