CHAPTER 5
MACROMOLECULES

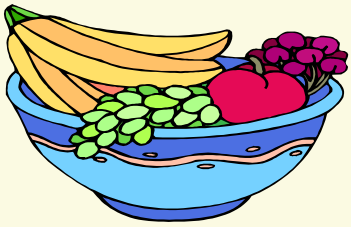
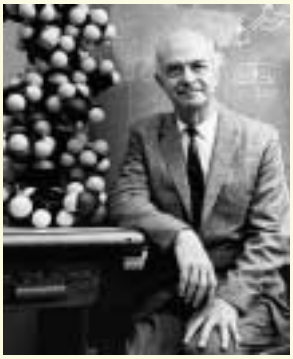
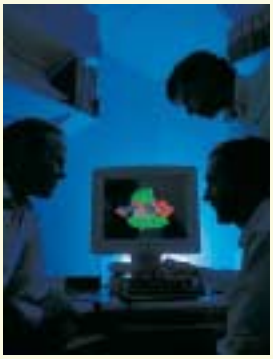


Figure 5.1 Building models to study the structure and function of macromolecules

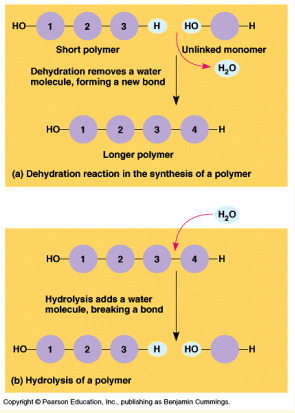




POLYMER PRINCIPLES

- ✔MONOMERS, DIMERSW, POLYMERS
- ✔CONDENSATION REACTION/A DEHYDRATION REACTION, WITH THE LOSS OF WATER, MAKING LARGER MOLECULES.
- ✔HYDROLYSIS, ADDING WATER AND SPLITING LARGE MOLECULES TO MAKE SMALLER MOLECULES.

Figure 5.2 The synthesis and breakdown of polymers



MACROMOLECULES

- ✔CARBOHYDRATES:SUGARS/STARCHES AND CELLULOSE
- ✔LIPIDS: FATS, STEROLS AND WAXES
- ✔PROTEINS: MADE OF AMINO ACIDS
- ✔NUCLEIC ACIDS: DNA, RNA, ATP, FAD, NAD
- ✔ARE WHAT THE STUFF OF LIFE IS MADE OF.
- ✔ALL HAVE FUNCTIONAL GROUPS

CARBOHYDRATES

- ✔MONOSACCHARIDES: FRUCTOSE/GLUCOSE
- ✔ HEXOSE SUGARS WITH 6C
- ✔ PENTOSE SUGARS WITH 5C
- ✔ GLUCOSE METABOLISM
- ✔DISACCHARIDES/DIMERS
- ✔LACTOSE,SUCROSE,MALTOSE
- ✔ALL HAVE GLUCOSE + 1 OTHER MONOMER

Figure 5.3 The structure and classification of some monosaccharides

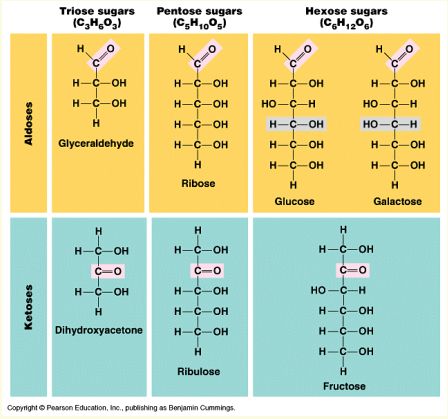


Figure 5.4 Linear and ring forms of glucose

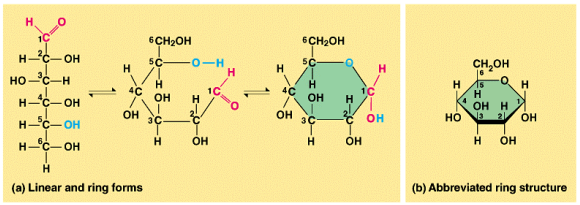
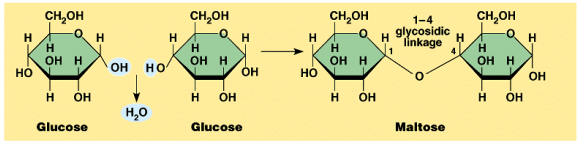


Figure 5.5 Examples of disaccharide synthesis



POLYSACCHARIDES

- ✔AMYLOSE; MANY MALTOSE UNITS
- ✔GLYCOGEN/ANIMAL STARCH
- ✔CELLULOSE/CELL WALLS/COTTON
- ✔DEXTRAN :DEXTROSE
- ✔MAKE DIMERS FROM MONOMERS + WATER
- ✔MAKE MONOMERS FROM DIMERS - WATER
- ✔MANY CHO MOLECULES

Figure 5.6 Storage polysaccharides

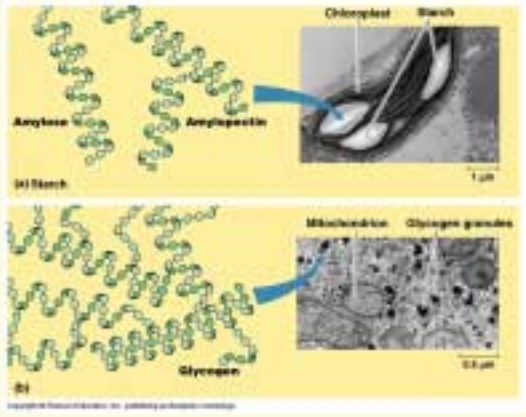


Figure 5.7b,c Starch and cellulose structures

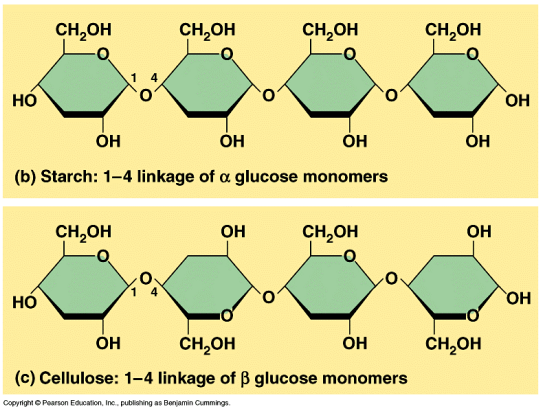
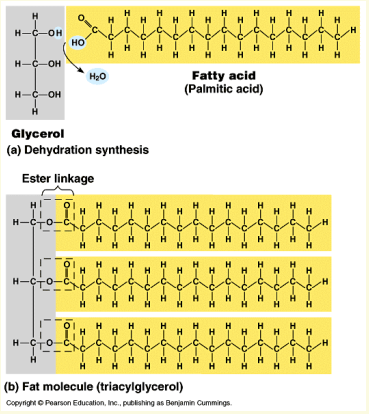


Figure 5.x1 Cellulose digestion: termite and *Trichonympha*

LIPIDS INCLUDE FATS/WAXES

- ✔TRIGLYCERIDES/PHOSPHOLIPIDS /STEROLS
- ✔GLYCEROL + FATTY ACID = TRIGLYCERIDE
- ✔LONG CHAIN OF CARBON ATOMS: C-C-C-C-C-C
- ✔PROVIDES ENERGY
- ✔CELL MEMBRANES/STEROLS/CHOLESTEROL

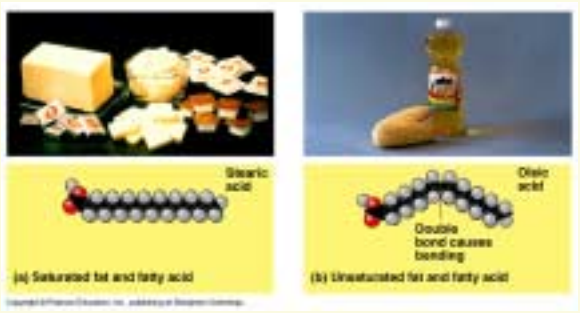
Figure 5.10 The synthesis and structure of a fat, or triacylglycerol



CHARACTERISTICS OF FATS

- ✔SATURATED FATS/SOLID AT ROOM TEMP., BUTTER, LARD AND TALLOW, CARBONS SATURATED WITH CARBONS. C-C-C-C-C-C-C
- ✔UNSATURATED FATS: AT LEAST 1 DOUBLE BOND; MONOUNSATURATED: C=C-C-C, COCONUT, DATE PALM NUT, SOLID AT ROOM TEMPERATUR
- ✔POLYUNSATURATED: 2 OR MORE

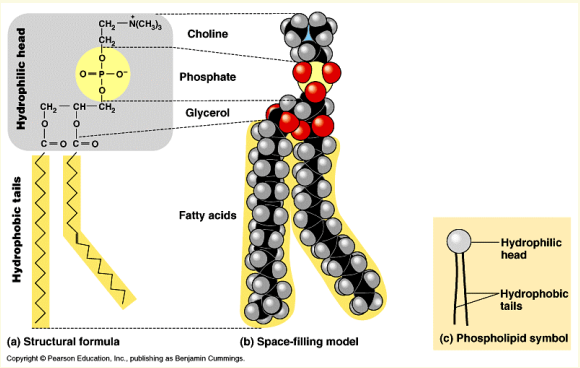
Figure 5.11 Examples of saturated and unsaturated fats and fatty acids



TRANS-FATTY ACIDS

- ✔ARE SEMISOLID, MARGARINES
- ✔VEGETABLE OILS WITH HYDROGEN ADDED
- ✔CRISCO
- ✔OFTEN ASSOCIATED WITH CIRCULATORY DISEASES
- ✔CONTAIN CALORIES LIKE ALL OTHER FATS

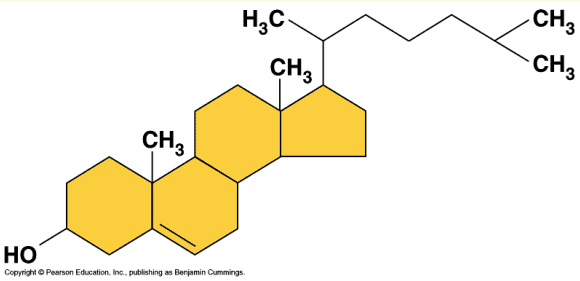
Figure 5.12 The structure of a phospholipid



PROTEINS

- ✔MADE FROM 20 AMINO ACIDS
- ✔PROTEIN TYPES:
- ✔ STRUCTURAL/MUSCLE
- ✔ CARRIER/HEMOGLOBIN
- ✔ HORMONE/INSULIN
- ✔ ANTIBODIES/IMMUNOGLOBULINS
- ✔ ENZYME/SALIVARY AMYLASE
- ✔ IONIC/CARRIER IONS, K+,Na+

Figure 5.14 Cholesterol, a steroid



PROTEIN SYNTHESIS

- ✔DONE BY TRANSCRIPTION/TRANSLATION
- ✔BEGINS WITH DNA IN NUCLEUS/m-RNA
- ✔in transcription m-RNA codes from DNA
- ✔This codon goes to ribosome where t-RNA transfer s code with amino acids: called translation/ peptide bonds are made
- ✔Organism then is made from 6 types of

Figure 5.15 The 20 amino acids of proteins: nonpolar

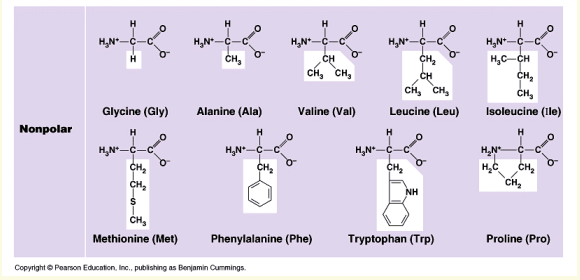


Figure 5.15 The 20 amino acids of proteins: polar and electrically charged

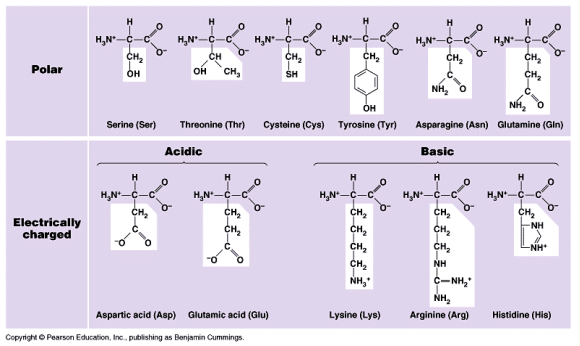


Table 5.1 An Overview of Protein Functions

Table 5.1 An Overview of Protein Functions

Type of Protein	Function	Examples
Structural proteins	Support	Insects and spiders use silk fibers to make their cocoons and webs, respectively. Collagen and elastin provide a fibrous framework in animal connective tissues. Keratin is the protein of hair, horns, feathers, and other skin appendages.
Storage proteins	Storage of amino acids	Ovalbumin is the protein of egg white, used as an amino acid source for the developing embryo. Casein, the protein of milk, is the major source of amino acids for baby mammals. Plants have storage proteins in their seeds.
Transport proteins	Transport of other substances	Hemoglobin, the iron-containing protein of vertebrate blood, transports oxygen from the lungs to other parts of the body. Other proteins transport molecules across cell membranes.
Hormonal proteins	Coordination of an organism's activities	Insulin, a hormone secreted by the pancreas, helps regulate the concentration of sugar in the blood of vertebrates.
Receptor proteins	Response of cell to chemical stimuli	Receptors built into the membrane of a nerve cell detect chemical signals released by other nerve cells.
Contractile proteins	Movement	Actin and myosin are responsible for the movement of muscles. Other proteins are responsible for the undulations of the organelles called cilia and flagella.
Defensive proteins	Protection against disease	Antibodies combat bacteria and viruses.
Enzymatic proteins	Selective acceleration of chemical reactions	Digestive enzymes catalyze the hydrolysis of the polymers in food.

Figure 5.16 Making a polypeptide chain

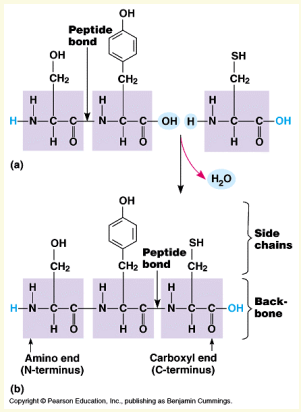
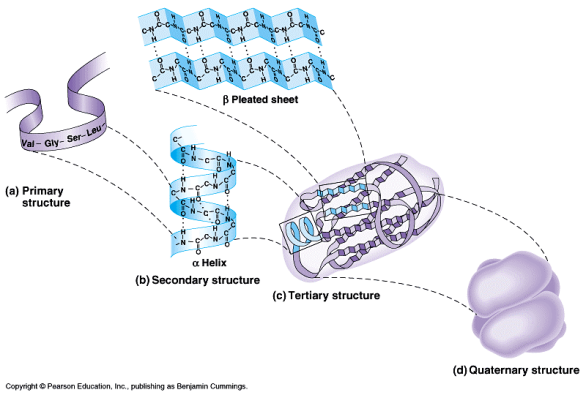


Figure 5.24 Review: the four levels of protein structure



MAKING A HAIR PROTEIN

- ✔DNA CODES TO m-RNA/CODES FOR HAIR COLOR AND STRUCTURE
- ✔PROTEIN SYNTHESIS
- ✔PROTEIN KERATIN FOR HAIR STRUCTURE
- ✔PROTEIN MELANIN FOR HAIR COLOR

ONE GENE/ONE ENZYME THEORY

- ✔LACTOSE INTOLERANCE
- ✔REQUIRES 3 ENZYMES TO CONVERT LACTOSE TO GLUCOSE AND GALACTOSE.
- ✔GLUCOSE IS NEEDED ENERGY SOURCE.
- ✔PTC/PORPHYRIA CUNEATA TARDIA
- ✔ IRON EXCESS ON PHORPYRINS
- ✔ SKIN BLISTERS

NUCLEOTIDES

- ✔DNA, RNA, ATP, NAD,FAD
- ✔DNA HAS 4 NUCLEOTIDES
- ✔EACH NUCLEOTIDE HAS PHOSPHATE, RIBOSE SUGAR, AND 4 NITROGEN BASES; A-T,C-G.
- ✔m-RNA, t-RNA DIFFER IN SHAPE, FUNCTION, RIBOSE SUGAR AND HAS U INSTEAD OF T.
- ✔ATP IS ENERGY CARRIER IN CELLS

Figure 5.28 DNA→ RNA → protein: a diagrammatic overview of information flow in a cell