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Report

What are the essential Element of RNA, DNA, and amino acids

RNA, DNA, and amino acids are all built from a core set of chemical elements, though the specific arrangements differ. Here's a breakdown:

Essential Elements (all three share these core four)

C, H, N, O, P — these five elements cover almost everything:

- **Carbon (C)** — the structural backbone for all organic molecules
- **Hydrogen (H)** — found throughout, involved in bonding
- **Nitrogen (N)** — key part of nitrogenous bases (DNA/RNA) and amino groups (amino acids)
- **Oxygen (O)** — part of sugar-phosphate backbones, carboxyl groups, and phosphate groups
- **Phosphorus (P)** — found in DNA/RNA, but *not* in the basic structure of amino acids (only relevant if phosphorylated, e.g., phosphoserine)

Sulfur (S) — present in *some* amino acids (cysteine, methionine), but not in DNA or RNA.

Breakdown by Molecule

DNA (Deoxyribonucleic Acid)

- **Elements:** C, H, N, O, P
- **Structure:** made of nucleotides, each containing:
 - A **deoxyribose sugar** (C, H, O)
 - A **phosphate group** (P, O)
 - A **nitrogenous base** — adenine, thymine, guanine, or cytosine (C, H, N, O)

RNA (Ribonucleic Acid)

- **Elements:** C, H, N, O, P (same core set as DNA)
- **Structure:** nucleotides with:
 - A **ribose sugar** (has one more oxygen than deoxyribose — this is the key structural difference)
 - A **phosphate group** (P, O)
 - A **nitrogenous base** — adenine, uracil (replaces thymine), guanine, or cytosine

Amino Acids

- **Elements:** C, H, N, O, and sometimes S
- **Structure:** every amino acid has:
 - A **central carbon (C α)**
 - An **amino group** (–NH₂) → contributes N, H
 - A **carboxyl group** (–COOH) → contributes C, O, H
 - A **hydrogen atom**
 - A **variable side chain (R group)** — this is where elemental composition diverges:
 - Most side chains only add more C, H, O, N
 - **Cysteine and methionine** contain **sulfur (S)**

Quick Comparison Table

Element	DNA	RNA	Amino Acids
Carbon (C)	✓	✓	✓
Hydrogen (H)	✓	✓	✓
Nitrogen (N)	✓	✓	✓
Oxygen (O)	✓	✓	✓
Phosphorus (P)	✓	✓	✗ (not standard)
Sulfur (S)	✗	✗	✓ (only Cys, Met)

If you'd like, I can go deeper into the specific molecular structures (e.g., the four DNA bases or the 20 amino acid side chains).

Ask Claude your own question