

Kickoff: Tell me everything you know about these pictures.

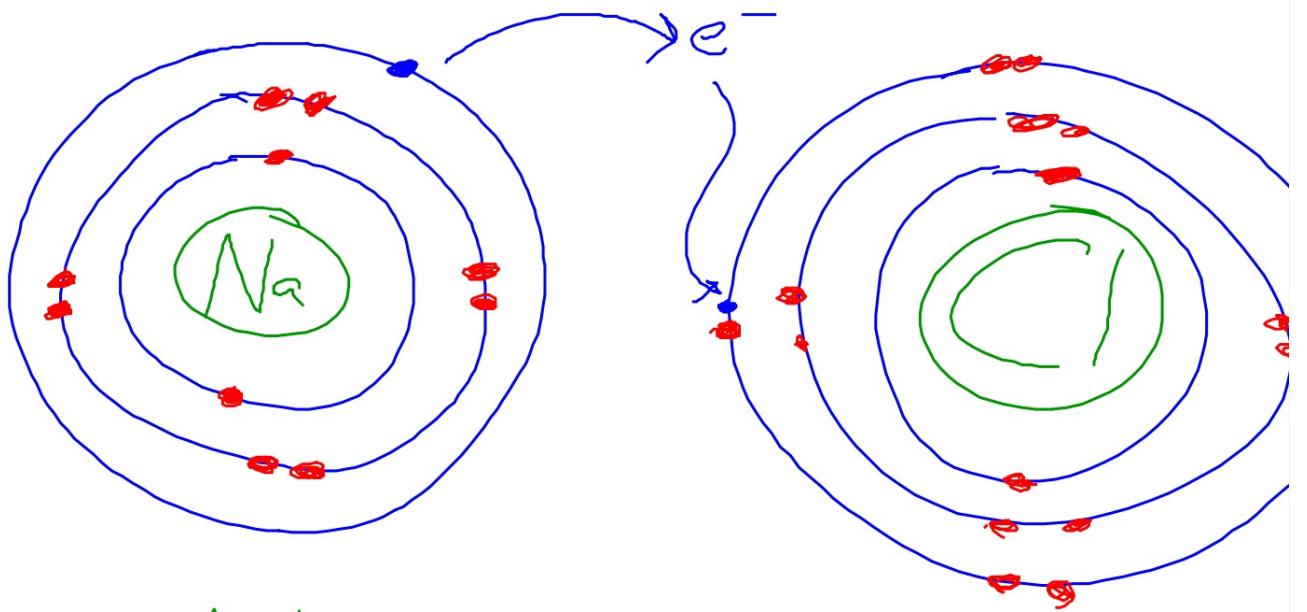
74	—
W	—
Tungsten	—
183.85	—

6 C Carbon 12.011	7 N Nitrogen 14.007	8 O Oxygen 15.999
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Kickoff: (10/15/14)

What is the difference between and ionic and covalent bond?

atom gains/loses e^-
ionic bond - oppositely charged atoms are drawn.
Covalent bond - share e^-



MATCH THE DESCRIPTION WITH THE CORRECT LETTER FOR EACH PARTICLE OR PARTICLES:

You can use them more than once!

E for ELECTRON

P FOR PROTON

N FOR NEUTRON

_____ positively charged

_____ orbits the nucleus in energy levels

_____ uncharged or neutral

_____ negatively charged

_____ & _____ found in the nucleus

FILL IN THE CHARTS BELOW FOR ATOMS/IONS IMPORTANT TO LIVING THINGS:

ATOM NAME	SYMBOL
CARBON	
	N
	O
HYDROGEN	
	P
SULFUR	

IONS	SYMBOL
CALCIUM ION	
	K ⁺
	Cl ⁻
SODIUM ION	
	HYDROGEN ION

2.1 Atoms, Ions, and Molecules

KEY CONCEPT

All living things are based on atoms and their interactions.

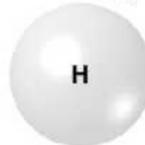


2.1 Atoms, Ions, and Molecules

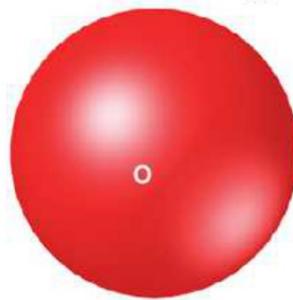
► Living things consist of atoms of different elements.

- An atom is the smallest basic unit of matter.
- An element is one type of atom.

Hydrogen atom (H)

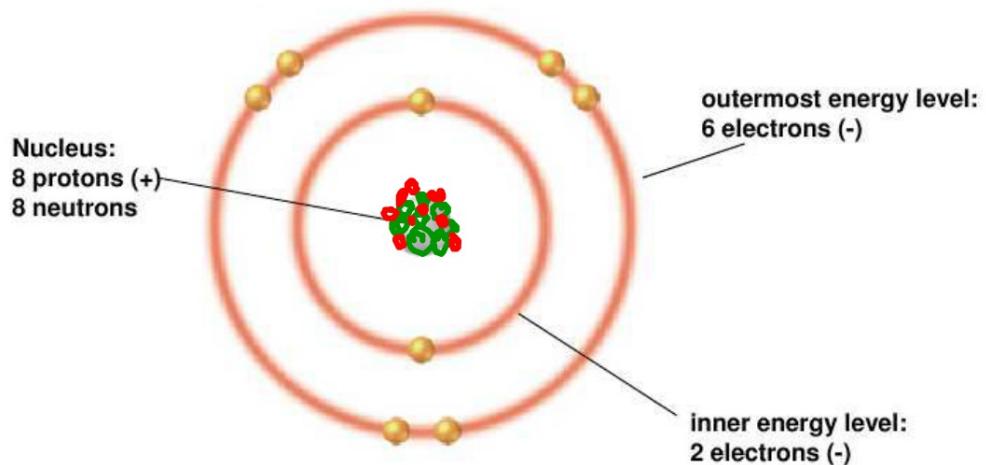


Oxygen atom (O)



2.1 Atoms, Ions, and Molecules

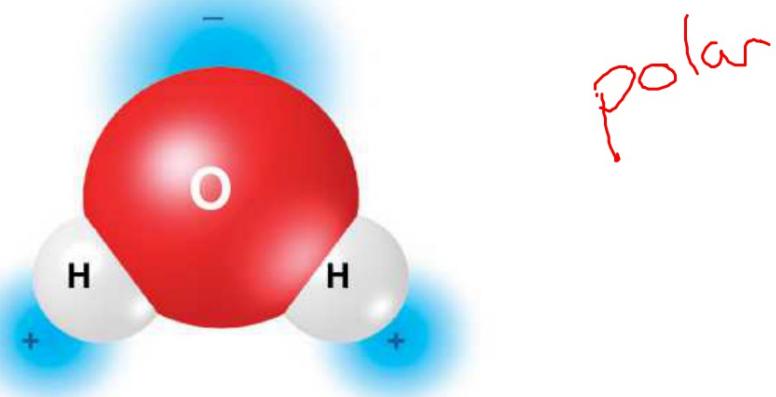
- An atom has a nucleus and electrons.
 - The nucleus has protons and neutrons.
 - Electrons are in energy levels outside nucleus.



2.1 Atoms, Ions, and Molecules

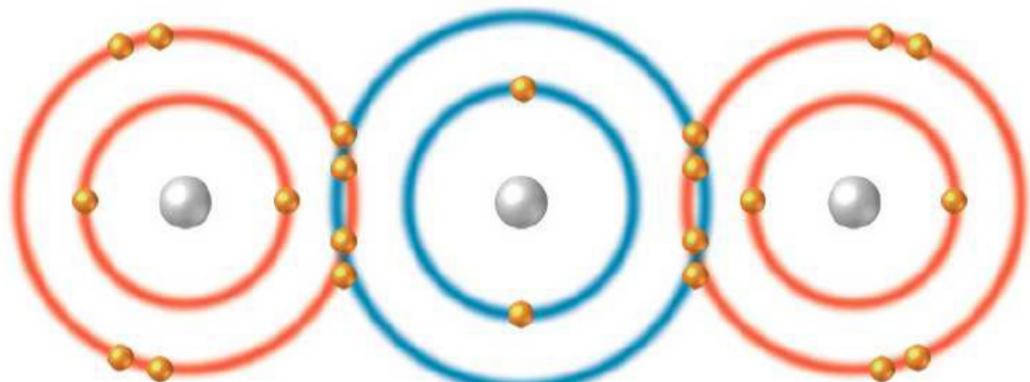
- A compound is made of atoms of different elements bonded together.
 - water (H_2O)

Covalent—Share electrons



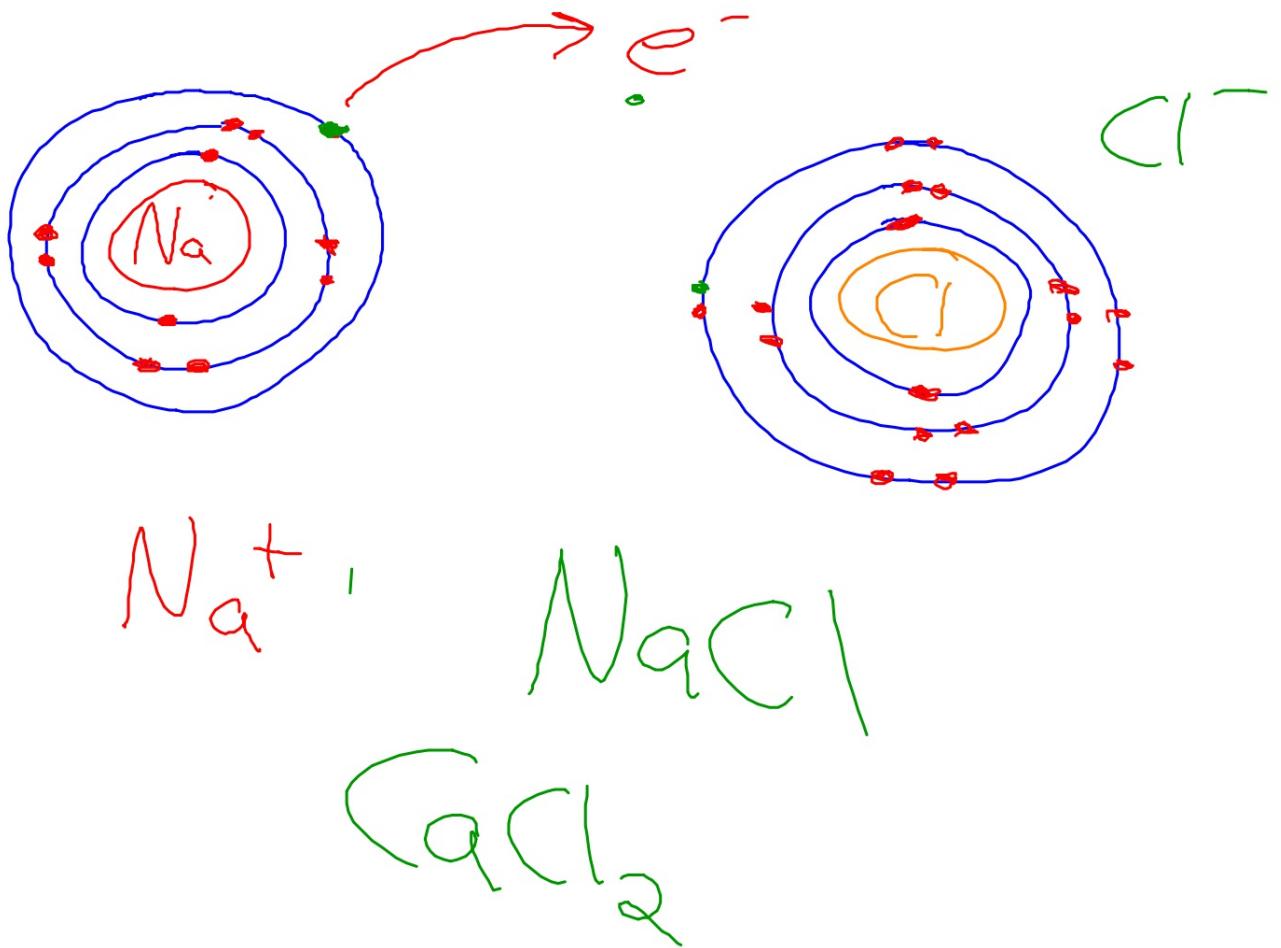
2.1 Atoms, Ions, and Molecules

- A compound is made of atoms of different elements bonded together.
 - water (H_2O)
 - carbon dioxide (CO_2)



2.1 Atoms, Ions, and Molecules

- A compound is made of atoms of different elements bonded together.
 - water (H_2O)
 - carbon dioxide (CO_2)
 - many other carbon-based compounds in living things



2.1 Atoms, Ions, and Molecules

► Ions form when atoms gain or lose electrons.

e^- = electron

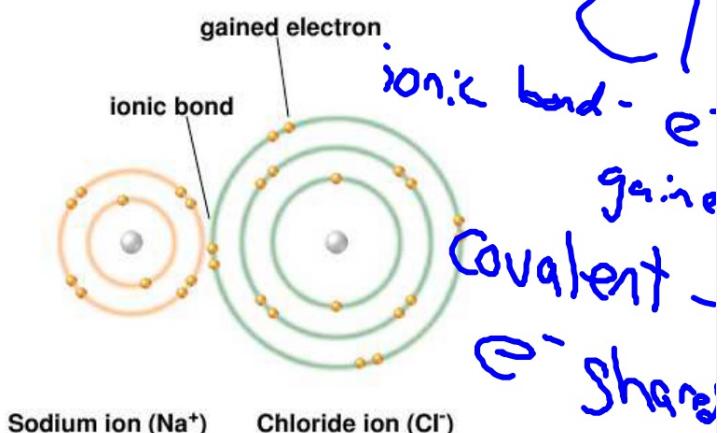
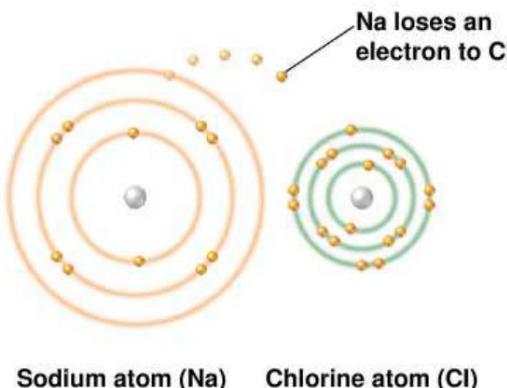
- An ion is an atom that has gained or lost one or more electrons.

– positive ions - cation 

– negative ions - anion



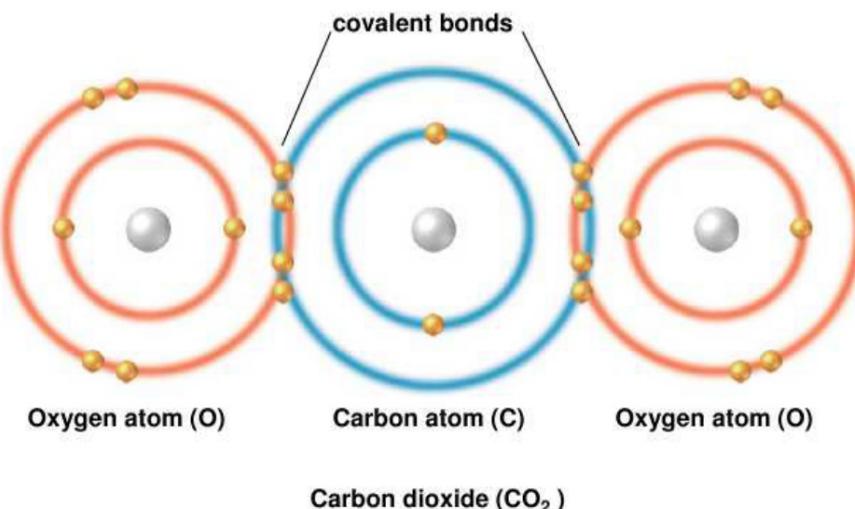
- Ionic bonds form between oppositely charged ions.



2.1 Atoms, Ions, and Molecules

► Atoms share pairs of electrons in covalent bonds.

- A covalent bond forms when atoms share a pair of electrons.
 - multiple covalent bonds
 - diatomic molecules



2.2 Properties of Water

KEY CONCEPT

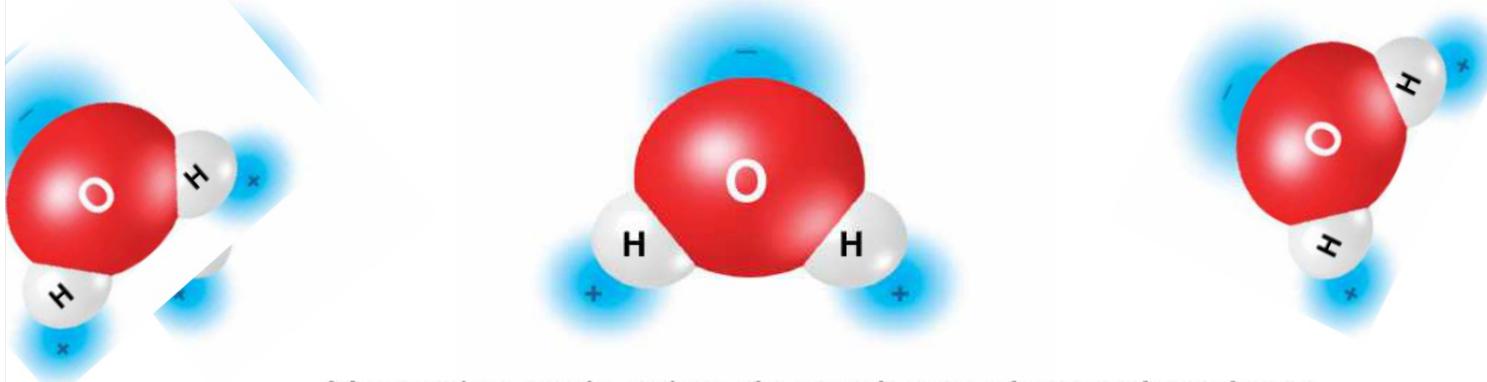
Water's unique properties allow life to exist on Earth.



2.2 Properties of Water

► Life depends on hydrogen bonds in water.

- Water is a polar molecule.
 - Polar molecules have slightly charged regions

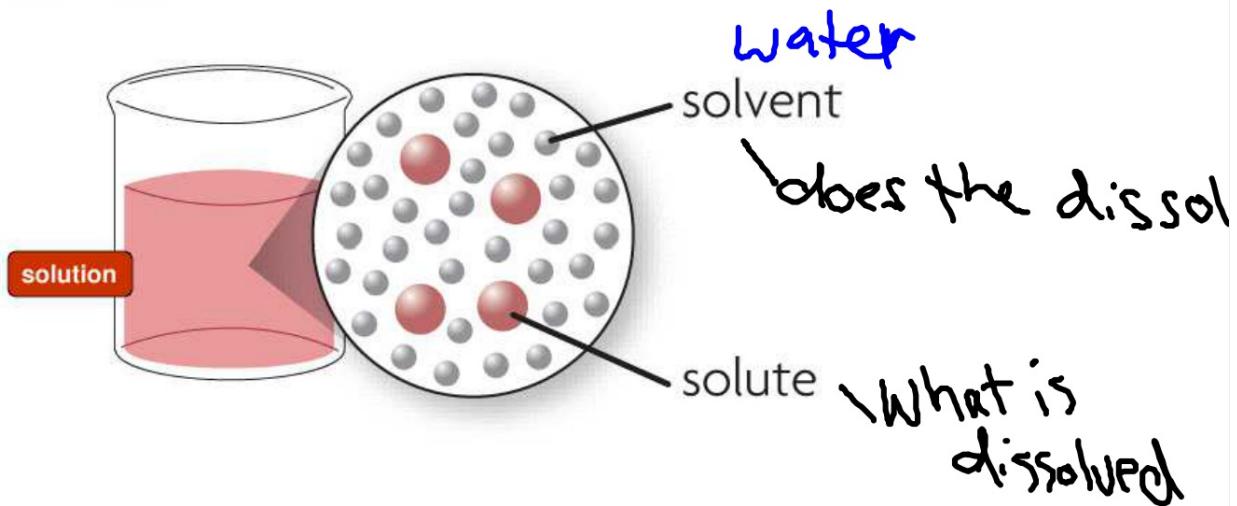


- Nonpolar molecules do not have charged regions.
- Hydrogen bonds form between slightly positive hydrogen atoms and slightly negative atoms.

2.2 Properties of Water

Many compounds dissolve in water. "universal solvent"

- A solution is formed when one substance dissolves in another.
 - A solution is a homogeneous mixture. *Same different*
 - Solvents dissolve other substances.
 - Solutes dissolve in a solvent.



2.2 Properties of Water

- “Like dissolves like.”
 - Polar solvents dissolve polar solutes.
 - Nonpolar solvents dissolve nonpolar solutes.
 - Polar substances and nonpolar substances generally remain separate.

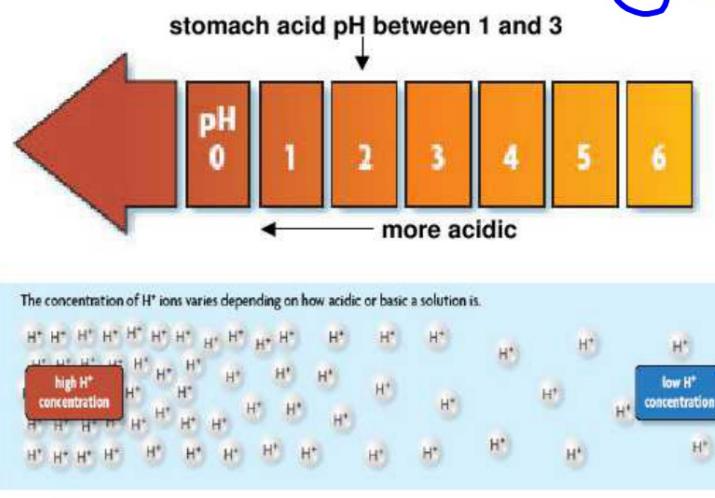
2.2 Properties of Water

Some compounds form acids or bases.

- An acid releases a hydrogen ion when it dissolves in water.
 - high H⁺ concentration
 - pH less than 7

$$pH = -\log [H^+]$$

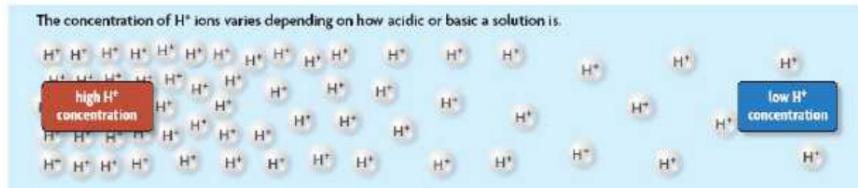
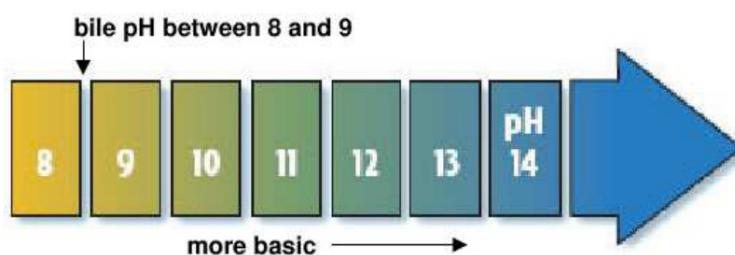
0 - 14



HNO₃
H₂CO₃
H₂SO₄
HCl

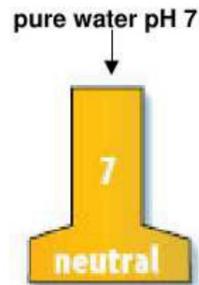
2.2 Properties of Water

- A base removes hydrogen ions from a solution.
 - low H⁺ concentration
 - pH greater than 7

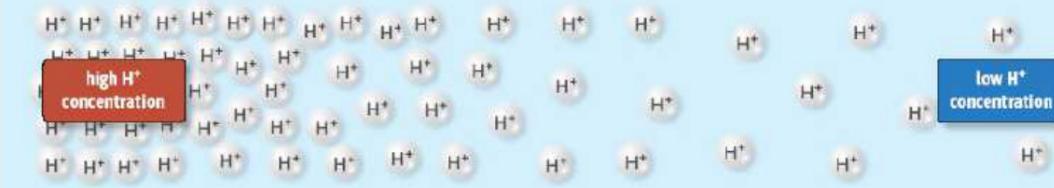


2.2 Properties of Water

- A neutral solution has a pH of 7.



The concentration of H⁺ ions varies depending on how acidic or basic a solution is.



Kickoff:

1. Which is more similar to a hydrogen bond: ionic or covalent? Why?
2. Carbon can form millions of different types of compounds. What characteristic of carbon allows it to form all of these compounds?

Which type of bond is it forming?

The attraction between the hydrogen atom in one water molecule and the oxygen molecule in another is an example of a _____ bond.

- A. polymer
- B. acidic
- C. hydrogen
- D. ionic

Which of the following is/are TRUE about water?

- A. It is a good solvent because it dissolves many kinds of molecules.
- B. It helps in homeostasis because it doesn't change temperature easily.
- C. It is polar and forms hydrogen bonds that help water molecules stick together.
- D. It makes up approximately 70% of all living things and is an important participant/product in many chemical reactions.
- E. All of these

ATOMS with an electric charge are called _____

- A. molecules
- B. electrons
- C. polar
- D. ions

MOLECULES that have an uneven pattern of electric charge (more positive in one area; more negative in another) are said to be _____.

- A. nucleic
- B. polar
- C. non-polar
- D. ionic

A water molecule is made up of _____.

- A. two hydrogen atoms and one oxygen atom
- B. one hydrogen atom and two oxygen atoms
- C. one hydrogen atom and 3 carbon atoms
- D. two hydrogen atoms and 1 sodium ion

_____ ions are measured with a pH scale and determine the acidity of a solution.

- A. Na^+
- B. C
- C. K^+
- D. H^+

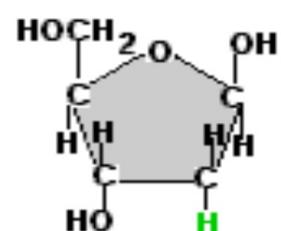
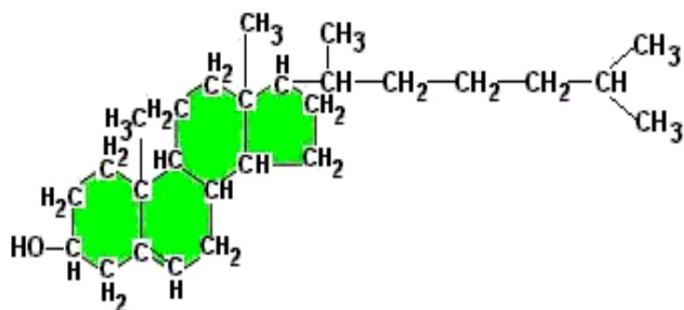
2.3 Carbon-Based Molecules

KEY CONCEPT

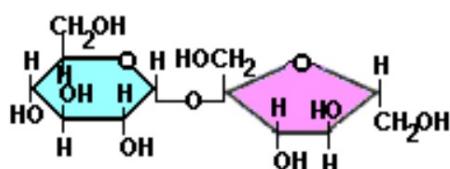
Carbon-based molecules are the foundation of life.



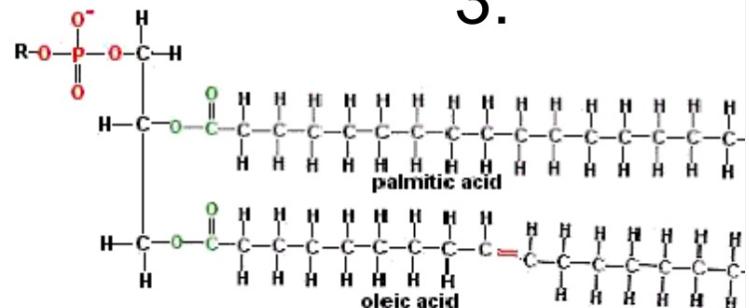
Kickoff: Identify the following structures as a lipid or a carbohydrate.



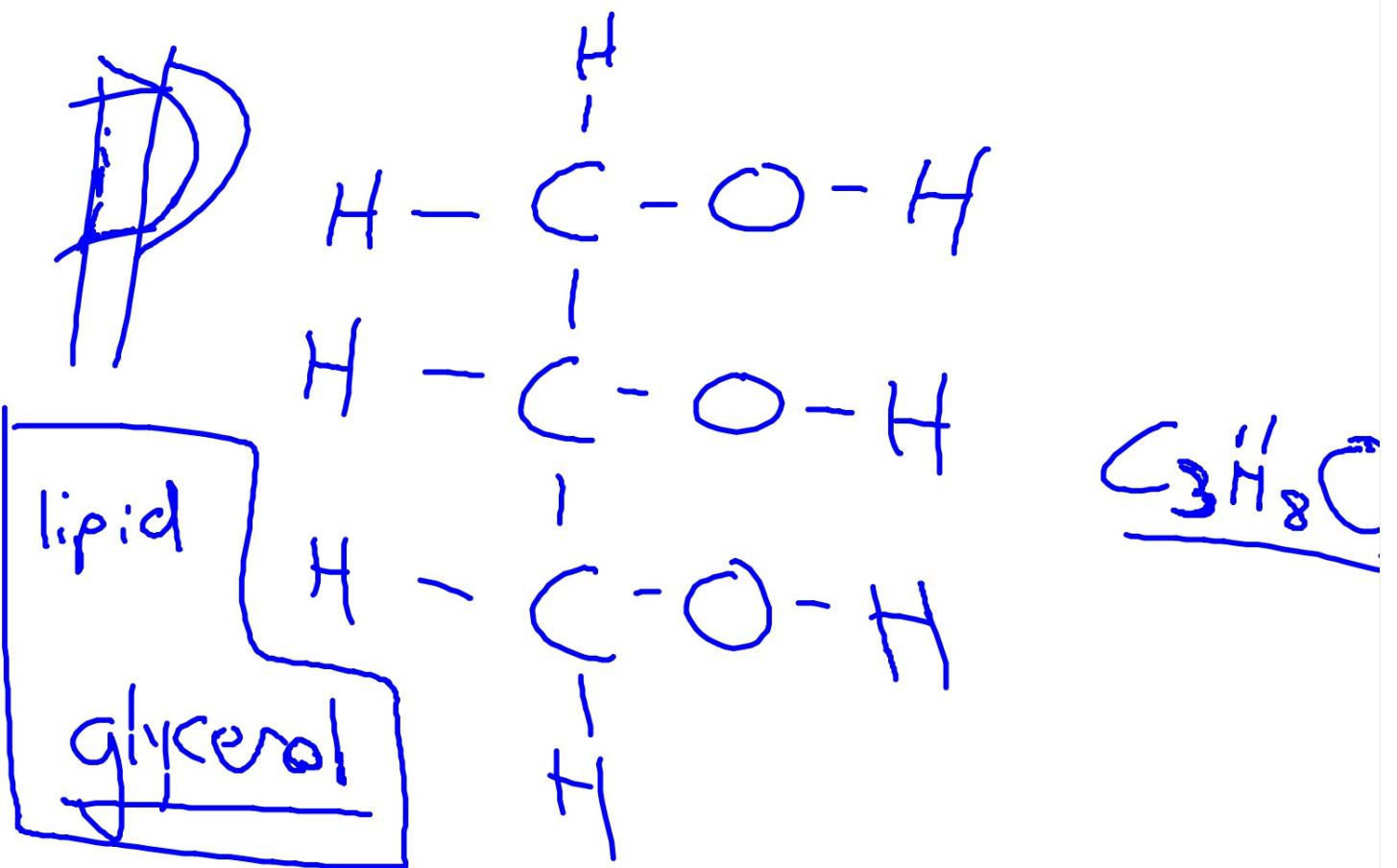
1.



2.

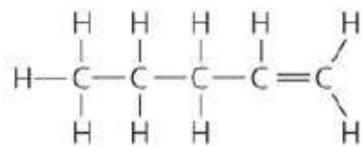


4.

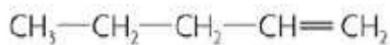


- straight chain
- branched chain
- ring

Straight chain

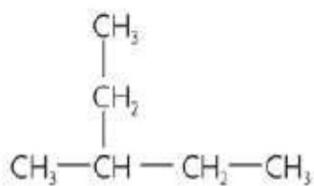


A simplified structure can also be shown as:



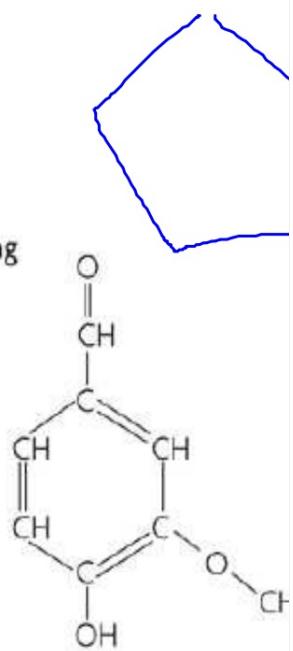
Pentene

Branched chain



Hexane

Ring

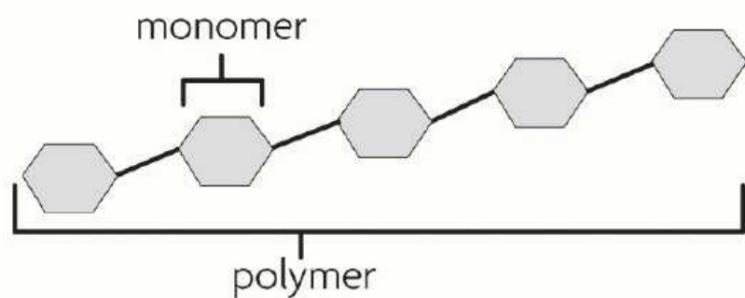


Vanillin

2.3 Carbon-Based Molecules

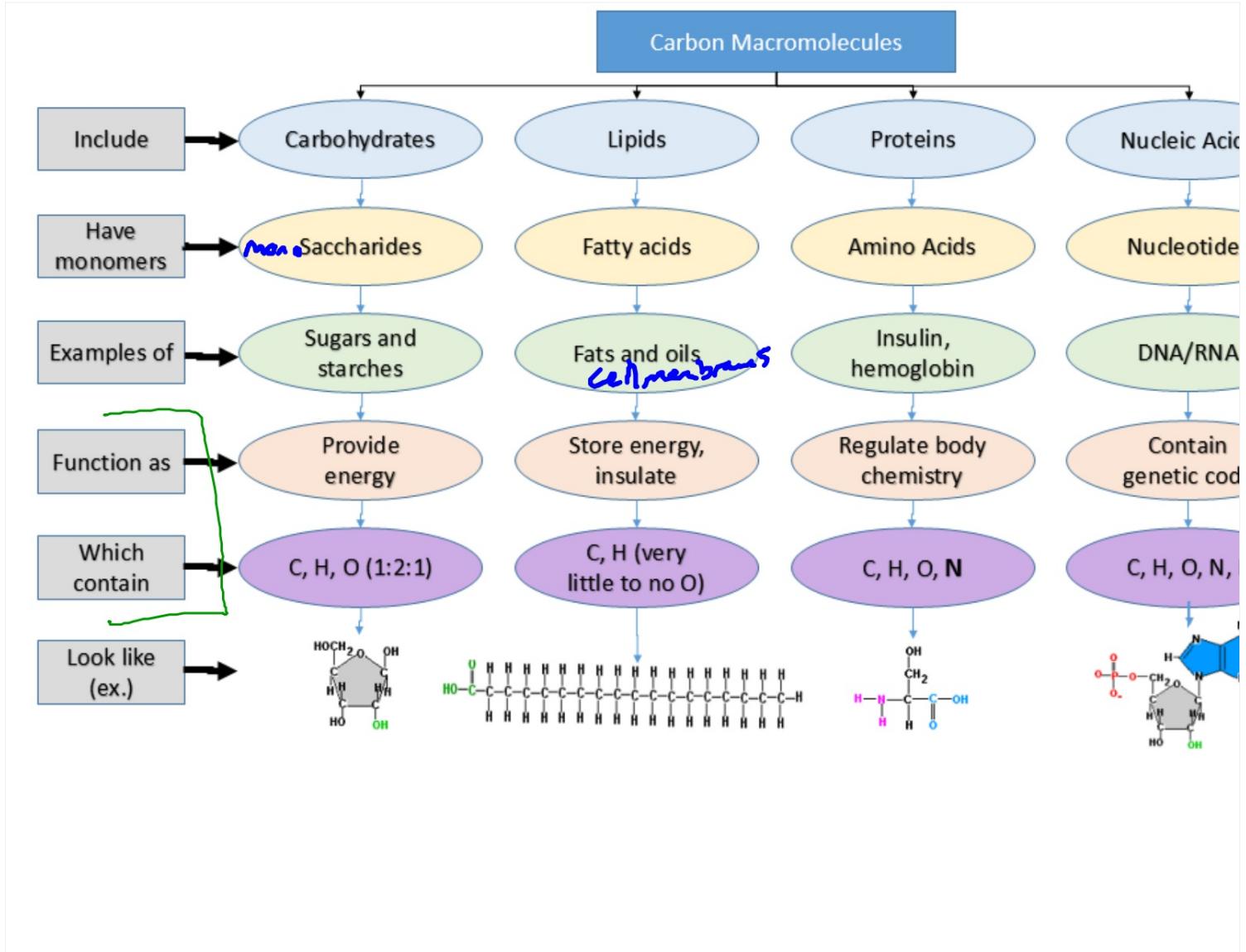
- Many carbon-based molecules are made of many small subunits bonded together.
 - Monomers are the individual subunits.
 - Polymers are made of many monomers.

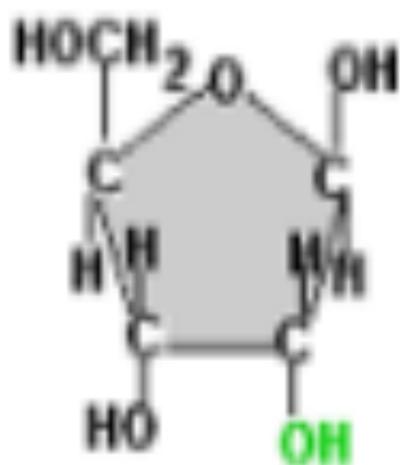
mono- = one
poly- = many



Std. 1.3 Distinguish ...

Carbon Compound	Monomer	Polymer	Major elements	Function
carbohydrates	monosaccharide <u>glucose</u>	polysaccharide <u>cellulose, starch</u>	C, H, O 1:2:1	provide energy (immediate)
lipids	fatty acid <u>glycerol</u>	lipid <u>triglyceride</u>	C, H, O very little	Store energy make cell membranes lipid hormones insulate
protein	amino acid <u>leucine</u>	protein <u>catalase</u>	C, H, O, N	regulate Blood chemistry
nucleic acid DNA/RNA	nucleotide <u>Cytidine- P</u>	nucleic acid <u>DNA, RNA</u>	C, H, O, N, P	Coding for proteins





Carbohydrates

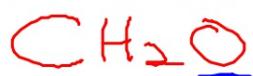
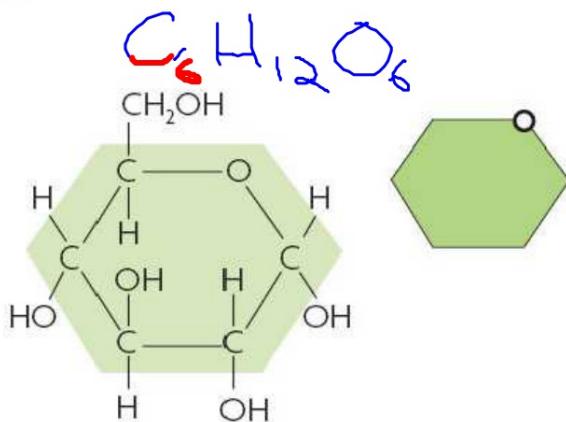
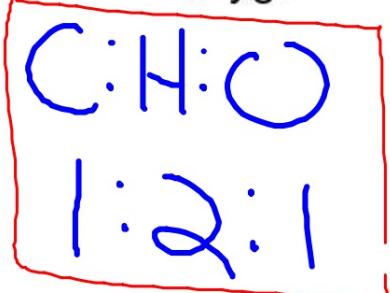
- OSE

- Carbon + water C_6H_{12}
 $1:2:$
- monomer: Monosacchar.
- Examples: Sugars / starches
- Function: provide immediate en

2.3 Carbon-Based Molecules

- Four main types of carbon-based molecules are found in living things

- Carbohydrates are made of carbon, hydrogen, and oxygen.



all Sugars are
Carbohydrates

-ose = Glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) can be ring shaped and is often shown as a simplified hexagon.
Sugar

2.3 Carbon-Based Molecules

- Four main types of carbon-based molecules are found in living things.

- Carbohydrates are made of carbon, hydrogen, and oxygen. $\text{-O}_x \text{H}_2\text{O}$

- Carbohydrates include sugars and starches.

monomer →

- Monosaccharides are simple sugars glucose

Polymer

- Polysaccharides include starches, cellulose, and glycogen.

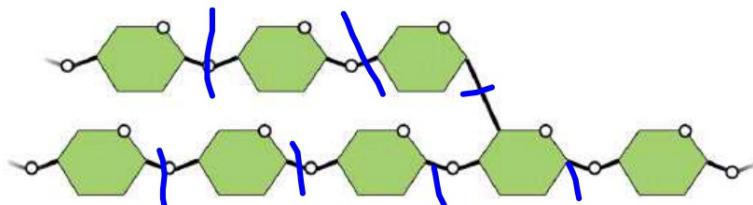


2.3 Carbon-Based Molecules

Fructose

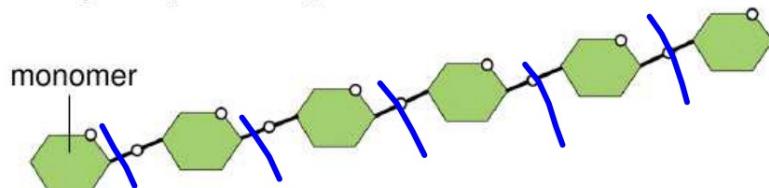
- Carbohydrates can be broken down to provide energy for cells.
- Some carbohydrates are part of cell structure.

Polymer (starch)

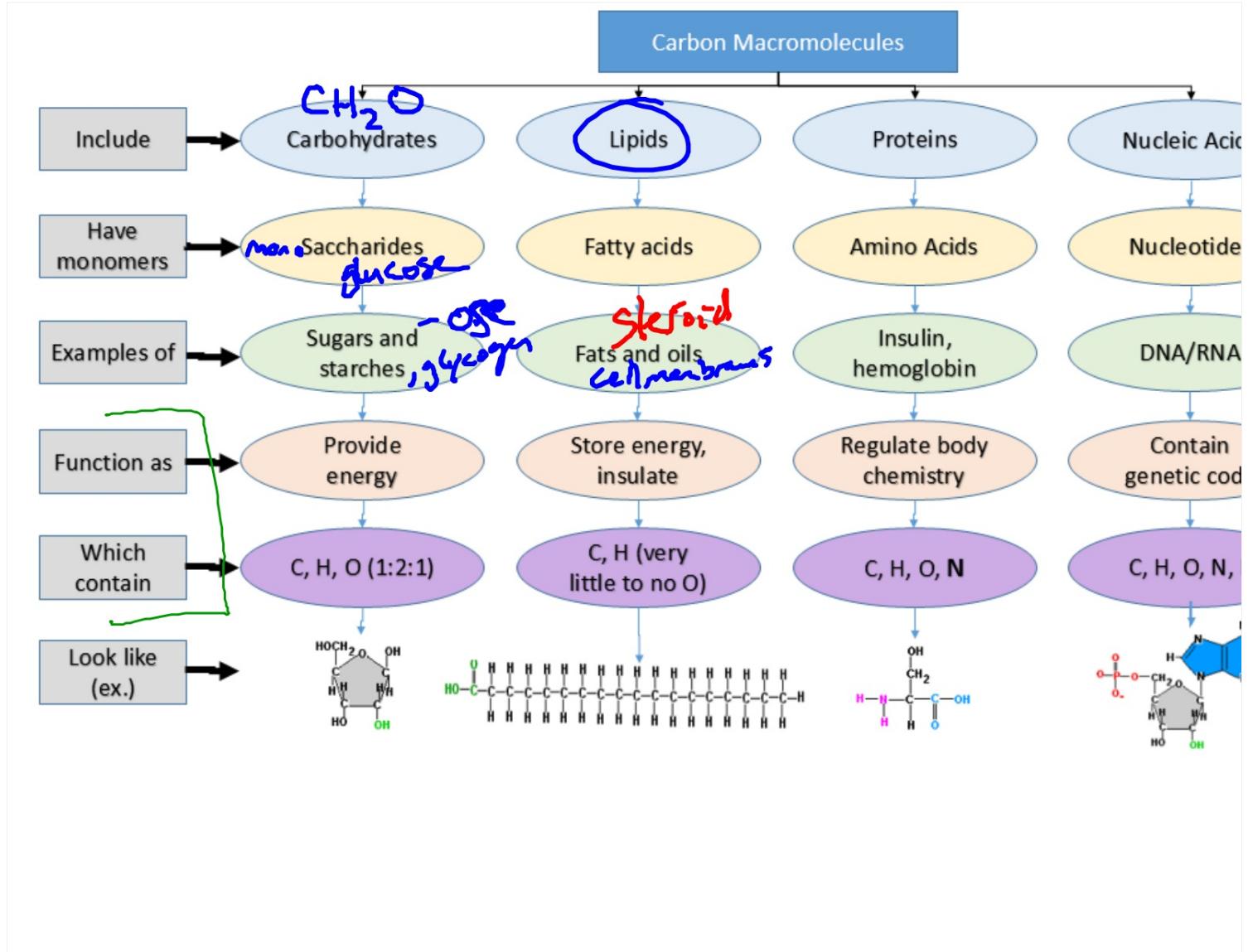


Starch is a polymer of glucose monomers that often has a branched structure.

Polymer (cellulose)

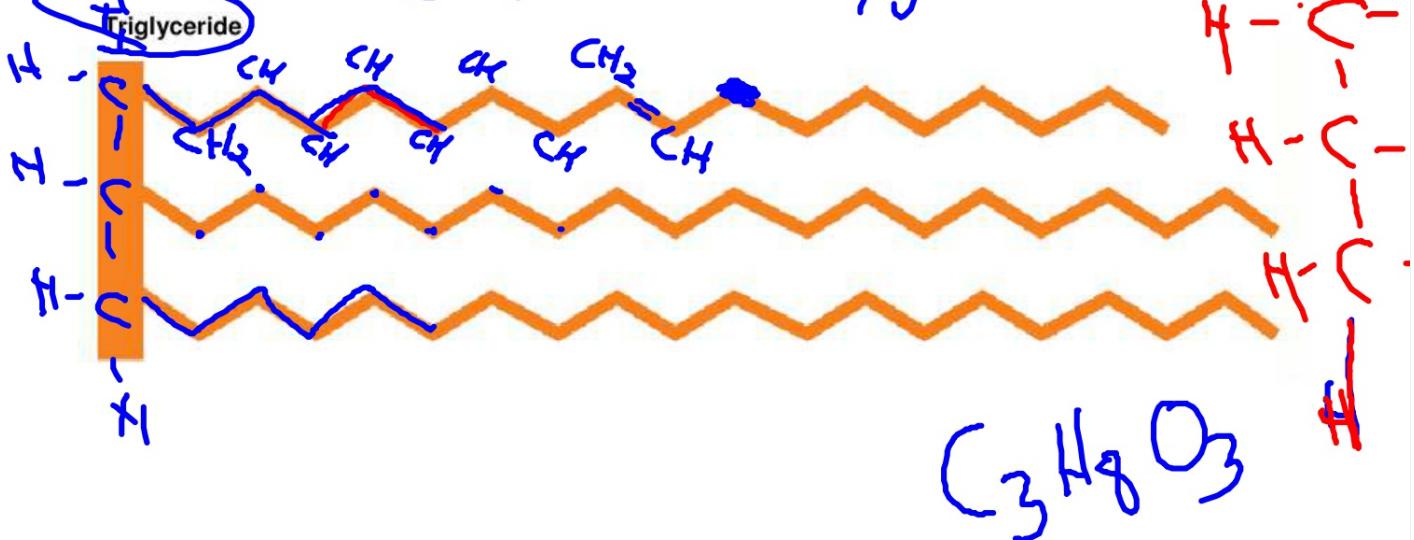


Cellulose is a polymer of glucose monomers that has a straight, rigid structure



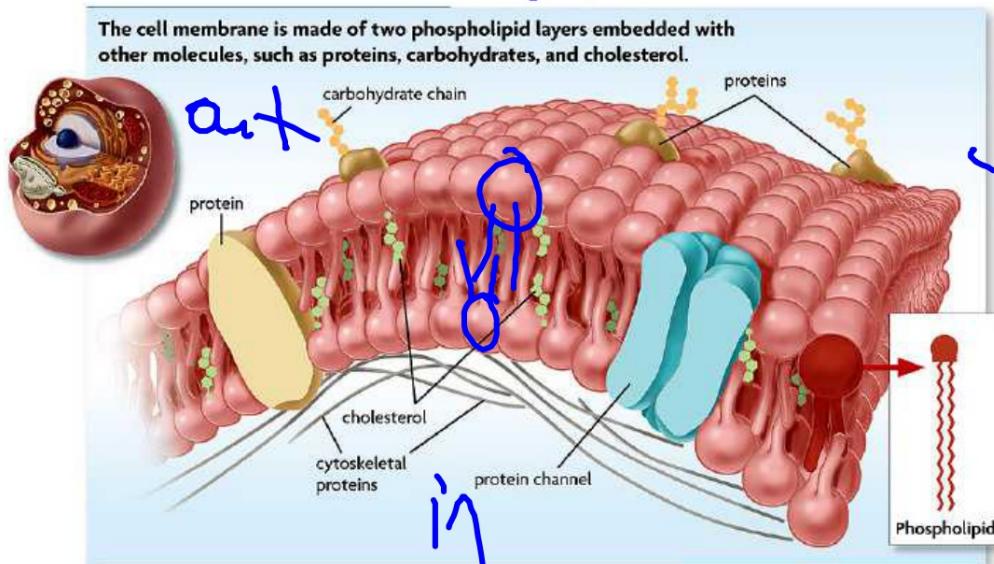
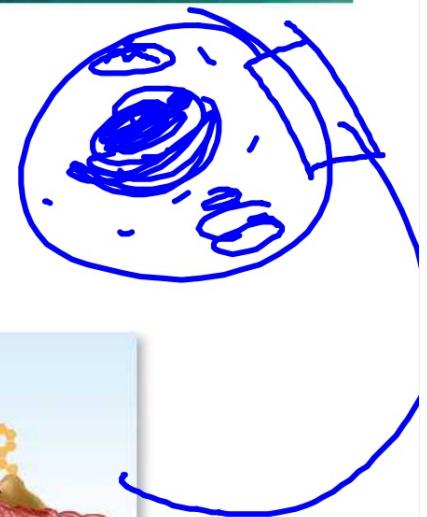
2.3 Carbon-Based Molecules

- Lipids are nonpolar molecules that include fats, oils, and cholesterol.
- ← fat*
- mostly H + C*
- Steroids*
- one*
- Many contain carbon chains called fatty acids.
 - Fats and oils contain fatty acids bonded to glycerol.
- glycerol:*
- little to no oxygen*



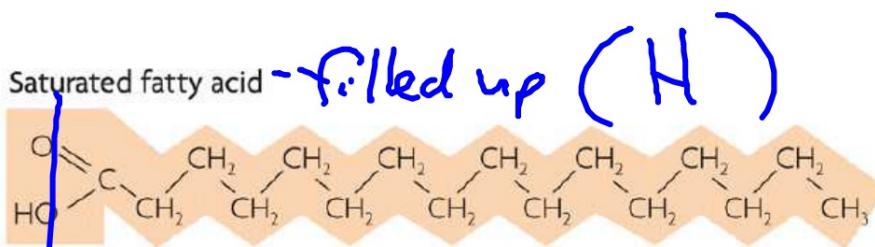
2.3 Carbon-Based Molecules

- Lipids have several different functions.
- insulate
- broken down as a source of energy
- make up cell membranes
- used to make hormones, steroid

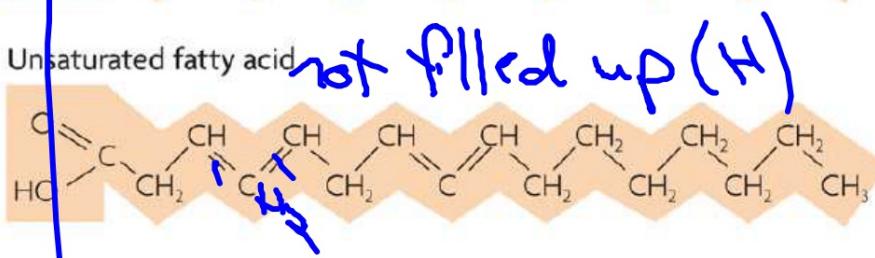


2.3 Carbon-Based Molecules

- Fats and oils have different types of fatty acids.
 - saturated fatty acids
 - unsaturated fatty acids



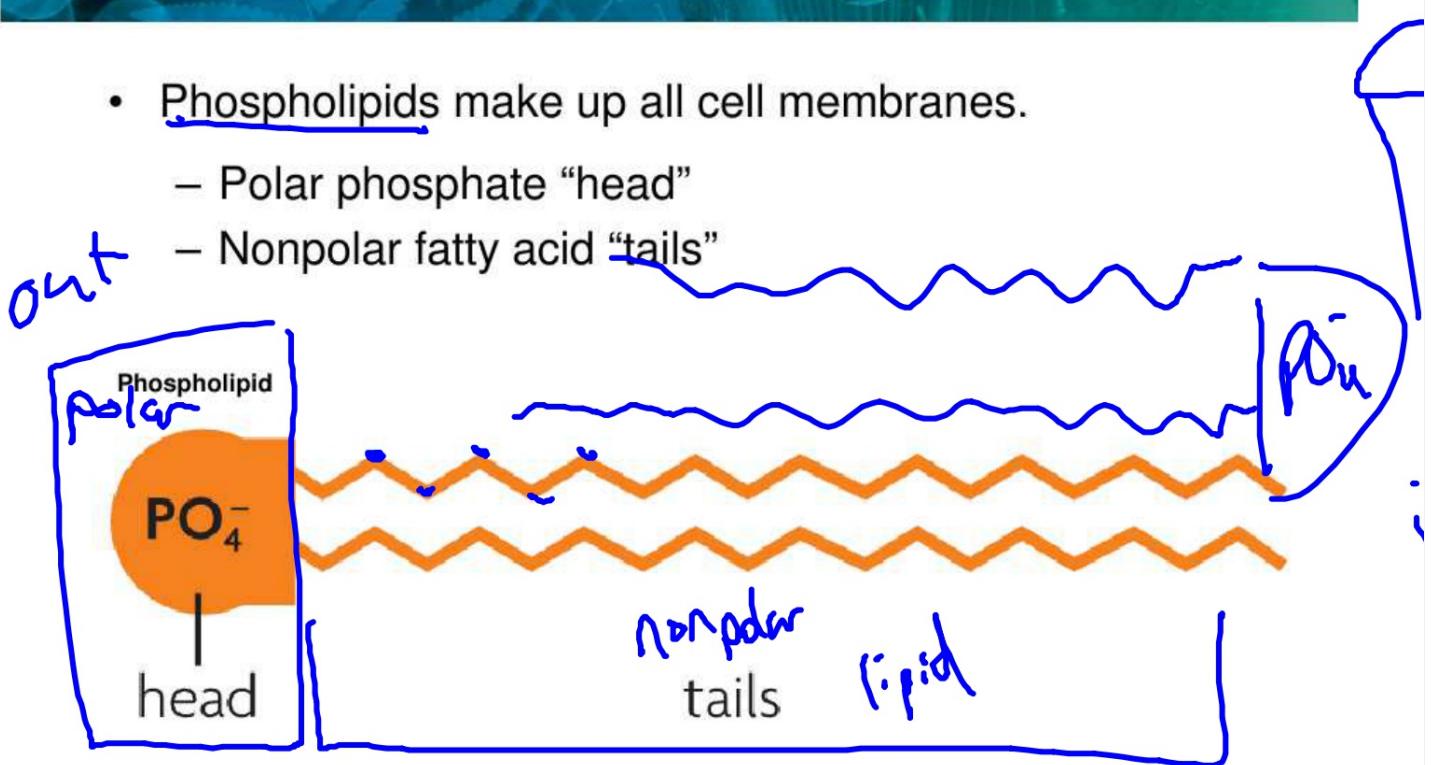
Saturated fats contain fatty acids in which all carbon–carbon bonds are single bonds.

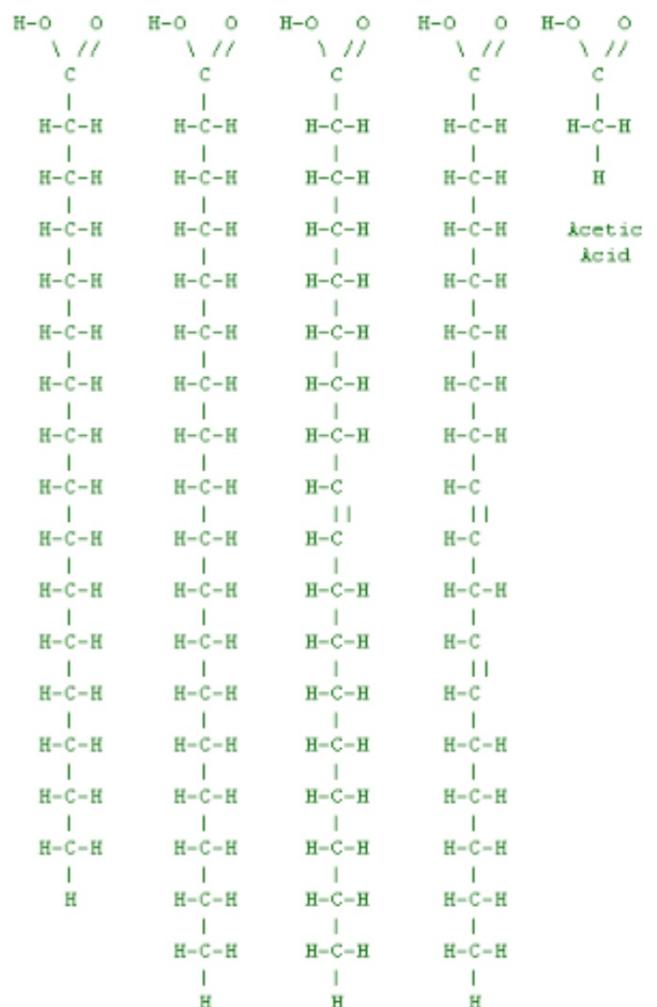


Unsaturated fats have fatty acids with at least one carbon–carbon double bond.

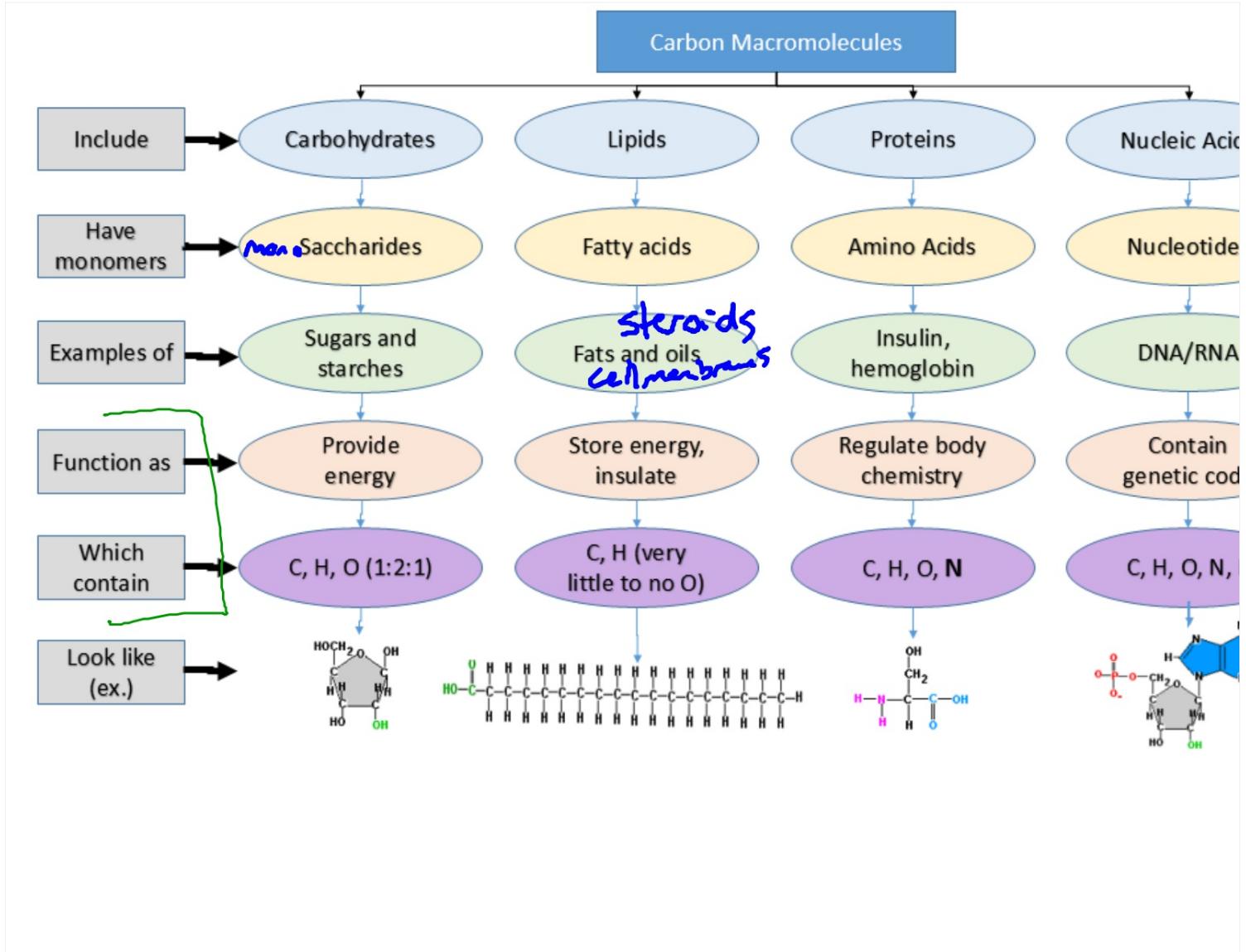
2.3 Carbon-Based Molecules

- Phospholipids make up all cell membranes.
 - Polar phosphate “head”
 - Nonpolar fatty acid “tails”



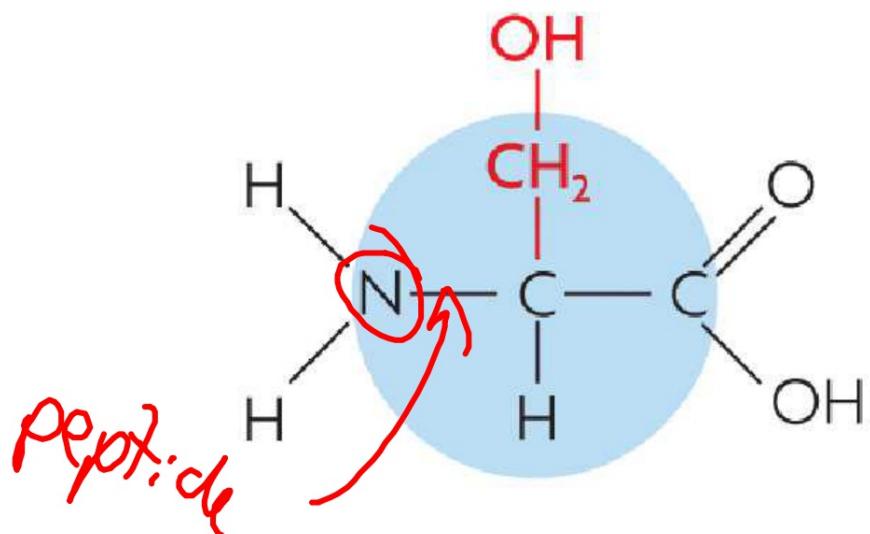


Palmitic Stearic Oleic Linoleic
 Acid Acid Acid Acid



2.3 Carbon-Based Molecules

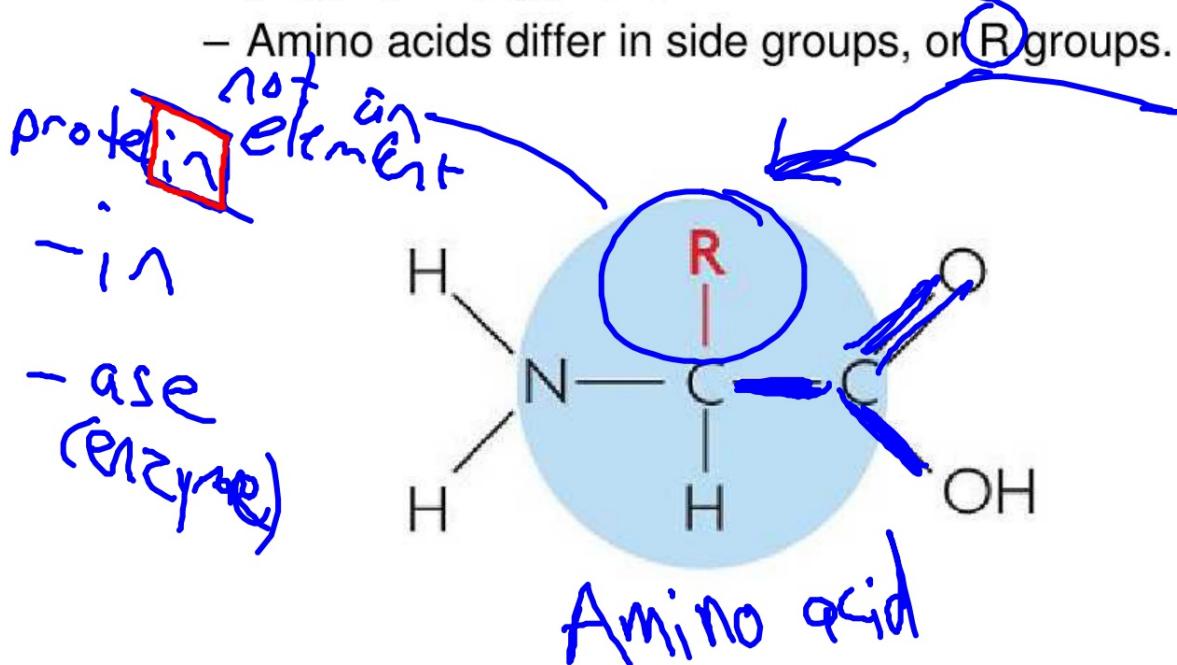
- Proteins are polymers of amino acid monomers.
 - Twenty different amino acids are used to build *essential* proteins in organisms.



2.3 Carbon-Based Molecules

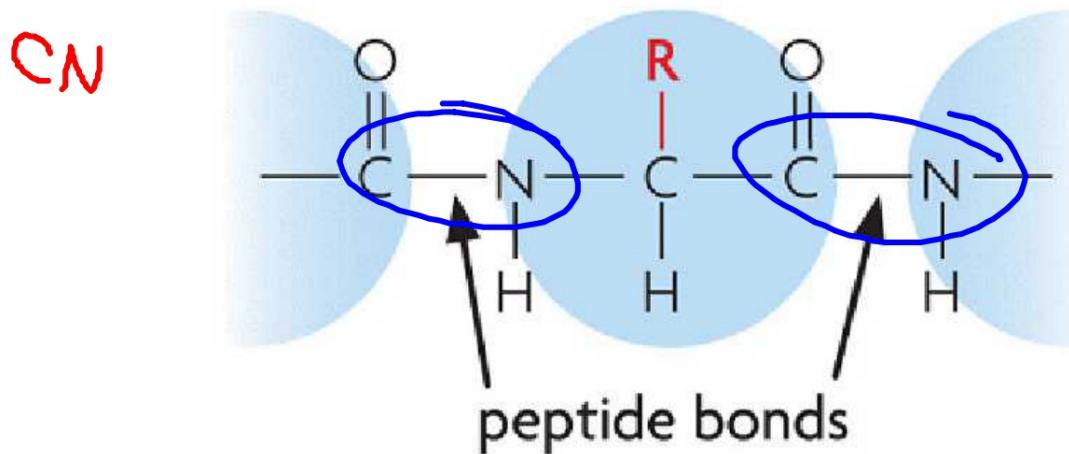
- Proteins are polymers of amino acid monomers.
 - Twenty different amino acids are used to build proteins in organisms.
 - Amino acids differ in side groups, or R groups.

essential



2.3 Carbon-Based Molecules

- Proteins are polymers of amino acid monomers.
 - Twenty different amino acids are used to build proteins in organisms.
 - Amino acids differ in side groups, or R groups.
 - Amino acids are linked by peptide bonds.

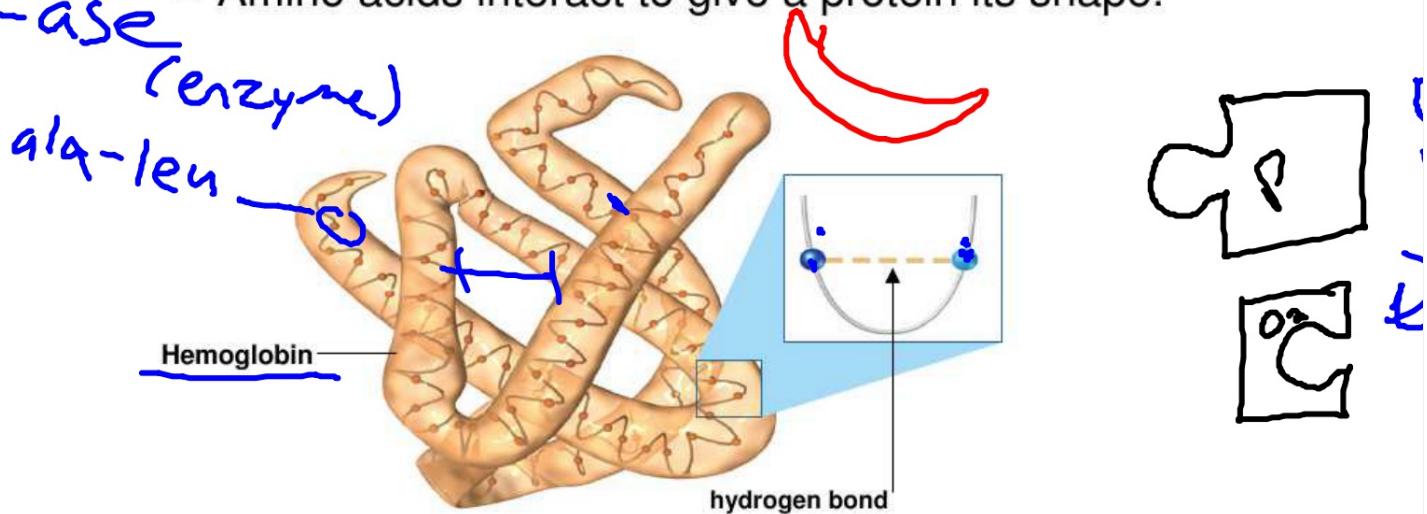


2.3 Carbon-Based Molecules

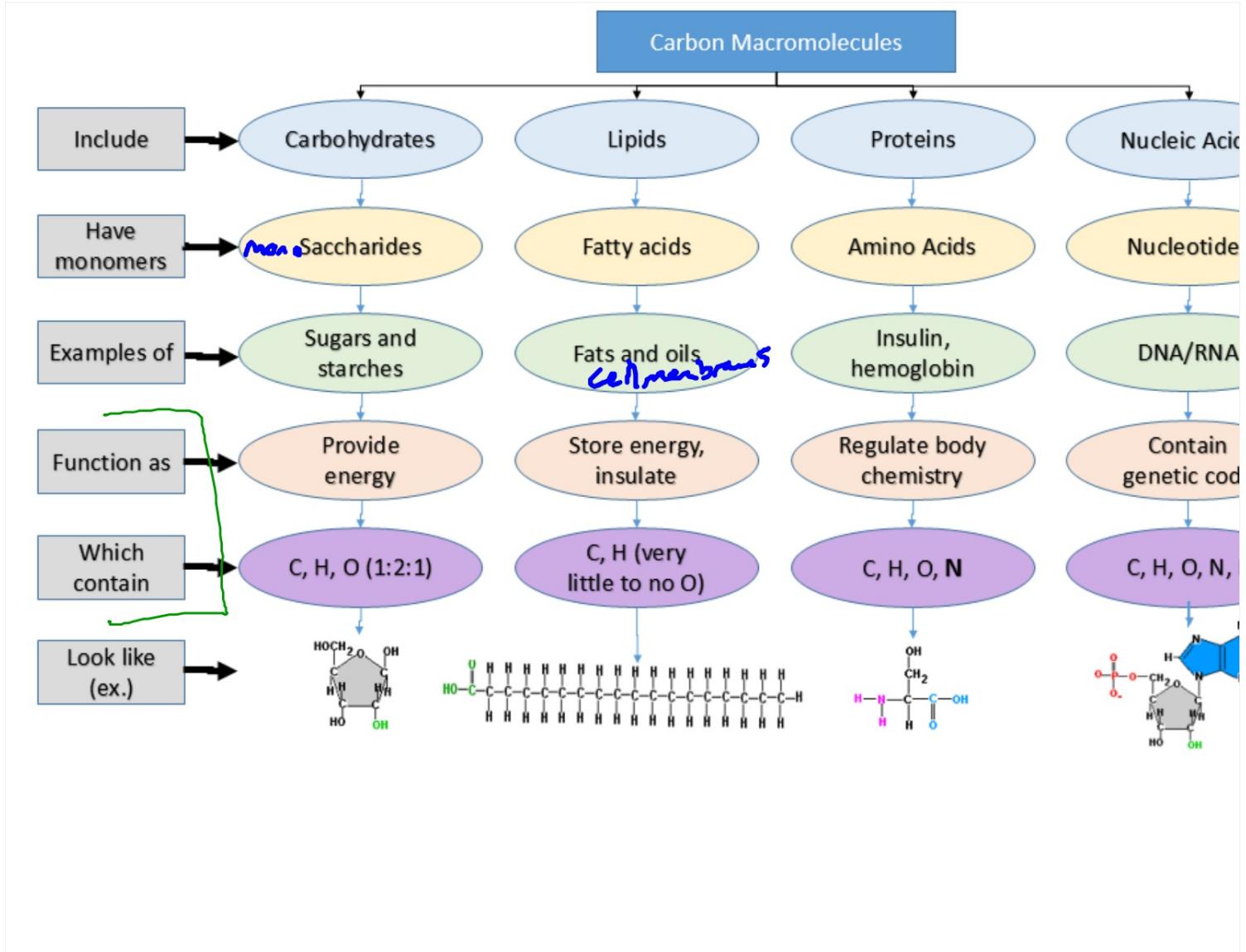
* *Structural determines function*

- Proteins differ in the number and order of amino acids.

- ase
 - Amino acids interact to give a protein its shape.



- Incorrect amino acids change a protein's structure and function.



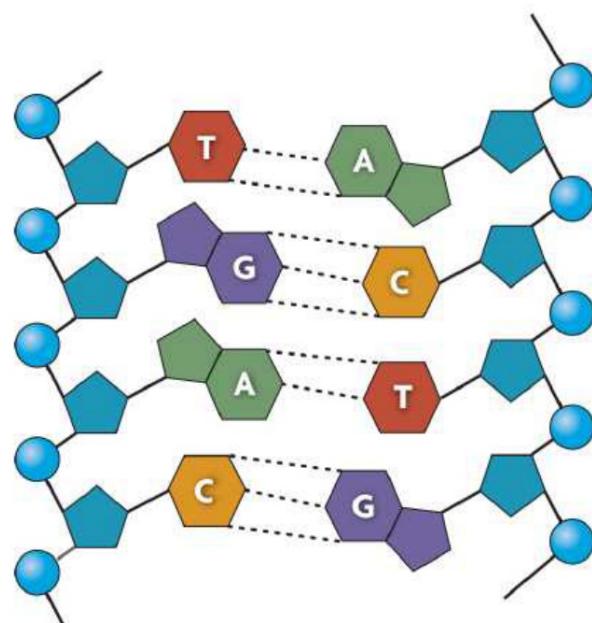
Kickoff:

**Label the monomers and function of each of
the following:**

- 1. Cellulose**
- 2. Cholesterol**
- 3. Starch**
- 4. Triglyceride**
- 5. Hemoglobin**
- 6. Glycogen**
- 7. Insulin**
- 8. Testosterone**

2.3 Carbon-Based Molecules

- Nucleic acids are polymers of monomers called nucleotides.

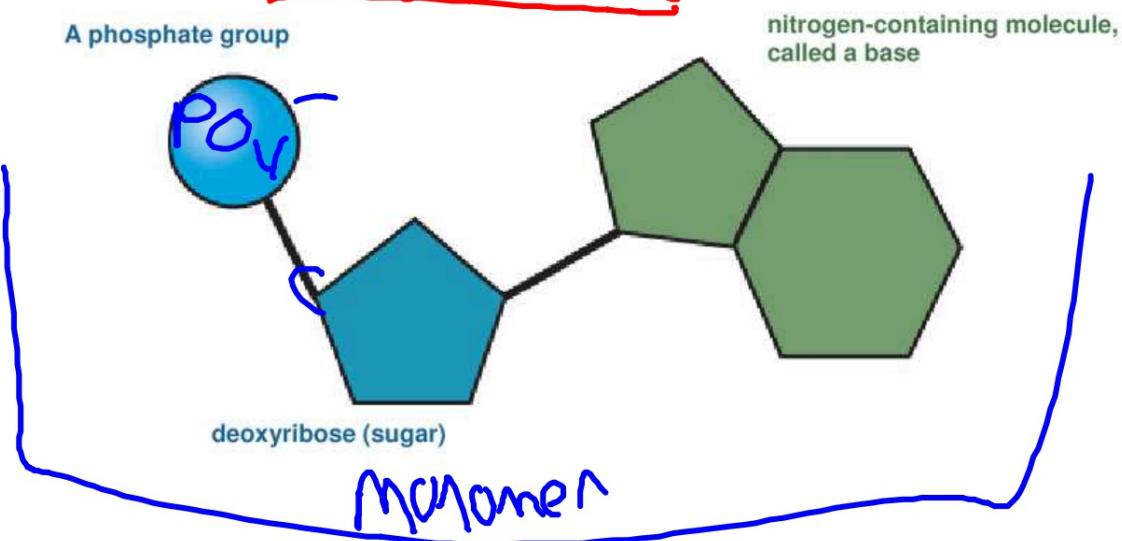


2.3 Carbon-Based Molecules

deoxyribonucleic acid - DNA

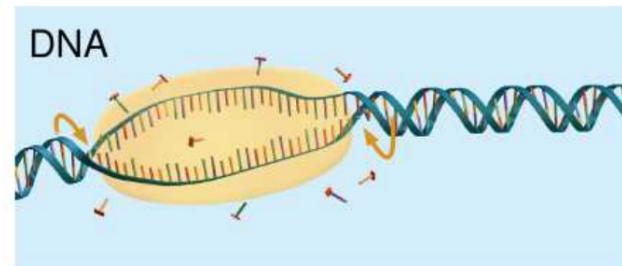
- Nucleic acids are polymers of monomers called nucleotides.
 - Nucleotides are made of a sugar, phosphate group, and a nitrogen base.

Nucleotide

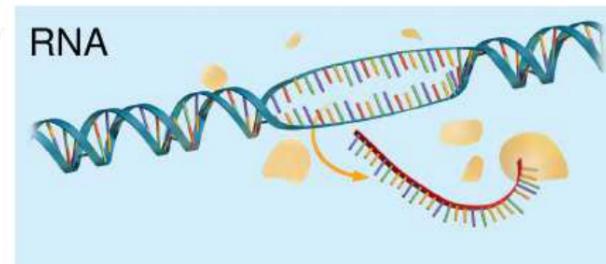


2.3 Carbon-Based Molecules

- Nucleic acids are polymers of monomers called nucleotides.
 - Nucleotides are made of a sugar, phosphate group, and a nitrogen base.
 - DNA stores genetic information.



- RNA builds proteins.



Monomer	Polymer
monosaccharides (simple sugars)	polysaccharides <i>carbohydrates</i>
amino acid	proteins
nucleotides	nucleic acids
fatty acids	lipids (triglycerides)*

