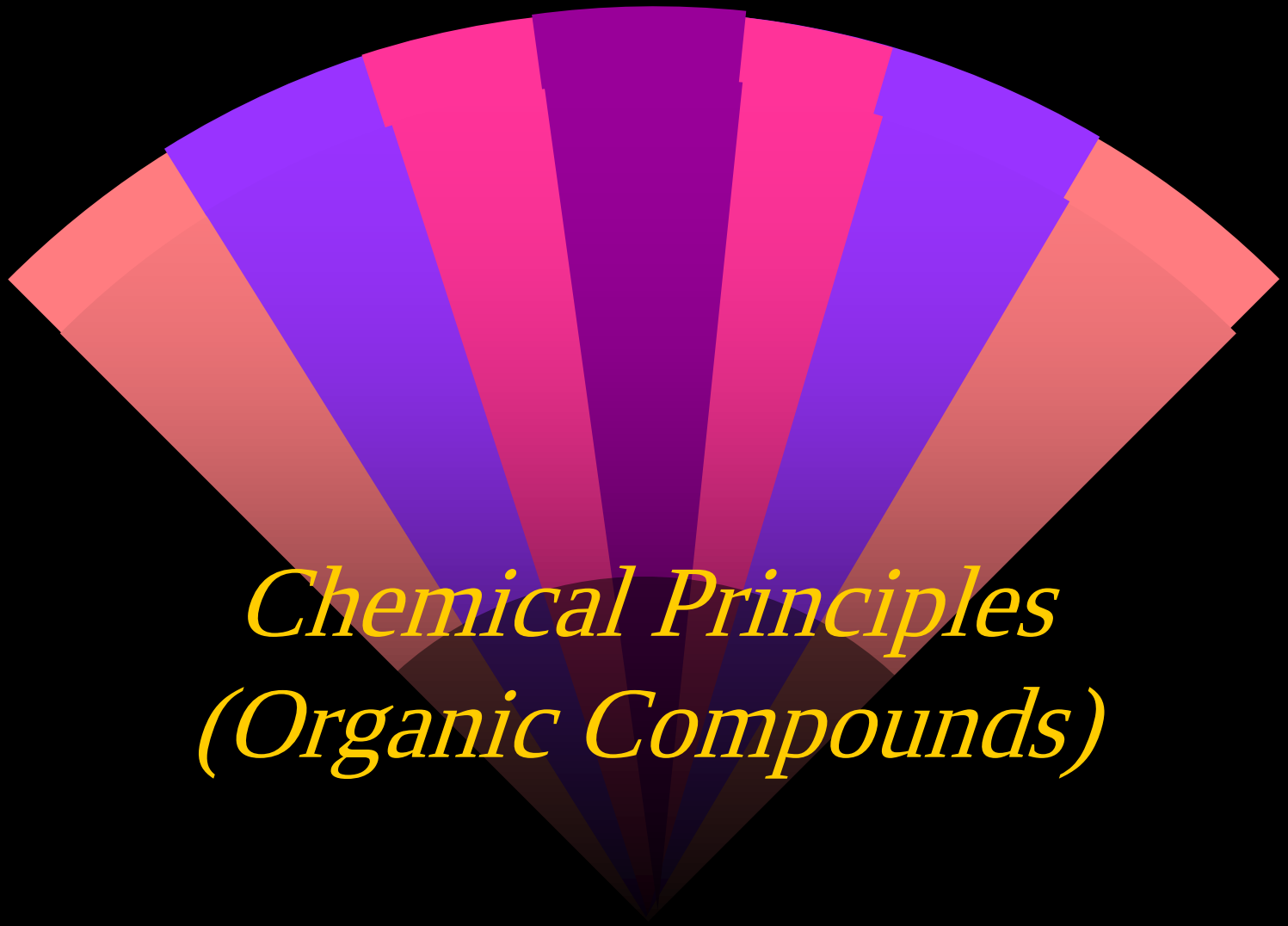


Chemical Principles (Organic Compounds)

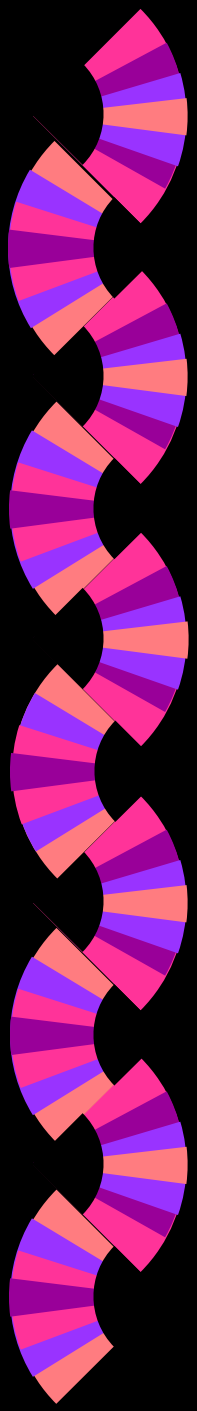
Chapter 2

Organic Compounds

- Contain Carbon and Hydrogen
- Compounds of Life
- Biologic Molecules

4 Groups of Organic Compounds

- 1. Proteins
- 2. Carbohydrates
- 3. Lipids
- 4. Nucleic Acids



Synthesis and Hydrolysis

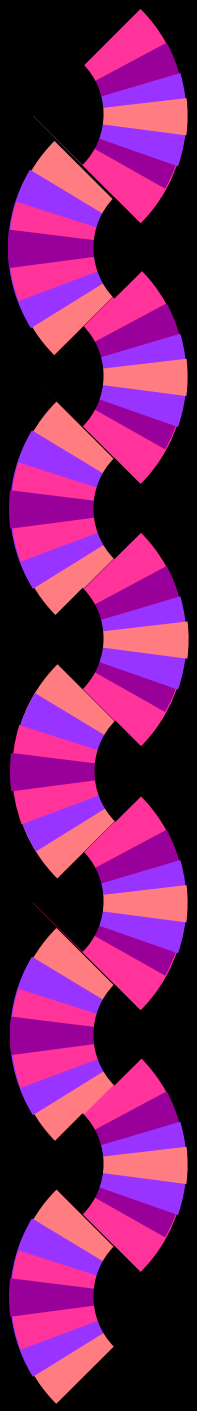
Proteins

- Enzymes, carrier molecules, hormones, antibodies, cell wall, cell membrane
- Over 50 % of a cells dry weight is Protein
- Basic Unit Molecule
  - Amino acids - 20 amino acids found in living systems

Amino acid structure

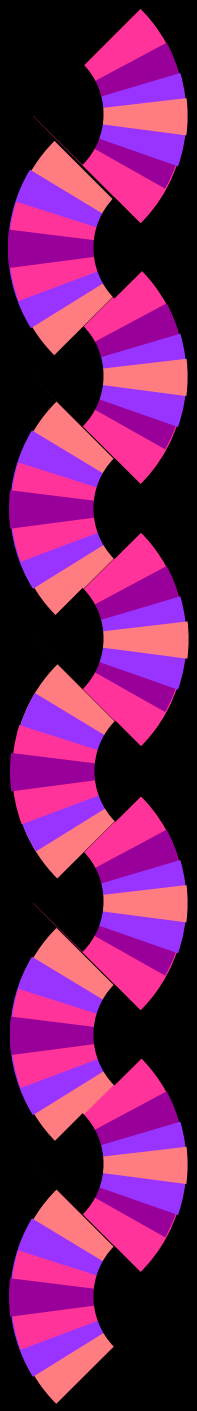
- AA-AA — Dipeptide
- AA-AA-AA — Tripeptide
- AA-AA-AA-AA — Tetrapeptide
- AA-AA-AA-AA-AA — Polypeptide

- Bond between Amino acids - Peptide Bond



Levels of Structure

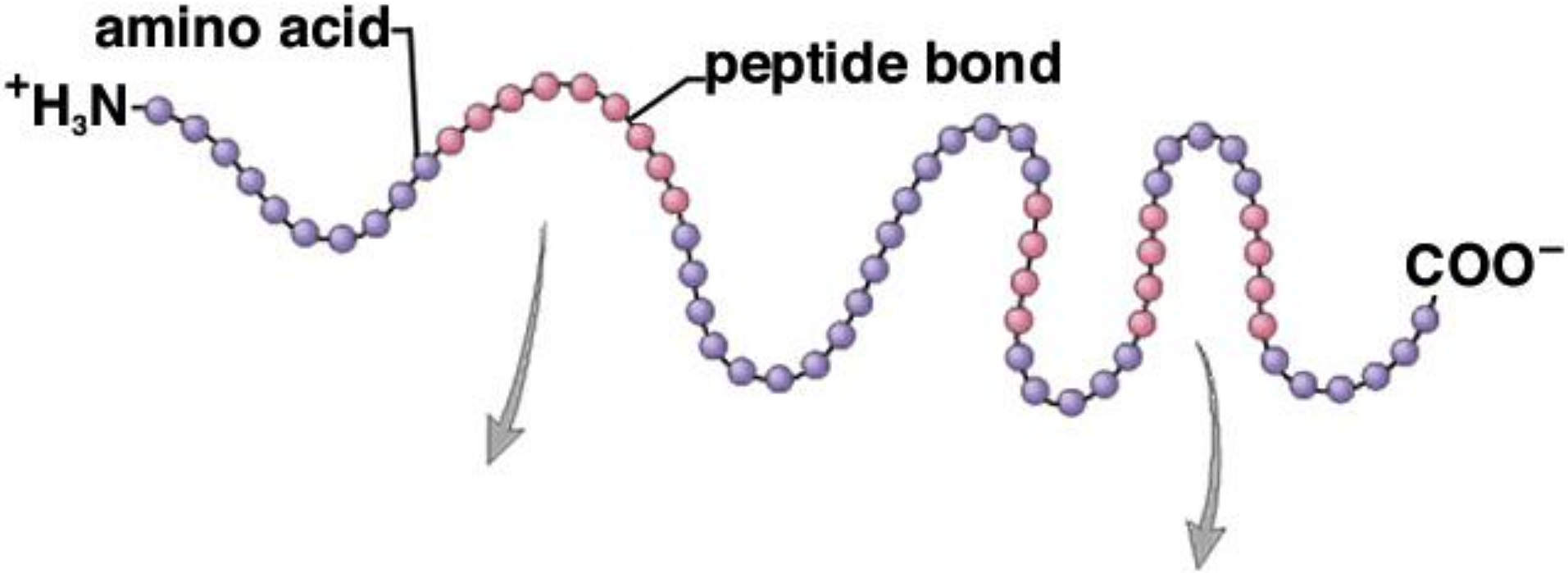
- 1. Primary
- 2. Secondary
- 3. Tertiary
- 4. Quaternary



Primary Level of Structure

- The linear sequence of Amino acids

Levels of protein organization — Primary structure

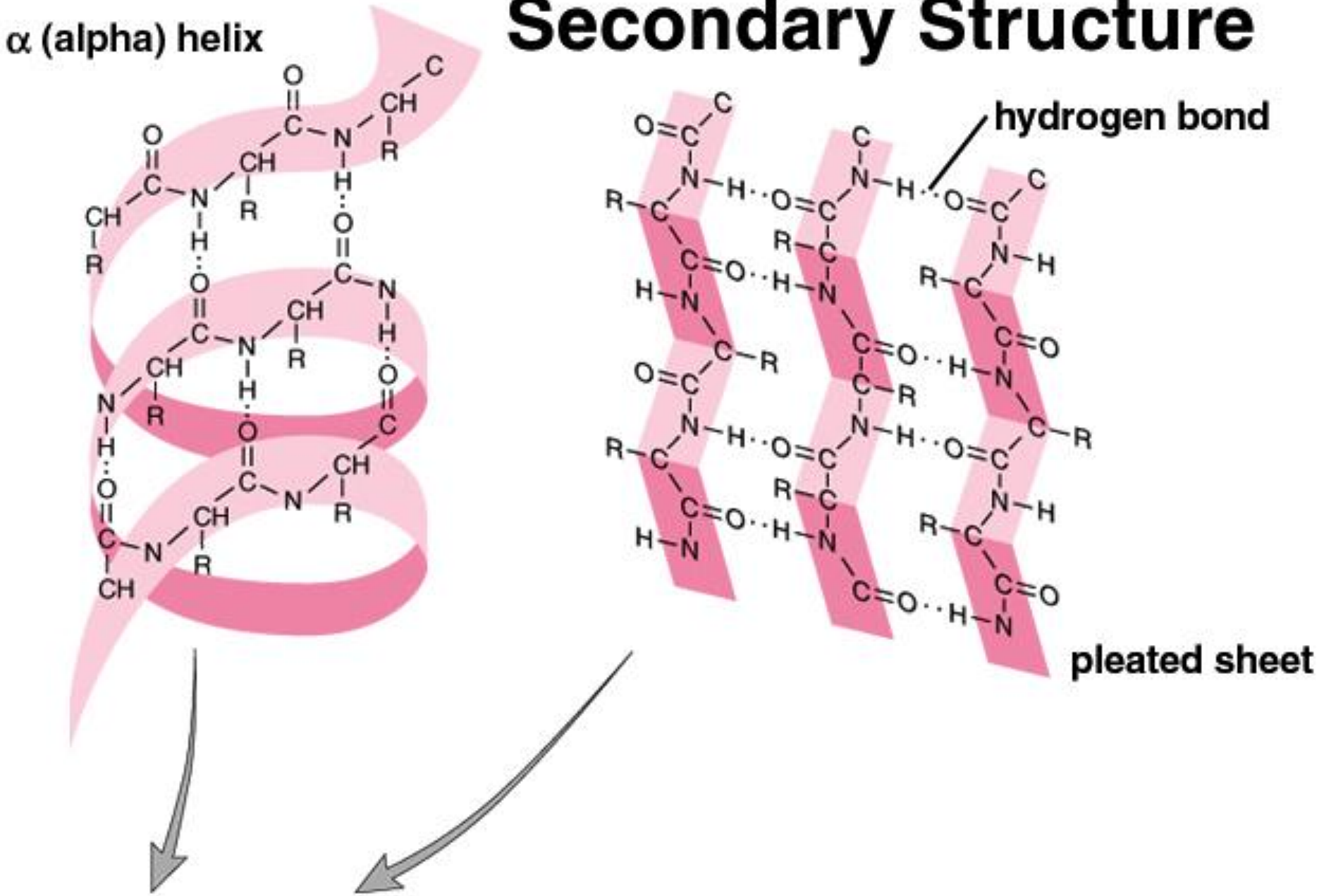


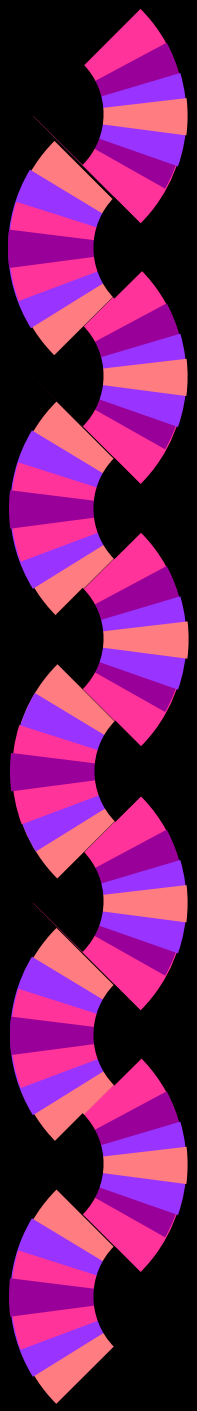
Secondary Level of Structure

- When the a chain of polypeptides takes on a specific orientation in space

- 2 Main Types
  - Alpha Helix
  - Beta Pleated Sheet

Levels of protein organization — Secondary Structure

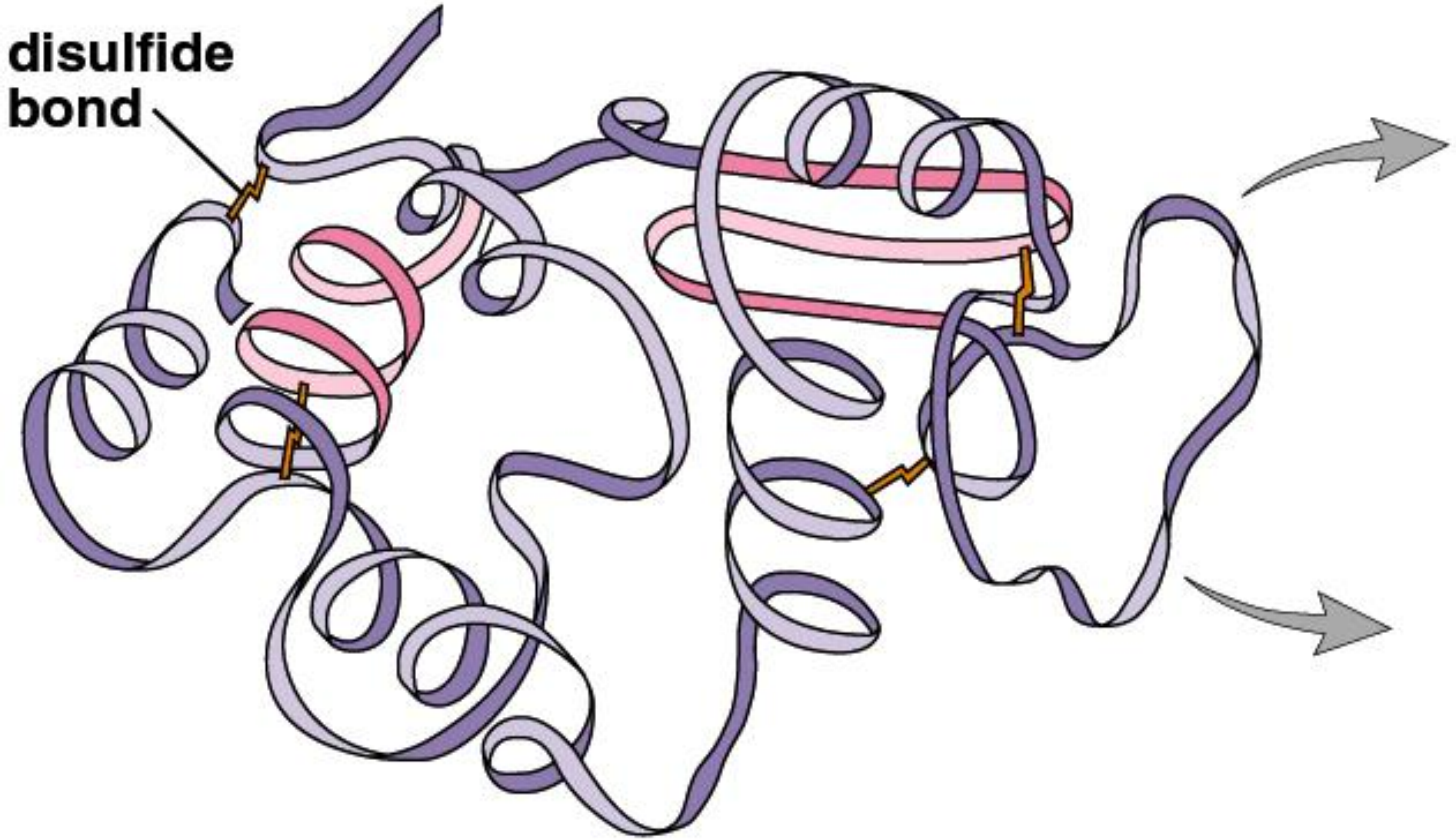




Tertiary Level of Structure

- Final 3 dimensional configuration
- Held together by many different bonds:
  - peptide
  - ionic
  - hydrogen
  - covalent
  - sulfhydryl

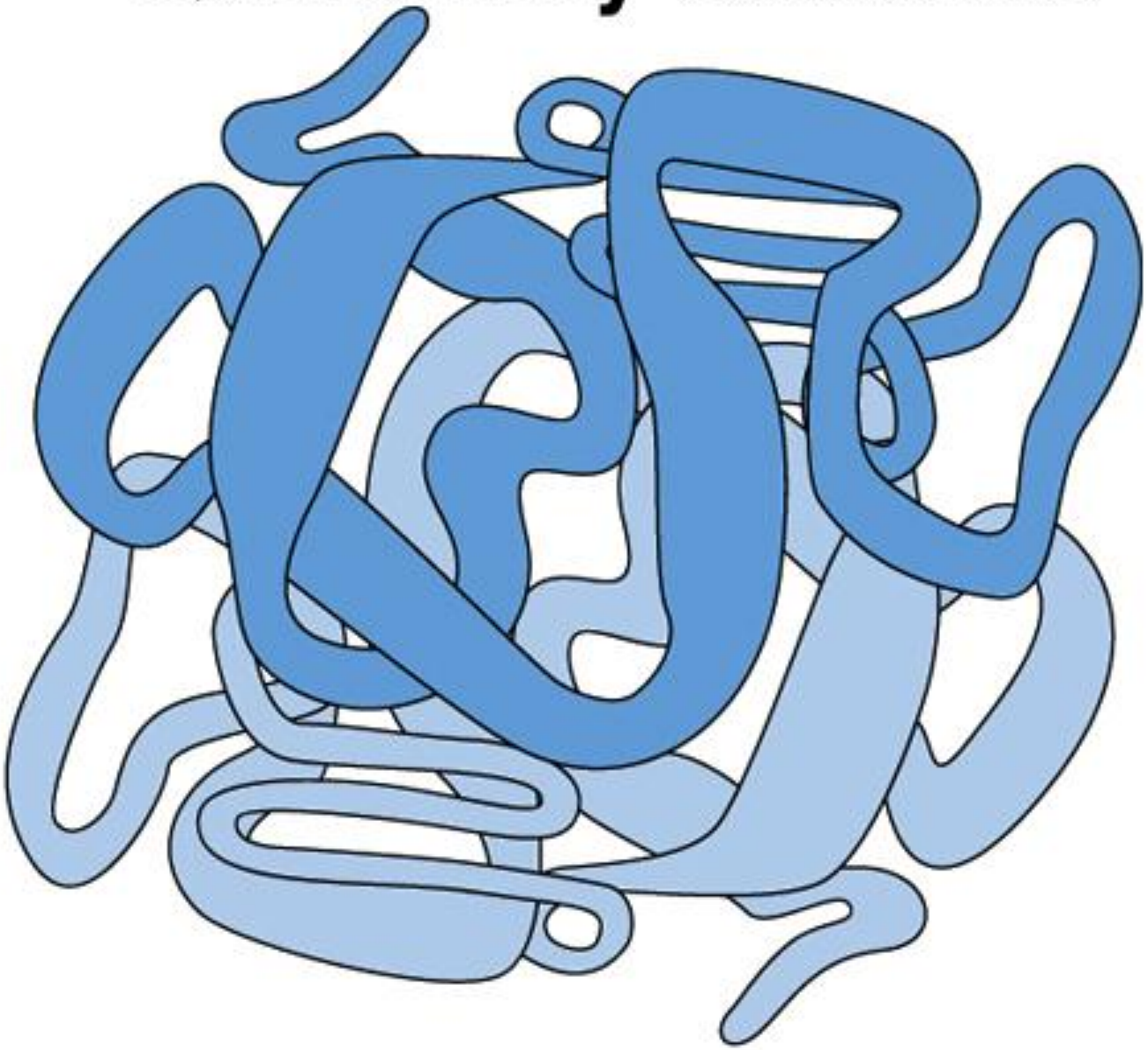
Levels of protein organization — Tertiary Stucture

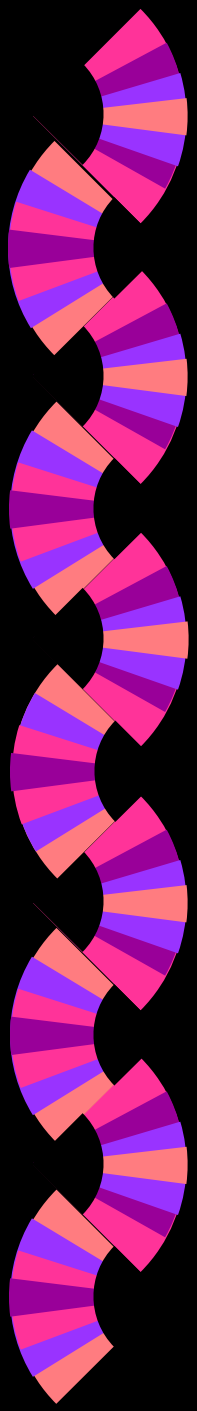


Quaternary Level of Structure

- When 2 or more proteins come together to form a functional unit

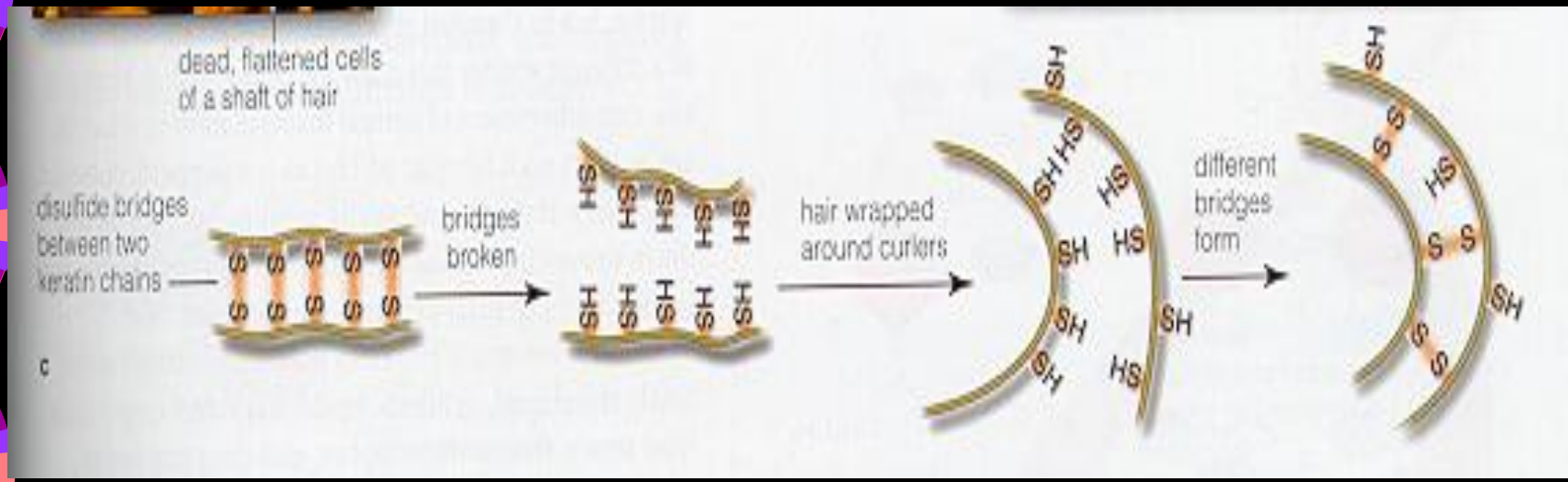
Levels of protein organization — Quaternary Structure





Denatured

- Temperature
- pH
- salt concentrations
- heavy metals


dead, flattened cells
of a shaft of hair
disulfide bridges
between two
keratin chains
bridges
broken
hair wrapped
around curlers
different
bridges
form
c

Simple vs. Conjugated Proteins

- Simple proteins - contains only amino acids
- Conjugated proteins - amino acid with another component
  - Glycoprotein
  - Nucleoprotein
  - Lipoprotein
  - Phosphoprotein

Carbohydrates - sugars and starches

- C, H, O
- Ratio of H to O
- 2 : 1
- Hydrates of carbon

- Functions
  - Fuel for cell activity
  - food reserve (starch)
  - part of bacterial cell wall
  - part of DNA and RNA (deoxyribose and ribose)

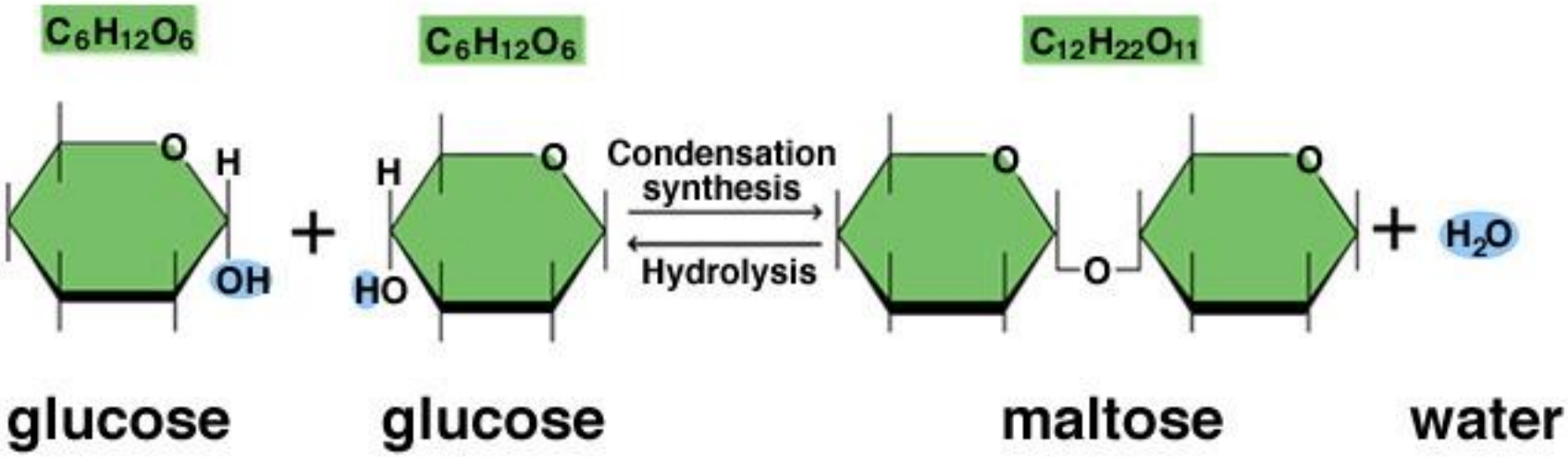
Monosaccharides - simple sugars

- Contain from 3 to 7 carbons
  - Trioses 3 carbons
  - Tetroses 4 carbons
  - Pentoses 5 carbons
  - Hexoses 6 carbons
  - Heptoses 7 carbons
- Glucose, Fructose, Galactose

Disaccharides - 2 monosaccharides

- Glucose + Fructose = Sucrose
- Glucose + Galactose = Lactose
- Glucose + Glucose = Maltose

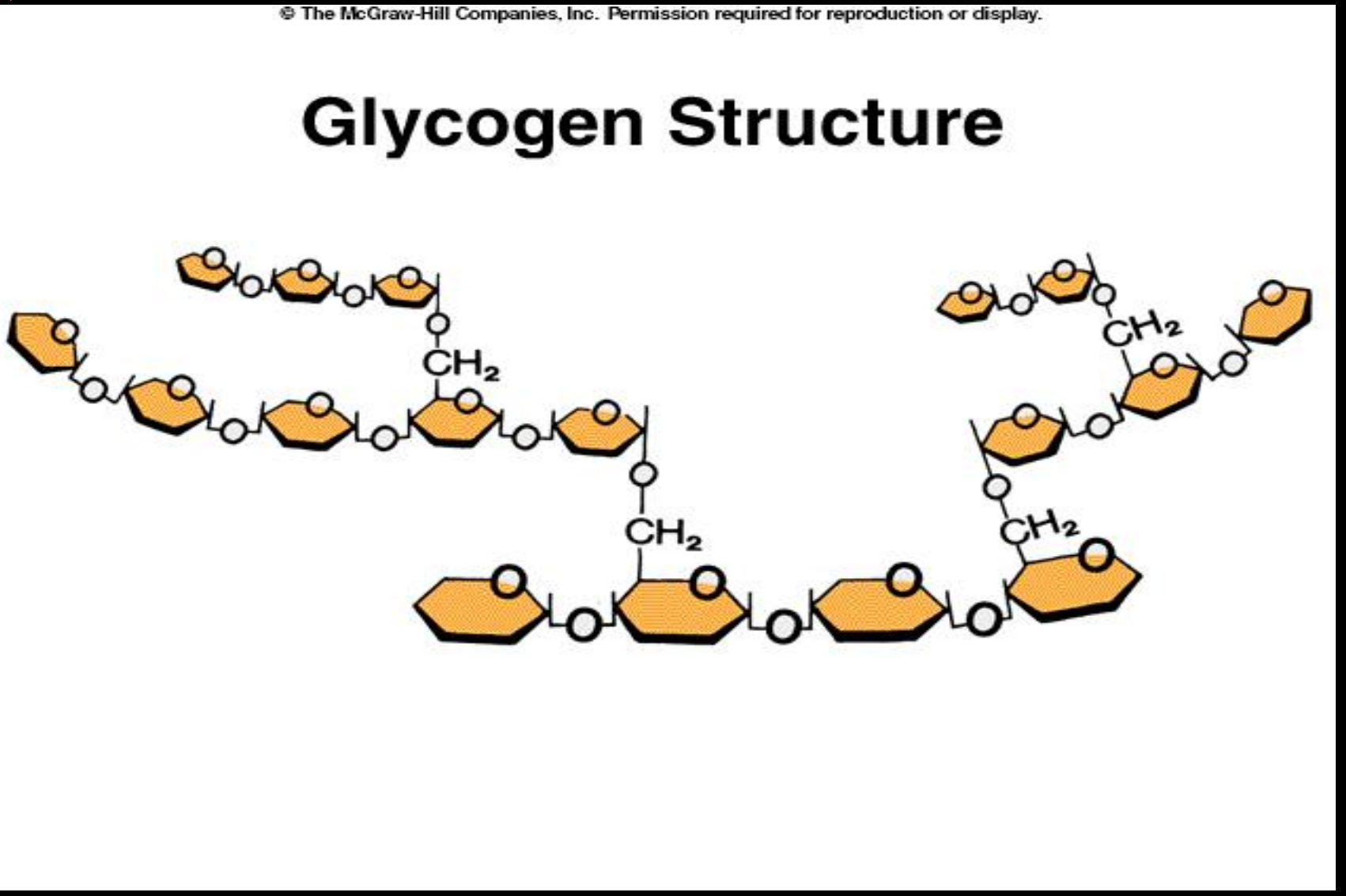
Condensation synthesis and hydrolysis of maltose, a disaccharide



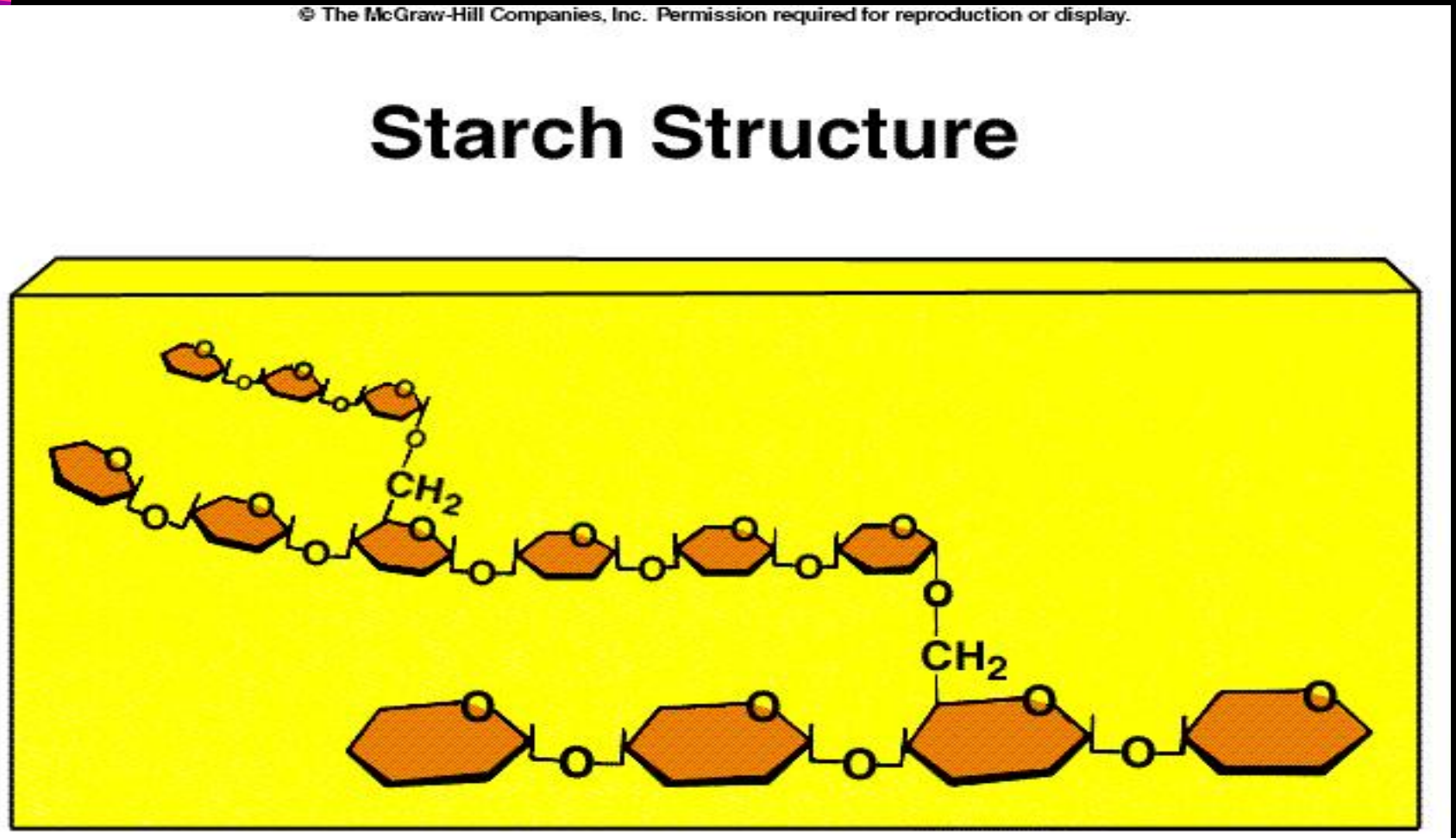
Polysaccharides - a chain of monosaccharides

- 1. Glycogen
- 2. Starch
- 3. Cellulose

- 1. Glycogen - storage form of glucose for animals and some bacteria



2. Starch - storage form of glucose in plants



- 3. Cellulose - main structural component of plant and algae cell walls

Cellulose Structure

Lipids - fats and oils

- C, H, O (but lack the 2:1 ratio found in carbohydrates)
- wide variety of lipids, but all are non-polar

- Function
  - energy storage
  - structure of cell membrane and cell wall

Simple Lipids (fats)

- 1 Glycerol
- 3 Fatty acids

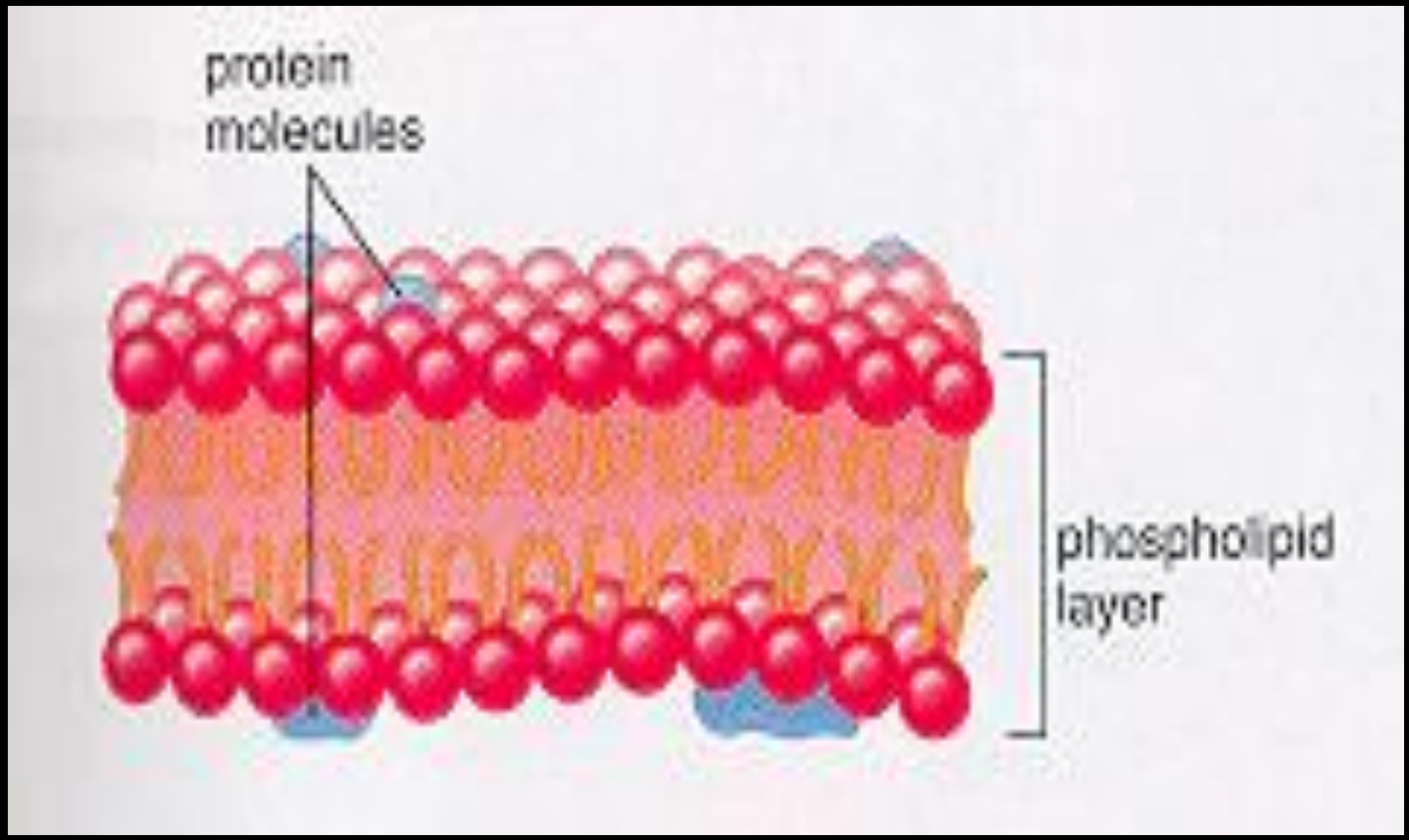
Triglyceride

- Fatty acids
  - saturated
  - unsaturated

Phospholipid - Complex Lipid

- Phosphate group replaces one of the Fatty Acids
- Polar head & non-polar tail
- Main structural component of the cell membrane

Cell Membrane

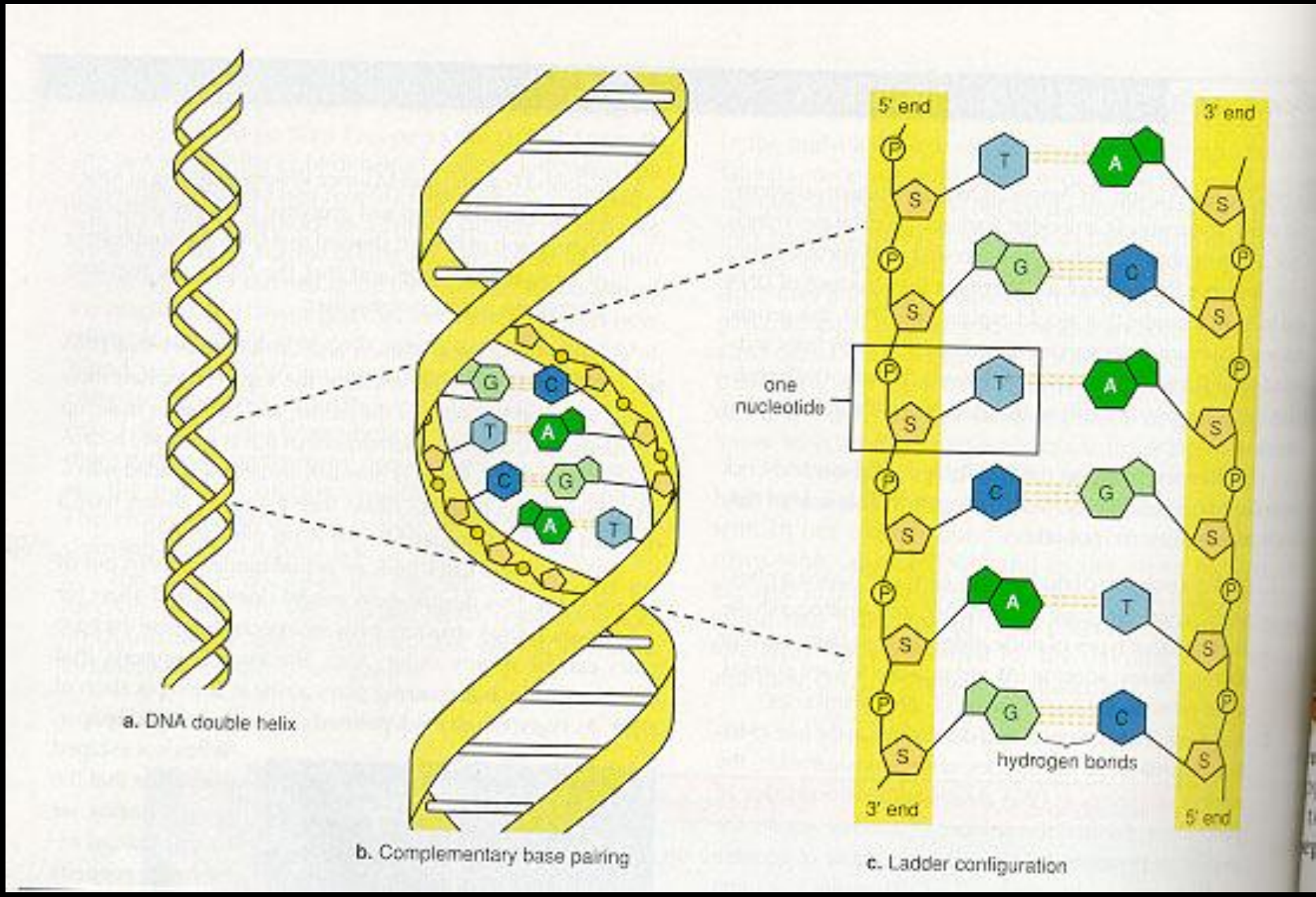


Nucleic Acids

- DNA - deoxyribonucleic acid
- RNA - ribonucleic acid

- Basic Unit - Nucleotide

- Nucleotide
  - phosphate
  - pentose sugar
  - nitrogenous base


5' end
3' end
one nucleotide
hydrogen bonds
3' end
5' end
a. DNA double helix
b. Complementary base pairing
c. Ladder configuration

ATP - Adenosine triphosphate

- Energy carrying molecule of the cell
- ATP cycle