Pattern Matching: Classifying Organic Molecules

Adapted from Kim Foglia, Explore Biology…at least as far as I can tell
Modified for Honors Biology

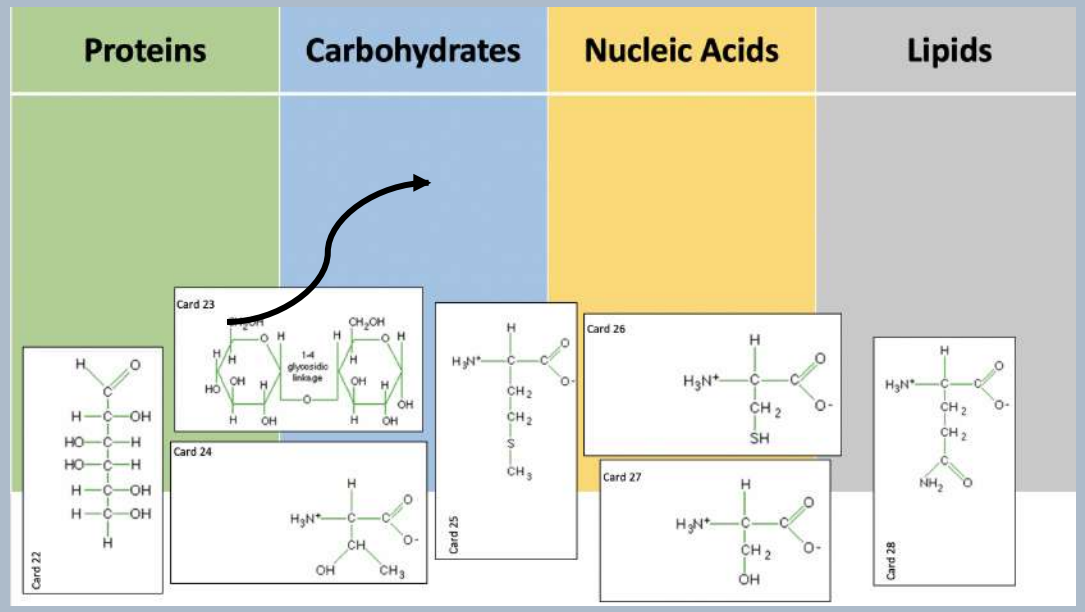
Background: You have previously learned about the four classes of large biological molecules: lipids, nucleic acids, proteins, and carbohydrates. In this activity, you will work with a group to identify the major classes of organic molecules and distinguish the features of each class of molecules. There may be as many as 10,000 different kinds of molecules in a living thing.

In this activity you will examine, distinguish the features of, and classify 14 molecules and 32 descriptions.
Answer the questions that follow.

Which elements are present in each type of molecule?
Start by filling in the table, writing “+” or “-” in each box.

	Carbon	Hydrogen	Oxygen	Nitrogen	Phosphorus
Proteins	+	+	+	+	−
Carbohydrates	+	+	+	−	−
Nucleic Acids	+	+	+	+	+
Lipids	+	+	+	−	−

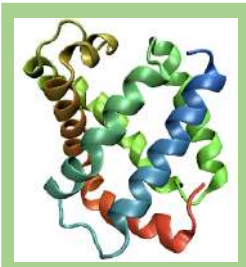
Sorting Slides

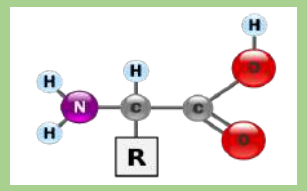


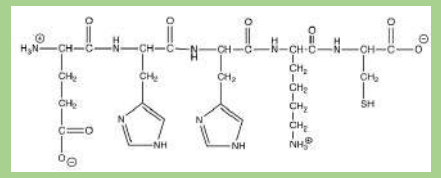
On the next seven slides, you'll find moveable cards with the molecular structure of a macromolecule. Drag and drop each card into the correct category.

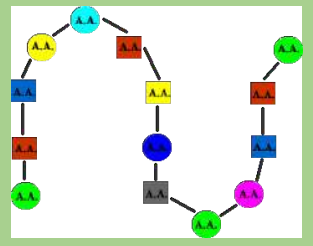
If you are unsure, leave the card at the bottom of the slide as an "Unknown." You'll have a chance later to go back and determine the correct category for that molecule.

Proteins

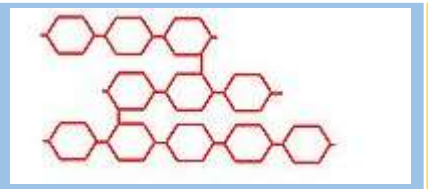


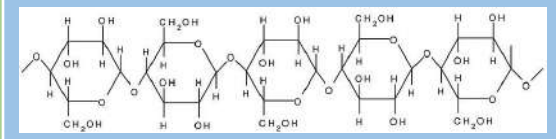


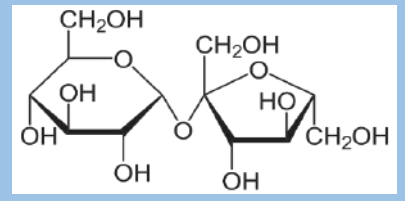


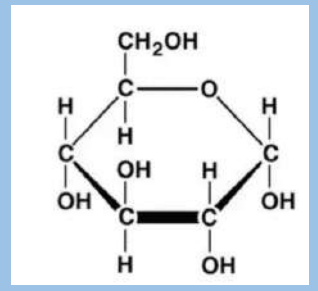


Carbohydrates

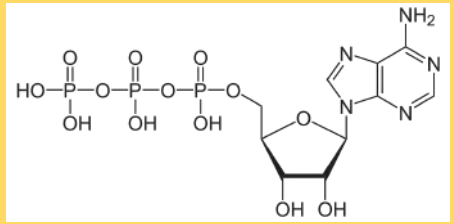


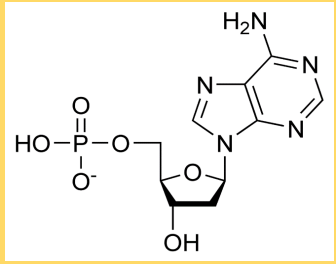




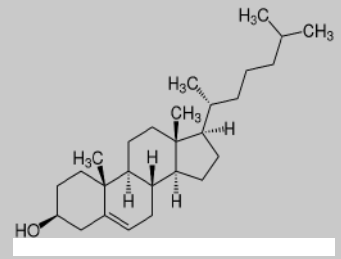


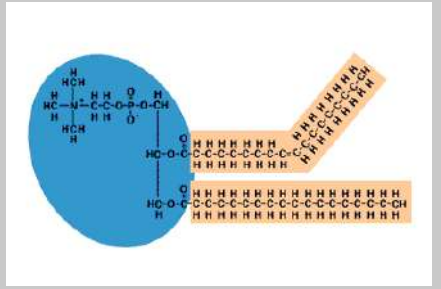
Nucleic Acids

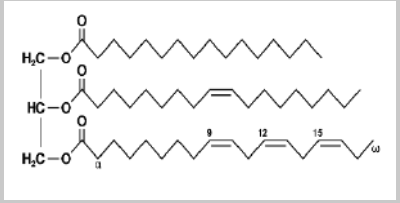




Lipids







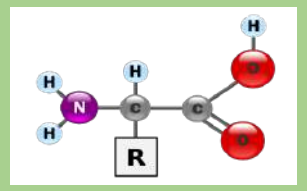
Proteins	Carbohydrates	Nucleic Acids	Lipids
Polypeptide	Polysaccharides	Nucleotide	Fatty Acid and Glycerol
Amino group	monosaccharide	polynucleotide	Oils, Fats, Waxes
Greatest diversity of functions	Primary function is energy storage	Genetic Information	Hydrophobic
Keratin and hemoglobin	Glucose, galactose, fructose	DNA, RNA	steroids

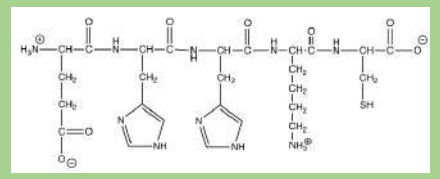
Proteins	Carbohydrates	Nucleic Acids	Lipids
Four levels of organization	Ends in -ose	Stored in the nucleus	Saturated or unsaturated
Enzymes	Produced by Photosynthesis	Nitrogen base, phosphate group, 5-carbon sugar	Waterproofing
R-Groups	Plant cell walls	Adenine, Thymine,,	Primary component of cell membranes
20 different types	Glycogen, cellulose, starch	Cytosine, Guanine	triglycerides

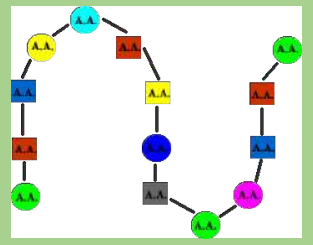
Once all the cards have been sorted, describe the patterns, shapes, and/or functional groups you noticed that led you to sort the cards as you did.

	Things We Noticed…
Proteins	
Carbohydrates	
Nucleic Acids	
Lipids	

Proteins – **Copy and paste all the cards identified as proteins.** You should have 12 items.







Polypeptide

Amino group

Greatest diversity of functions

Keratin and hemoglobin

Four levels of organization

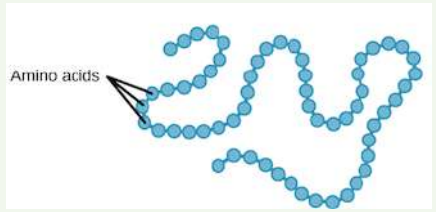
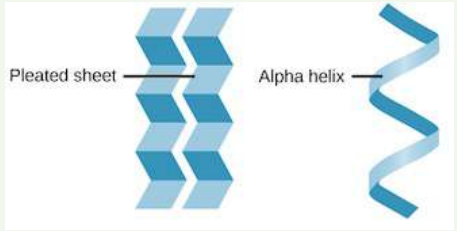
Enzymes

R-Groups

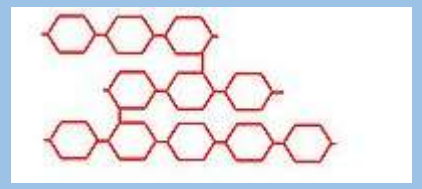
20 different types

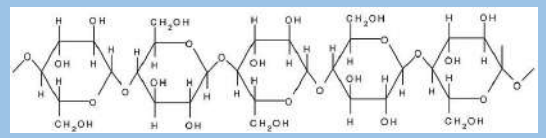
PROTEINS

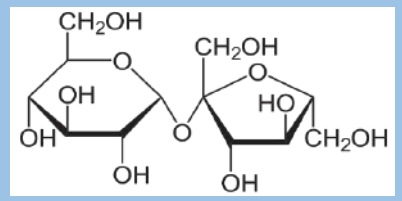
Proteins have four levels of organization. Drag the description and image to the correct category.

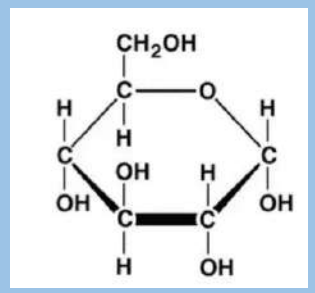
Primary	Secondary	Tertiary	Quartenary
			
Sequence of a chain of amino acids	Hydrogen bonding of the peptide backbone causes the amino acids to fold into a repeating pattern.	Three-dimensional folding pattern of a protein due to side-chain interactions.	Protein consisting of more than one amino acid chain.

Carbohydrates -- Copy and paste all carbohydrate cards. You should have 12 items. If you don't, sort through your pile of unknowns to search for more. Remember, carbohydrates only contain carbon, oxygen, and hydrogen in a very specific 1 carbon: 2 hydrogen : 1 oxygen ratio.









Polysaccharides

monosaccharide

Primary function is energy storage

Glucose, galactose, fructose

Ends in -ose

Produced by Photosynthesis

Plant cell walls

Glycogen, cellulose, starch

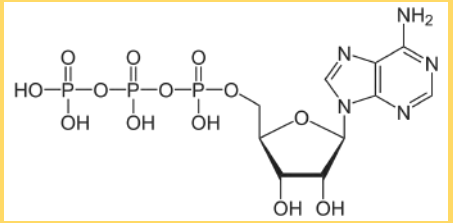
Carbohydrates – Type in the name of the carbohydrate to its function/description. Terms in the word bank or used once.

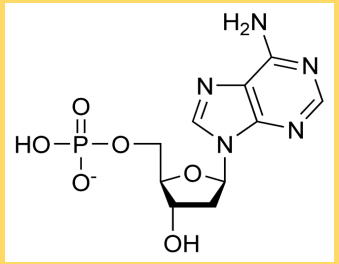
Carbohydrate Name	Description/ Function
Glucose	Primary energy storing compound for ALL organisms.
Fructose	Simple sugar commonly found in fruits.
Lactose	Simple sugar commonly found in milk and dairy products.
Starch	Polymer, stores energy in plants.
Glycogen	Polymer, stores energy in animal muscle.
Cellulose	Polymer, provides structure and rigidity to the plant cell wall.

Word Bank

Cellulose
Fructose
Glucose
Glycogen
Lactose
Starch

Nucleic Acids - Nucleic Acids store, transmit, and help express hereditary information. You should have 11 items. Copy and paste them below.





Nucleotide

polynucleotide

Genetic Information

DNA, RNA

Stored in the nucleus

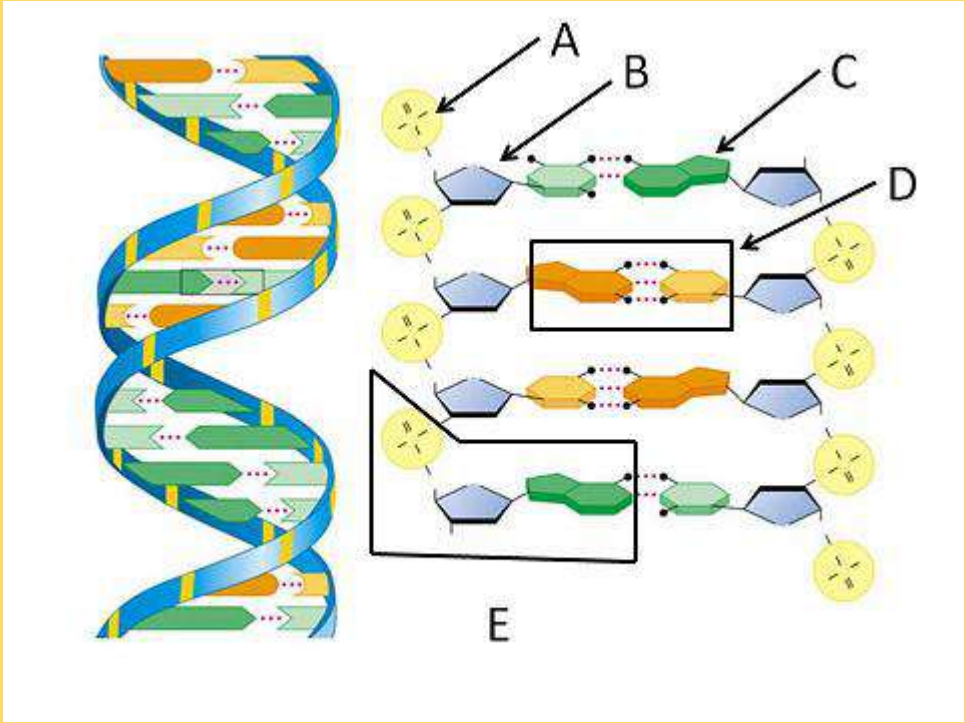
Nitrogen base, phosphate group, 5-carbon sugar

Adenine, Thymine,,

Cytosine, Guanine

Nucleic Acids

Now examine this molecule:



Which letter represents the 5-carbon sugar?

B

Which letter represents the phosphate group?

A

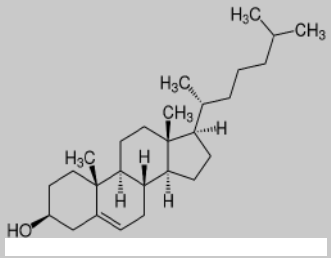
Which letter represents the nitrogenous base?

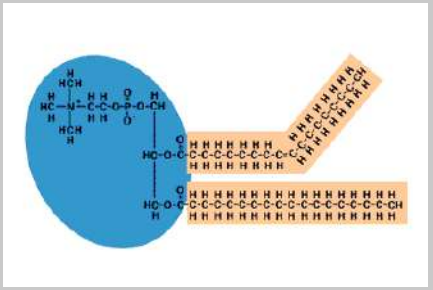
C

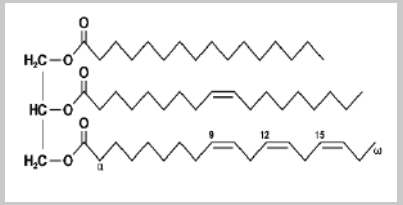
Which letter represents one nucleotide?

E

Lipids – copy and paste the lipid cards here. You should have 11 items.







Fatty Acid and Glycerol

Oils, Fats, Waxes

Hydrophobic

steroids

Saturated or unsaturated

Waterproofing

Primary component of cell membranes

triglycerides

Lipids – answer the questions below.

How are unsaturated fats and saturated fats different?

Saturated fats – have only single bonds between the carbon-carbon bonds, solid at room temperature.
Unsaturated fats – have one or more double or triple bonds between the carbon-carbon bonds. Liquid at room temperature.

Label the parts of the triglyceride below by dragging the labels to the parts of the picture.