

Transcription and Translation Practice

Protein Looping Activity

Teacher Guide

Objective:

Transcribe and translate a section of DNA codons. Students will demonstrate how the DNA codons must be transcribed into RNA codons before being translated into amino acids.

Background:

Proteins perform a variety of functions necessary for life. Proteins are made of chains of amino acids, called polypeptides. These polypeptides are folded and sometimes linked to form complex protein structures. Some example of proteins include:

1. Structural proteins like **actin** help to build the cytoskeleton.
2. Enzymes like **DNA polymerase** help to facilitate chemical reactions which allows life to proceed.
3. Transporter proteins like **hemoglobin** help molecules move around the cells and the body.
4. Cell signaling proteins such as **G protein-coupled receptors** help to send and receive signals around the cells.
5. Immune system proteins like **antibodies** help to defend our bodies and cells from pathogens.

Relevant Standards:

MS-LS1-1: From Molecules to Organisms: Structures and Processes

- Standard: "Develop and use a model to describe how the structure of molecules and cells contributes to the function of a living organism."
- Relevance: Transcription and translation of DNA codons involve understanding the molecular structures (like DNA and RNA) and their roles in producing proteins.

MS-LS1-2: From Molecules to Organisms: Structures and Processes

- Standard: "Develop and use a model to describe how animals and plants use the information in DNA to maintain stability and function."
- Relevance: This involves understanding how genetic information encoded in DNA is used to produce proteins, maintaining the stability and function of an organism.



DNA Codon	RNA Codon	Amino Acid
TAC	AUG	Met
GAC	CUG	Leu
CGT	GCA	Ala
AGA	UCU	Ser
TTT	AAA	Lys
TGA	ACU	Thr
CCA	GGU	Gly
GTT	CAA	Gln
GCT	CGA	Arg
TGG	ACC	Thr
AGC	UCG	Ser
TCC	AGG	Arg
GGA	CCU	Pro
GAT	CUA	Leu
ACT	UGA	Stop

Activity Instructions:

1. Print out the looping game pages cut the pages into quarters. Randomly hang the cards around the room. (There is no particular order to the cards.)
2. Give each student a copy of the Transcription and Translation Looping Activity Student Guide.
3. Students will pick one station to start. It doesn't matter where they start. Each student will look at the DNA codon on the bottom of the page and record it in the first box in their table. They will then transcribe the DNA codon into an RNA codon and record it in their table. Then, using the RNA codon chart they will find the corresponding amino acid and record it on their sheet. They will go find the page with that amino acid on the top and find the next DNA codon to transcribe.
4. Let students move about the room freely to find all 15 amino acids.
5. Students will then order their amino acid sequence so it starts with the start codon (Met) and ends with the stop codon. All students should have the same order of amino acids but will have a different starting point.

Amino acid correct order:

Met-Leu-Ala-Ser-Lys-Thr-Gly-Gln-Arg-Thr-Ser-Arg-Pro-Leu-Stop