

S12282: The Extremes of Life

Lesson 1: What is Life?

Learning Objectives:

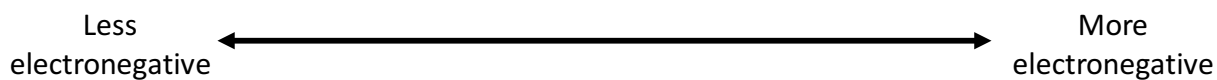
- Create a list of the properties and behaviors living things have in common
- Compare and contrast the elemental composition of living and nonliving things
- Identify hydrogen bond donors and acceptors
- Identify common chemical groups and their properties
- List common types of biological macromolecules and their functions
- Describe the central dogma of molecular biology
- Identify common features of all cells

What properties or behaviors do living things have in common?

What are the elements important for life on Earth?

What is electronegativity?

Fill out the electronegativity scale:



What are hydrogen bonds?

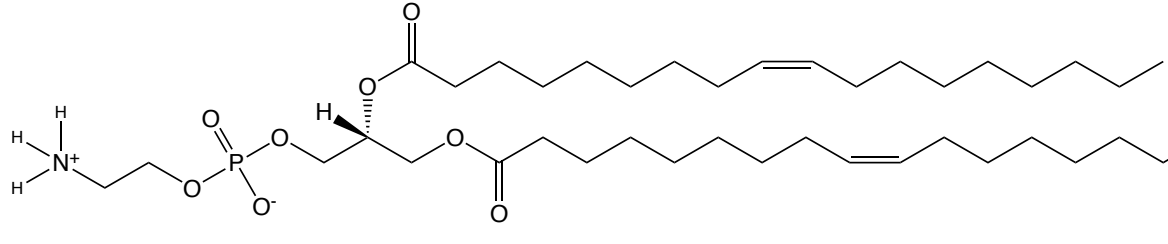
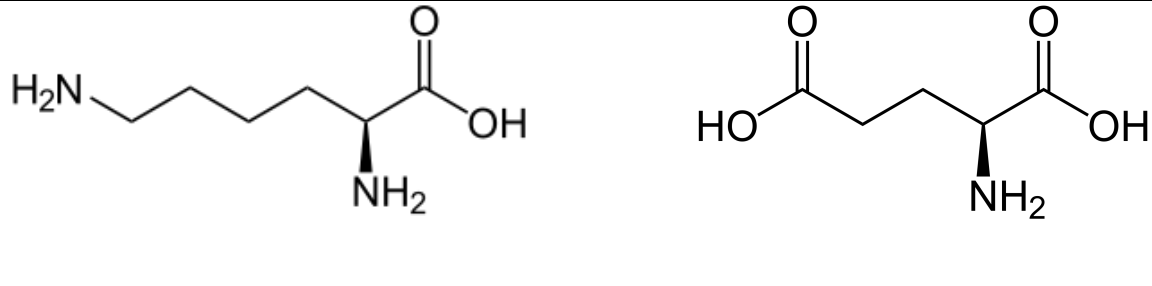
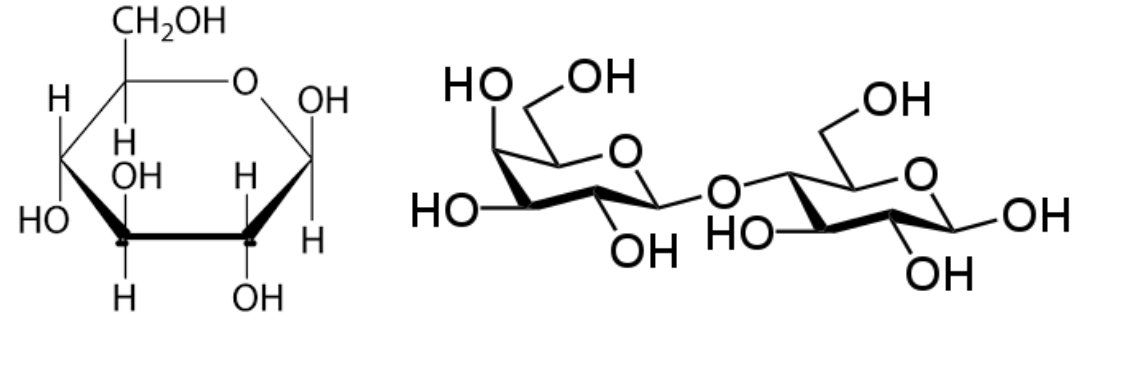
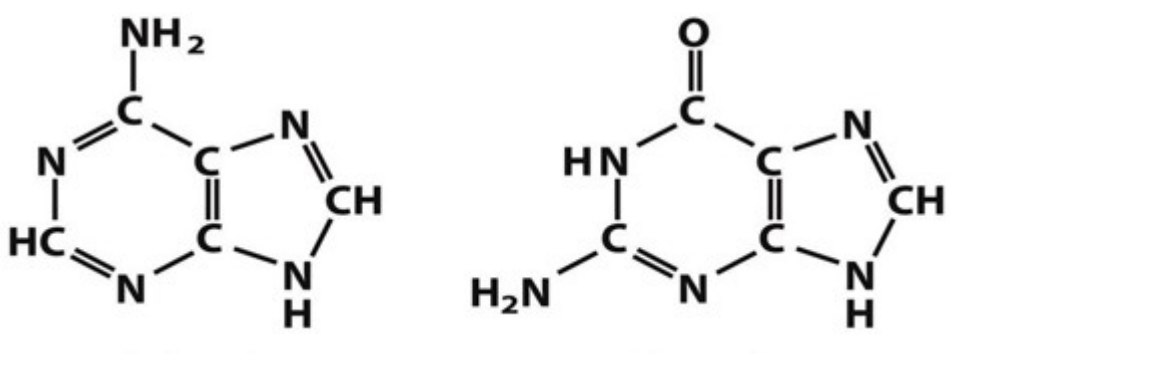
Draw some examples of hydrogen bonds:

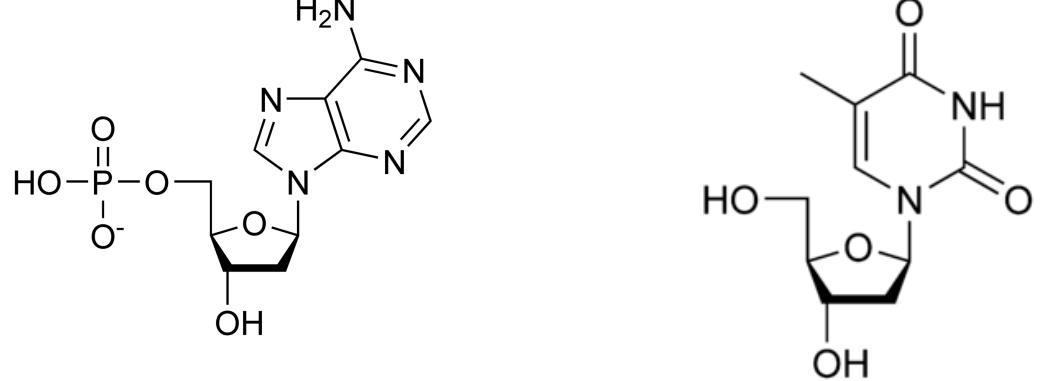
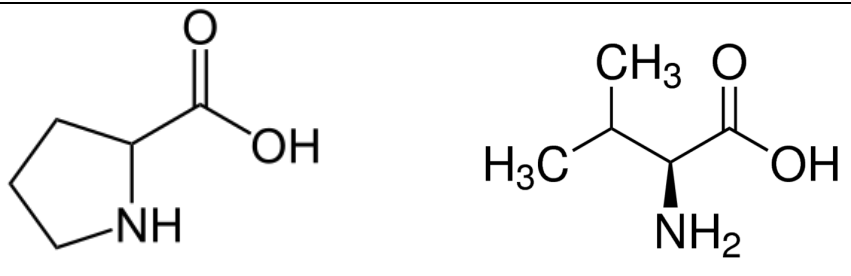
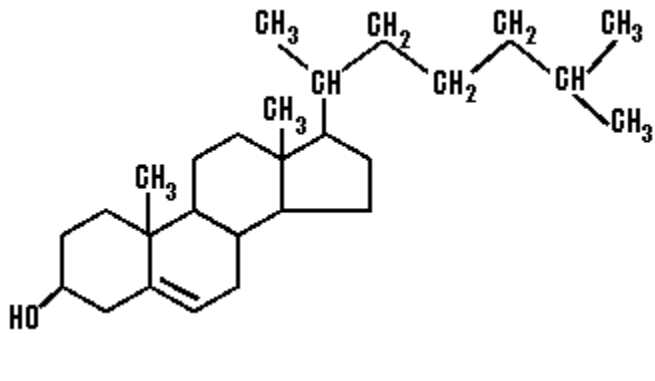
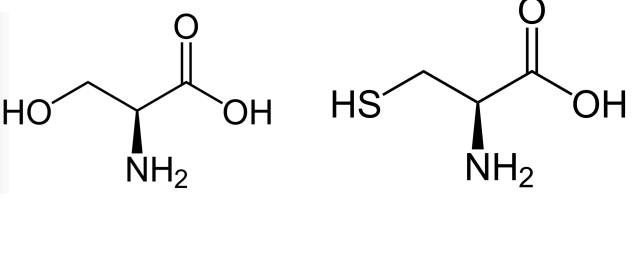
Fill out the table of common chemical groups that appear in biology:

Functional Group	Structure	Properties
Hydroxyl		
Ether		
Methyl		
Carbonyl		
Carboxyl		
Amino		
Sulfhydryl		
Phosphate		

Now you try! Identify the chemical groups in the molecules below.

First, identify the chemical groups in the molecules that matches the letter you are assigned. If you finish early, you can move on to other molecules.

A	
B	
C	
D	

E	 <p>Chemical structures of Adenosine (left) and Inosine (right). Adenosine consists of a ribose sugar with a phosphate group at the 3' position and an adenine base at the 1' position. Inosine consists of a ribose sugar with a hypoxanthine base at the 1' position.</p>
F	 <p>Chemical structures of Proline (left) and Alanine (right). Proline is a five-membered ring containing one nitrogen atom and a carboxylic acid group. Alanine is a central carbon atom bonded to a methyl group, an amino group, and a carboxylic acid group.</p>
G	 <p>Chemical structure of a steroid molecule, showing the characteristic four-ring nucleus (three six-membered rings and one five-membered ring) with various substituents including methyl groups, a hydroxyl group, and a long branched side chain.</p>
H	 <p>Chemical structures of Serine (left) and Cysteine (right). Serine is a central carbon atom bonded to a hydroxyl group, an amino group, and a carboxylic acid group. Cysteine is a central carbon atom bonded to a thiol group, an amino group, and a carboxylic acid group.</p>

Fill out the table of common biological macromolecules below.

Type of Macromolecule	Monomer	Examples	Function

What is the central dogma of molecular biology?

What are features common to all cells and what do they do?