

Chapter 2 – The Chemistry of Life

Evolution – developed to explain how/why organisms change

Lamarck – Usage increases strength, passage to offspring, WRONG

For chapter 1 and the first part of Ch 2, just use your logic, review your chemistry, and you'll be fine.

109 elements, 92 natural. Einsteinium is the only element named after a guy when he's still alive

6 elements that make up 95% of all living organism.

Carbon, Hydrogen, Oxygen, Nitrogen, Phosphorous, Sulfur

Organic compounds are used for energy and building material.

Macromolecules – organic compounds, large molecules or polymers

Types of compounds – **Carbohydrates, Lipids, Protein, Nucleic Acid**

Carbohydrates – CH_2O – ratio for carbohydrates

Types – Sugars, starches, glycogen, cellulose

Sugars – simple carb, most common source of energy – **Composed of Monosacchrides**

3 – 7 Carbon atoms. 3 Carbons – triose, 5 carbons, pentose, 6 carbons, hexose

Hexose = Glucose – $\text{C}_6\text{H}_{12}\text{O}_6$ – produced by plants during photosynthesis

Fructose – Fruit Sugar, sweetest of the sugars, $\text{C}_6\text{H}_{12}\text{O}_6$

Isomer – same formula, different structure

Disaccharide – two sugars bonded together

Sucrose – $\text{C}_{12}\text{H}_{22}\text{O}_{11}$ ($\text{C}_{12}\text{H}_{24}\text{O}_{12} - \text{H}_2\text{O}$) Isomer of Lactose (milk sugar)

Maltose – malt sugar. **Ose ending – sugar**

Polysacchrides – many sugar molecules boded together.

Starch – how plants store sugar – found in potatoes, grains.

Glycogen – animal starch, how animals store short-term energy, stored in muscles, liver

Cellulose – most complex carbohydrate, most abundant, in all plant fibers

Lipids – fats and oils, long term energy reserve - **Made from fatty acids and glycerol.**

Important for cell membranes, heat/cushioning. Males normal 15%, females 25% body fat

Triglycerides – common type of simple fats.

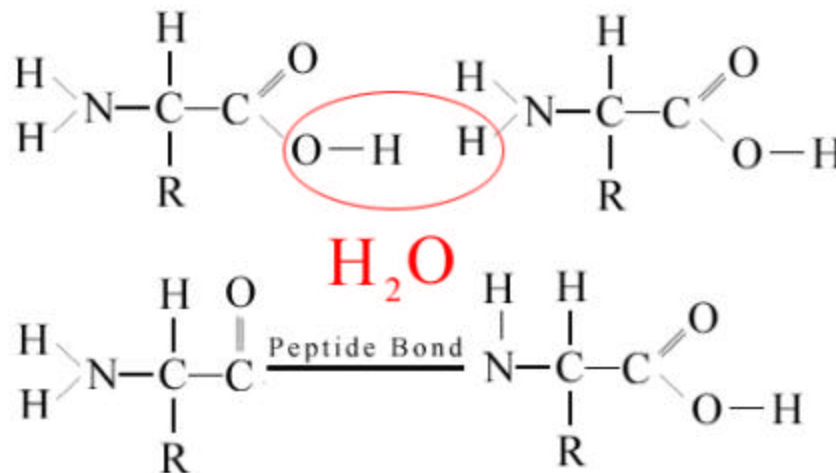
Saturated Fats – all single bonds, animal fat, solid at room temperature

Unsaturated fats, some double bonds, plant fat, olive/sunflower oil, liquid at room temperature

Phopholipids/cholesterol – 2 fatty acids + phosphorous.

Important for cell membranes, digestion, production of estrogen and testosterone

Proteins – The Building Blocks of Life – made from **amino acids**, with **polypeptide bonds**.



Enzymes – proteins that **catalyze** reactions

Each enzyme can only catalyze a very small number of reactions

Catalyzing power affected by temperature, pH, molecule type, etc.

Lock and Key Principle – **substrate** – the substance being affected in the reaction

Active Sites – part of the substrate that “fits” the enzyme

Nucleic Acids – Master Molecules of Life, DNA/RNA, made from **nucleotides**

Chemical link between generations, **primary control over protein synthesis**

DNA – Deoxyribonucleic Acid – Remains in the nucleus, too large to be in cytoplasm

Consists of a Phosphate Group, a 5 carbon sugar, an NH₂ group

Contains deoxyribose. DNA Sugar has 1 oxygen. **DNA Molecules are double stranded**

4 letters of DNA Alphabet – Adenine, Guanine, Cytosine, Thymine, **AT, CG**

Only 1 type of DN

RNA – Ribose Nucleic Acid. Carries out the instructions in the DNA

RNA resides in the nucleus and the cytoplasm, Single Stranded molecules

Contains Ribose (a type of sugar), 4 Letters A, G, C, U

3 Different types of RNA – Messenger, Transfer, Ribosomal

Structure is Always Related to Function

Double Helix – model of the DNA, made by **Watson/Crick.**

Franklin/Wilkins – x ray diffraction of DNA, Franklin Dies.

10 pairs of N bases between each “twist”

Genes – Packs of DNA

Chromosomes – Packs of Genes

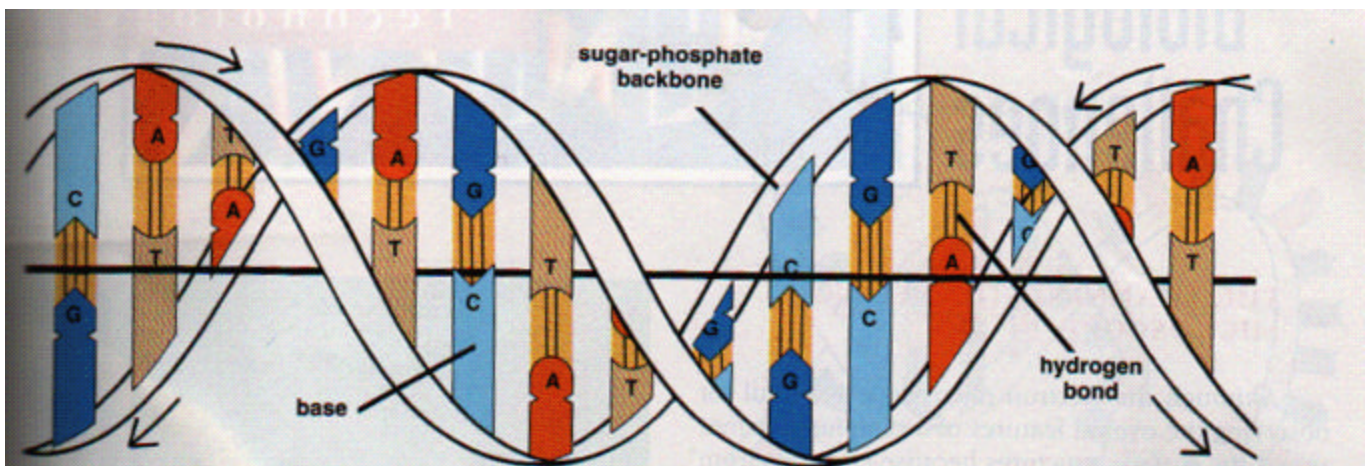


FIGURE 2.28 The structure of DNA. Alternating sugar and phosphate molecules connect each chain of nucleotides. Two chains are held together by specific pairing of the bases—A to T and G to C—and coiled around a central axis to form a double helix. The axis is shown to help visualize the correct twisting. The two strands run in opposite directions, and there are 10 nucleotides per turn of the helix. Only a small portion of a DNA molecule is shown.