



CHAPTER 7
NUCLEIC ACIDS

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7.1 INTRODUCTION

Nucleic acids are among thousands of different kinds of organic molecules exist in living organisms known as biomolecules. They exist as hundreds to millions of nucleotide units that linked together by phosphodiester linkages to form long polynucleotide chain or strands. As a free unit, nucleotide involves in a wide variety of biosynthetic and energy-generating reactions. Among the reactions is the formation of the high-energy phosphate bonds of adenosine triphosphate (ATP), derived from the breakdown of food molecules. The most important function of nucleotides however is as the building block molecules of the nucleic acids. Nucleic acids, on the other hand are the building block of deoxyribonucleic acid or DNA and ribonucleic acid or RNA. Both molecules, DNA and RNA are chemical compositions that are responsible in the inheritance information or also known as genetics. Long before, humans have observed inheritance patterns in living organisms without understanding the mechanisms that transmit physical traits and developmental processes from parents to offsprings.

Many scientific investigations have revealed that the chromosomes within the nucleus of a cell are the storehouse of this genetic information. Chromosomes carry the discrete units of inherited traits known as genes. Genes however, carry the genetic information on certain physical traits. A complete set of genetic information in an organism, encoded in the nucleotide base sequence of its DNA, is now referred to as its genome (**Figure 7.1**). The discovery of the structure of DNA as a helical duplex of nucleotide polymers was made by James Watson and Francis Crick in 1953. However, there are scientist before them such as Erwin Chargaff and Rosalind Franklin whose efforts have led to the founder of double helixes model.

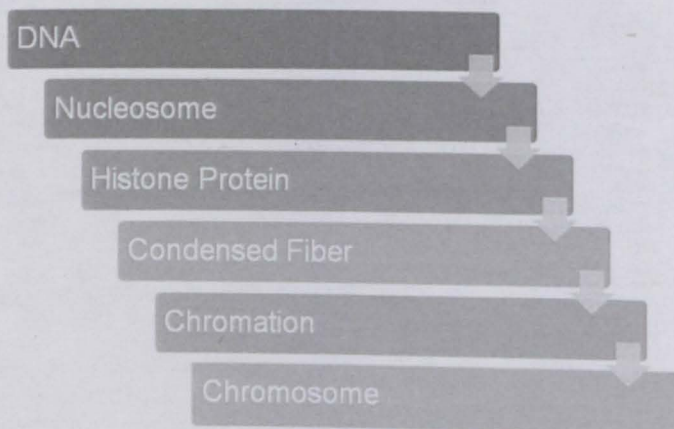


Figure 7.1: Organization of DNA in chromosome.

7.2 THE STRUCTURE OF NUCLEIC ACIDS

As mentioned earlier, nucleic acids consists of large numbers of nucleotides named as polynucleotides. The nucleotide (**Figure 7.2**) is a molecule with three important components: a five-carbon sugar (either ribose or deoxyribose), a nitrogenous base and one or more phosphate group. There are two classes of base: the bicyclic purines and the monocyclic pyrimidines (**Figure 7.3**). The purines are categorized as adenine (A) and guanine (G) while the pyrimidines categorized as thymine (T), cytosine (C) and uracil (U). The polynucleotide chains or strands later are projected to be DNA or RNA, the two important types of nucleic acids.

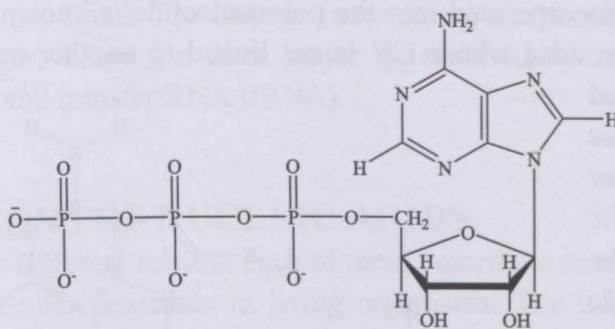


Figure 7.2: Nucleotide Structure.

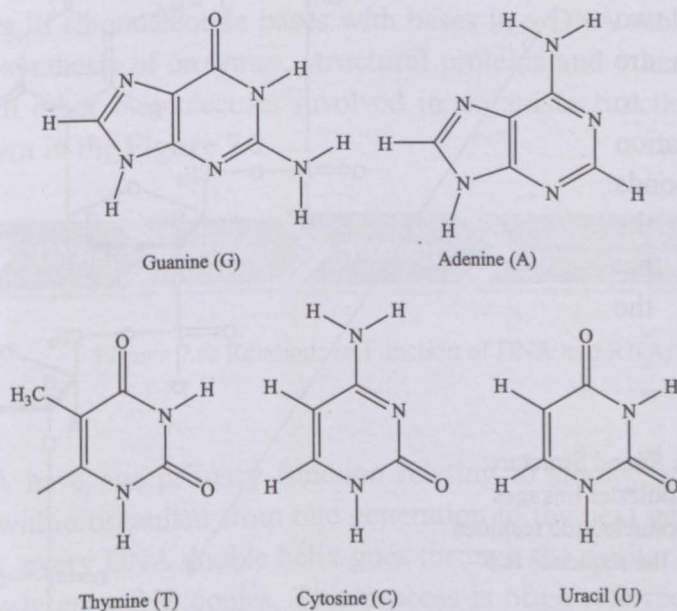


Figure 7.3: The nitrogenous bases of purines and pyrimidine.