

## THE GENETIC CODE ACTIVITY

### Introduction:

DNA, deoxyribose nucleic acid, is the genetic secret to all life. Knowledge of its structure and functions is fundamental to an understanding of molecular biology.

### Background:

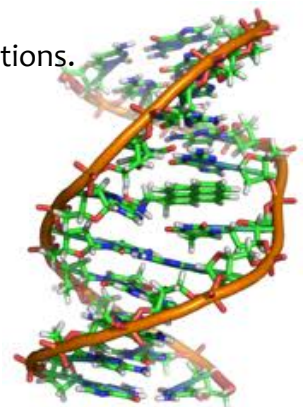
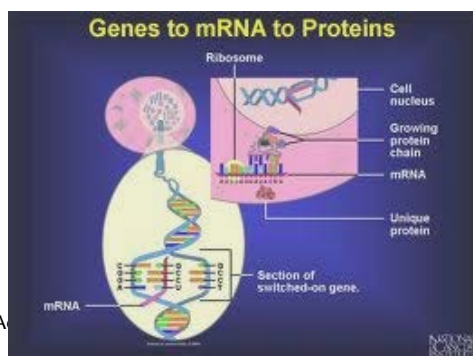
Less than fifty years ago the nature of the genetic code still eluded scientists. In the fifty years since the structure of DNA was first hypothesized, it has become the most significant biological topic of the century. Understanding the structure of DNA helps to explain many life processes and leads to an understanding of why we are who we are. In this activity, the major process of DNA transcription and translation will be modeled. Each step of the procedure will simulate a key structure or process.

DNA serves as the genetic template and storage place for genetic messages or **genes**. In order for the messages to be processed, **RNA** (ribonucleic acid) becomes involved. The first step involves the synthesis of **messenger RNA** (mRNA) from the DNA template by the process of **transcription**. This happens in the nucleus of eukaryotic cells. mRNA then carries this message to the **ribosomes** where proteins are synthesized. In RNA, thymine (T) is replaced by uracil (U) as the base complement to adenine(A).

The code in the newly synthesized mRNA undergoes the process of **translation** and is used to produce a specific sequence of **amino acids**, i.e., a specific **protein**. This translation process involves another type of RNA, called **transfer RNA** (tRNA). The tRNA has a three-base section called the anticodon which is the key to linking its specific attached amino acid to the growing chain of amino acids. The order in which the tRNA molecules are used is determined by the **codon** sequence of the mRNA, which, remember, was originally encoded in the DNA in the nucleus.

### Procedure:

1. Take the Genetic Code Worksheet to the “nucleus” of the classroom.
2. Carefully copy your assigned DNA code onto your worksheet. No mutations! Make sure to note the number of the DNA template.
3. While in the “nucleus” area, determine the transcribed code for mRNA that reflects the DNA code. Write this in the appropriate space on the Genetic Code Worksheet.
4. Return to the “cytoplasm” (your desk) and determine the corresponding tRNA code. Write this in the appropriate space on your worksheet.
5. Go to the “ribosome” area of the classroom and determine the message that is now encoded in the RNA molecules. Write your completely decoded message on the worksheet.
6. Return to your desk and determine the chain of amino acids in your protein (using the mRNA chain you decoded earlier and the Genetic Code).
7. Check with your instructor to make sure the genetic decoding work has no mutations.
8. Decode all 3 DNA sequences using the above procedures.



# The Genetic Code Worksheet

Name: \_\_\_\_\_ Block: \_\_\_\_\_

## **1.**

DNA ( # ) \_\_\_\_\_

mRNA \_\_\_\_\_

tRNA \_\_\_\_\_

Decoded Message: \_\_\_\_\_

Amino Acids: \_\_\_\_\_

## **2.**

DNA ( # ) \_\_\_\_\_

mRNA \_\_\_\_\_

tRNA \_\_\_\_\_

Decoded Message: \_\_\_\_\_

Amino Acids: \_\_\_\_\_

## **3.**

DNA ( # ) \_\_\_\_\_

mRNA \_\_\_\_\_

tRNA \_\_\_\_\_

Decoded Message: \_\_\_\_\_

Amino Acids: \_\_\_\_\_