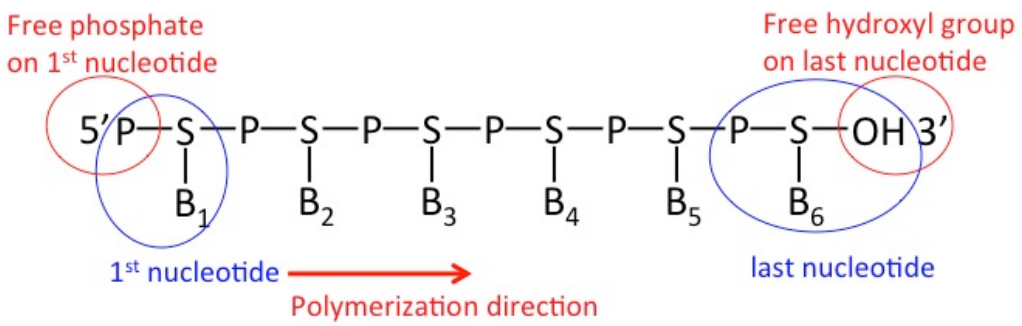
Nucleic acid polarity and structure – Reference Summary

Anatomy of a nucleic acid



Above is a diagram of a nucleic acid polymer.

Recall that each nucleotide is composed of a sugar (S), phosphate (P) and base (B).

The strand is polymerized from the 5' end to the 3' end. The nucleotide at the 5' end has a free phosphate and the nucleotide at the 3' end has a free 3'OH group on its sugar.

Nomenclature

S-P backbone is not written, just the bases and the polarity of the strand.

ALWAYS write 5' and 3' on each nucleic acid strand!

In other words, written nucleic acids take the following form:

5'$B_1B_2B_3B_4B_5B_6$3'

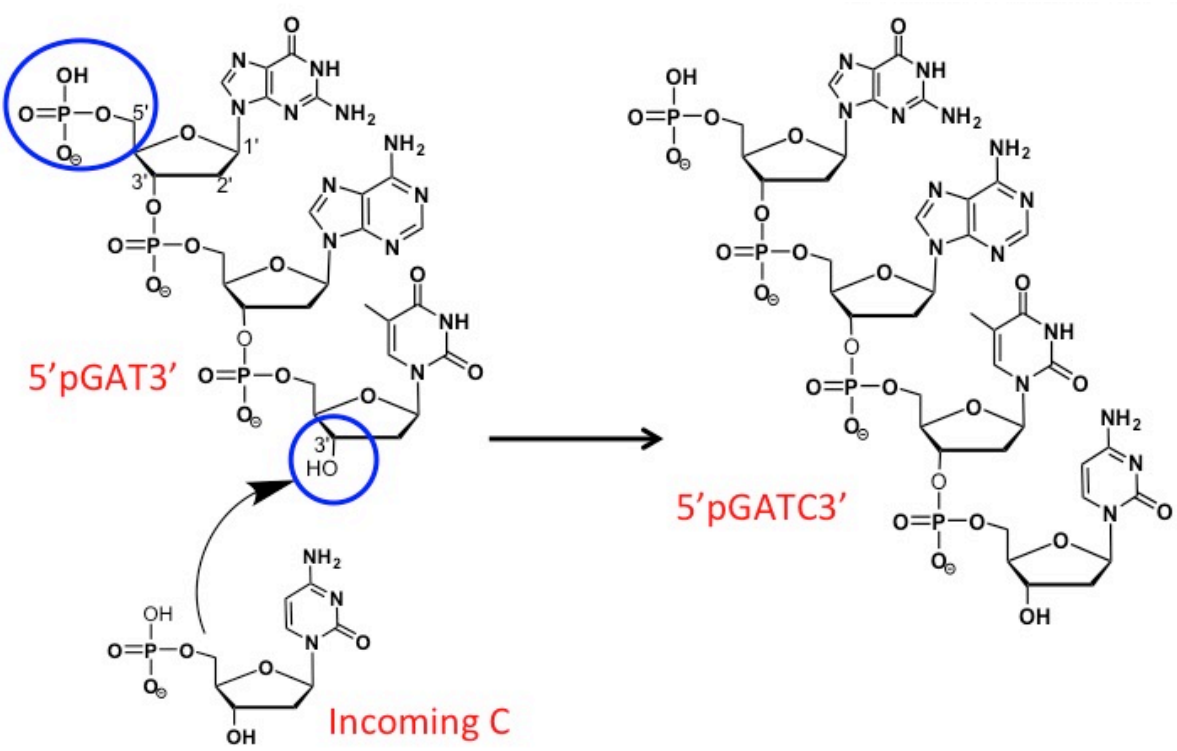
For example: **5'GAATCC3'**

Polarity of Synthesis

Nucleic acids are made from 5'P to 3'OH. This means that the –3'OH end is the growing end, *i.e.*, receives the incoming nucleotide (as shown below)

Base order = INFORMATION

Polarity = 5' and 3' ends show first to last nucleotide added and confer a direction to read information



DNA has a double-helix structure

backbone = Ss and Ps

B pairs (BPs) stacked inside the DH and bound to each other by H-bonds

Every BP in the DH is separated from the next base pair by 0.34 nm.

The two strands of the helix run in opposite directions (5' → 3' and 3' → 5') = **antiparallel orientation** (key DNA property)

Base complementary rule:

A can only pair with T and G can only pair with C

For instance: If the sequence of one DNA strand is 5'AATTGGCC3', the complementary strand would have the sequence 3'TTAACCGG5'

RNA structure

RNA is usually **single-stranded**

The RNA four nitrogenous bases are A, **U**, G, and C

There are four major types of RNA: messenger RNA (mRNA), ribosomal RNA (rRNA), transfer

RNA (tRNA), and microRNA (miRNA)

The RNA base sequence is complementary to the coding sequence of the DNA from which it has been copied but

If the **DNA strand** has a sequence **5'AATTGCGC3'**, the sequence of the **complementary RNA strand** is **5'UUAACGCG3'**