

# Assignment: Discovering the structure of DNA

## Learning objectives:

- 3.1 Name the major and trace elements of the body and give their biochemical roles.
- 3.2 Explain the importance of water to the body by referring to its molecular structure.
- 3.3 Distinguish the major types of biomolecules in the body.

## Consider reviewing the following topics:

- Review the biomolecules, specifically the nucleic acids and their monomers, and the central dogma of biology.
- **Specifically: You should review the “2. Chemistry and Biomolecules” lecture notes (slides 93-115) and pages 57 to 60 in your textbook. Additionally, if you need more clarification, read this article called “[DNA structure and function](#)” and watch this [Youtube video](#).**

## Introduction

The year is 1953, communists are being persecuted by McCarthy, the Korean War is in full swing, Coca-Cola still costs a nickel, and parents vehemently oppose rock-n-roll. Throughout these exciting times, you're a nurse in a hospital affiliated with Cambridge University. The institute is abuzz with delight as scientists in the research wing of the hospital have elucidated the structure of DNA. From what you've learned in your biology courses in the nursing program, our understanding of the relationship between nucleic acids and proteins isn't quite complete (the central dogma of biology, DNA  $\neq$  RNA  $\rightarrow$  protein, would be proposed five years later). What you do understand is that the relationship between structure and function is of paramount importance in biology. Consequently, by unraveling the shape of DNA, its role in heredity (the passage of genetic material from cell to cell) may be more apparent.

As a nurse, you don't know many grad students in the research wing of the hospital, but you do spend a lot of time with the technicians that maintain and run the equipment used for research. Your technician friend was responsible for preparing the sample of DNA used in the X-ray crystallographer. This friend has described the method of X-ray crystallography in the following way: you need to figure out the optimal conditions that would cause DNA to crystallize in a conformation that is biologically relevant, shoot X-rays at this crystal in various positions, observe and analyze how the X-rays scatter in two dimensions, and compile the scattering images to form a three dimensional model of DNA. Solving any one of these steps can take years, but she's been performing these experiments for quite some time now. She explains there's strong evidence to suggest that DNA is double stranded, helical, and made up of nucleotides, but how these nucleotides are arranged into a single molecule of DNA hasn't been discovered.

Recently, two researchers in your hospital, Francis Crick and James Watson, published a scientific article describing the molecular structure of DNA. However, rumours are abound that Francis and James only arrived at their model using someone else's data without giving this other source proper credit (essentially, stealing it). You and your colleagues are fascinated by this discovery, and together you try to understand the molecular structure outlined in the scientific article. You've also uncovered the stolen data (called Photo 51) used to write the article. Currently, you and some colleagues are in the cafeteria trying to piece everything together to better understand DNA.