## **Transcription Questions:**

- **1.** Notice that the process of transcription is similar to DNA replication. What are some **similarities** between transcription and DNA replication?
- 2. There are also a few important differences between DNA replication and transcription. Fill in the blanks in the following table to summarize these differences.

	DNA replication	Transcription
Section	The whole chromosome is replicated.	
What is made?	A double-stranded DNA molecule is made.	
Enzyme(s)/ Proteins	DNA helicase – splits the DNA into leading and lagging strands DNA polymerase III – attaches DNA nucleotides Primase – attaches the RNA primer DNA polymerase I – removes the RNA primer and replaces them with DNA nucleotides DNA ligase – links the Okazaki fragments with phosphodiester bonds	

3. Why does mRNA need to be modified before leaving the nucleus?

4. Re Gene DNA		a gen	e that	intere	sts you	ı. Shov	v how —	the fir			ides ar ase pai			_		
3'																5′
mRNA																
Draw lines on mRNA above to separate codons																
Amir	o acid	S														
																_

## Take the quiz:

- 1. In eukaryotic cells, transcription cannot begin until:
  - a. the two DNA strands have completely separated and exposed the promoter.
  - b. the appropriate transcription factors have bound to the promoter.
  - c. the 5' caps are removed from the mRNA.
  - d. the DNA introns are removed from the template.
  - e. DNA nucleases have isolated the transcription unit from the noncoding DNA
- 2. Which of the following is not true of a codon?
  - a. It consists of three nucleotides.
  - b. It may code for the same amino acid as another codon does.
  - c. It never codes for more than one amino acid.
  - d. It relates to both DNA and RNA.
  - e. It is the basic unit of the genetic code.

- 3. Which of the following is *not* true of RNA processing?
  - a. Exons are excised and hydrolyzed before mRNA moves out of the nucleus.
  - b. The presence of introns may facilitate crossing over between regions of a gene that code for polypeptide domains.
  - c. Ribosome may function in RNA splicing.
  - d. RNA splicing may be catalyzed by spliceosomes.
  - e. A primary transcript is often much longer than the final RNA molecule that leaves the nucleus.
- 4. Using the genetic code table identify a possible 5' 3' sequence of nucleotides in the *DNA* template strand for an mRNA coding for the polypeptide sequence Phe-Pro-Lys.
  - a. UUU-GGG-AAA
  - b. GAA-CCC-CTT
  - c. AAA-ACC-TTT
  - d. CTT-CGG-GAA
  - e. AAA-CCC-UUU

## **Translation Questions:**

- 1. Explain why a cell needs both mRNA and tRNA in order to synthesize a protein. First, explain their functions.
- 2. How do tRNA and mRNA work together to result in the right amino acids in the right sequence as a polypeptide is synthesized?
- 3. a) Why it makes sense to use the word translation to describe this part of protein synthesis.
- b) Explain why it would not make sense to use the word translation to describe mRNA synthesis (transcription).
- 4. In the table below, compare the DNA for the *Beginning of the Normal Hemoglobin Gene* vs. the *Beginning of the Sickle Cell Hemoglobin Gene*. What is the only difference?

Beginning of <b>Normal</b> Hemoglobin <b>Gene</b>	CAC	CGTA	GAC	TGA	GGA	CTC				
Transcription produces:	codon 1	codon 2	codon 3	codon 4	codon 5	codon 6				
Beginning of <b>Normal</b> Hemoglobin <b>mRNA</b>										
Translation produces:	amino acid 1	amino acid 2	amino acid 3	amino acid 4	amino acid 5	amino acid 6				
Beginning of <b>Normal</b> Hemoglobin <b>Protein</b>										
Beginning of Sickle Cell Hemoglobin Gene CACGTAGACTGAGGACAC										
Transcription produces:	codon 1	codon 2	Codon 3	codon 4	codon 5	codon 6				
Beginning of Sickle Cell Hemoglobin mRNA										
Translation produces:	amino acid 1	amino acid 2	Amino acid 3	amino acid 4	amino acid 5	amino acid 6				
Beginning of <b>Sickle Cell</b> Hemoglobin <b>Protein</b>										

- 5. How does DNA determine whether you develop sickle cell anemia?
- 6. Why does a cell need to carry out transcription before translation?
- 7. To summarize what you have learned, explain how a gene directs the synthesis of a protein. Include in your explanation the words amino acid, anti-codon, codon, cytoplasm, DNA, mRNA, nucleotide, nucleus, protein, ribosome, RNA polymerase, tRNA, transcription, and translation.

8. Considering that we are all made up of the same 4 nucleotides in our DNA, the same 4 nucleotides in our RNA, and the same 20 amino acids in our proteins, why are we so different from each other?