

## Protein synthesis

### Chromosomes, genes, and DNA

With the exception of red blood cells, which have no nucleus or nuclear DNA, each one of your body cells contains a complete (diploid) set of chromosomes. Each chromosome is made up of thousands of genes. Each gene consists of a sequence of DNA base pairs (Figure 10.2). In total, the DNA in one of your cells contains about 3 billion base pairs! The order of base pairs along a gene is called its **base sequence**.

### Genes and proteins

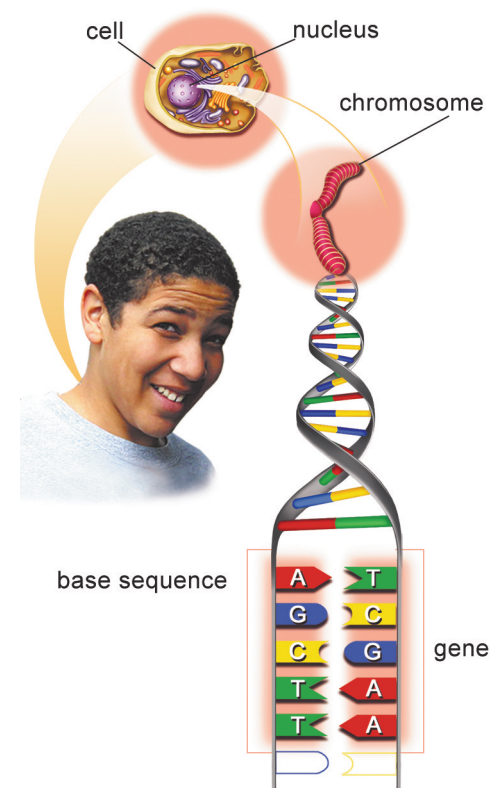
**Genes control the production of proteins.** Your body structures are made of proteins. As a result, those proteins help determine your traits. For example, the color of your eyes is determined by a protein. Proteins are made of long chains of smaller molecules called *amino acids*. The production of proteins in the cell is called **protein synthesis**.

### Amino acids make up proteins

**The order of base pairs along a gene forms a code that tells a cell which protein to make.** Sets of three bases along a strand of DNA form three-letter codes that tell the cell which amino acids make up the protein. There are 20 different amino acids. Those amino acids can be put together in many ways to make millions of different proteins. During protein synthesis, the cell reads the three-letter codes along the DNA molecule and uses that information to build a protein from different amino acids.

### The role of RNA

Protein synthesis takes place in the ribosomes. It involves another nucleic acid called *RNA*. RNA is different from DNA because it consists of a single strand. Also, instead of the base thymine (T), RNA has the base uracil (U). In RNA, A pairs with U instead of with T. *Messenger RNA* carries the three-letter codes from the DNA in the nucleus to the ribosome. *Transfer RNA* decodes the base sequence and carries the correct amino acids to the ribosome.



**Figure 10.2:** The relationship between chromosomes, genes, and DNA.

### **VOCABULARY**

**base sequence** - the order of base pairs along a gene.

**protein synthesis** - the production of proteins in the cell.