

**Questions for Dr. Schmidt's Lectures****25 points total; 5 pages**

March 1, 2007

**True / False (1/2 point each) - 4 points total**

1. Aminoacyl tRNA synthetases...  
\_\_\_ of type Class I couple adenylated amino acids with the ribose 2' OH of tRNAs.  
\_\_\_ recognize nucleotide landmarks on tRNAs that necessarily include the anticodon.
2. In vivo, eukaryotic tRNAs ...  
\_\_\_ are found mostly in an activated state (i.e. charged with amino acids).  
\_\_\_ are always post-transcriptionally modified.
3. Regarding chain termination  
\_\_\_ RF1 and RF3 form a complex that binds the ribosome.  
\_\_\_ GTP hydrolysis mediated by RF3 is required for release of the polypeptide.
4. The antibiotic puromycin...  
\_\_\_ can covalently attach to the growing polypeptide chain during translation elongation.  
\_\_\_ is a structural mimic of EF-G.

**Multiple Choice and One-Two Word Answers (1 point each) – 4 points total**

5. Which estimate best typifies the % of cellular mass devoted to translation in a normal cell?  
A) 5-20%  
B) 20-35%  
C) 35-50%  
D) 50-65%
6. Considering all stages of translation, which of the following molecules would not be an effective inhibitor of translation?  
A) ATP $\gamma$ S  
B) GMPPCP  
C) GTP $\alpha$ S  
D) GTP $\gamma$ S
7. Colicin E3 disrupts what stage of prokaryotic translation?  
A) amino acid activation  
B) initiation  
C) elongation  
D) termination
8. Regarding eukaryotic protein turnover, which of the following is false?  
A) the output of the proteasome is oligopeptides.  
B) ubiquitination is an energy dependent event.  
C) ubiquitin marks the lysine side chains of proteins that are "condemned."  
D) any form of ubiquitination "condemns" a protein for degradation.

**Short Answer - These can be answered using lists or a couple of sentences at most - 10 points total**

9. Why can an organism having fewer than 61 tRNAs still recognize all 61 amino acid encoding codons? (1 point)

10. Using the lecture discussion as a reference, describe one pro and one con regarding the use of nitrites by the food industry. (2 points)

11. All tRNAs have a common trinucleotide sequence, but this sequence is not encoded in eukaryotic tRNA genes...

What is the sequence? (1 point)

Where is it found on tRNAs? (1 point)

How is it created on eukaryotic tRNAs? (1 point)

12. Why is the cryoEM structure of RF2, rather than its crystal structure, more in line with the structural expectations for this molecule? (2 points)

13. You wish to study the biochemical properties of a certain eukaryotic protein that is expressed in liver tissue. Traditional biochemical purification methods using liver tissue yield little of the protein because it is subject to rapid turnover. Thus, you plan to purify the protein from bacteria by taking advantage of a plasmid-based expression system. The plasmid you will use has a Shine-Delgarno sequence that is immediately followed by a restriction site into which you are told you must clone your gene. In preparation for this step, you have isolated chromosomal DNA that contains your gene of interest. It is a large piece of DNA. It contains your gene (i.e. the promoter, open reading frame for your protein, and the 3' untranslated sequence) as well as a number of other genes; assume that all the open reading frames lack introns. Taking into account the lecture material...

What portion of the DNA fragment will you use for subcloning? (1 point)

What change to the coding sequence would you recommend to help ensure good protein stability? (1 point)

**Long Answer - answer the following questions using several sentences and/or diagrams; continue on the back of the page if necessary - 7 points total**

14. Define translational frameshifting AND explain the process using a pertinent example from lecture or homework assignments. (3 points)

15. You have isolated a new antibiotic that works by allowing initiator fMet-tRNA<sup>fMET</sup> into the A site of a prokaryotic ribosome. This antibiotic does not interfere with the access of other tRNAs to the A site, and it does not affect entry of fMet-tRNA<sup>fMET</sup> into the P site. What is the effect of this compound on translation and explain why the effect is observed? (4 points)

**Bonus Question – 2 points total**

Answer *only one* of the following. Circle the question that you are answering. If you answer both, only the first will be graded.

1. What two main methods were used by Weihofen to assess the topology of the signal peptide peptidase?
2. Provide an example of how a virus can disrupt eukaryotic translation to its advantage. Provide some specifics and keep your answer within the context of our class discussion, lecture notes, and associated readings.