

## Chapter 1 KeyTerms

### Polymers

Proteins, carbohydrates, lipids(fats), nuclear acid(DNA/RNA),

Is a chain of many monomers linked together.

Mono = one

Di = two

### Monomers

Amino acids, sugars, fatty acids, nucleatoids

Made:(Dehydration synthesis) or broken down(Hydrolysis) over in living cells

### MacroMolecules

Large Polymers called macromolecules

Formed by monomers joining, through loss of water called pelydatiation synthesis

### Dehydration Synthesis (DS)

Monomers are joined in dehydration synthesis

Chains of monomers are Polymers

Enzymes that speed up DS, are called dehydrogenases

### Hydrolysis

Polymer breaking into units is hydrolysis

Enzymes that speed it up are called hydrolases

## Lipids

### Lipids

Made up of C,H,O

Large molecules that are insoluble in water

### Neutral Fats

### Triglycerides

## Lipids (cont)

Made up of 3 fatty acids bonded to one glycerol

Fatty acids contain a long chain of 16-18 carbons with an acid on the end

Glycerol is small 3 carbon chain with 3 alcohol (OH) groups

Butter, animal fats molecules bind together through dehydration synthesis

### Types of Triglycerides

#### Saturated Fats

No double bonds in the carbon fatty acid chains

Filled with hydrogens

Unhealthy

Mostly come from animals

Become solid at room temperature

Examples:Lard, butter, animal fats

#### Unsaturated Fats

There is one monounsaturated or more double bonds oolyunsaturated

Mostly come from plants

Liquid at room temperature

Healthy

Example:Olive oil, Corn oil, Palm oil

#### Phospholipids

Used to make up two layered cell membraines in cells

The third fatty acid group of a triglyceride is replaced by an inorganic phosphate group

^ This creates a polar end

#### Polar End

Phosphate end is water soluble:HydroPhilic

## Lipids (cont)

Fatty Acids is not water soluble:Hydrophobic

### Steroids

Very different structure from lipids but are also water isoluble

Made up of 4 carbon ring molecules fused together

Example:Testosterone, estrogen, cholesterol, and vitamin D

Used as sex hormones

### Uses of Lipids

Long term storage for energy

Better energy storage than glycogen or starch

Insulation and protection in animals

Making hormones(Steroids)

Structure of cell membranes.

Without lipids we would have no cells

## DNA RNA difference

DNA	RNA
Nitrogen base:ATGC	Nitrogen Base:AUGC
Sugar:deoxy ribose	Sugar:ribos
Double stranded	Single stranded
1 type	2 types:mRNA - Messenger rRNA - Ribosomal rRNA - Transfer
Forms double helix	No helix
DNA makes DNA	DNA makes RNA
Very bid molecule	Much smaller molecule

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## Adenosine Triphosphate

### ATP

ATP also has nuclear acid has same structure as nucleotide

Only three phosphate groups instead of one

Energy source for the body

### Adenosine Triphosphate

#### Cellular Respiration

Mitochondria turn energy of glucose into ATP

It takes a lot of energy to put two phosphate molecules together

When you break the bond a lot of energy is released

$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + \text{energy}$   
(Heat and ATP)

## Monomer Polymer Building Blocks

Monomers (Sub units)	Polymers
Sugars	Polysaccharides
Fatty Acids	Eats/Lipids/Membranes
Amino Acids	Protiens
Nucleotides	Nuclear acids
Cycle	
Polymers	
	Carbohydrates
	Protiens
	Lipids(Fat)
	DNA/RNA(Nuclear acids)
Go through H <sub>2</sub> O Energy (Hydrolysis)	
Monomers	
	Simple Sugar
	Amino Acids
	Fatty Acids @ Glycerol

## Monomer Polymer Building Blocks (cont)

### Nucleotides

Go through H<sub>2</sub>O Energy Dehydration Synthesis

Reactions require

ATP energy

Water

Enzymes

Cycle Continues

## Proteins

### Proteins

Made up of C,H,O and N

No set ratio

Made up of chains of Amino acids (Usually 75 or more)

Amino acid chains formed through dehydration synthesis

40% of the human body is made of protein

Building blocks of Proteins are Amino acids

Amino group (NH<sub>2</sub> or NH<sub>3</sub>) acts as a base (Accepts H<sup>+</sup>)

Carboxyl group (COOH or COO<sup>-</sup>) acts as an acid (Donates H<sup>+</sup>)

R Group: There are 20 different possibilities

Amino acids bond through dehydration synthesis

The amino acids bind together with a peptide bond

## Proteins (cont)

Peptide bond is formed between C and N no water is lost (Dehydration Synthesis)

When original two amino acids form beginning of the chain with one peptide bond is called a Dipeptide

It can grow and become a Tripeptide

End state is Polypeptide (30 and 30,000 amino acids)

Another name fro polypeptide is Protein

Every protein is different because the order of amino acids is different

Or order of different R groups and how they bond

They also function differently

Levels of Protein Structure

### Primary Structure

First level of how proteins are formed

Order of amino acids joined together with peptide bonds

Amino acids sequence tgat determine the nature and chem of protein

### Secondary Structure



## Proteins (cont)

Second step in forming protein

When peptide bond is formed, a double bonded oxygen is left over.

Attracted to positive NH<sub>3</sub> amino group from other amino acids in the chain

This attraction forms a hydrogen bond

This causes the chain to twist called alpha helix or a beta pleated sheet

### Tertiary Structure

The next interaction take place between R groups

Some R groups are reactive and will interact with other reactive R groups in the chain.

These amino acids that are either charged or that have a sulphure atom

The interactions (tand attractions and S-S bridges) will fold the molecule over into a highly specific 3 dimensional shape

It is 3-D shape that will determine the proteins job or role in the body

## Proteins (cont)

### Quaternary Structure

This last level in protein formation is not seen in all proteins

Proteins can actually be 2 or more molecules joined to form a functional protein

These are held by ionic bond

Two Examples

Insulin has 2 subunits

Hemoglobin has 4 subunits

The whole process

Primary protein structure

Secondary protein structure

Tertiary protein structure

Quaternary protein structure

### Denaturation

Final shape of protein is very specific and enables it to do its job/function

Any change in a proteins shape will affect its function

Denaturation is when a protein tertiary structure is lost

This happens when R group bonds are broken

## Proteins (cont)

When a denaturation the protein cannot do its job and becomes useless

How does this happen?

### Temperature

High temperature affects the weak hydrogen bonds and can distort or break them

A slight increase in temp can cause reversible change (Fever)

A high increase will cause irreversible change (Cooking an egg)

### Chemicals

Heavy metals like lead and mercury are large atoms that are attracted the R groups of amino acids

They bond to the R group and distort proteins shape

This is usually irreversible

### PH

As some of the R groups are acids and some are bases, every protein (enzyme) has a preferred PH

## Proteins (cont)

Any change in PH causes a change in the acid base R group interactions and this will change the shape of the protein

Functions of Proteins

### Structural

Proteins help make up all structures in living things

Actin & Myosin: Muscle Proteins

Keratin: Nails, Hair, Horns, Feathers

Collagen: Bones, teeth, cartilage, tendon, ligament, blood vessels, skin matrix

### Functional

Other proteins help us to keep our bodies functioning properly and to digest our food

Enzymes: Are proteins that are catalysts which speed up reactions and control all cell activities

Food Source: Once we have used up all of our carbohydrates and fats, proteins will be a use of energy

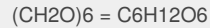
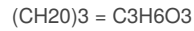
Proteins are worth the least amount of energy per gram

## CarboHydrates

Hydrated Carbons



Ratio of Carbons, Hydrogens and Oxygens are 1:2:1



Sugars

Known also as Saccharides

Carbohydrates end in 'ose'

Carbohydrates

### Rihasocharides

Basic sugar molecule Glucose



Glucose has ring Structure

Glucose: 6 sided

Fructose: 5 sided

6 sides: Hexose

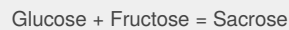
5 sides: Pentose

Carbohydrates

### disaccharides

If two sugar are formed through dehydration synthesis a disaccharide is formed

Glucose combination



Carbohydrates

### Polysaccharides

When many sugars bind through dehydration synthesis four polysaccharides can form

Starch

Glycogen

Cellulose

Chitin

Carbohydrate Polysaccharides

### Cellulose

## CarboHydrates (cont)

Plant Cell walls made of cellulose

Are long chains of glucose molecules with side chains

No mammal can break the bond

Linkage between carbon atoms of the sugars is different than starch and glycogen

We can't digest cellulose (Fibre)

Carbohydrate Polysaccharides

### Starch

Plants store energy as starch

Starch made up of glucose molecules linked together (Many)

Few side chains

Carbohydrate Polysaccharides

### Glycogen

Animals store energy as glycogen (Extra glucose)

Glycogen made up of glucose molecules linked together

Glycogen has many side chains

Carbohydrate Polysaccharides

### Chitin

Made by animals and fungi

Long glucose chains linked by covalent bonds

Very strong

Make structures like exo-skeletons, fingernails, claws, and beaks

Main function of carbs

Energy: When bonds between carbon atoms are broken, energy released can be used by cells

Carbohydrates are primary energy molecules for all life

Structural: Cellulose major structural compound in plants (Cell wall)

## Nuclear Acids

### Nuclear Acids

Are acidic molecules are found in nucleus

Two types VERY large

DNA:Deoxyribonucleic acid

RNA:Ribonucleic Acid

All acids are composed of units called Nucleotides

Nucleotides composed of three sub molecules

Pentose sugar (Ribose or deoxyribose)

Phosphate

Nitrogen Base (Purine or Pyrimidine)

Nitrogen base

### Purines

Adenine and Guanine

Have two rings

Found in DNA and RNA

Nitrogen base

### Pyrimidines

Cytosine, thymine and Uracil

Have one ring

Cytosine is in both DNA and RNA

Thymine is DNA only

Uracil is RNA only

Deoxyribonucleic Acid

Structure of DNA:Composed of two complimentary nucleotides

Two strands joined by hydrogen bonds which between complimentary nitrogen bases:

Adenine with Thymine (A-T or T-A)

Cytosine with Guanine (C-G or G-C)

When DNA is first formed its just two linear strands of nucleotides joined together

Due to internal bonding the DNA molecule then forms into a double helix

## Nuclear Acids (cont)

### Functions of DNA

Directs and controls all cell activity

Does this by making all proteins and enzymes

Contains all genetic information necessary to make one complete organism of very exact specifications

### Bonucleic Acid

RNA is made by DNA

Not confined to the nucleus it moves out of the nucleus into the cytoplasm of the cell

It has ribose sugar instead of Deoxyribose

No thymine uses uracil instead

Single stranded no helix

8 types of RNA

RNA function is assist DNA in making proteins

