T-GB Test 1 Lab Practical

1.) Determining Acids and Bases

Litmus paper is used to determine the acidity and/or basicity of a solution. The degree of color change is proportional to the concentration of protons or hydroxide ions in the solution.

Determining Acidity: Blue litmus paper is used to test for the extent of acidity in a solution. If a solution has a pH of 5 or lower, the litmus paper will turn various shades of red. The deeper the red color, the more acidic the solution.

Determining Basicity: Red litmus paper is used to test the degree of basicity in a solution. If a solution has a pH of 8 or higher, the litmus paper will turn proportionally deeper shades of blue. More basic solutions will turn a deeper shade of blue.

Use the dropper to test each of the following solutions.

a) Coffee

b) Milk

c) Orange juice

d) Soda

e) Detergent

Order the solutions from most acidic to most basic.

2.) Water is polar (hydrophilic) and causes the exclusion and aggregation of nonpolar (hydrophobic) compounds. Introducing nonpolar material to water will result in the formation of globular shapes as it attempts to sequester itself from the polar environment.

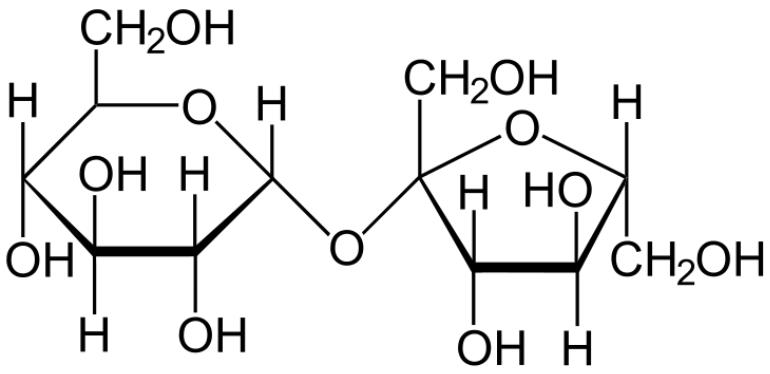
We can use the solution properties to simulate the formation of a cell. Carefully introduce the vegetable oil (nonpolar) into a bullet tube filled with water. Attempt to pierce the oil globule and infuse it with food coloring. If successful, the oil globule will capture the color and not allow it into the surrounding aqueous environment.

Once you've had your fun, go a little crazy. Make sure you can identify polar and nonpolar functional groups.

3.) For each structure:

a) Identify the functional groups in each of the following molecules.
b) Determine the type of the macromolecule.
c) Based on this information, what special characteristics or attributes might the molecule display?

i)



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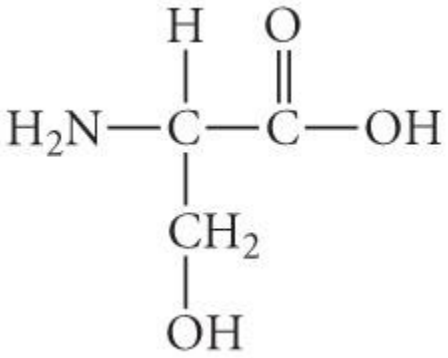

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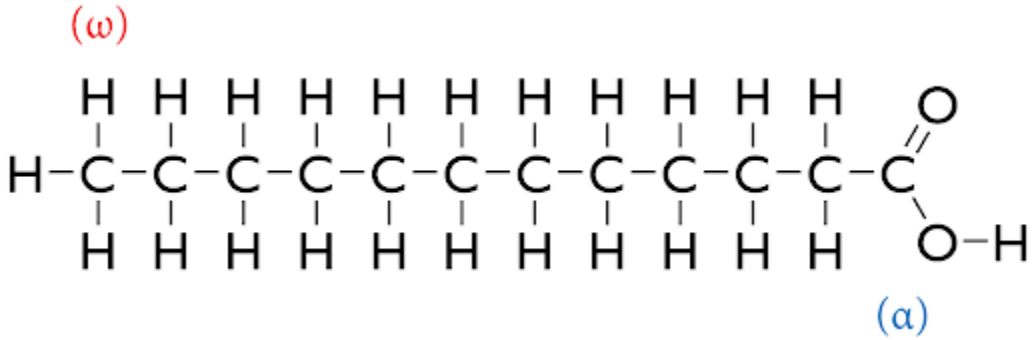

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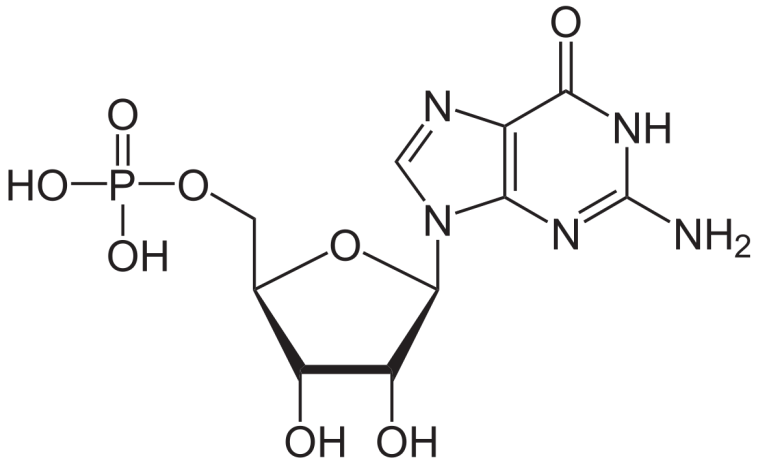

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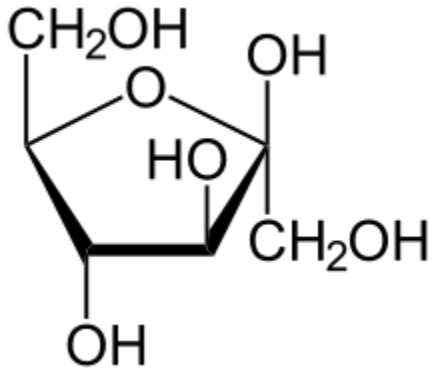

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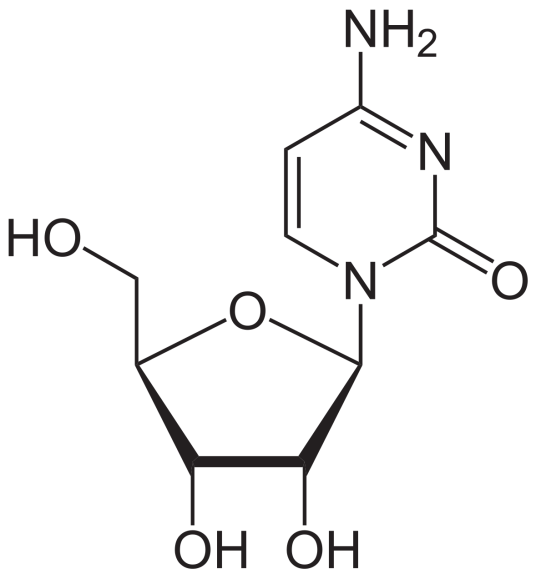

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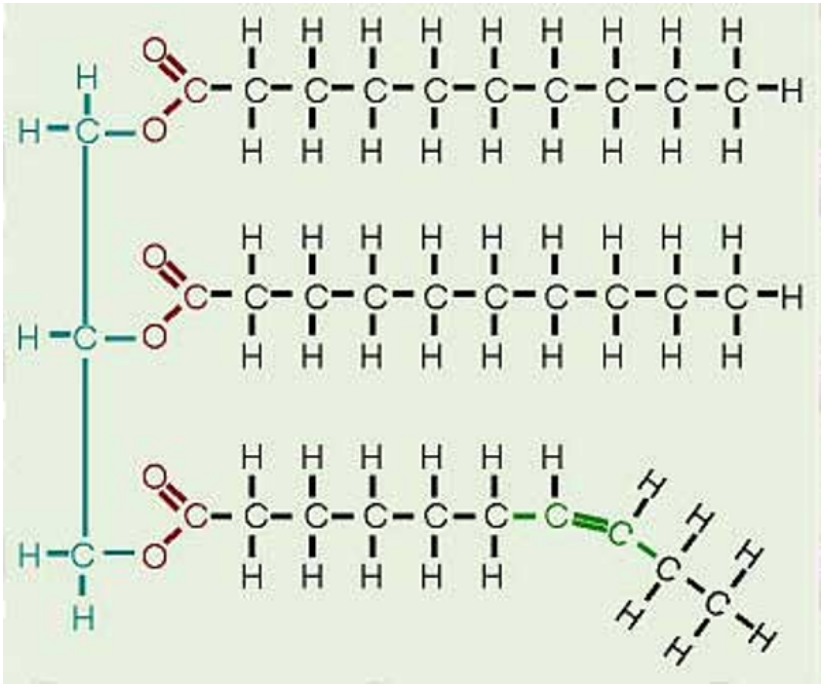
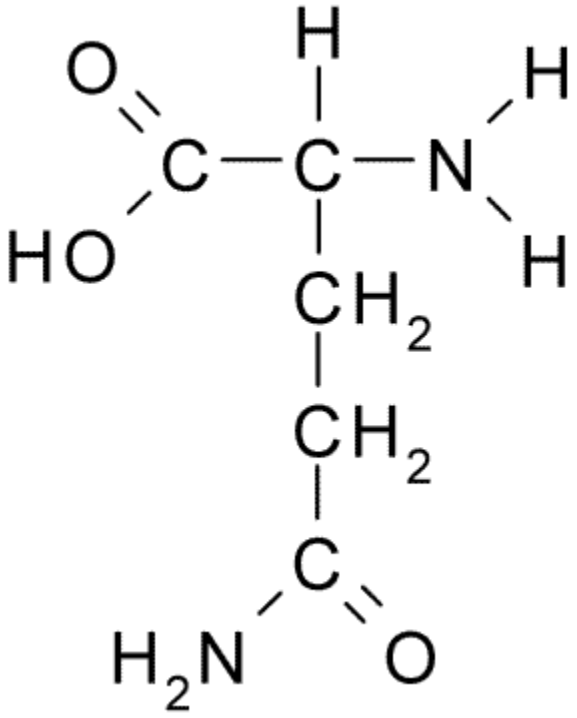
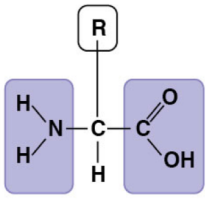


viii)

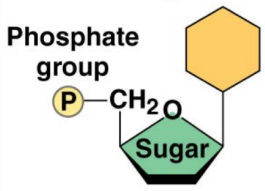


Types of Macromolecules

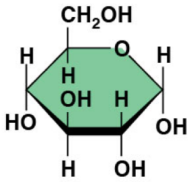
Type: Proteins
Monomer: amino acids
Polymer: polypeptide

Components	Examples	Functions
 Amino acid monomer (20 types)	• Enzymes • Structural proteins • Storage proteins • Transport proteins • Hormones • Receptor proteins • Motor proteins • Defensive proteins	• Catalyze chemical reactions • Provide structural support • Store amino acids • Transport substances • Coordinate organismal responses • Receive signals from outside cell • Function in cell movement • Protect against disease

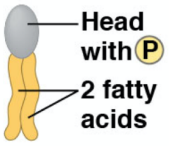
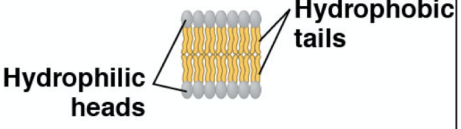
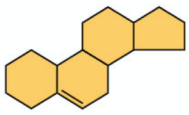
Type: Nucleic Acids
Monomer: nucleotide
Polymer: polynucleotide

Components	Examples	Functions
 Nucleotide monomer	DNA:  • Sugar = deoxyribose • Nitrogenous bases = C, G, A, T • Usually double-stranded	Stores hereditary information
	RNA:  • Sugar = ribose • Nitrogenous bases = C, G, A, U • Usually single-stranded	Various functions in gene expression, including carrying instructions from DNA to ribosomes

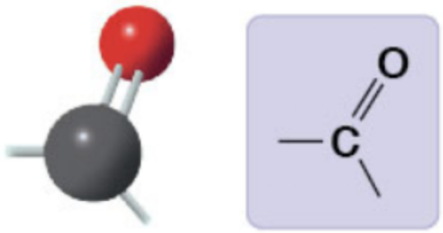
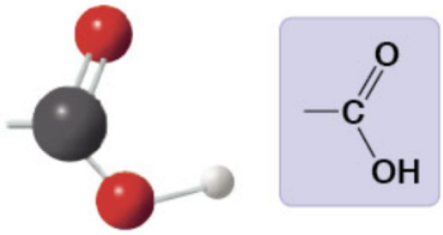
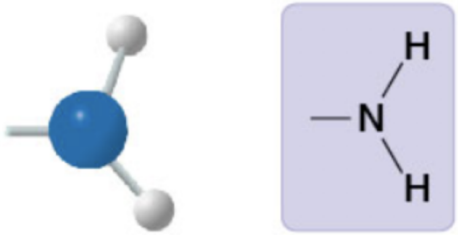
Type: Carbohydrate (Sugar)
Monomer: monosaccharide
Polymer: polysaccharide

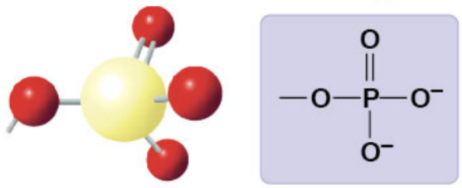
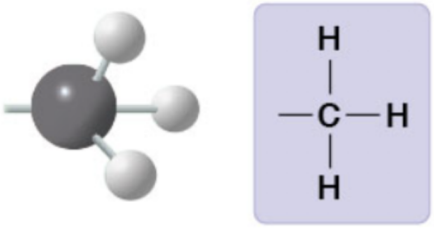
Components	Examples	Functions
 Monosaccharide monomer	Monosaccharides: glucose, fructose	Fuel; carbon sources that can be converted to other molecules or combined into polymers
	Disaccharides: lactose, sucrose	
	Polysaccharides: • Cellulose (plants) • Starch (plants) • Glycogen (animals) • Chitin (animals and fungi)	• Strengthens plant cell walls • Stores glucose for energy • Stores glucose for energy • Strengthens exoskeletons and fungal cell walls

Type: Fats (Lipids)
Monomer: fatty acid
Polymer: triacylglycerol

Components	Examples	Functions
Glycerol 	Triacylglycerols (fats or oils): glycerol + three fatty acids	Important energy source 
	Phospholipids: glycerol + phosphate group + two fatty acids	Lipid bilayers of membranes 
 Steroid backbone	Steroids: four fused rings with attached chemical groups	• Component of cell membranes (cholesterol) • Signaling molecules that travel through the body (hormones)

Functional Groups

Name	Structure	Polarity	Links	Other
Hydroxyl		Polar	Sugars	Accounts for sweetness.
Carbonyl		Polar	Fats	Head group of fats.
Carboxyl		Polar	Amino acids	Found in every amino acid.
Amino		Polar	Amino acids	Found in every amino acid.
Sulfhydryl		Polar	Antigens	Smells awful.

Phosphate		Polar	DNA	Releases energy in ATP.
Methyl		Nonpolar	none	A primary component in gas.