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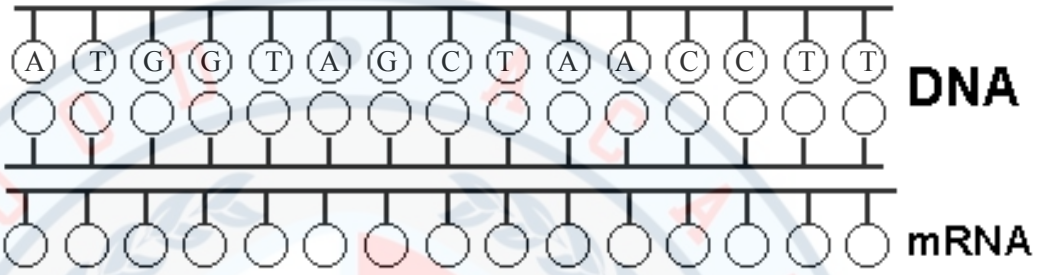
Transcription & Translation Week #____

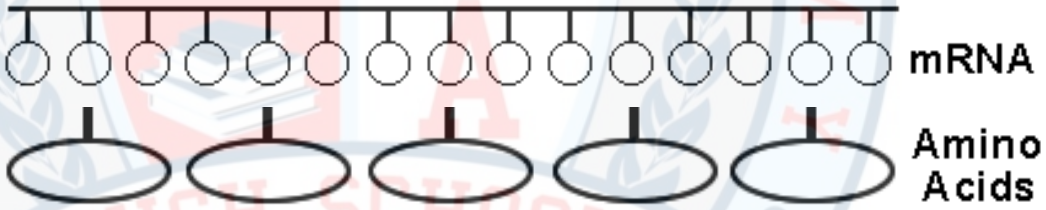
The first step in decoding genetic messages is **transcription**. This process occurs in the **nucleus** of a cell where a nucleotide base sequence is transcribed from DNA to message RNA, or mRNA. As implied by its name, mRNA carries a coded message from DNA, in the nucleus, to the rest of the cell. Transcription is similar to DNA replication except that in mRNA, the nitrogen base Thymine (T) is replaced by the nitrogen base Uracil (U). It is also similar to DNA replication in that an enzyme is responsible for unzipping the DNA molecule. In transcription, this enzyme is called **RNA polymerase**.

*Directions: Fill in the complementary DNA strand and **use this strand** to transcribe DNA into mRNA.*



The second step in decoding genetic messages is **translation**. The sequence of nucleotide bases in an mRNA molecule is a set of instructions that originated in the nucleus and is carried to the **ribosome** in the cell's **cytoplasm**. When a ribosome is attached to an mRNA sequence, the codons are read by the ribosome. A codon is three consecutive nucleotide bases in an mRNA strand. Each codon specifies for a particular amino acid used to create a protein.

Directions: Copy the mRNA sequence from above and box each codon. Use Figure 1 to decode each codon. Abbreviate amino acids by writing the first three letters.



How to Read a Codon Chart

Example codon: AGC

1. Place your left pointer finger on the first letter of your codon (A) along the left column of the codon chart.
2. Place your right pointer finger on the second letter of your codon (G) along the top of the codon chart.
3. Slide your fingers to meet. They should be on a section of four boxes (serine, serine, arginine, arginine).
4. Move your right pointer finger directly to the right and place it on the third letter of your codon (C) on the right side of the codon chart.
5. Slide your right finger back to find the amino acid (serine).

First Letter	Second Letter				Third Letter
	U	C	A	G	
U	phenylalanine	serine	tyrosine	cysteine	U
	phenylalanine	serine	tyrosine	cysteine	C
	leucine	serine	stop	stop	A
	leucine	serine	stop	tryptophan	G
C	leucine	proline	histidine	arginine	U
	leucine	proline	histidine	arginine	C
	leucine	proline	glutamine	arginine	A
	leucine	proline	glutamine	arginine	G
A	isoleucine	threonine	asparagine	serine	U
	isoleucine	threonine	asparagine	serine	C
	isoleucine	threonine	lysine	arginine	A
	(start) methionine	threonine	lysine	arginine	G
G	valine	alanine	aspartate	glycine	U
	valine	alanine	aspartate	glycine	C
	valine	alanine	glutamate	glycine	A
	valine	alanine	glutamate	glycine	G

Figure 1

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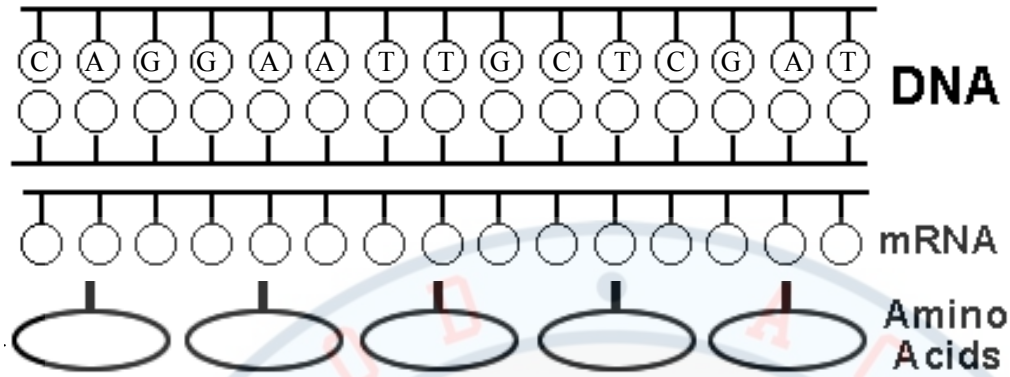
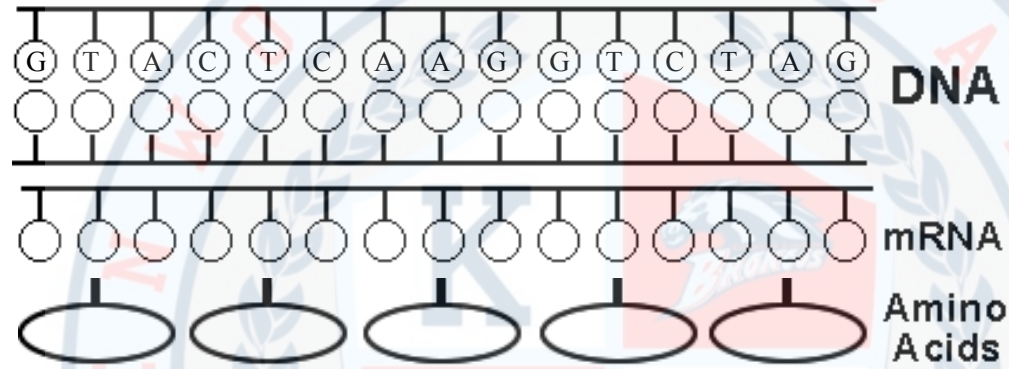
Directions: Complete transcription and translation in the examples. Use the first page for assistance.

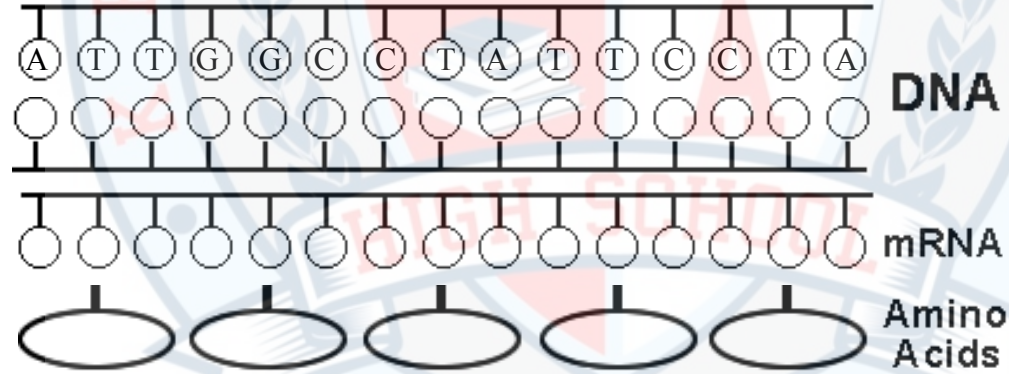
1.



2.



3.



Check for Understanding Questions

1. The process by which the genetic code of DNA is copied into a strand of RNA is called:
   a. translation b. transcription c. transformation d. replication

2. Which of the following describes mRNA?
   a. RNA is double stranded and contains the base thymine.
   b. RNA is single stranded and contains the base uracil.
   c. RNA is longer than DNA and uses five bases to encode information.
   d. RNA is made in the nucleus of a cell and stays there to carry out its functions.

3. Which of the following statements about the genetic code is true?
   a. A codon can specify for more than one amino acid.
   b. Every codon specifies for a different amino acid.
   c. Some codons specify for the same amino acid.
   d. Some codons have no function at all.

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How does DNA determine the traits of an organism?

In this activity, you will examine the DNA sequence of a fictitious organism: the Snork. Snorks were discovered on the planet DeeZoo in a distant solar system. Snorks only have one chromosome with 6 genes on it. Your job is to complete transcription and translation in order to determine the traits of the Snork.

Recall....

1. Transcribe the DNA sequence A C C G G T T A T into mRNA. _____
2. Translate the mRNA sequence into amino acids. _____
3. According to Table 2., what trait is coded for with this particular amino acid chain? _____
4. According to Table 1., what gene did you just transcribe and translate? _____

Directions: Complete Table 1. to determine the appearance of your stork. Notice the sample column that has already been completed.

Gene #	1	2	3	4	5	6
DNA	A C C G G T T A T	A G C C G A G G G	T T T A A C A A A	G G A C G C C G A	G G G A G G A A A	T T C T T C C T A
mRNA	U G G C C A A U A					
Amino Acids	try-pro-iso					
Traits	Hairless					

Table 1.

Amino Acid Sequence	Trait
try-pro-iso	hairless
try-gly-iso	hairy
ser-ala-pro	4 legged
ser-arg-pro	2 legged
pro-val-phe	round head
pro-ser-phe	block head
lys-phe-phe	no tail
lys-lys-asp	tail
pro-ala-ala	square eyes
pro-ala-cys	round eyes
lys-leu-phe	long legs
leu-leu-arg	short legs

Table 2.

Sketch your Snork here:

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On the lines provided, write a summary of how your Snork's DNA eventually provided enough information for you to sketch its appearance. You must include the following terms in your explanation: DNA, mRNA, transcription, translation, nucleus, cytoplasm, ribosome, codon, amino acids, and protein.