

Elements of Life

Learning objective 1.2.A Describe the composition of macromolecules required by living organisms.

Name:

Date:

Period:

Use the tool **The Element Fingerprint**. Work in the **Scan a molecule** tab for Parts 1 to 3, then switch to **Read the evidence** for Part 4.

Part 1 • Predict, then check

For each molecule below, write your prediction **before** you press anything. Then press the elements you predicted, press **Reveal composition**, and record what was actually there.

Molecule	I predict these elements	Actually present	Formula
Glucose			
Cysteine			
Adenosine monophosphate			

Part 2 • Scan and record

Scan each molecule. Record the elements present and the macromolecule class the tool reports. For the larger molecules the drawing opens without hydrogens — tick **Show hydrogen atoms** if you want to see them.

Molecule	Elements present	Class	Formula
Ribose			
Glycerol			
Palmitic acid			
Alanine			
Methionine			
Thymidine monophosphate			
Phospholipid (short-tailed model)			

Part 3 · Look for the pattern

1. Identify the three elements that appeared in every molecule you scanned, and explain why their presence cannot tell one macromolecule class from another.

2. Describe the element that appeared only in proteins, name the two amino acids that carry it, and explain what it makes possible in a folded protein.

3. Identify the two macromolecule classes that contained phosphorus, and state where the phosphorus sits in each one.

Part 4 • Identify and justify

Switch to the **Read the evidence** tab and work through the cards. Then answer these on your own. Each answer needs an **identification** and a **justification** — the same two parts an exam question is scored on.

4. A researcher grows algae in water containing dissolved carbon dioxide and a source of phosphate, but no nitrogen compounds. Predict which classes of molecule the algae will struggle to synthesize, and justify your prediction using element composition.

5. Viruses were labeled with radioactive phosphorus in one trial and radioactive sulfur in another. Only the phosphorus appeared inside the infected bacteria. Identify the type of molecule the viruses injected, and justify your choice.

6. A toxic compound in apple seeds contains nitrogen. Identify ONE class of biological macromolecule that could serve as a chemical precursor for it, and justify your choice.

What the model simplifies

Structures are drawn flat. Real molecules are three-dimensional, and shape matters as much as composition. Bond lines show connections only, not real bond lengths or angles.

The phospholipid uses two seven-carbon tails so it fits on screen; real membrane phospholipids have tails roughly 16 to 18 carbons. Its head group is phosphatidylcholine, which carries a nitrogen — not every phospholipid head does.

Element colors in the tool are a reading aid, not a chemistry standard. Every atom is also labeled with its letter.