

Background

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

Procedure

Part 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 the DNA gene. The arrow marks the starting point.



Part 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 Codon				
		A	G	U	C	
First Base in Codon	A	Lysine	Arginine	Isoleucine	Threonine	A
		Lysine	Arginine	Methionine	Threonine	G
		Asparagine	Serine	Isoleucine	Threonine	U
		Asparagine	Serine	Isoleucine	Threonine	C
	G	Glutamic Acid	Glycine	Valine	Alanine	A
		Glutamic Acid	Glycine	Valine	Alanine	G
		Aspartic Acid	Glycine	Valine	Alanine	U
		Aspartic Acid	Glycine	Valine	Alanine	C
	U	Stop	Stop	Leucine	Serine	A
		Stop	Tryptophan	Leucine	Serine	G
		Tyrosine	Cysteine	Phenylalanine	Serine	U
		Tyrosine	Cysteine	Phenylalanine	Serine	C
	C	Glutamine	Arginine	Leucine	Proline	A
		Glutamine	Arginine	Leucine	Proline	G
		Histidine	Arginine	Leucine	Proline	U
		Histidine	Arginine	Leucine	Proline	C

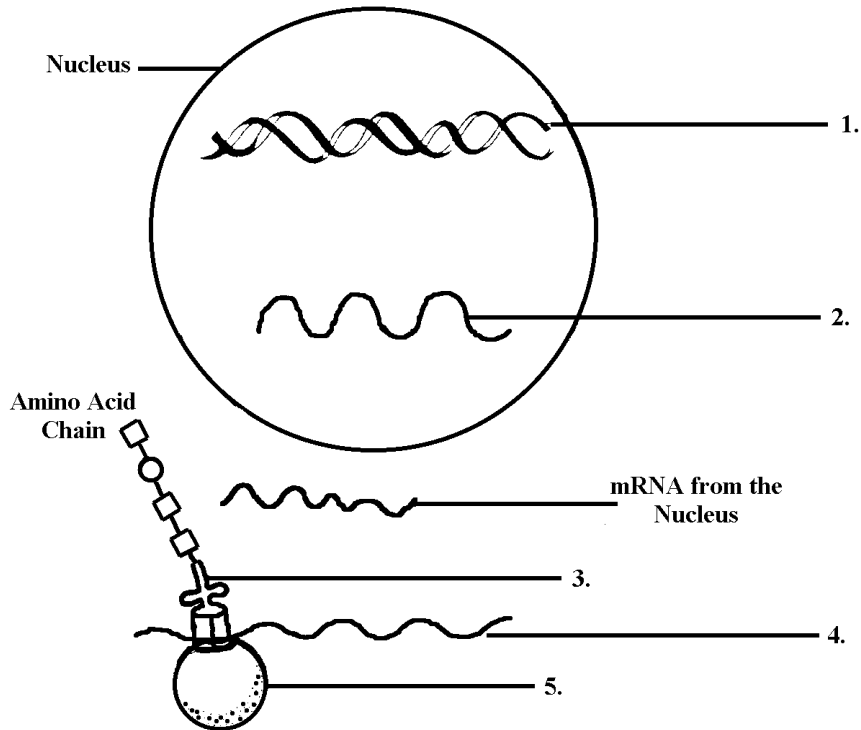
1. Use your mRNA sequence from Part A to write the sequence of amino acids in this part of the oxytocin molecule.

Amino Acids ↓

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

3. What is the purpose of the UAA codon?

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



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

Part of the Cell	Name of the Processes	Description
Nucleus		
Ribosome		