

CHAPTER 7

Nucleic Acids and Protein Synthesis
Section 7-3

SKILL ACTIVITY
Sequencing events

Protein Synthesis

Protein synthesis is a complex process. In this activity you will trace the steps that are involved in the protein synthesis of a part of a molecule of oxytocin. Oxytocin is the pituitary hormone that helps regulate blood pressure, stimulates the uterus to contract during childbirth, and stimulates the production of milk after childbirth.

A. Protein synthesis begins with DNA in the nucleus. Below is a DNA sequence that could code for part of a molecule of oxytocin. Write the sequence of messenger RNA (mRNA) codons that would result from the transcription of this portion of DNA. The arrow marks the starting point.

↓
ACA ATA TAG CTT TTG ACG GGG AAC CCC ATT
 1 2 3 4 5 6 7 8 9 10

mRNA:

↓

UGU UAU AAC GAA AAC UGC CCC AUG GGG UAA

B. After transcription, mRNA attaches to a ribosome, where translation takes place. Each codon of mRNA bonds with an anticodon of a transfer RNA (tRNA) and each tRNA molecule bonds with a specific amino acid. The table below shows the mRNA codons and the amino acids for which they code. For example, if you were given the codon AGA, you can see from the table that these bases code for the amino acid arginine.

		Second Base in Code					
		A	G	U	C		
First Base in Code	A	Lysine Lysine Asparagine Asparagine	Arginine Arginine Serine Serine	Isoleucine Methionine Isoleucine Isoleucine	Threonine Threonine Threonine Threonine	A G U C	Third Base in Code
	G	Glutamic acid Glutamic acid Aspartic acid Aspartic acid	Glycine Glycine Glycine Glycine	Valine Valine Valine Valine	Alanine Alanine Alanine Alanine	A G U C	
	U	STOP STOP Tyrosine Tyrosine	STOP Tryptophan Cysteine Cysteine	Leucine Leucine Phenylalanine Phenylalanine	Serine Serine Serine Serine	A G U C	
	C	Glutamine Glutamine Histidine Histidine	Arginine Arginine Arginine Arginine	Leucine Leucine Leucine Leucine	Proline Proline Proline Proline	A G U C	

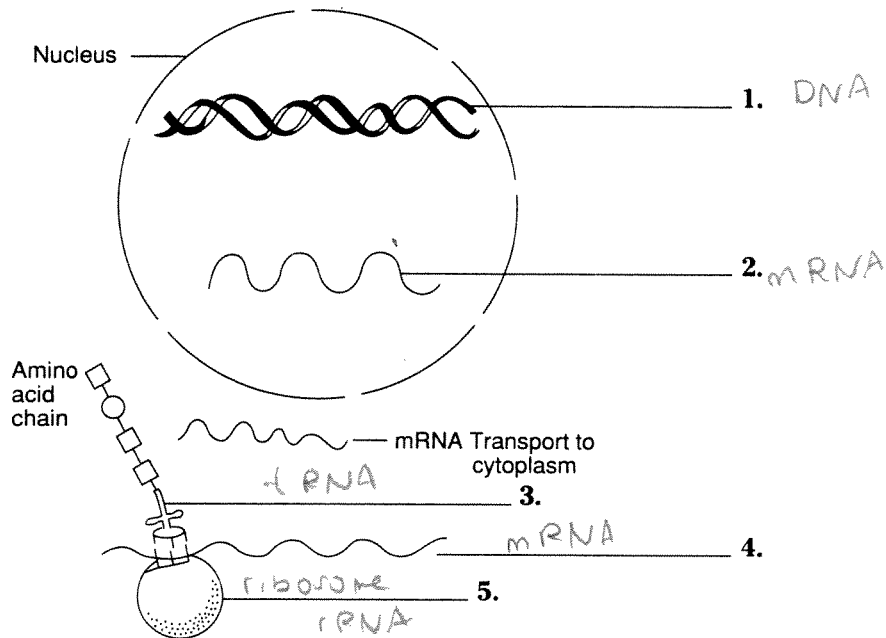
Use your mRNA sequence from A to write the sequence of amino acids in this part of the oxytocin molecule.

↓ cysteine, tyrosine, isoleucine, glutamine, asparagine, cysteine, proline, leucine
glycine stop

1. How many amino acids make up this portion of the oxytocin molecule? 9

2. What is the purpose of the UAA codon?
stop the polypeptide production.

C. In order to get another view of the entire process of protein synthesis, label the structures on the diagram below.



D. To complete the chart below, give the name and a brief description of each step in protein synthesis that occurs in the part of the cell shown in C.

Part of cell	Name of Protein Synthesis Process	Description
Nucleus	transcription	make mRNA
Ribosome	translation	make amino acid chain
Cytoplasm	translation	_____