

Quick Review of water:

Watch this:

<https://www.youtube.com/watch?v=0eNSnj4ZfZ8&t=209s>

While you are watching - write down a list of any connections you remember from yesterday.

Review Carbohydrates:

sakaride ✓

1. Differentiate between a monomer and a polymer.

2. What are 2 examples of monomers of carbohydrates.

~~protein~~

3. If I gave you a list of chemical names, how would you be able to identify the carbohydrates?

proteen

4. What types of bonds hold monosaccharides together to form disaccharides?

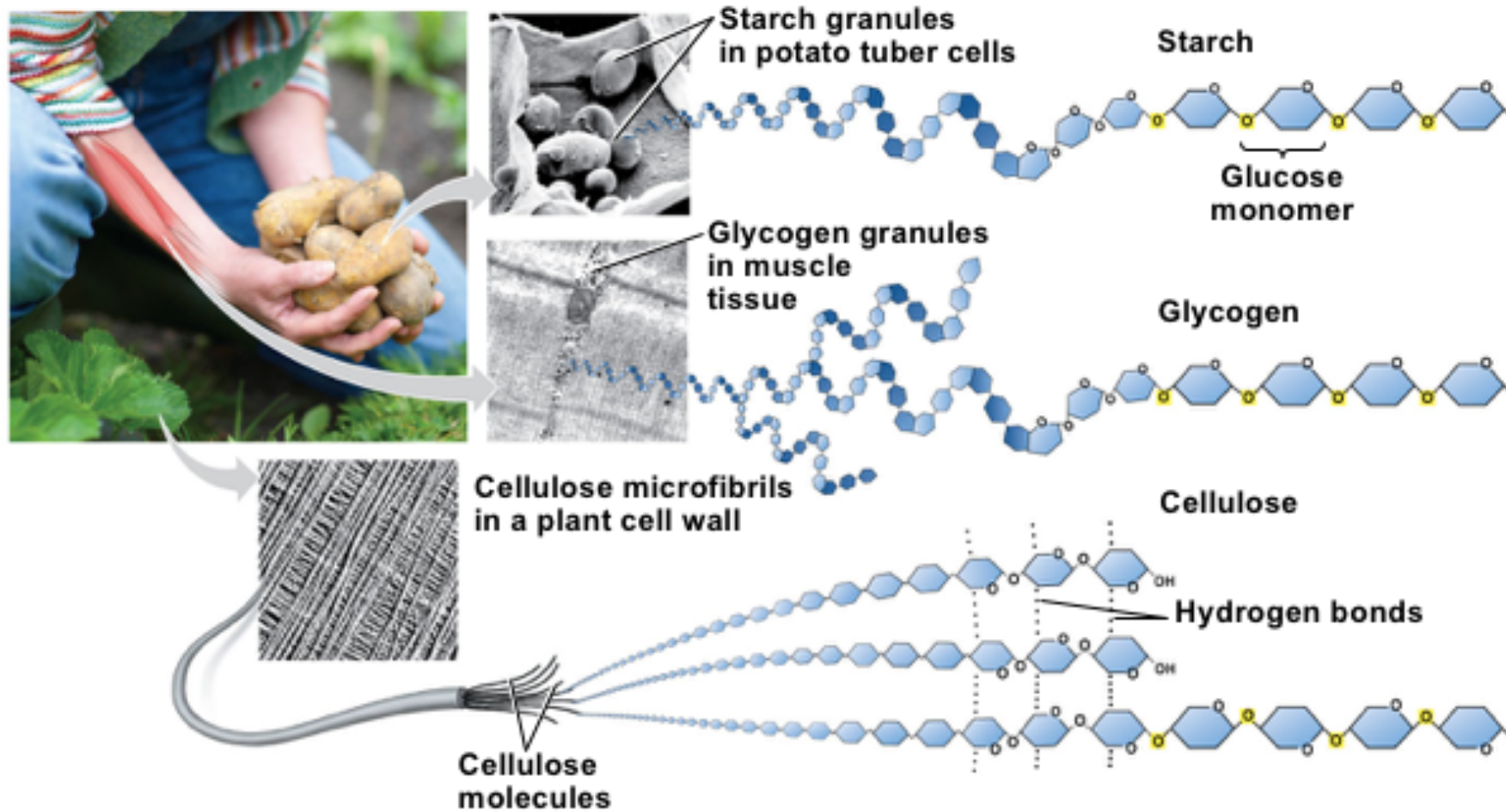
add ↓

↓ break

5. Differentiate between dehydration synthesis and hydrolysis.

remove
water

6. Fats and Carbohydrates are both made up of C, H & O. How can you differentiate between the two biomolecules?



Biomolecules Con't (Lipids, Proteins and Nucleic Acids!)

polar — charged hydro-
philic

non-polar — NOT charged
neutral hydro-
phobic

Lipids (fats, phospholipids, waxes and steroids)



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- Contain elements C, H, O
- oxygen:hydrogen ratio is much greater than in water. (long hydrogen/carbon chains with many less oxygen atoms than in carbohydrates)

Non-polar and thus: Hydrophobic

Lipids are hydrophobic molecules that contain elements C, H and O.

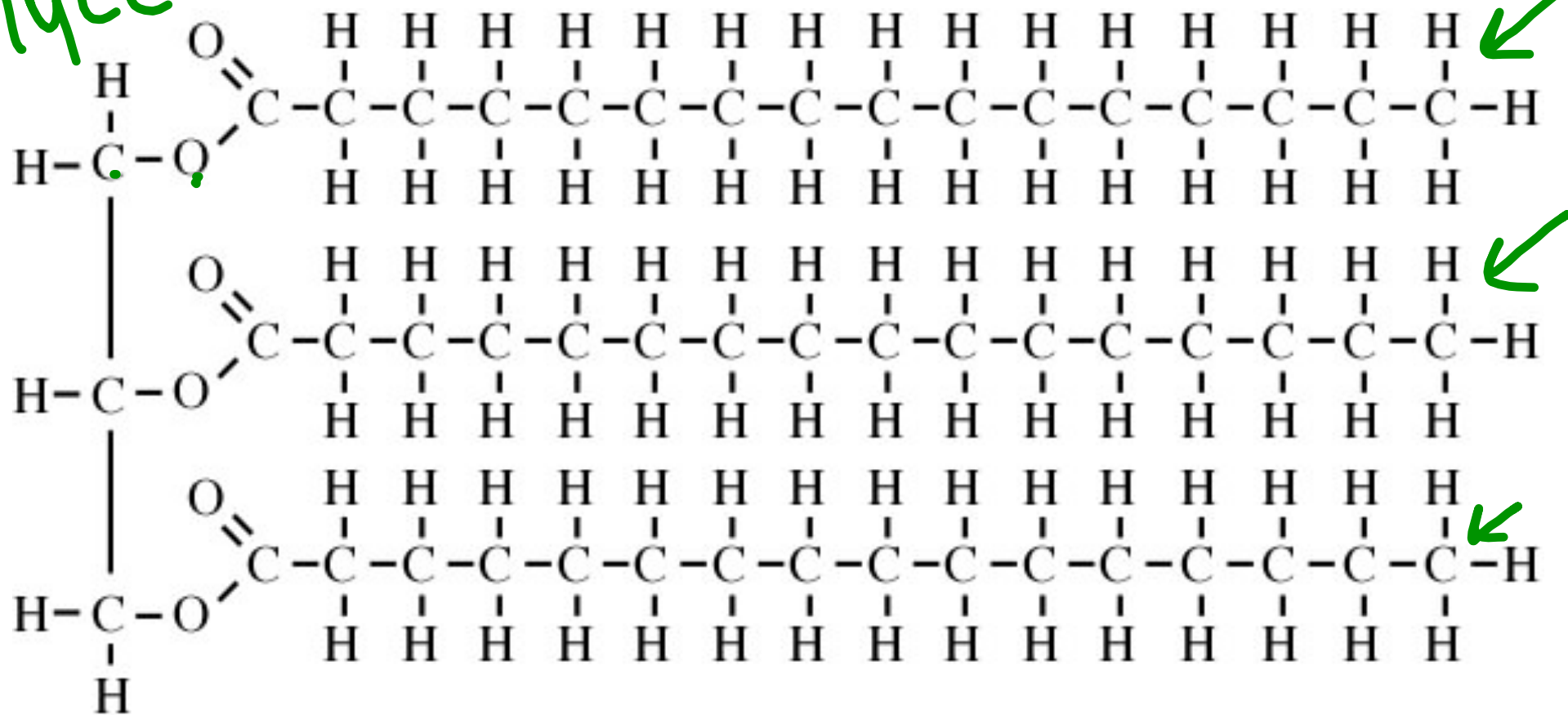
ex/ Fat

Non-polar

They contain fewer oxygens than carbohydrates.

Fatty acids

Glycerol



Types of Lipids:

1) A fat is constructed from two kinds of smaller molecules: glycerol and fatty acids.

2) Phospholipids have a polar head and a non-polar tail. They form cell membranes.

phosphate + glycerol + 2 fatty acids

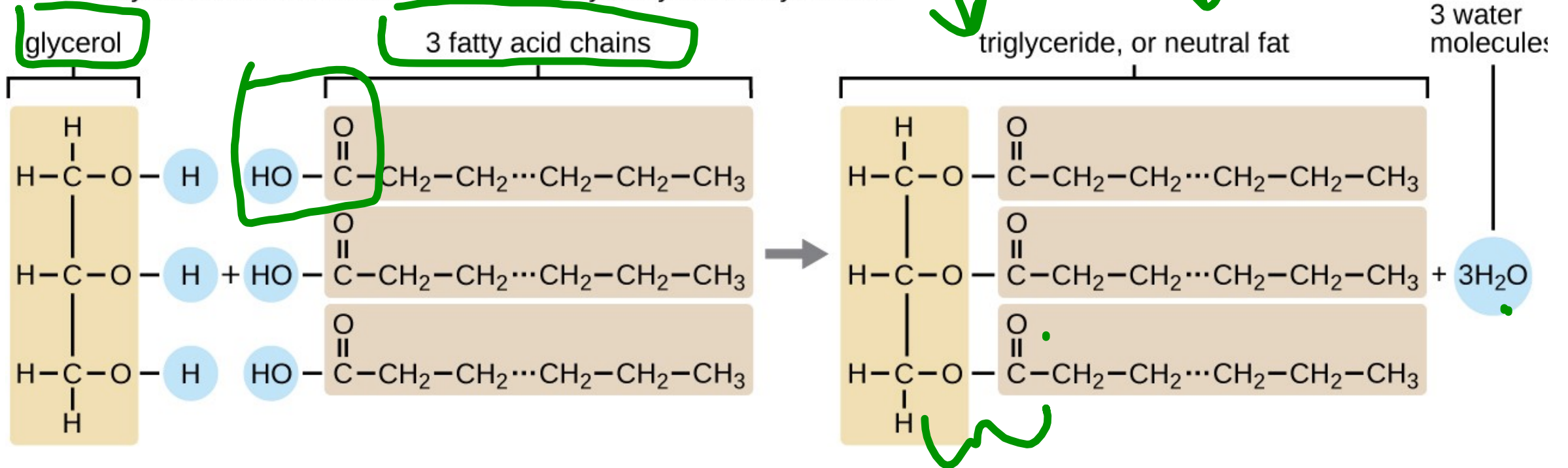
3) **Steroids** are important cell messengers.

↳ Hormones

4) **Waxes** are for protection/insulation.

Dehydration Synthesis of Triglyceride

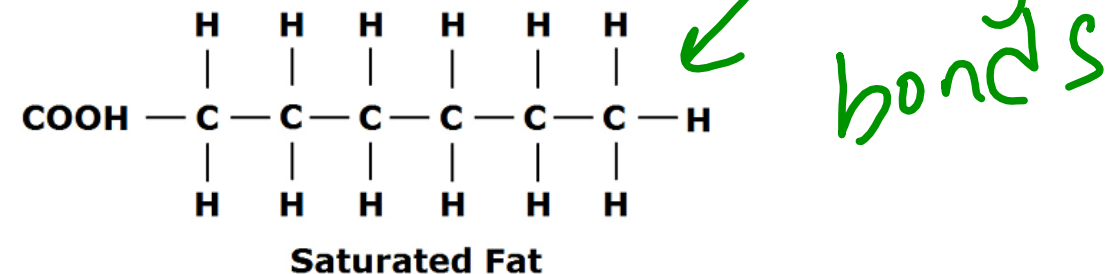
Three fatty acid chains are bound to glycerol by dehydration synthesis.



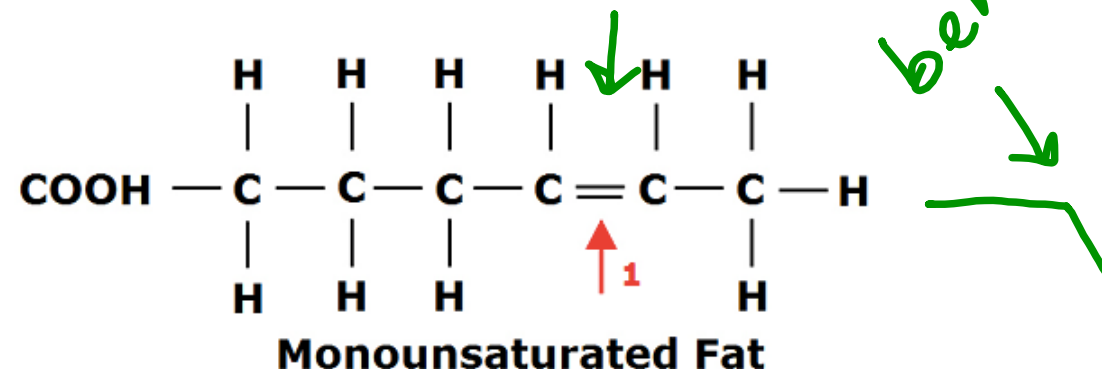
(Type of bond is called an ester linkage)

Fatty acids, the chains connected to glycerol in fat molecules, can have different lengths and numbers of carbon-carbon double bonds.

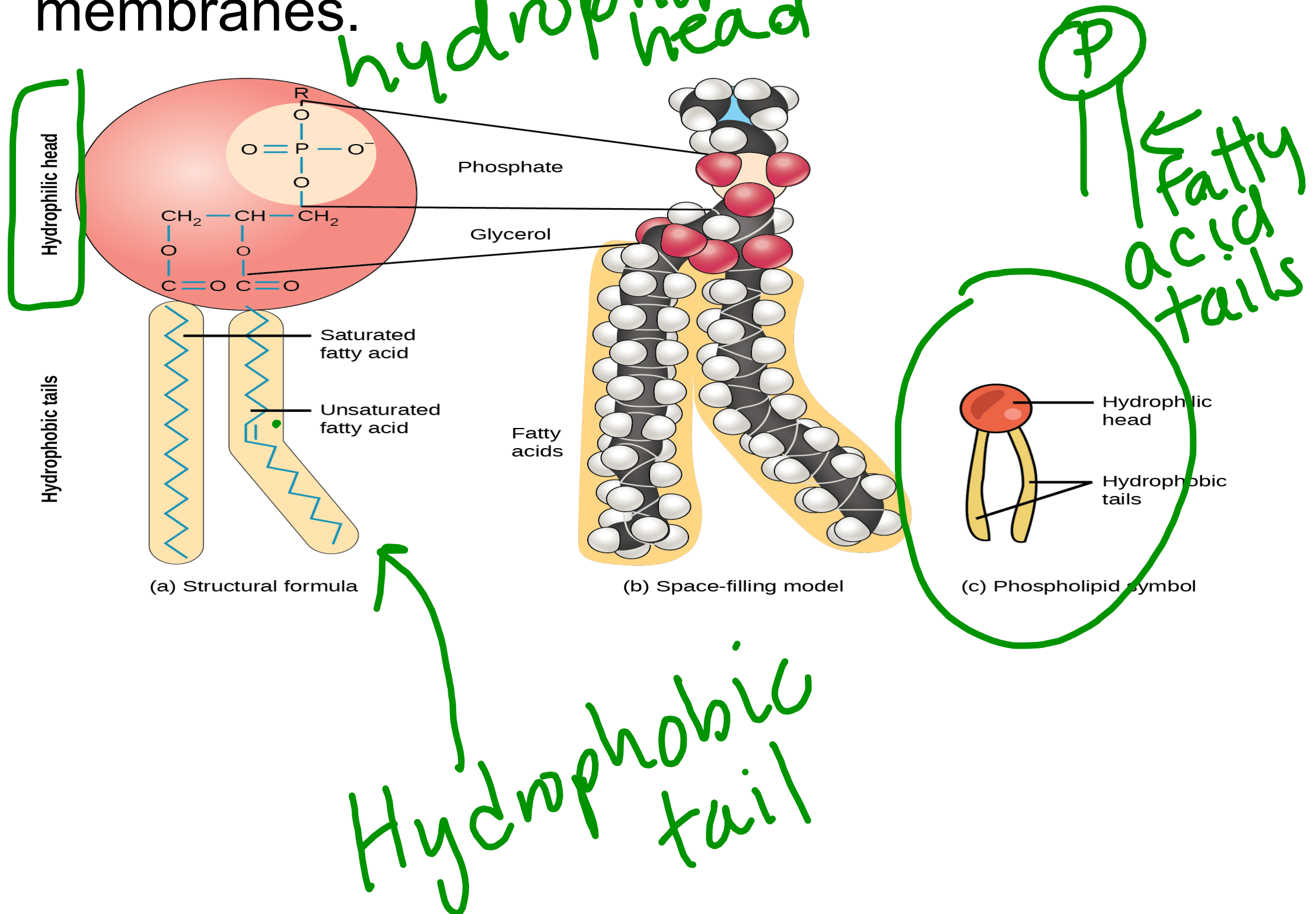
Saturated fatty acids have no carbon-carbon double bonds.



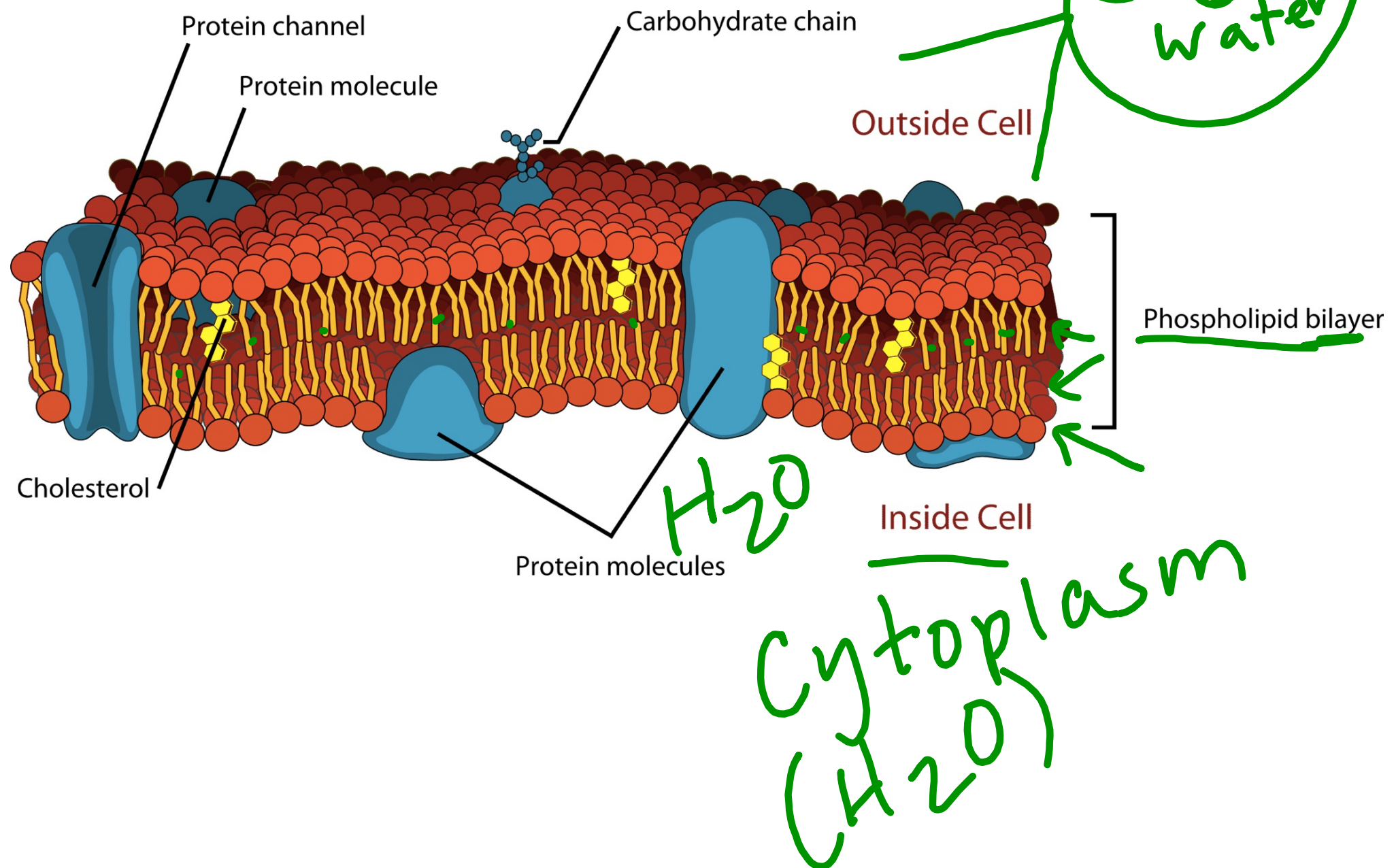
Unsaturated fatty acids have at least one carbon-carbon double bond. The arrangement of atoms around the double bond determine if it is cis- or trans-fat.



Phospholipids are major components of cell membranes.



Phospholipids arrange themselves to create a **bilayer**.



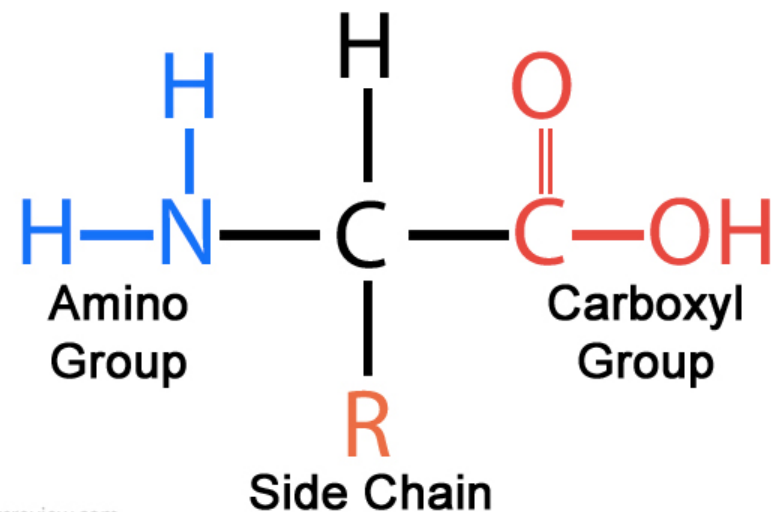
Proteins have very important functions within the cell including:

-- structural support, storage, transport, signaling, movement and defense.

Some proteins are **enzymes** that help to speed up chemical reactions.

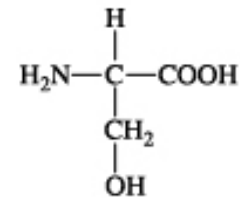
Proteins are polymers made from **amino acids**. The C-N bond between the monomers is called the **peptide bond**.

Amino Acid Structure

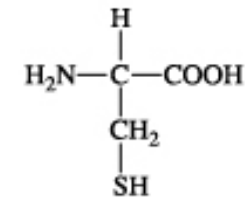


There are 20 different amino acids that build proteins. The R side chain makes each one unique.

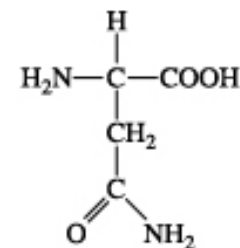
Examples:



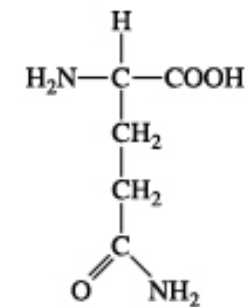
serine
(Ser, S)



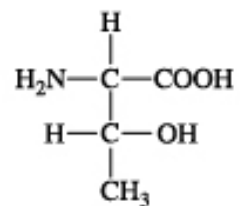
cysteine
(CysH, C)



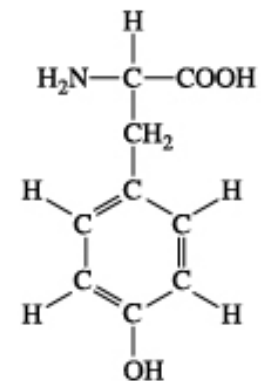
asparagine
(AspNH₂ or Asn, N; Asx or B)



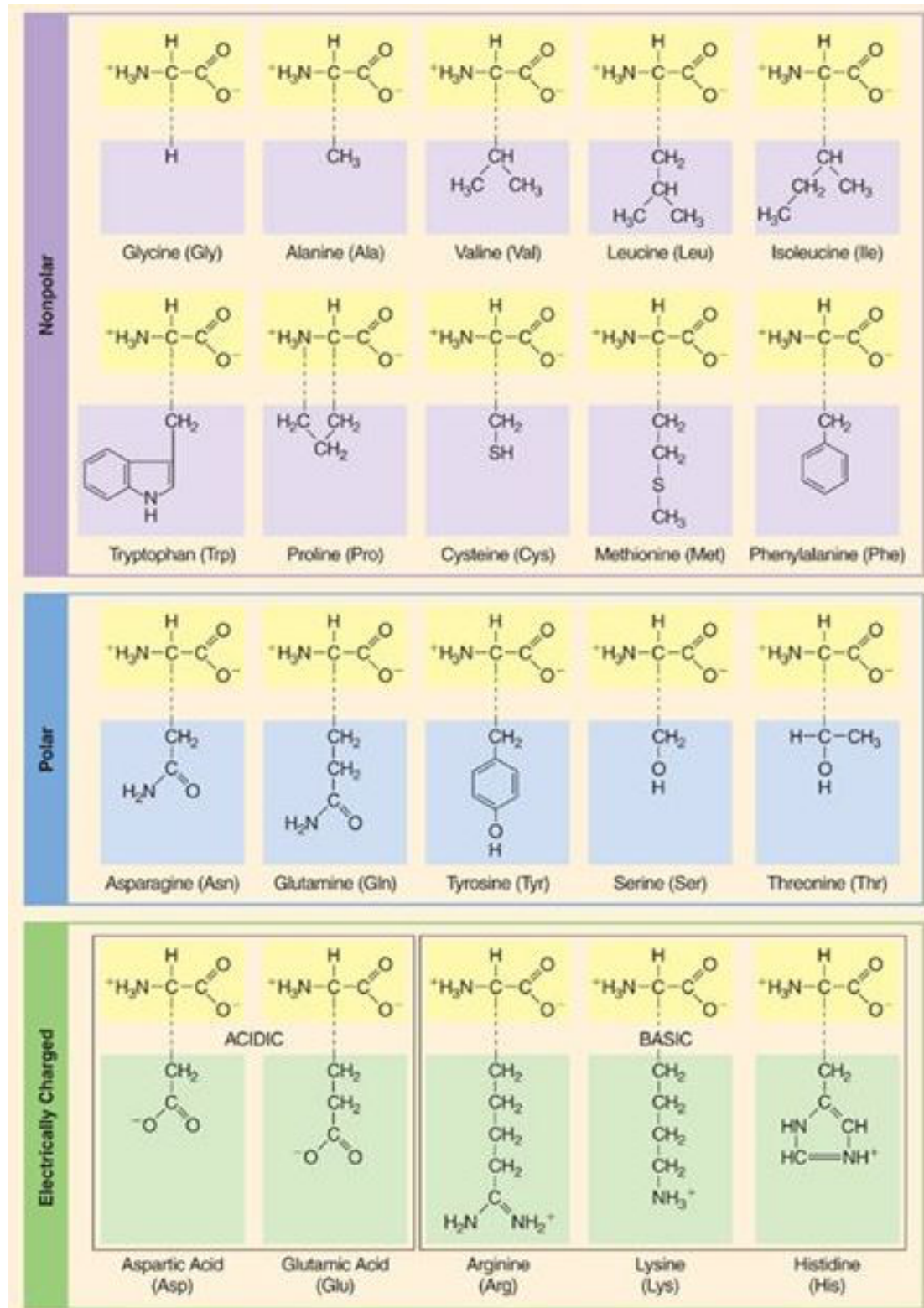
glutamine
(GluNH₂, GluN,
or Gln, Q; Glx or Z)



threonine
(Thr, T)



tyrosine
(Tyr, Y)



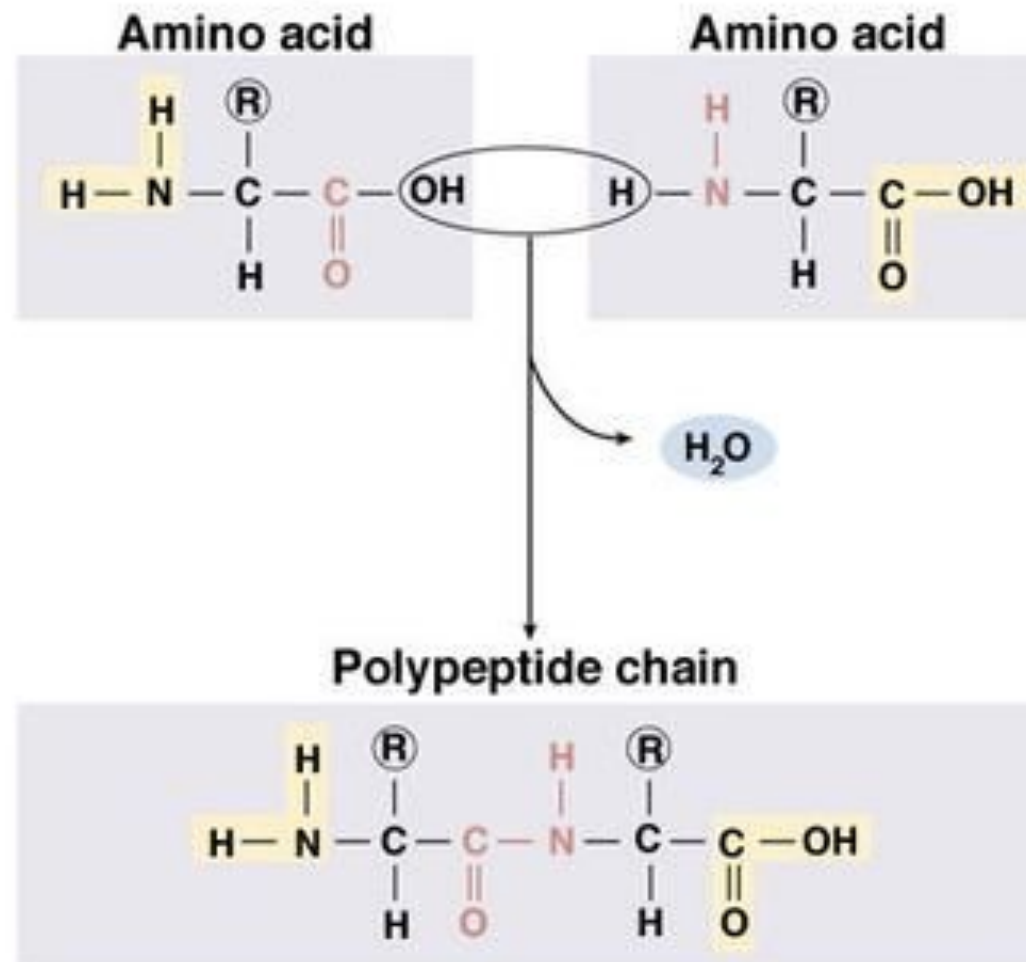
20 different
Amino Acids

Can you find
the R
groups?

Can you find
the functional
groups?

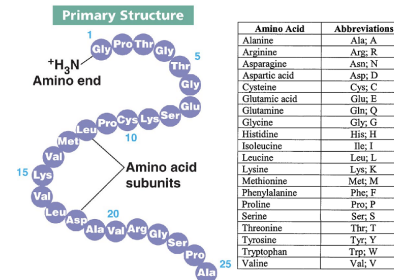
What makes
them polar or
non-polar?

Peptide Bond

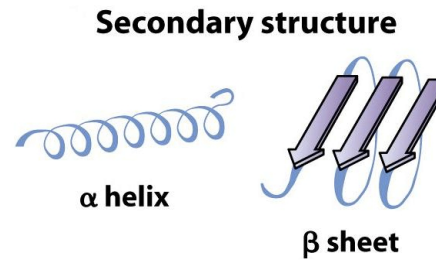


Proteins have different levels of structure:

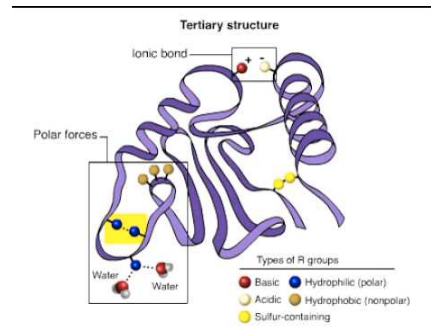
- **Primary structure** depends on the order of the amino acids



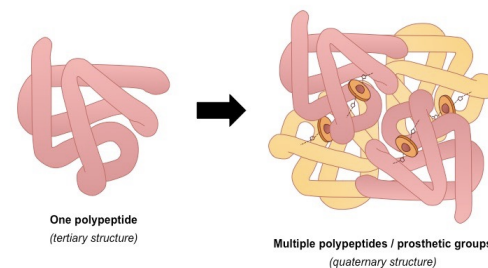
- **Secondary structure** depends on hydrogen bonds. Typical shapes are alpha helix or beta sheets.



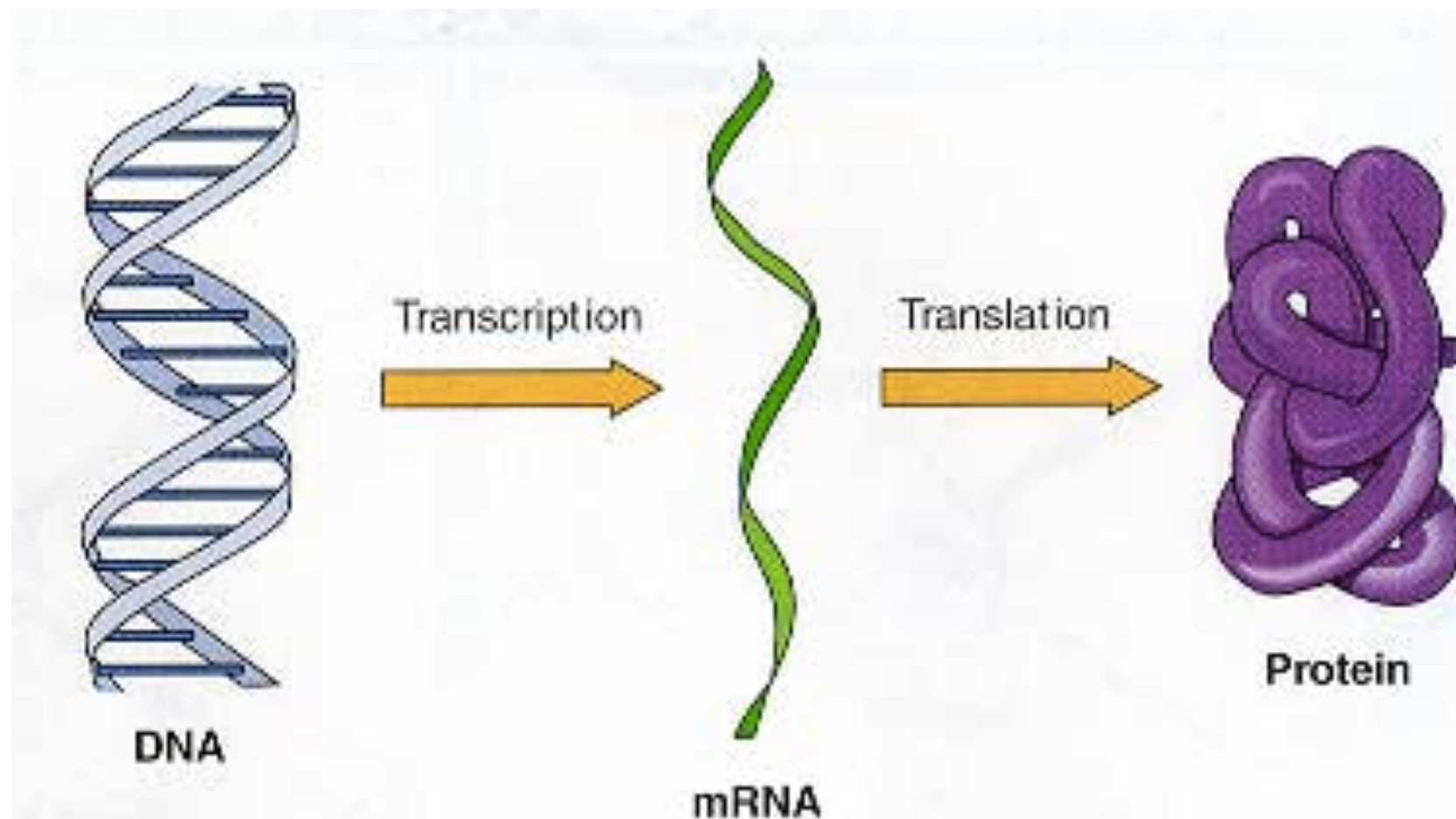
- **Tertiary structure** depends on the interaction of R groups from different amino acids. Typical interactions include disulfide or ionic bonds.



- **Quaternary structure** results from more than one polypeptide chain interacting. Many proteins require tetramers to form for function.



Examples of **nucleic acids** include DNA and RNA.



Central Dogma of Gene Expression.

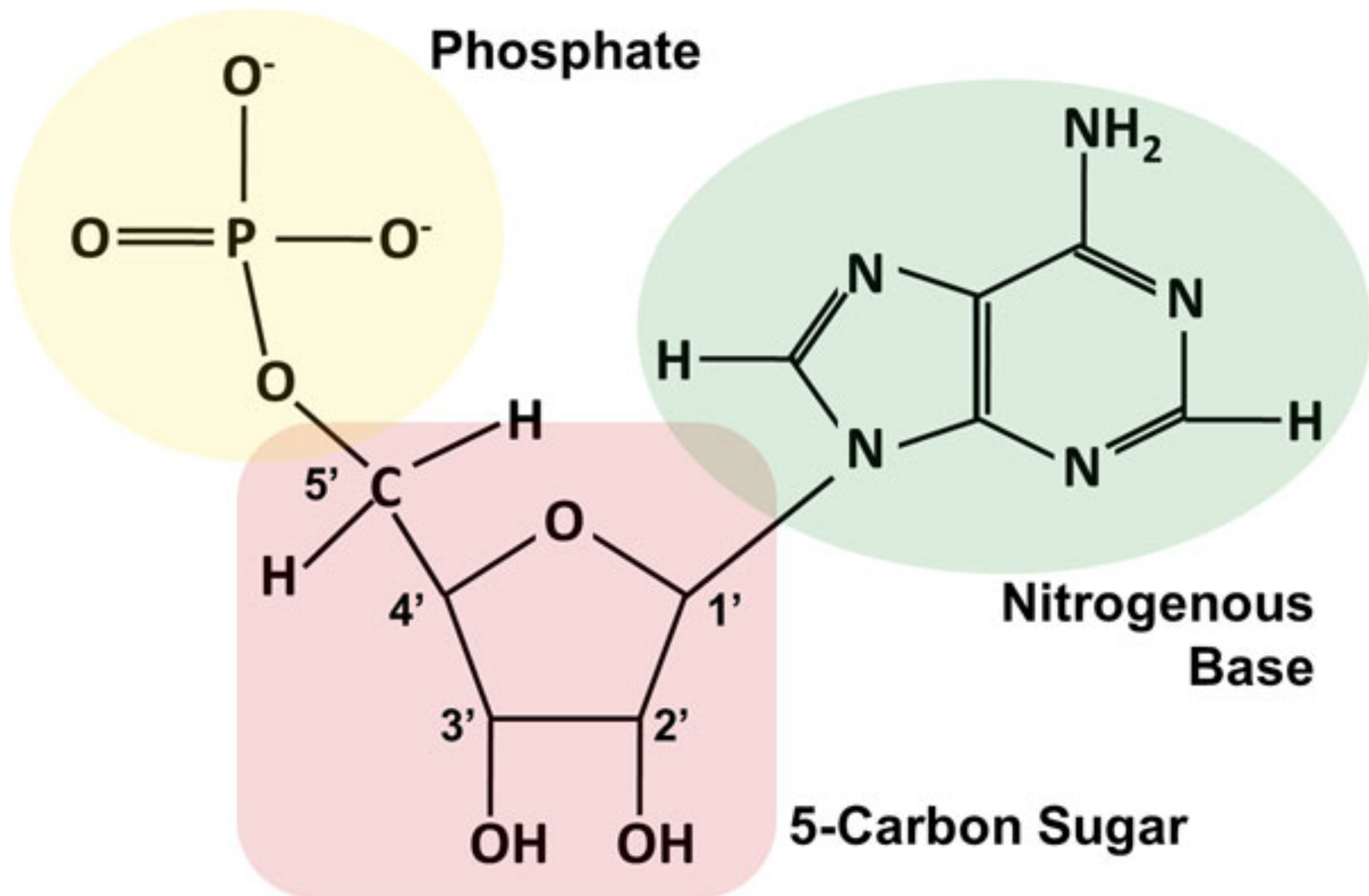
Through the production of mRNA (transcription) and the synthesis of proteins (translation), the information contained in DNA is expressed.

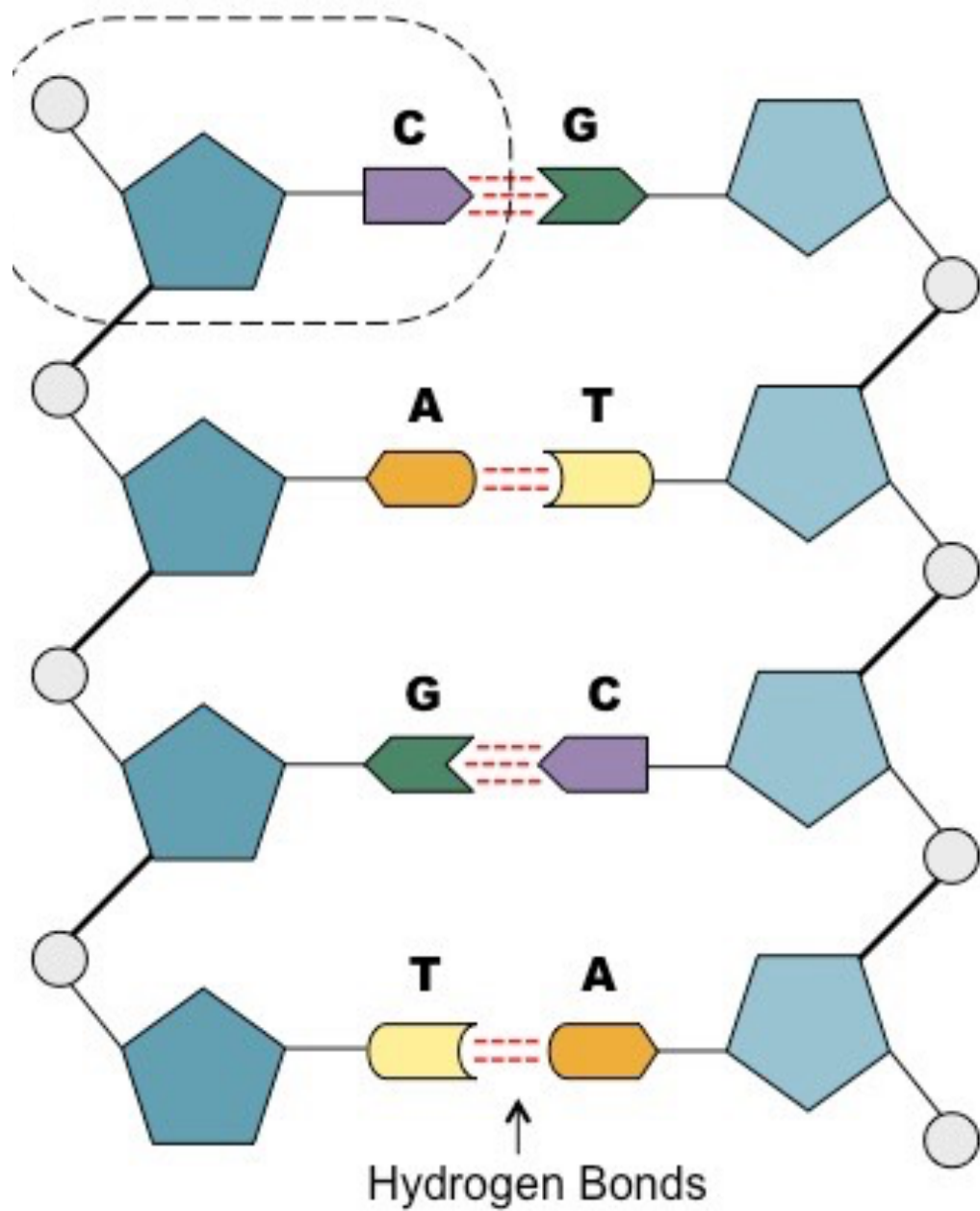
Nucleic acids are polymers consisting of **nucleotides**.

Each nucleotide has three parts:

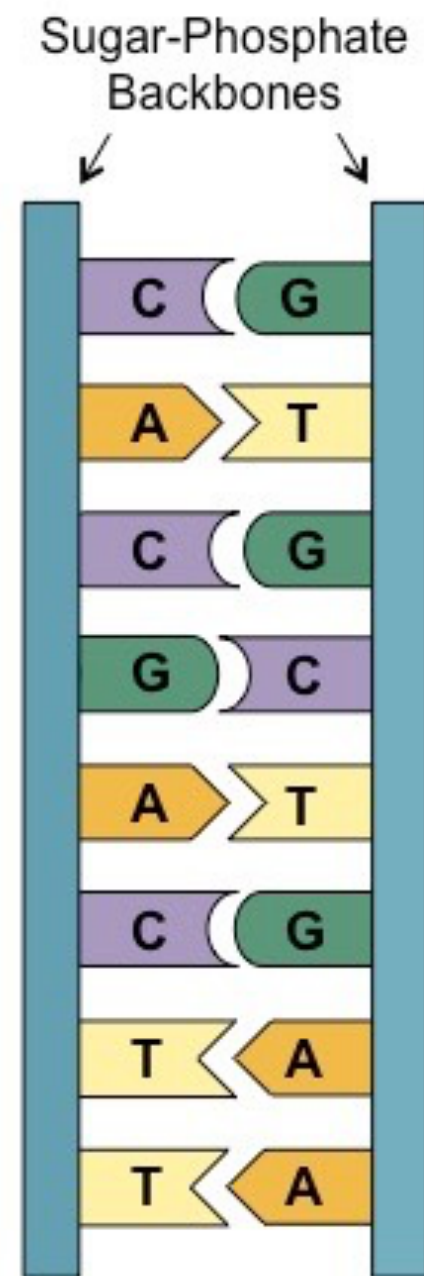
- A base (CGAT/U)
- A pentose sugar
- A phosphate group

They contain C, H, O, N and P.

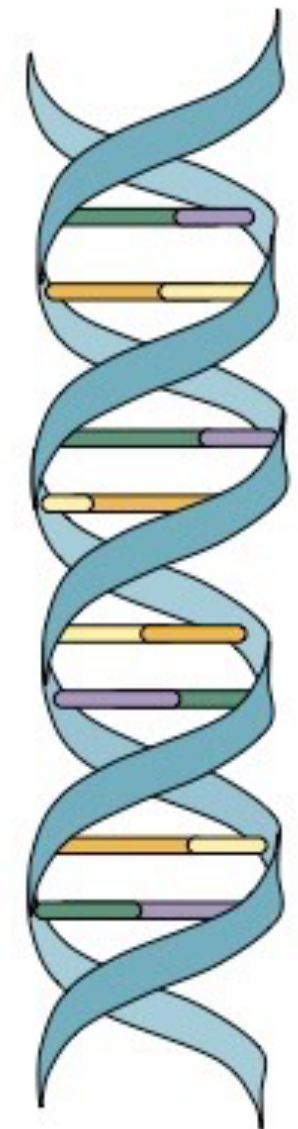




Antiparallel DNA Strands

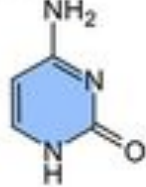


DNA Ladder



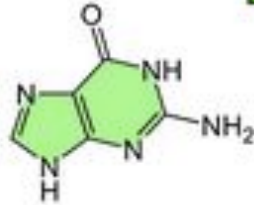
Double Helix

Cytosine



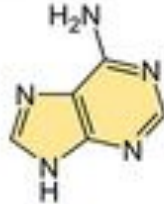
C

Guanine



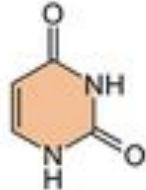
G

Adenine



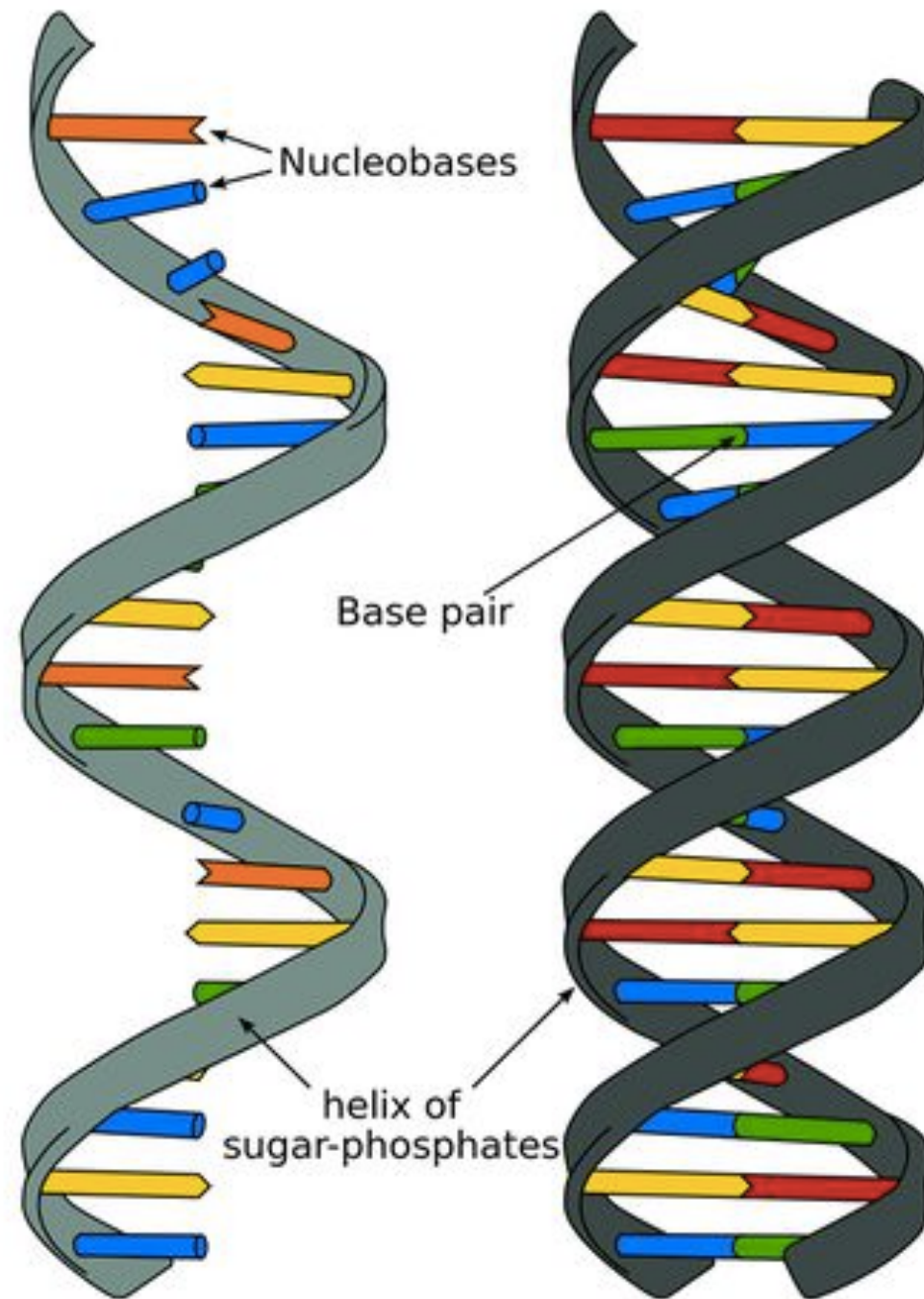
A

Uracil



U

Nucleobases
of RNA



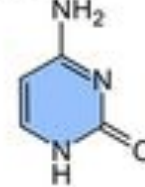
RNA

Ribonucleic acid

DNA

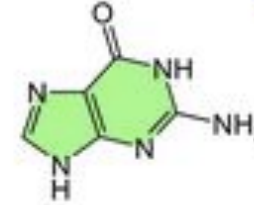
Deoxyribonucleic acid

Cytosine



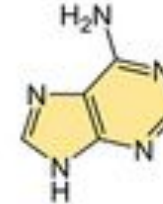
C

Guanine



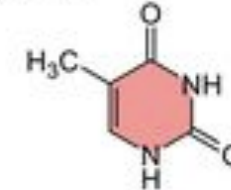
G

Adenine



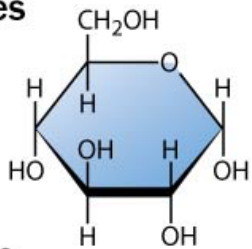
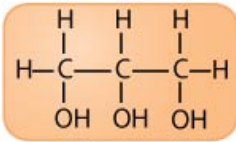
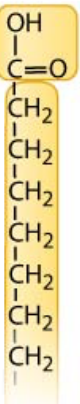
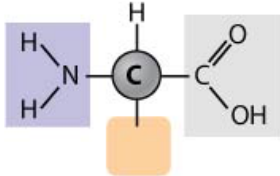
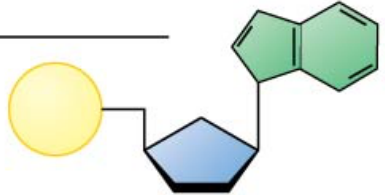
A

Thymine



T

Nucleobases
of DNA

Classes of Molecules and Their Components	Functions	Examples
Carbohydrates  Monosaccharide	Energy for cell, raw material Plant cell support	a. _____ Starch, glycogen c. _____
Lipids (don't form polymers) <div>   </div> <div> Glycerol Fatty acid </div> Components of a fat molecule	Energy storage Hormones	d. _____ Phospholipids f. _____
Proteins g. _____ h. _____  i. _____ Amino acid	Transport Communication Storage Receive signals	j. _____ k. _____ l. _____ m. _____ n. _____ Proteins in seeds Receptor protein
Nucleic Acids o. _____ p. _____  Nucleotide q. _____	Heredity	r. _____ DNA and RNA