

**BIO 184 - PAL Problem Set Lecture 3 (Brooker Chapter 12)
Transcription and RNA Modification**

Section A. Transcription

What is the central dogma of genetics?

What enzymes are responsible for catalyzing each step?

An RNA transcript has the following sequence: 5' – GGCAUGCAUUAUC – 3'

What is the sequence of the CODING strand of the DNA? Indicate the 5' and 3' ends.

What is the sequence of the TEMPLA TE strand of the DNA? Indicate the 5' and 3' ends.

What is the sequence of the ANTISENSE strand of the DNA? Indicate the 5' and 3' ends.

What is the sequence of the SENSE strand of the DNA? Indicate the 5' and 3' ends.

Which strand is read by RNA polymerase?

What are structural and nonstructural genes? List some examples of nonstructural genes.

Where does transcription and translation take place inside bacterial and eukaryotic cells?

What genes are transcribed by the three different eukaryotic RNA polymerases? How does this compare in bacteria?

Section B. Mechanisms of transcription

Name the three stages of transcription. What defines the beginning and end of each stage?

What are the components involved in each stage?

Where does RNA polymerase first attach to recognize a gene?

Which subunit of the RNA polymerase holoenzyme recognizes bacterial promoters?

With respect to the first transcribed base, where is the promoter found in relationship to the DNA strand used for transcription?

What are the similarities and differences between bacterial and eukaryotic promoters? What are the -10 and TATA Box?

What are transcription factors?

What is the primary role of sigma factors? Are sigma factors considered to be transcription factors? What is the difference between the different types of sigma factors?

What are the components of a closed and open promoter complex? What is the role of the mediator?

Section C. Mechanisms of transcription termination

What are the two mechanisms of bacterial transcriptional termination.

What is Rho?

What is a *rut* site?

What do both the rho-dependent and rho-independent mechanisms of termination have in common? What is different?

Section D. RNA Modification

Do bacteria process mRNA?

What is coupling of transcription and translation?

What is “colinearity”?

List three different ways eukaryotic mRNA is processed?

What is pre-mRNA?

What is capping? What does the Cap consist of? What is its purpose?

What is tailing? What does the tail consist of? What is its purpose?

What is splicing? What is its purpose?

Which mRNA modification provides a higher level of mRNA stability?

Which enzyme is responsible for the removal of introns from RNA?

How does the spliceosome work?

How does the spliceosome know where to splice?

What is a lariat?

What would likely happen if a mutation prevented an intron from being spliced?

How large are introns on average? What is the random chance of a ribosome hitting a stop codon? Are exon or intron sequences random or bias against stop codons?

What is alternative splicing?

What is the purpose of alternative splicing?

How does alternative splicing affect an organism's genome size?

How does alternative splicing contribute to specialized cells in multicellular organisms?

How frequent is alternative splicing in yeast and humans? Why do you think there is a difference?