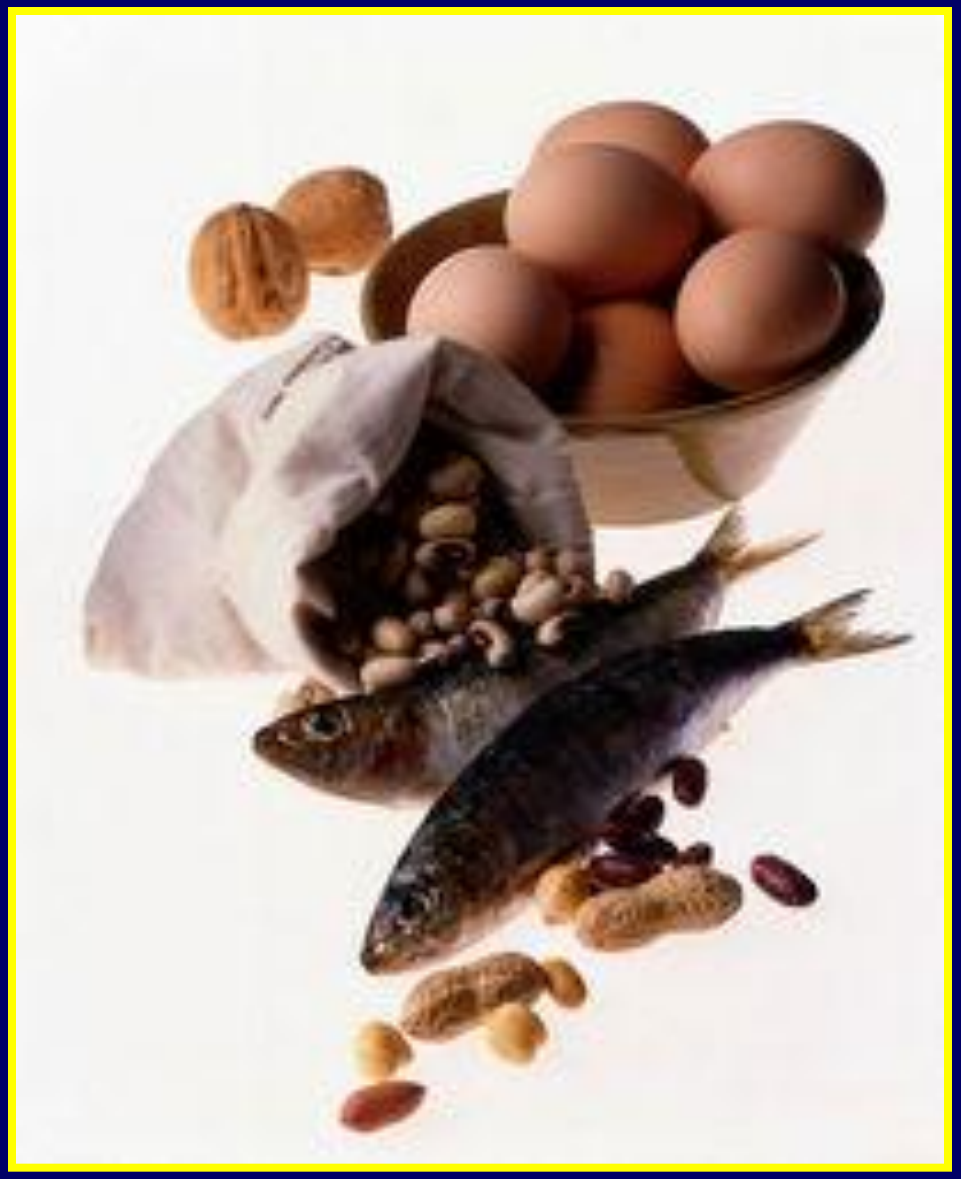
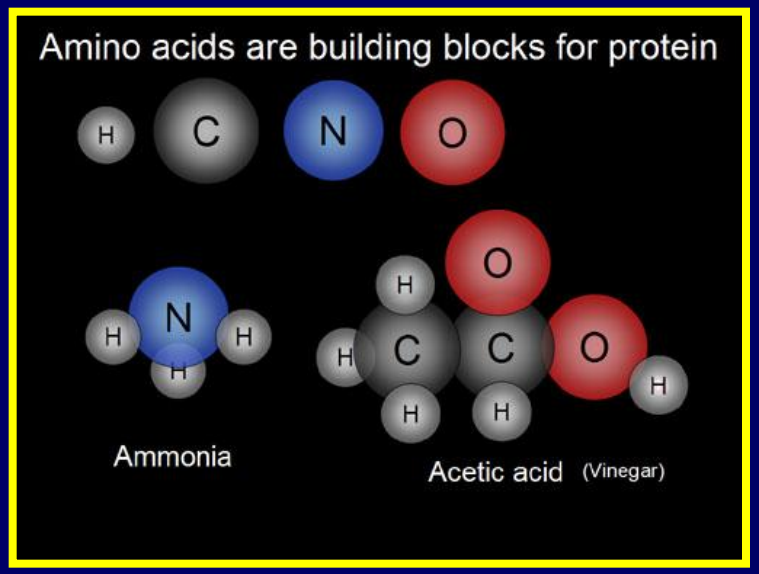
Biochemistry

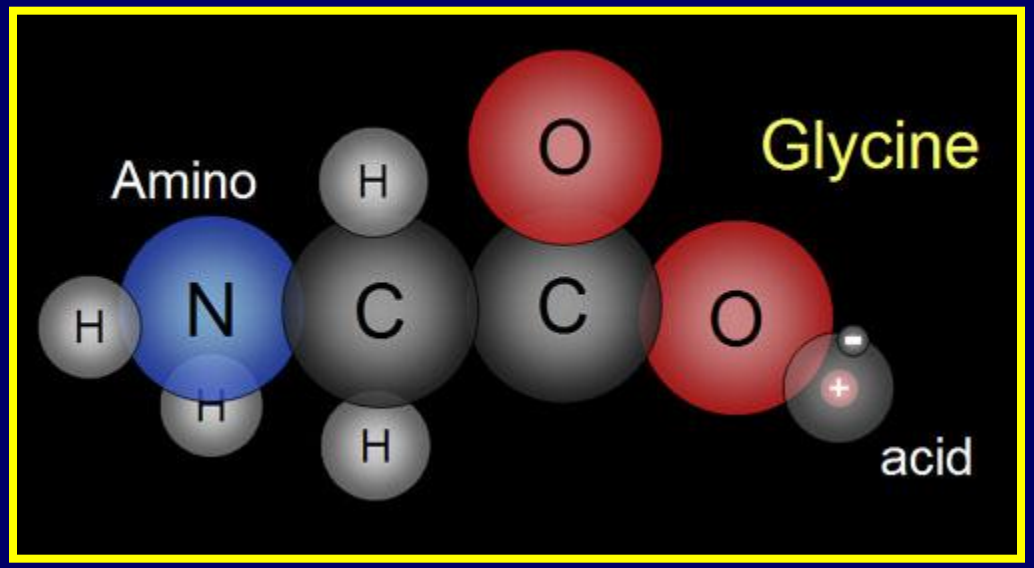
Clarifying Objective 4.1.1
Compare the structure and functions of the major biological molecules (carbohydrates, proteins, lipids, and nucleic acids).

Proteins



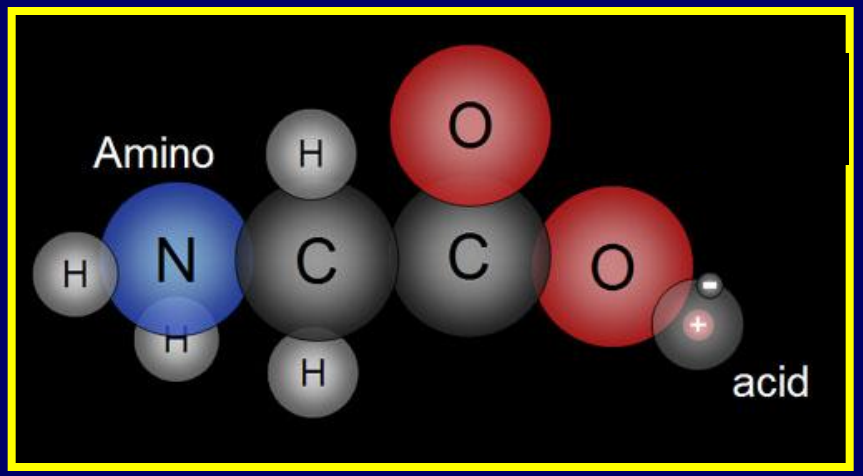
Proteins are made of carbon, hydrogen, and oxygen but also contain nitrogen in their base.



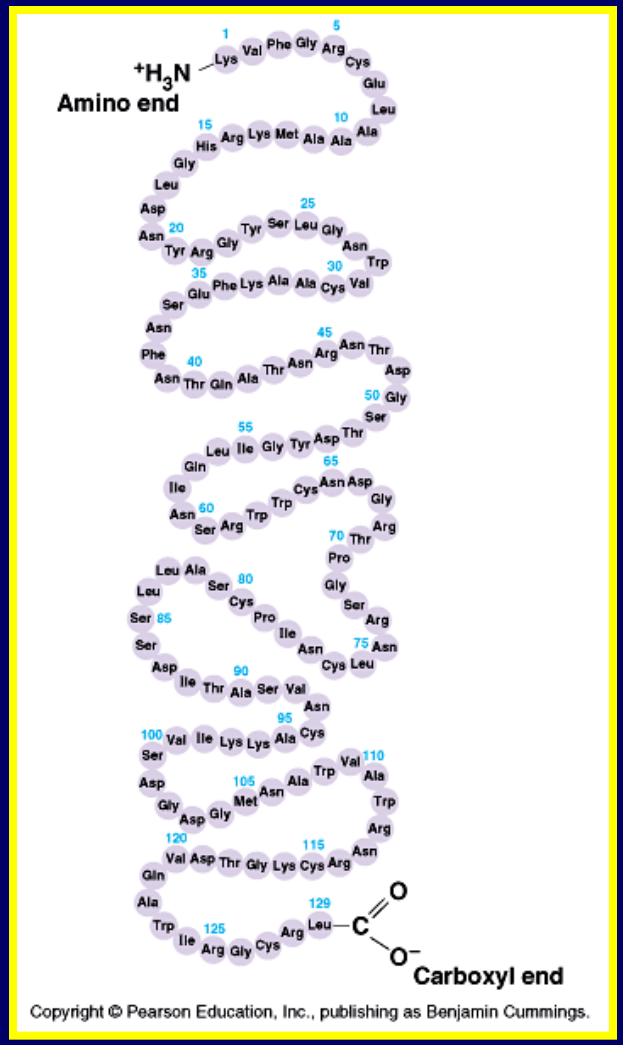


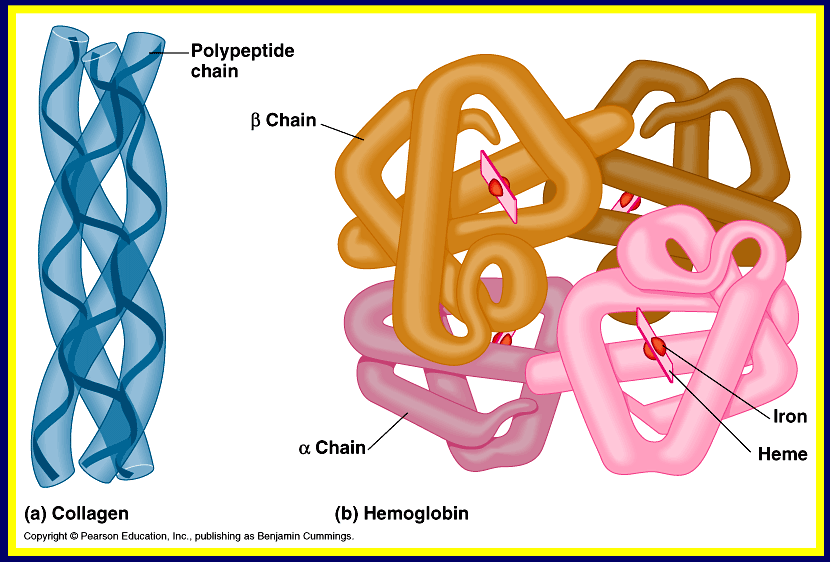
Monomers or subunits are called Amino Acids

Although there are thousands of different types of proteins, they are all formed from only <u>20 amino acids.</u>



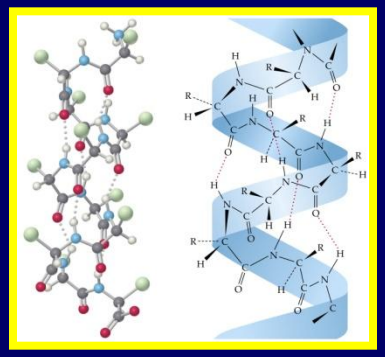
Long chains of amino acids bonded together are called polypeptides and form the primary structure of all proteins



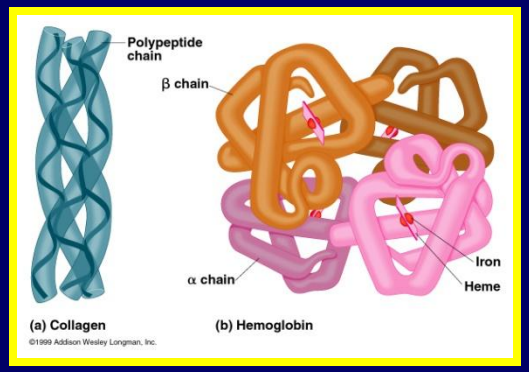


The long polypeptide then folds up to form fibrous type proteins or globular proteins

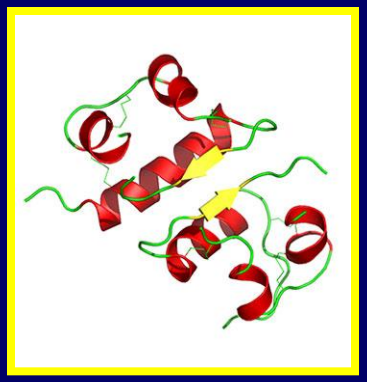
There are around 30,000 different human proteins including insulin, hemoglobin, keratin, collagen, and melanin.



Keratin

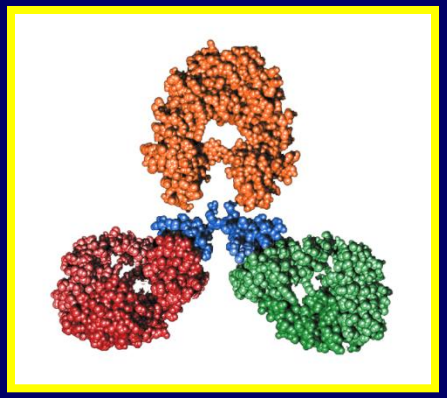


Collagen and Hemoglobin

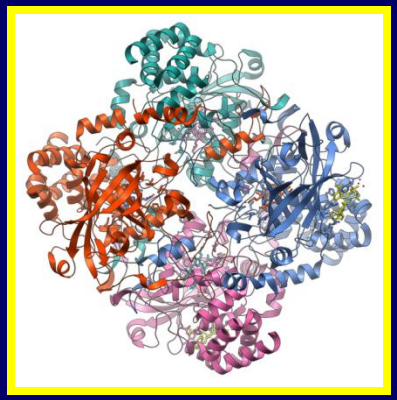


Insulin

Melanin



Antibodies



Catalase Enzyme

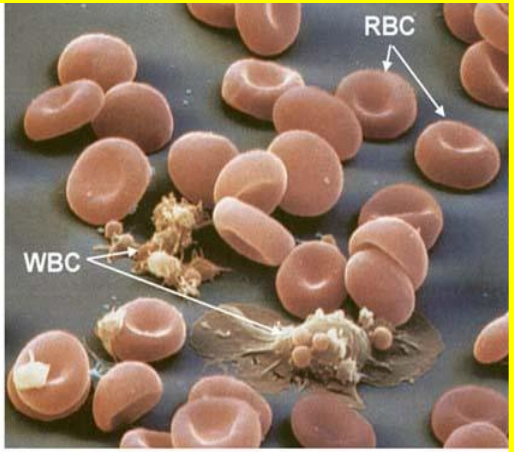
While being the most diverse macromolecule group, proteins provide two main functions: Providing structure and regulating chemical reactions.

Structural Proteins

Hair (keratin)
Fingernails (keratin)
Skin (collagen)
Muscles (myosin, etc.)
Cartilage (glycoprotein: proteins attached to carbohydrates)
Ligaments (collagen plus glycoproteins)
Eye cornea (collagen/keratin)

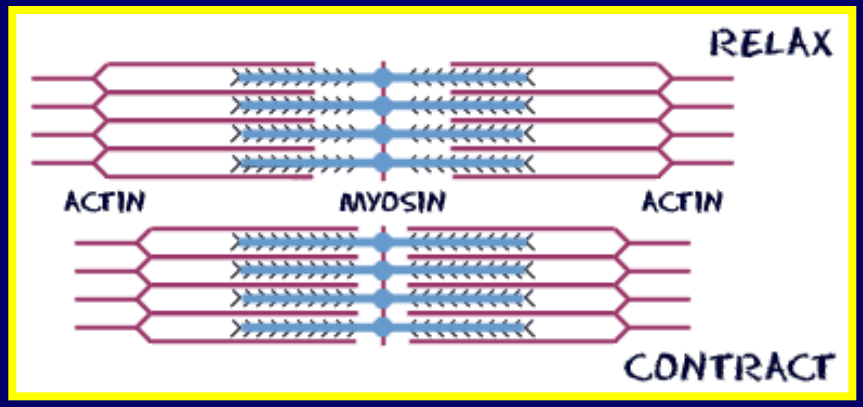
Chemical Proteins

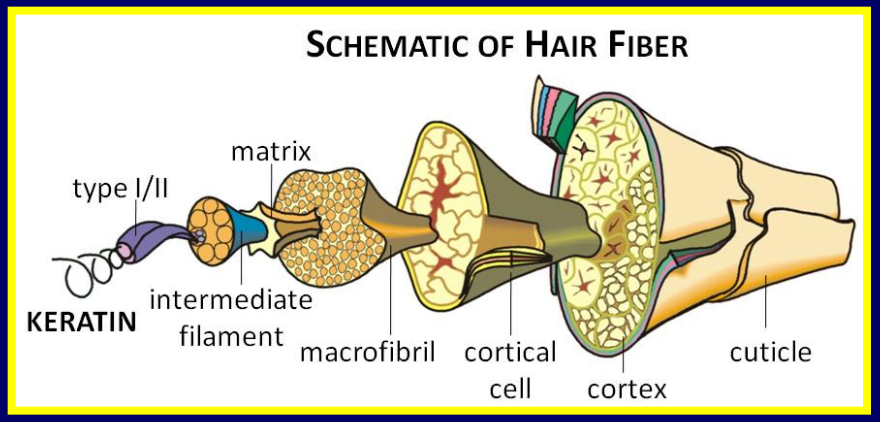
- In red blood cells (RBC), the protein, hemoglobin, carries the oxygen.

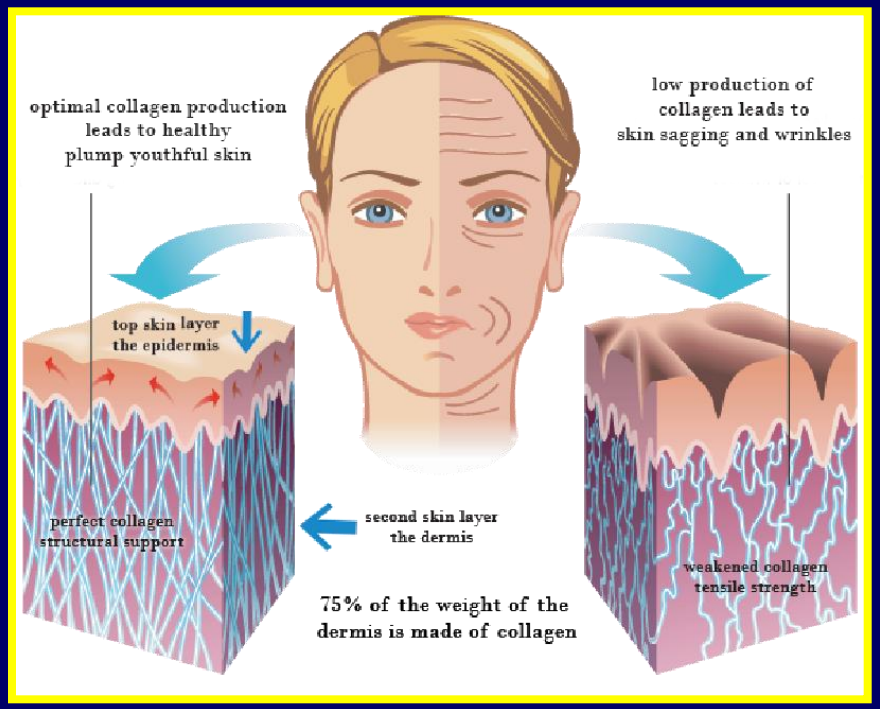


- The white blood cells (WBC) create specialized proteins called antibodies that can neutralize toxic substances in the blood. White blood cells also create hydrogen peroxide to kill bacteria.

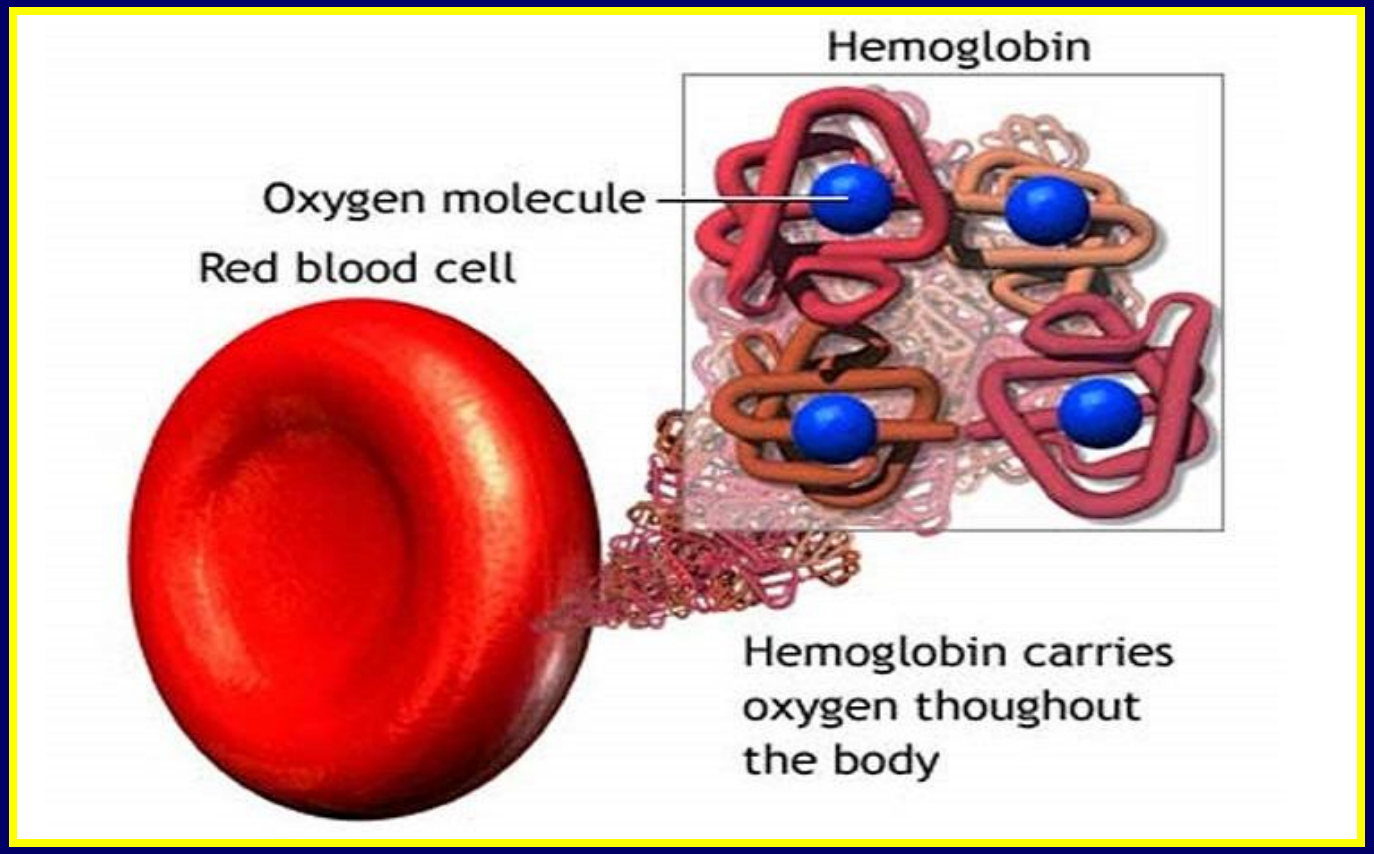
Some structural proteins include: actin and myosin found in muscles, keratin that gives strength to nails and hair, and collagen that makes skin stretch.



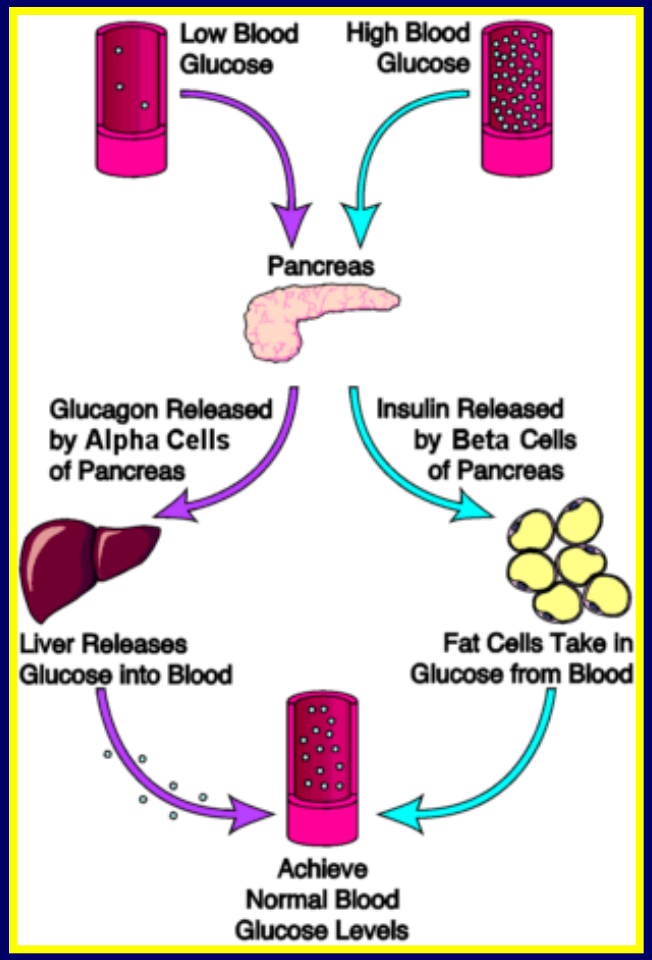




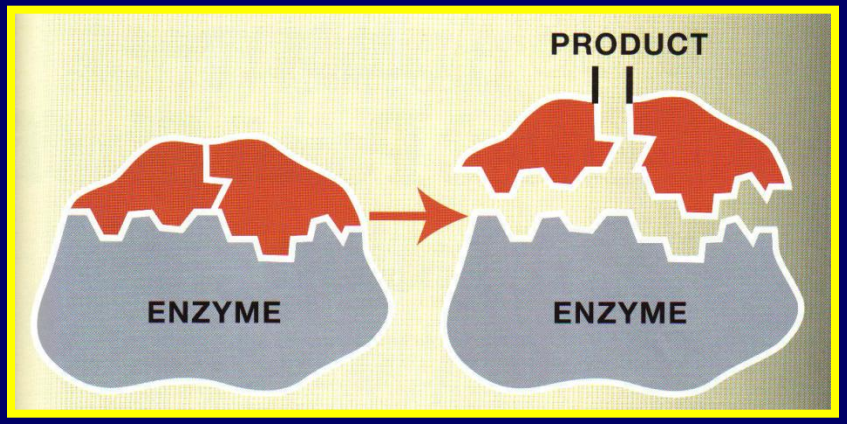
Hemoglobin, a chemical regulator protein, is found in red blood cells where it attaches to and carries oxygen to all the cells in the body.

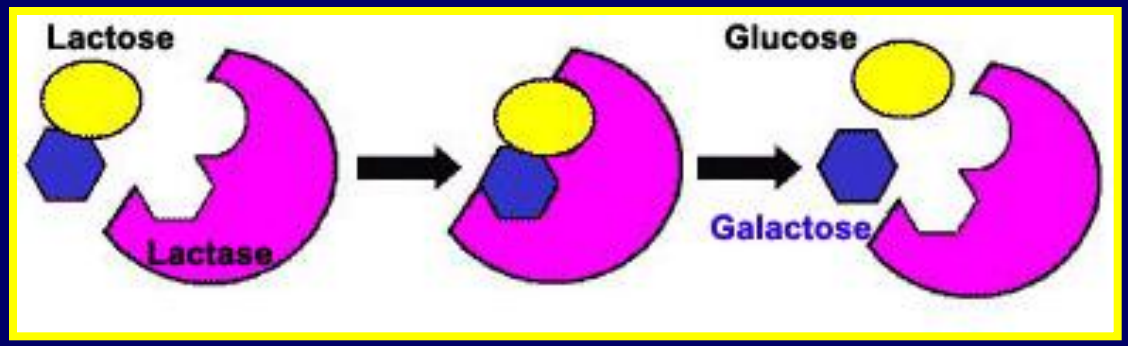


Insulin is a protein that regulates a cell's ability to take in glucose.

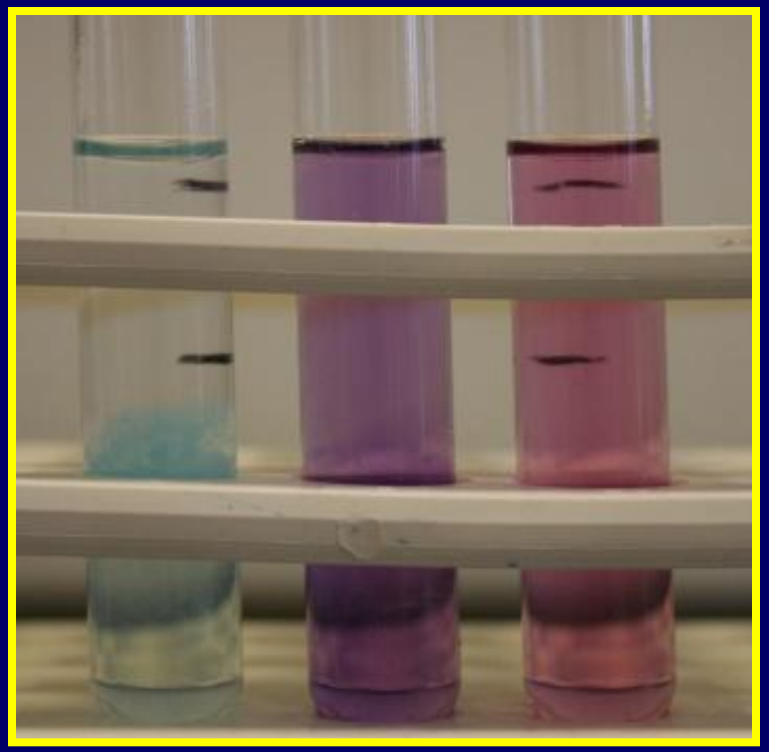


Enzymes are a group of proteins that speed up the rate of biological chemical reactions





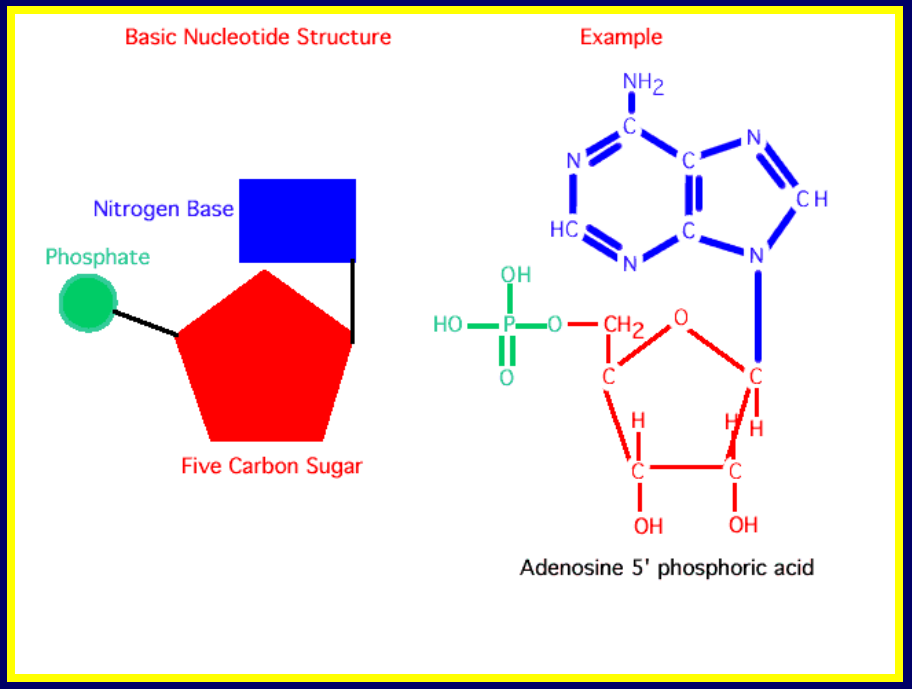
Identification Test for Proteins



Biuret solution turns a lavender color when proteins are present.

Nucleic Acids

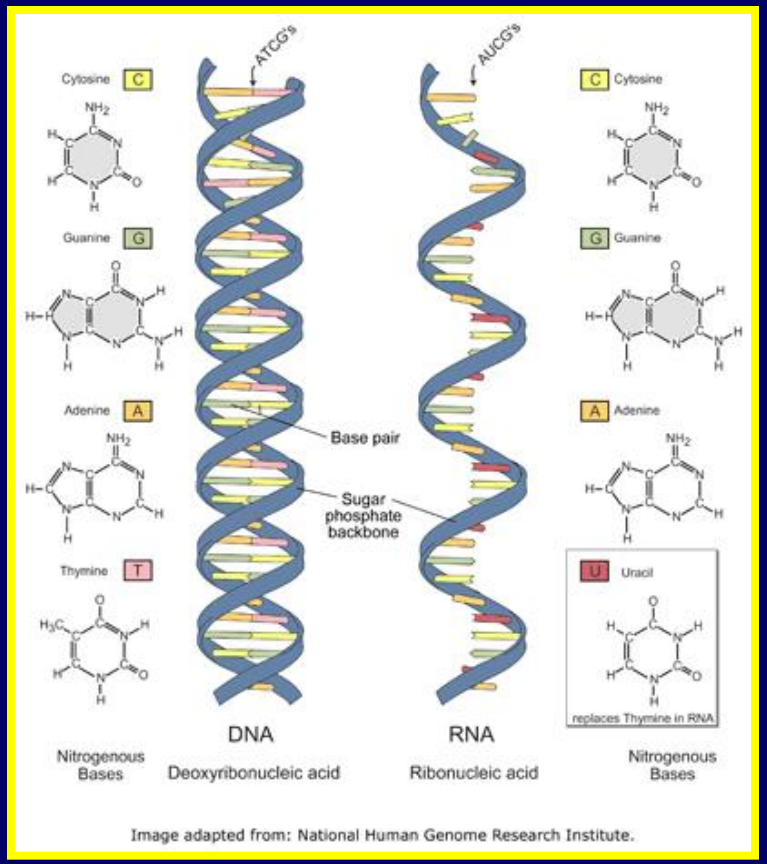
Nucleic acids are made of carbon, hydrogen, oxygen, nitrogen, and phosphorus.



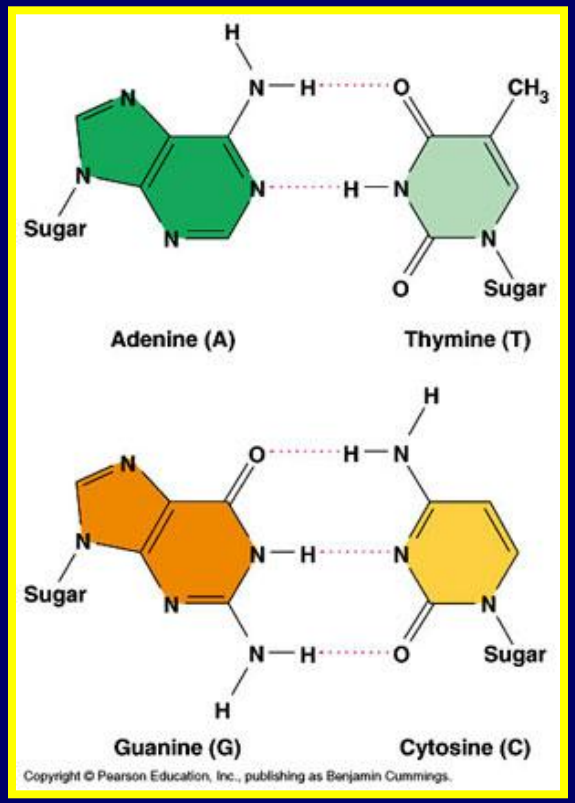
Monomers or subunits are called Nucleotides

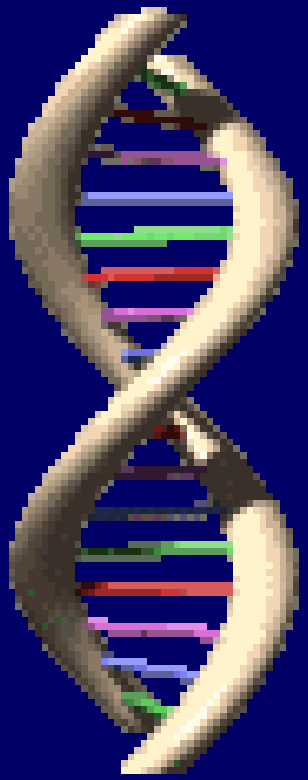
The nucleotides consist of a nitrogen base, a sugar and a phosphate group.

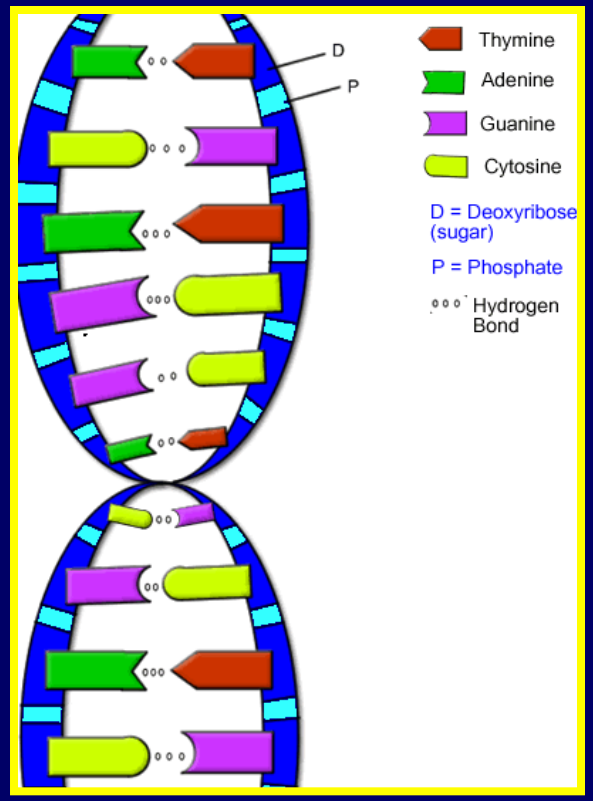
Two types of nucleic acids are Deoxyribonucleic Acid (DNA) and Ribonucleic Acid (RNA)



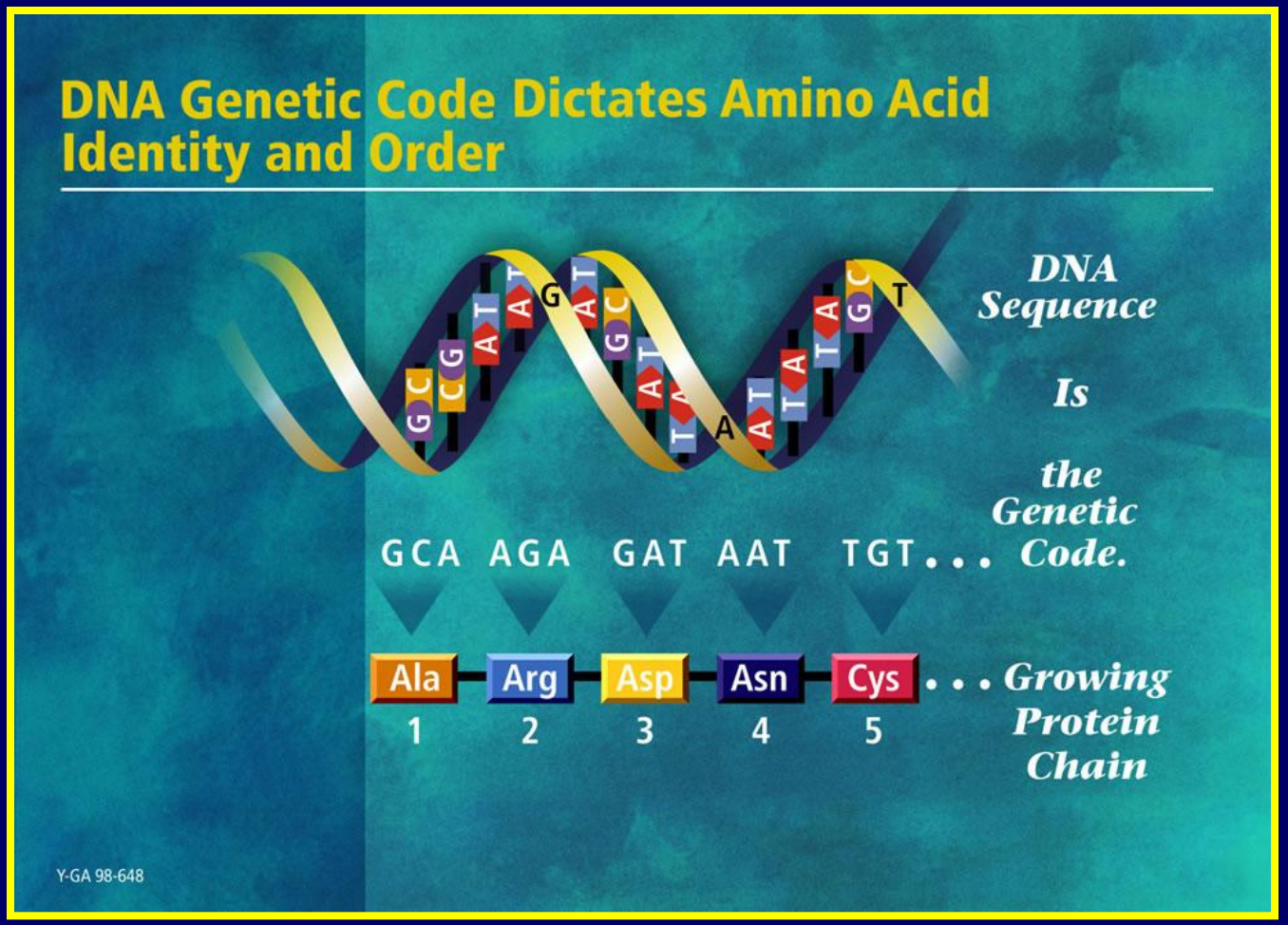
Deoxyribonucleic acid, DNA, contains a sugar called deoxyribose and four different nitrogen bases: adenine, thymine, cytosine, and guanine.

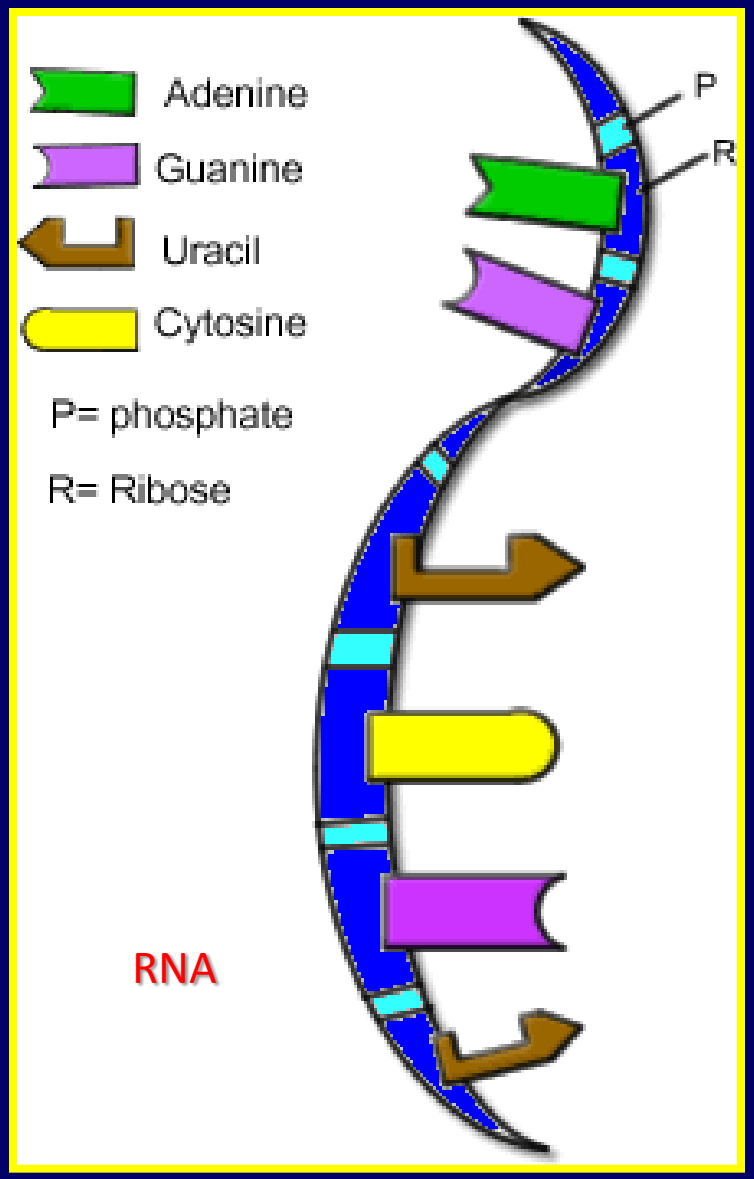






The function of DNA is to carry the genetic code for the production of proteins.



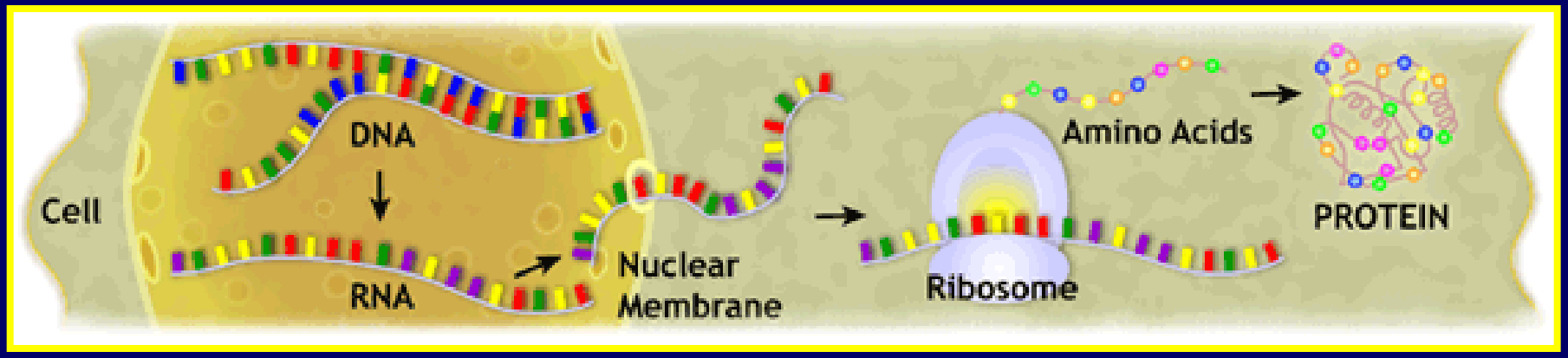


Ribonucleic acid, RNA, consists of a phosphate group, a ribose sugar, and 4 nitrogen bases: cytosine, guanine, adenosine, and uracil instead of thymine.

RNA only has a single strand of nucleotides, instead of two.

R U Single

The function of RNA is to use the genetic code on DNA to assemble amino acids into proteins.



DNA can be collected from any cells that still contain a nucleus through a process called DNA extraction.

The End