

We just study the chemistry of elements,
right?



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No Unauthorised Parking

Essential to humans

1	2											18
1 H												2 He
3 Li	4 Be											10 Ne
11 Na	12 Mg	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	36 Kr
19 K	20 Ca	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	54 Xe
37 Rb	38 Sr	55 Cs	56 Ba	57 La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	84 Po
87 Fr	88 Ra	89 Ac	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Uub	118 Og

■ Essential for humans
■ Suggested to be essential for humans
■ Nonessential for humans



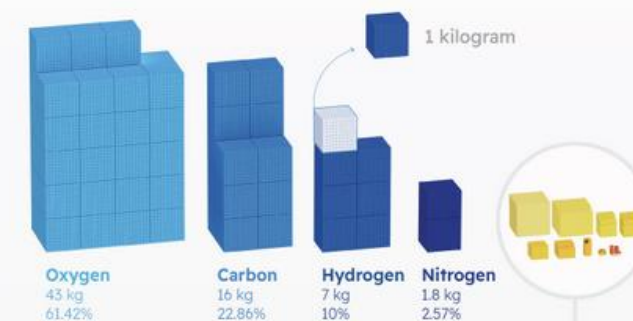
WHICH ELEMENTS MAKE UP THE HUMAN BODY?

118 chemical elements exist, yet only 21 of them make up the entire complexity of the human body's structure and functions. Here, we show how these 21 elements are organized.

*These values are for an average human body weighing 70 kg.

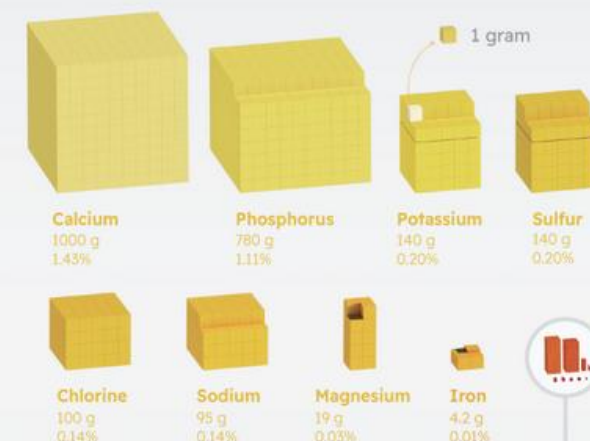
MAIN ELEMENTS OF LIFE 96%

Roughly 96% of the mass of the human body is made up of just four elements, the **main elements of life**:

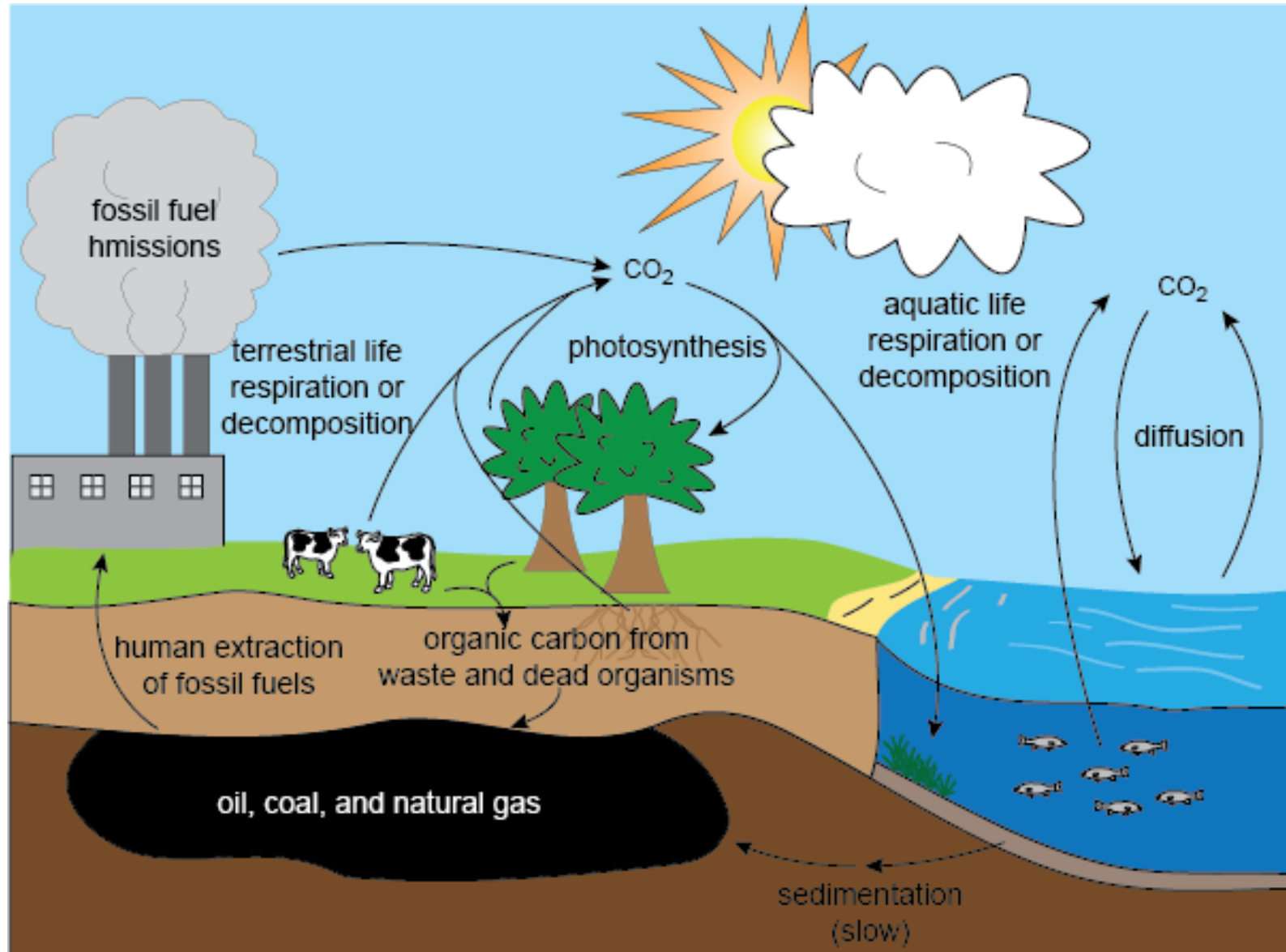


ESSENTIAL MINERALS 3%

Another eight elements make up about 3% of the remaining mass. All eight of these elements are **essential minerals**:



Carbon cycle

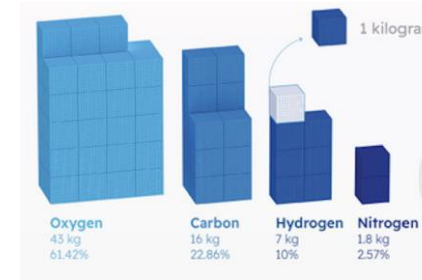


Sustainable materials

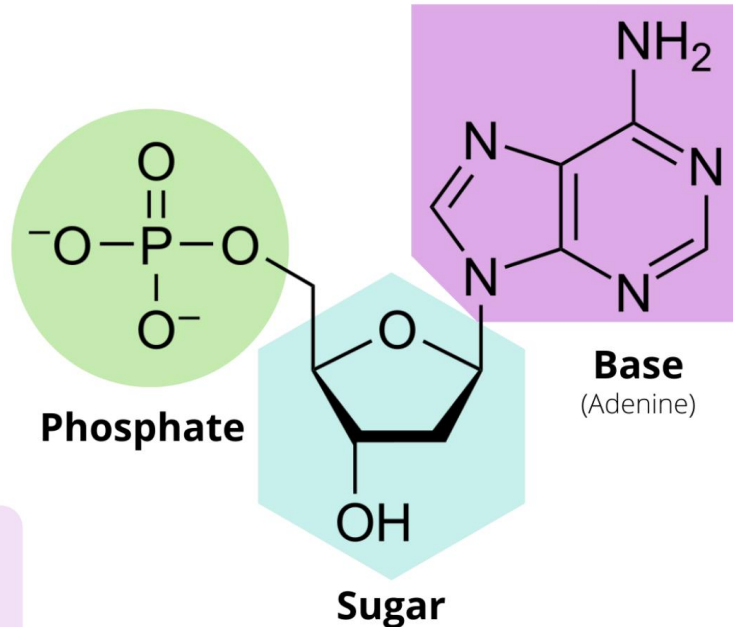
Inspiration for sustainable sources include sea slugs and garden snails



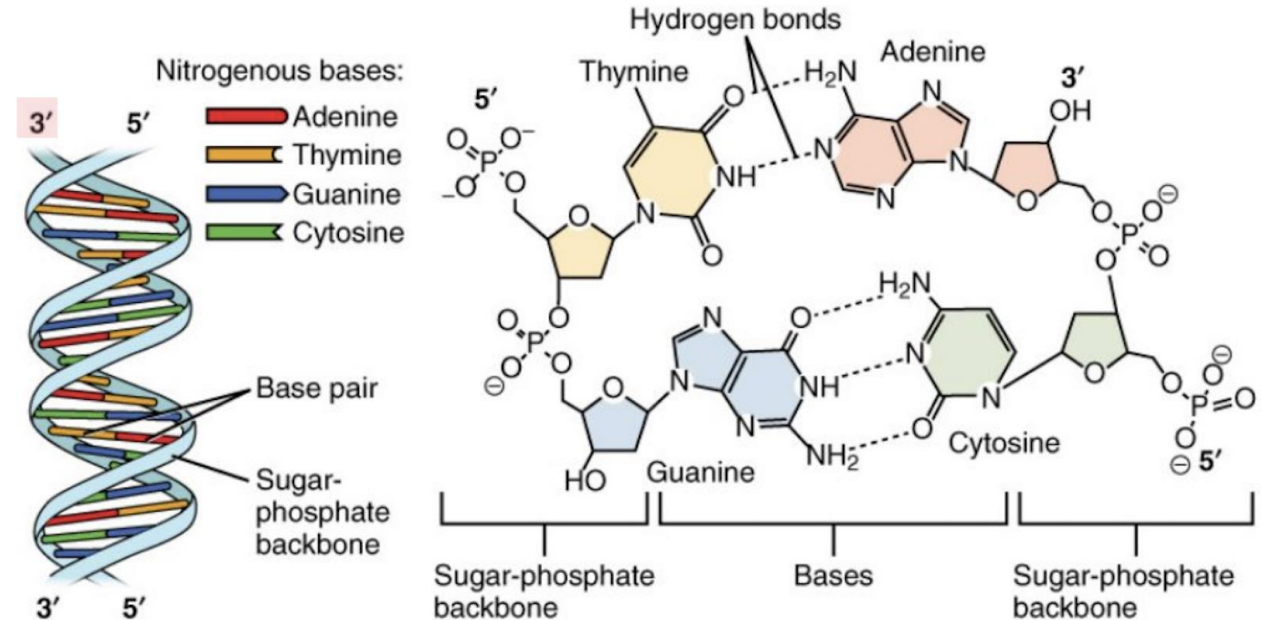
Hydrogen, carbon, introducing nitrogen, oxygen & phosphorus



3 Parts of a Nucleotide



Nucleotides in DNA



Chemical synthesis of nucleoside

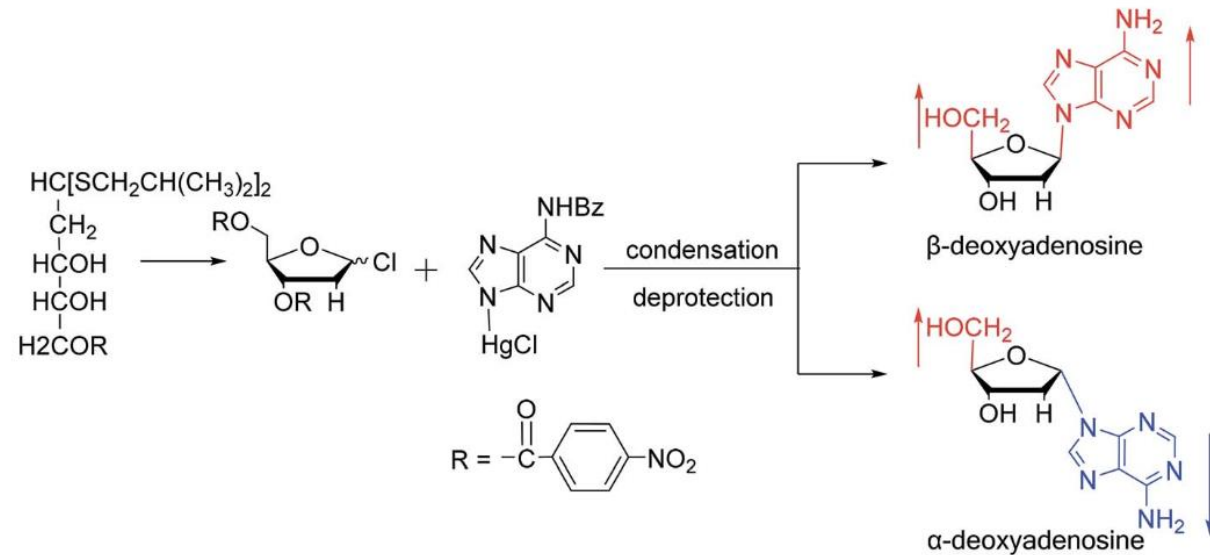
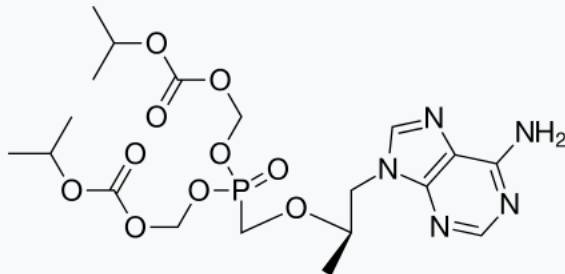
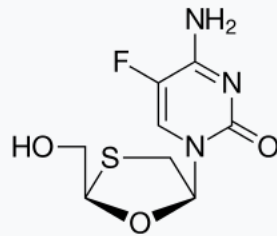
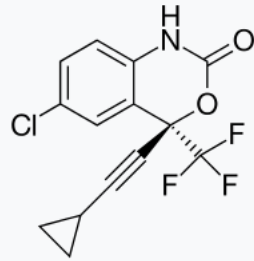


Fig. 4 First synthesis of α -deoxyadenosine.

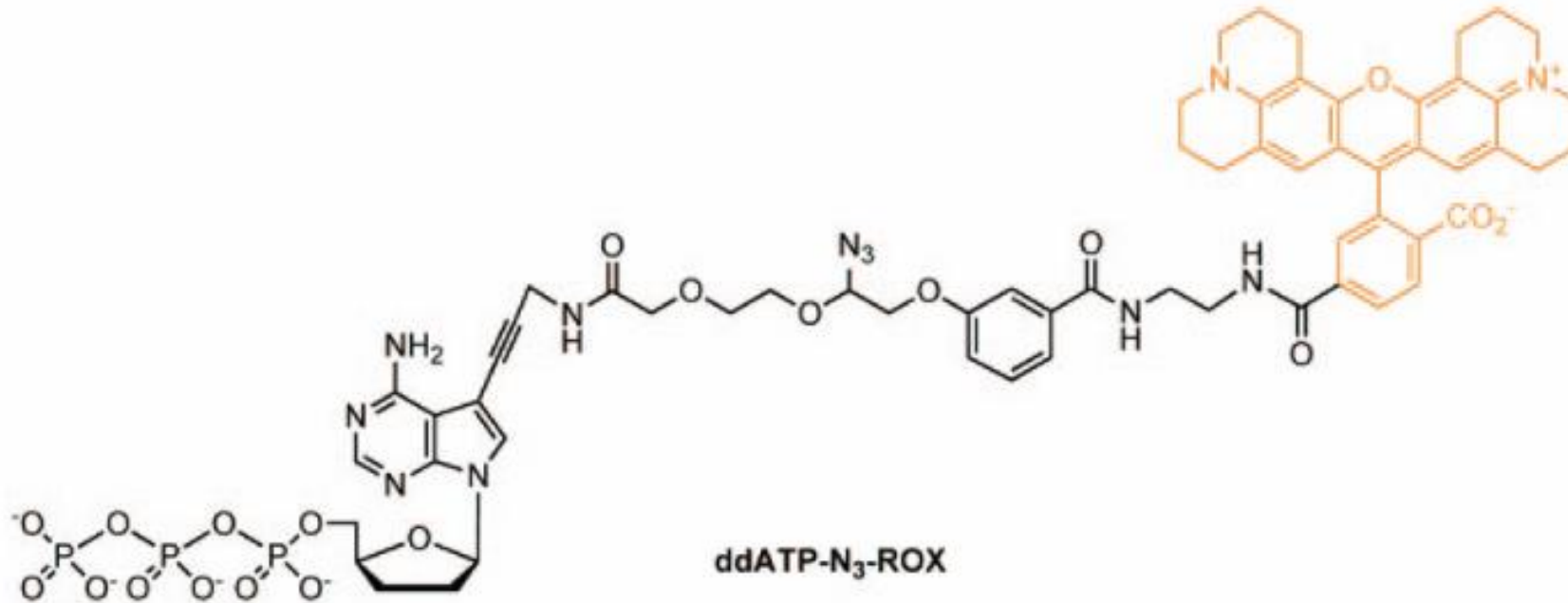
R. K. Ness and H. G. Fletcher, J. Am. Chem. Soc., 1960, 82, 3434–3437

Biologically active materials – nucleoside & nucleotide analogues

Efavirenz/emtricitabine/tenofovir disoproxil



Fluorescent label reagent for Illumina DNA sequencing



Four-color DNA sequencing with 3'_O_-modified
nucleotide reversible terminators and chemically cleavable fluorescent dideoxynucleotides [pnas.0804023105](https://doi.org/10.1073/pnas.0804023105)
PNAS **July 8, 2008** vol. 105 no. 27 **9145–9150**