AP BIOLOGY · UNIT 1 · TOPIC 1.2

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 and press Reveal composition. Record the elements present and the macromolecule class the tool reports. For the larger molecules the drawing opens without hydrogens; check **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. (a) Identify the three elements present in every molecule in the Part 2 table.

(b) Explain why the presence of these three elements cannot distinguish one class of macromolecule from another.

2. (a) Identify the element that appeared only in proteins.

(b) Identify the two amino acids in the tables that contain this element.

(c) Explain how this element helps stabilize the structure of a folded protein.

3. (a) Identify the two classes of macromolecule in the tables that contain phosphorus.

(b) Describe where the phosphorus is located in each class.

Part 4 · Identify and justify

Switch to the **Read the evidence** tab and work through the cards. Then answer questions 4 to 6 on your own. Each question has two parts: an identification or a prediction in (a), and its justification in (b).

4. Researchers grow algae in water that contains dissolved carbon dioxide and phosphate but no nitrogen compounds.
(a) Predict which classes of macromolecule the algae will be unable to synthesize.

(b) Justify your prediction based on the elements in each class.

5. In one experiment, researchers labeled viruses with radioactive phosphorus; in another, they labeled viruses with radioactive sulfur. Only the radioactive phosphorus appeared inside the infected bacteria.
(a) Identify the type of molecule the viruses injected into the bacteria.

(b) Provide reasoning to justify your identification.

6. A toxic compound in apple seeds contains nitrogen.
(a) Identify one class of biological macromolecule that could be a chemical precursor of this compound.

(b) Provide reasoning to justify your identification.

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.