Grade 12 Ontario Biology Textbook: Di Giuseppe, M., Vavitsas, A., Ritter, B., Fraser D., Arora, A., and Lisser, B. 2003. **Biology 12,** Nelson Thomson, Toronto, pp. 324

Try These: Transcription Questions

Questions

1. List and describe the three stages of transcription. K/U
2. If the DNA template strand has the sequence 3′-CAAATTGGCTTATTACCGGATG-5′, what would be the sequence of an RNA molecule transcribed from it? T/I
3. Explain the role of each of the following in transcription. K/U
   (a) promoter
   (b) RNA polymerase
   (c) spliceosomes
4. Differentiate between introns and exons. K/U
5. What are the key differences between transcription in eukaryotes and prokaryotes? K/U
6. Compare and contrast DNA replication and transcription. How are they similar? How are they different? Present your answer in table form. T/I C
7. How is it possible for an organism to produce more proteins than it has genes for? K/U
8. As a graduate student in a university laboratory, you have been challenged with the problem of determining whether a sample of mRNA is from a eukaryotic cell or a prokaryotic cell. You have been provided with a nucleotide sequencer, which will help you determine the DNA sequence. What features in the sequence will you look for to determine whether the mRNA is eukaryotic or prokaryotic? T/I
9. Suppose that you are provided with a sample of eukaryotic DNA. You divide the sample into three separate reaction mixtures and perform an experiment. Once transcription is complete, you analyze the base composition of mRNA from each mixture. You obtain the results in **Table 2**. Based on these results, answer the questions below. T/I

Table 2 Experimental Results

	A	G	C	T	U
DNA Strand I	19.1	26.0	31.0	23.9	0
DNA Strand II	24.2	30.8	25.7	19.3	0
mRNA Strand A	19.7	25.9	30.8	0	24.0
mRNA Strand B	24.1	30.9	25.9	0	19.0

   (a) Which strand of DNA served as the template for the synthesis of mRNA strand A? Which strand served as the template for the synthesis of mRNA strand B? Explain your reasoning.
   (b) Explain why the percentage of adenine is higher in the mRNA strands than in the DNA strands.
10. How does the absence of a nucleus in prokaryotes prevent prokaryotes from controlling gene expression by modifying RNA after transcription? T/I

1. Initiation – opening DNA at TATA box & exposing bases to be copied in the transcription unit , Elongation – creating mRNA strand using RNA polymerase, Termination & modification – Rho protein or hairpin loop causes DNA polymerase to stop transcribing, 5’ cap & poly A tail added, slicing out introns.
2. 5’ GUU UAA CCG AAU AAU GGC CUA C 3’
3. a) place for RNA polymerase to bind/start
   b) makes strand of RNA (pre-mRNA)
   c) cut out introns & put exons together
4. Introns – non-coding information & stay in nucleus, Exons – coding information & leave nucleus to be translated
5.

	Replication	Transcription
Template	both strands of DNA	one of DNA strands
Base pairing	A→T, G→C	A→U, T→A, G→C
Polymerase	DNA polymerase	RNA polymerase
Product	DNA	tRNA, mRNA, rRNA
Primer	+	–

6. Since a gene codes for a polypeptide it is not a protein yet. Proteins require a tertiary structure which is dependent on the environment. So, a single polypeptide could take on different forms in different environments. Also, several tertiary structures could join together to for quaternary structures which are distinct proteins. There could also be alternative splicing – not always the same exons are put together to leave the nucleus for translation.