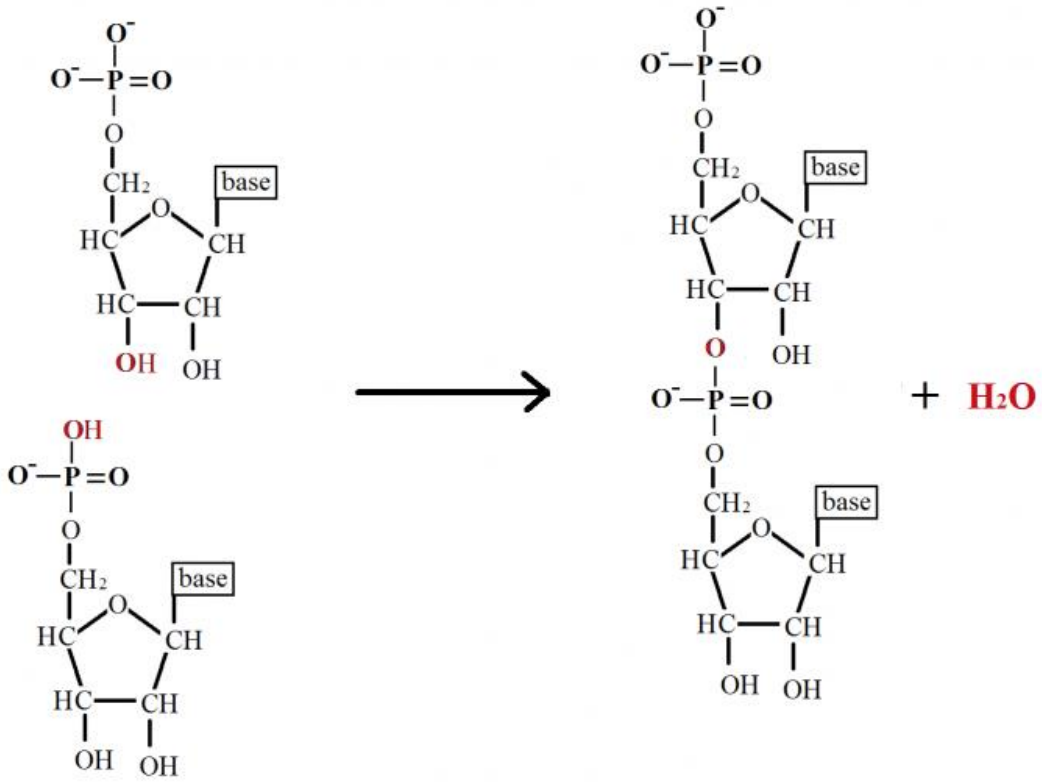
Third and final level of organization is polynucleotide which is formed by the joining of nucleotides by phospodiester bonds. During its formation, 3'OH of a nucleotide joins with 5'P of the next nucleotide and 3'OH of this nucleotide forms phosphodiester bond with 5'P of the next one. In this way, a chain of nucleotides called polynucleotide is formed. 5'P of the first nucleotide and 3'OH of the last nucleotide remains free which are called 5'P end and 3'OH end respectively.



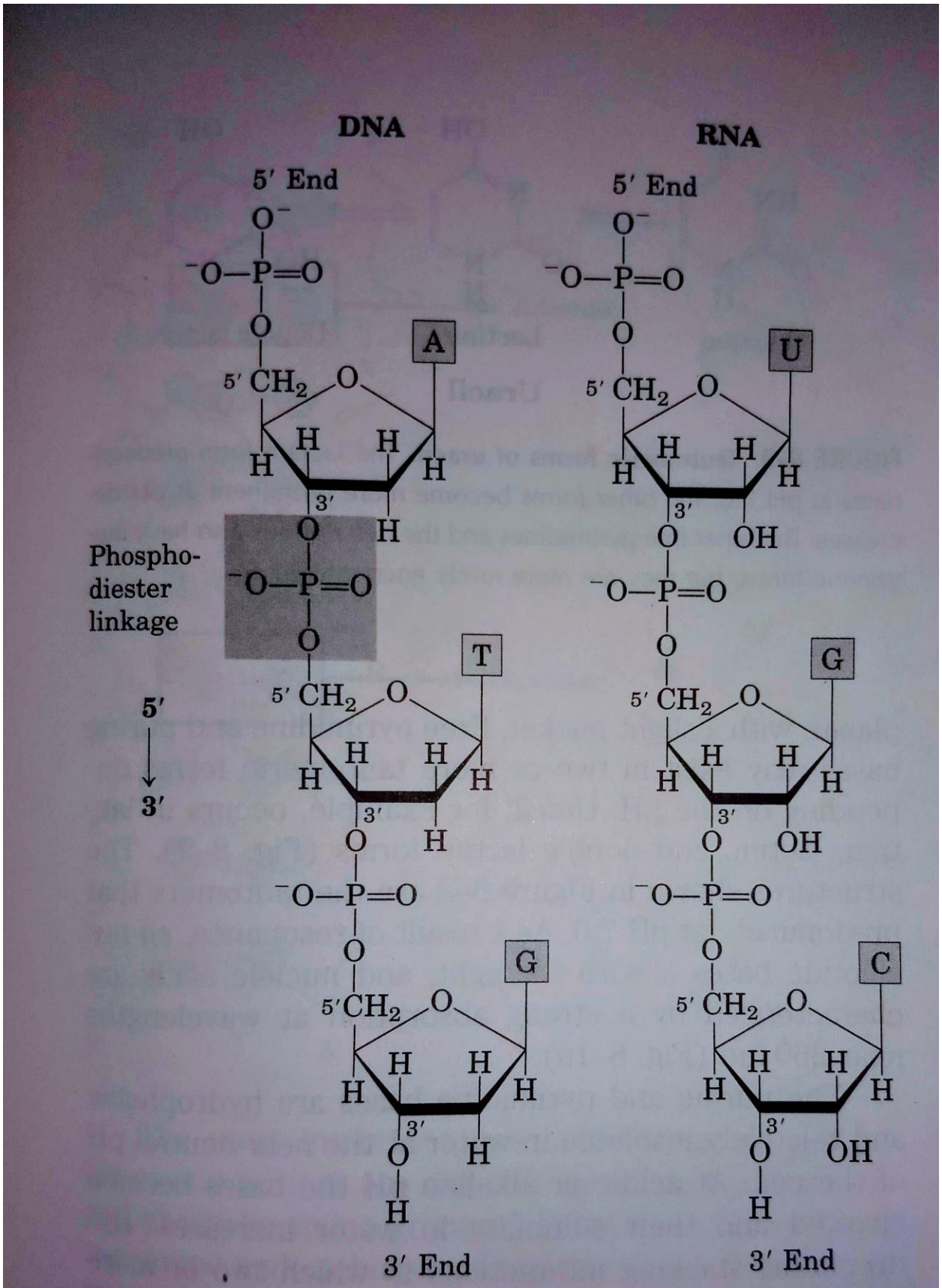


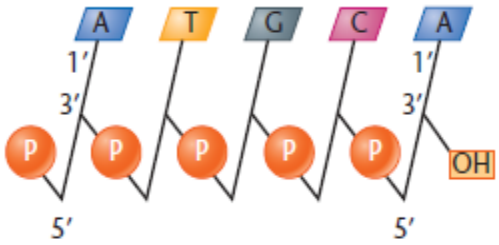
FIGURE 8–7 Phosphodiester linkages in the covalent backbone of DNA and RNA. The phosphodiester bonds (one of which is shaded in the DNA) link successive nucleotide units. The backbone of alternating pentose and phosphate groups in both types of nucleic acid is

Alternating sugar-phosphates is called sugar-phosphate backbone from which bases stick out.

Conventionally base sequence of a polynucleotide is written in 5'- 3' direction, from left to right, e.g., 5'ATG 3' (in the given above fig.). Smaller nucleotide chains, approx. 50 or less nucleotides called **oliginicleotides**.

Long polynucleotide chains account for the large molecular weight of DNA and explain its most important property—storage of vast quantities of genetic information. If each nucleotide position in this long chain can be occupied by any one of four nucleotides, extraordinary variation is possible. **For example, a polynucleotide only 1000 nucleotides in length can be arranged 4^{1000} different ways, each one different from all other possible sequences.**

This potential variation in molecular structure is essential if DNA is to store the vast amounts of chemical information necessary to direct cellular activities.



Shorthand notation for a polynucleotide chain