

MOLECULAR BASIS of GENES to PROTEINS INFORMATION FLOW

Framework

The goal of today's exercise is for you to look at RNA, its structure, its transcription, and its function in making proteins. The triplet code instructions of DNA are transcribed into a sequence of codons in mRNA. In eukaryotes mRNA is processed before it leaves the nucleus to produce a mature functional cytoplasmic mRNA. Complexed with ribosomes, mRNA is translated into a linear sequence of amino acids in a polypeptide as tRNAs match their anticodons to the codons of the mRNA. Have one member, in turn, of your Learning Community answer one part of each of the questions or problems, then let the next member go on to the next part in the materials below.

Part 1. Transcription of DNA & Genetic Code

- a. In your text book is a copy of the genetics code. Practice using the dictionary of the genetic code by determining the proper amino acid sequence for the polypeptide coded by the following DNA. Have one group of 3 members first make the mRNA first, then have another group of 3 make the correct polypeptide. remember the proper polarity.

5'- ATGCCTGACTTTAAGTGA -3'
3'- TACGGACTGAAATTCAC T -5'

mRNA...

Polypeptide...

- b. Using the codons and amino acids you identified in part 1a. above have one member of your group, in turn, fill in the following table.

DNA Triplet 3'→5'	mRNA codon 5'→3'	Anticodon 5'→3'	Amino acid
			methionine
		GCA	
TTC			
	UAG		

- Part 2. a. How does a mature cytoplasmic, eukaryotic mRNA differ physically from its primary transcript?

- b. Have one member of your group, in turn, define the function of each of the following types of RNAs.
1. mRNA
 2. tRNA
 3. rRNA
 4. snRNP RNA
 5. SRP RNA
- c. Define the differences between each of the following: non-sense mutation and mis-sense mutation.

Part 3. Have one member of your group fill in each of the following boxes in the table below. Define or explain the role of the listed items and in Transcription and Translation.

Item	In Transcription	In Translation
Template		
Location		
Molecules Involved		
Enzymes Involved		
Control start stop		
Product		
Energy source		

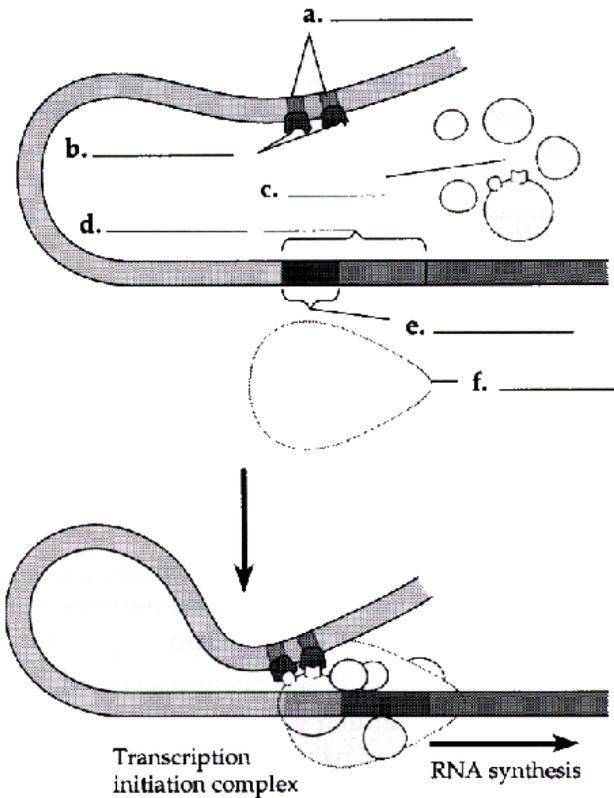
Part 4. In the figure to the right which details protein synthesis:

a. Name the stages (1-4)

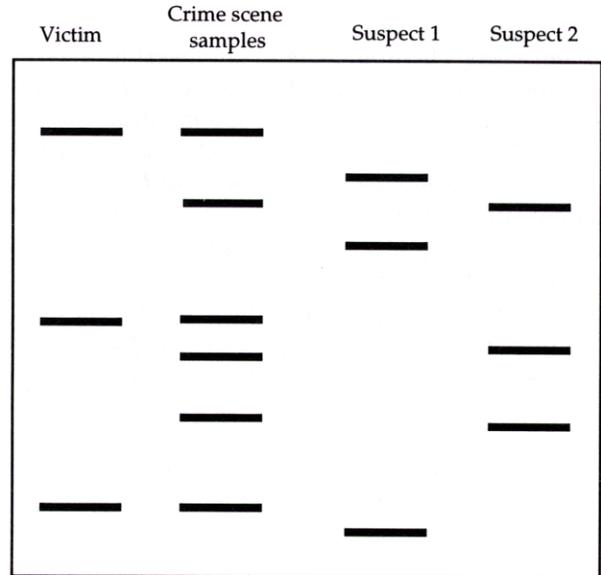
b. briefly describe what happens at each stage

c. identify the components (a. thru l.)

Part 5. Label the components of the diagram below in the formation of an initiation complex in eukaryotes.



Part 6. A bloody crime scene has occurred in Miami. The CSI Miami groups heads to the SoBe and collects blood samples from a victim, two different suspects, and from a possible murder scene. From the DNA electropherograms below, tell us which suspect you would charge with the crime and why. Also describe what techniques or procedures were used?

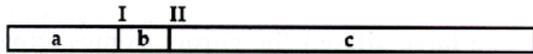


Part 7. Fill in this table on the basic tools of gene manipulations used in DNA biotechnology.

Technique or tool	Brief description	Some uses in DNA technology
Restriction enzymes		
Gel electrophoresis		
cDNA		
Labeled probes		
Southern blots		
DNA sequencing		
PCR		
RFLP analysis		

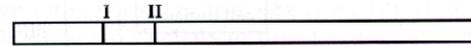
Part 8. The next two questions deal with restriction fragment analysis.

a. The segment of DNA has restriction sites I and II, which create restriction fragments a, b, and c. Which of the following gel electrophoresis patterns would represent the proper separation and identity of these fragments and why.



- a.
- b.
- c.
- d.
- e.

b. This restriction fragment contains a gene whose recessive allele is lethal. The normal allele has restriction sites for the restriction enzyme PST-I at the points I and II. The recessive allele lacks restriction site I. An individual who had a sister with the lethal trait is being tested to determine if he is a carrier of that allele. Which of the following gel electrophoresis patterns would be produced if he is a carrier (heterozygous for the lethal gene).



- a.
- b.
- c.
- d.
- e.