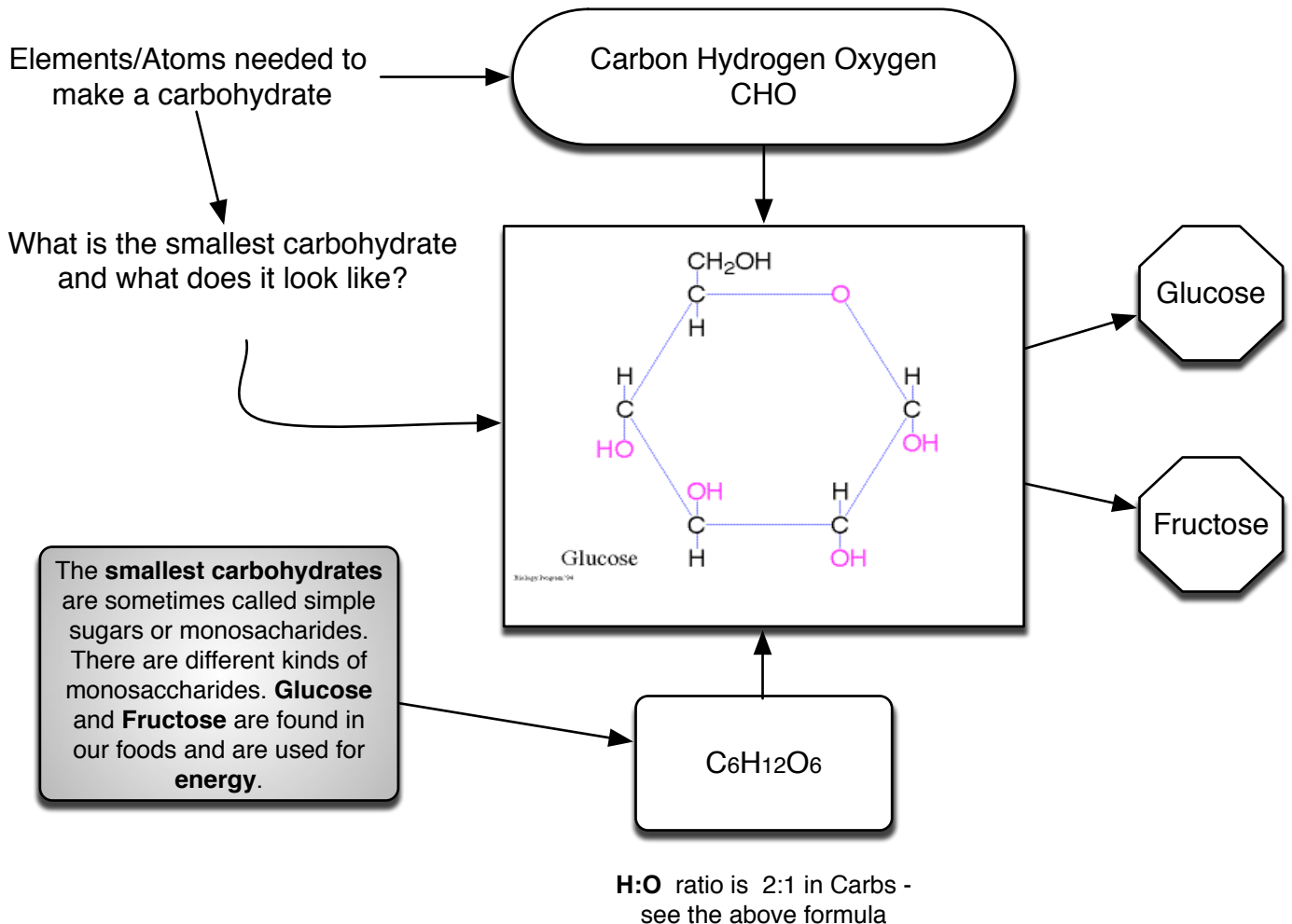
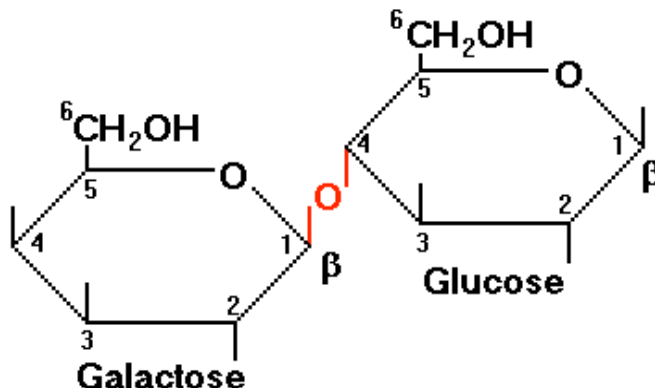


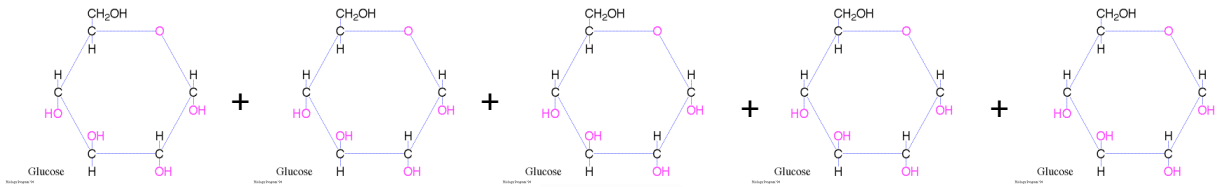
What Are Carbohydrates?

Carbohydrates are organic molecules that are mainly used as a source of **energy** by living things. Carbohydrates are made by Plants and Algae through the process of photosynthesis. There are several kinds of carbohydrates - we will present them here from smallest to biggest.



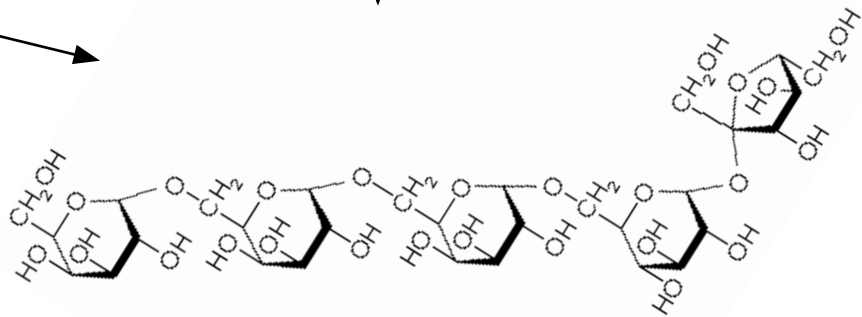
If two **monosaccharides** are combined a larger molecule results called a **disaccharide**. Two common examples found in our food are: **Lactose** and **Sucrose**





Many **monosaccharides** can be combined to form a **polysaccharide**. There are several kinds of polysaccharides: **Starch, Cellulose, Glycogen**

Combined through **Dehydration Synthesis**



All of the above mentioned are **Carbohydrates**.
The simpler ones (monosaccharides) are sometimes referred to as **Simple Sugars** (*glucose, fructose*)
Complex Carbohydrates (polysaccharides) usually refer to *starches*

What are Lipids?

Unsaturated fatty acids are generally considered to be more healthy

Which elements are needed to build lipids?

Carbon Hydrogen Oxygen

What are the building blocks of lipids?

Glycerol



Fatty Acid

Fatty Acid

Fatty Acid

This is a lipid molecule

Glycerol

Fatty Acid

Fatty Acid

Fatty Acid

Where can lipid molecules be found?

waxes

fats

Solid @
room
temp

oils

Liquid @
room
temp

Lipids can be found in **waxes**, **fats**, and **oils**.

What are their functions?

This depends on the organism and location of the lipid, but generally, they are the **major component** of cell **membranes**, they are used for **energy** (often **stored in fat cells**).

There are many functions in living things. The two above are enough to know for this course.

The smart ones will go to this link

<http://www.americanheart.org/presenter.jhtml?identifier=532>

What are proteins?

Elements/Atoms needed to build a Protein

Carbon, Hydrogen,
Oxygen, Nitrogen

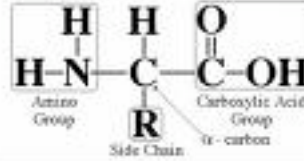
Remember

CHON

How are proteins made?

Proteins are made by
assembling smaller
molecules called **amino acids**.

Amino Acid Structure



There are 20
different
kinds of
amino acids

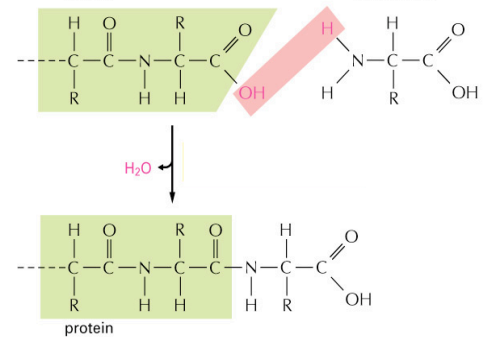
TABLE 3.1
Twenty amino acids found in proteins

| A. Amino acids with electrically charged side chains | | |
|--|---------------------|------------------|
| Positive | | Negative |
| Arginine (Arg) | Histidine (His) | Lysine (Lys) |
| Aspartic acid (Asp) | Glutamic acid (Glu) | |
| | | |
| B. Amino acids with polar but uncharged side chains | | |
| Serine (Ser) | Threonine (Thr) | Asparagine (Asn) |
| Glutamine (Gln) | | |
| | | |
| C. Special cases | | |
| Cysteine (Cys) | Glycine (Gly) | Proline (Pro) |
| | | |
| D. Amino acids with hydrophobic side chains | | |
| Alanine (Ala) | Isoleucine (Ile) | Leucine (Leu) |
| Methionine (Met) | Phenylalanine (Phe) | Tryptophan (Trp) |
| Tyrosine (Tyr) | Valine (Val) | |
| | | |

Amino acids can be
connected together
by **dehydration
synthesis**

Amino Acid chain

New **Amino
Acid** is added to
the chain

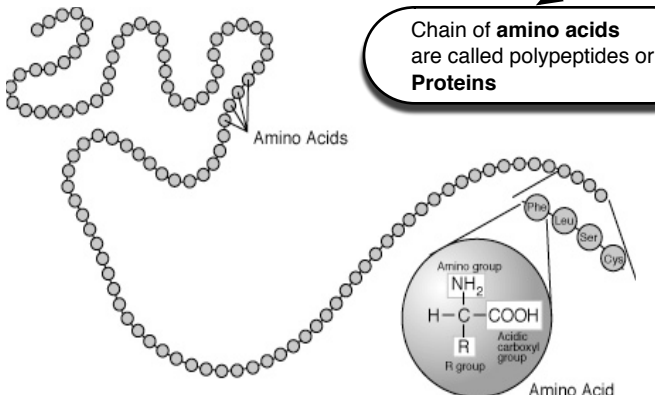


Chain of amino acids
are called polypeptides or
Proteins

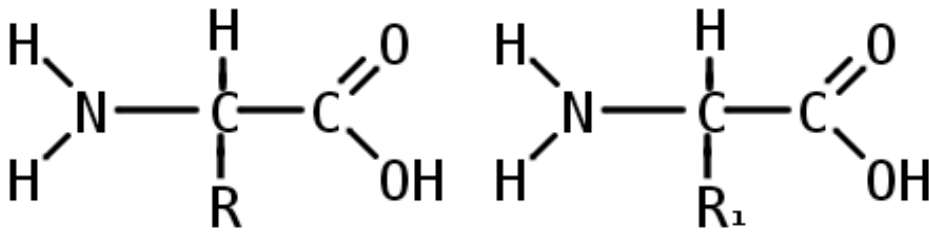
Figure 3-40 part 2 of 3 Essential Cell Biology, 2/e. (© 2004 Garland Science)

What are proteins?

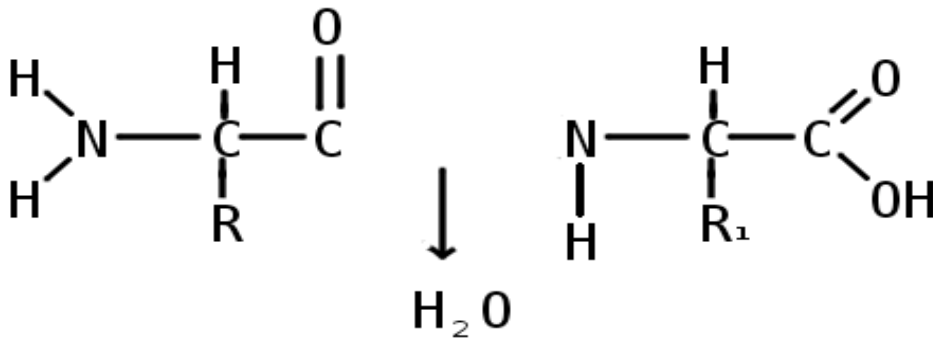
Proteins are macromolecules (**polymers**) that are made by adding amino acids (**monomers**) together. There can be thousands of different proteins found in a single cell. If the **20 different amino acids** are put together in various combinations there can be endless numbers of proteins.



Dehydration Synthesis of two amino acids

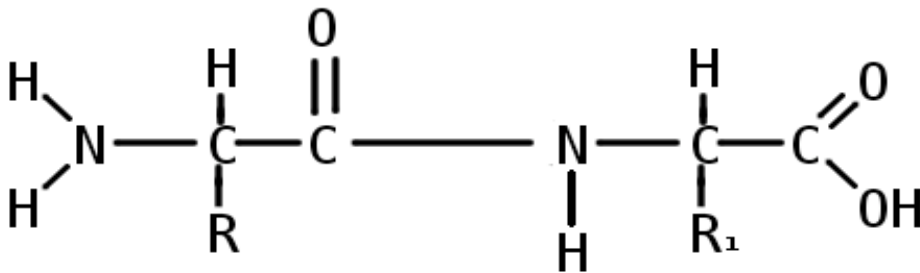


2 Amino Acids

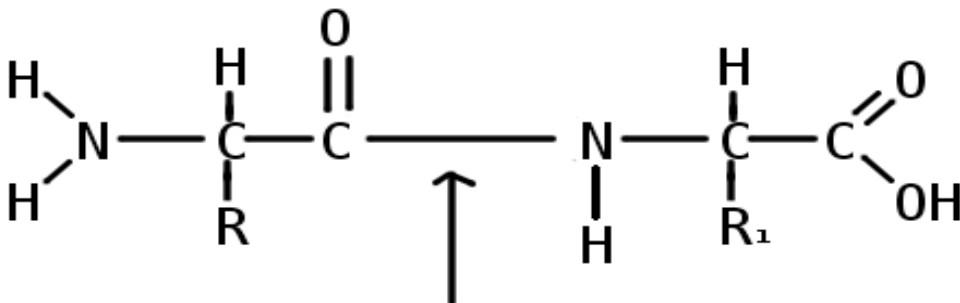


A condensation reaction.

Water is removed when they combine



Two combined amino acids



A peptide bond

Proteins are made through repeating this process

What is DNA?

Elements needed to build DNA

Carbon, Hydrogen, Oxygen,
Nitrogen, Phosphorus

Remember
CHONP

What are the parts of DNA?

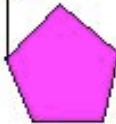
Phosphate



Nitrogenous Base



Deoxyribose

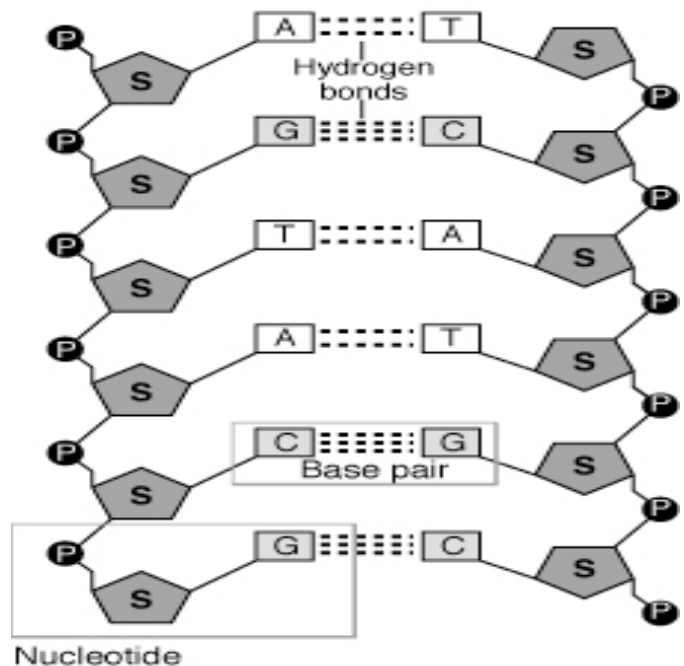


Nucleotides have three parts

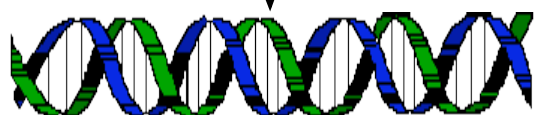
The very large DNA molecule is formed from smaller **sub-units** called **nucleotides**. Each nucleotide is composed of smaller aspects: **Phosphate group**, the **sugar Deoxyribose**, and the **nitrogen base** group. These three groups form a **nucleotide**. The large polymer DNA is formed by connecting many **Nucleotides** together

Connect **nucleotides** together to make DNA

Deoxyribonucleic Acid (DNA)



The Actual Shape
in Cells



Summary

The **polymer DNA** contains the genetic information (the instructions for building and running the organism).

There are **4 different nucleotides**, "building blocks" (the **monomers**) used in building this large molecule.

They are:
(A T C G)

