

Questions for Dr. Schmidt's Lectures**30 points total; 4 pages**February 29th, 2008**True / False (1/2 point each) - 4 points total**

1. Regarding translation initiation:
 initiator and internal methionines are coupled to the same type of tRNA in eukaryotes.
 tRNAs are coupled to amino acids via the 2' OH of their terminal ribose.
2. The Shine-Delgarno sequence is:
 typically a stretch of pyrimidine rich nucleotides.
 base pairs with the ATG of prokaryotic open reading frames.
3. Regarding the EF-Tu/Ts system:
 it is required for translation elongation.
 binding of a charged tRNA to EF-Tu/GTP is a rate limiting step for translation.
4. EF-G is:
 a ribonucleoprotein.
 binds and hydrolyzes GTP as part of its function.

Multiple Choice and One-Two Word Answers (1 point each) – 10 points total

5. At approximately what percent does translational frameshifting occur on RSV transcripts to produce the *gag-pol* polypeptide.
A) 1%
B) 5%
C) 25%
D) 50%
6. You have purified a protein that is likely to be a new component of the ribosome. Structure prediction algorithms suggest that your protein has a globular head domain and an extended tail region (the molecule sort of looks like a lollipop). What type of amino acids likely make up the tail region:
A) nonpolar
B) polar with neutral charge
C) polar with basic (positive) charge
D) polar with acidic (negative) charge
7. EF-Ts helps facilitate the regeneration of the EF-Tu/GTP complex by promoting:
A) phosphorylation of the GDP in the EF-Tu/GDP complex
B) dissociation of Mg^{2+} from the EF-Tu/GDP complex
C) physical exchange of GTP for GDP in the EF-Tu/GDP complex
D) the replacement of the EF-Tu/GDP complex with a new charged tRNA/GTP complex
8. Peptide bond formation (transpeptidation) requires nucleophilic attack on the growing peptidyl chain by an amino acid in which ribosomal binding site?
A) the A site
B) the B site
C) the E site
D) the P site

9. Based on class discussion, which of the following is not an example of a viral strategy to disrupt eukaryotic mRNA translation at the level of the 43S preinitiation complex?
- A) sequestration of eIF4E by 4E binding proteins (4E-BP) to destabilize interaction with methyl cap
 - B) proteolytic cleavage of PAB to destabilize interactions with poly A regions
 - C) phosphorylation of PAB to destabilize charge interactions between it and poly A regions
 - D) eviction of PAB from the eIF4F complex to destabilize interactions with poly A regions
10. What percent of proteins (prokaryotic and eukaryotic) retain their N-terminal methionine?
- A) 1%
 - B) 5%
 - C) 25%
 - D) 50%
11. Approximately what percent of phosphoamino acids are represented by modified Ser, Thr, and Tyr amino acids?
- A) 1%
 - B) 5%
 - C) 25%
 - D) 50%
12. Viruses have managed to disrupt PKR function by disabling which of the following?
- A) its phosphatase activity
 - B) the interaction between PKR and dsRNA
 - C) the ability of PKR to dimerize
 - D) its ability to bind its target substrate
13. Which molecule is the source of the nucleophile for translation termination?
14. On the table shown in class that described the 5 stages associated with prokaryotic translation, the minimum number of tRNAs needed for prokaryotic translation should be 21 rather than the 20 that was listed. What accounts for the extra tRNA?

Short Answer - These can be answered using a few words, a list, or short comments – 10 points total

15. All tRNAs have the same CCA sequence on the 3' end. This sequence is typically derived differently in prokaryotic and eukaryotic tRNAs. Very briefly indicate the origin of the sequence in both classes of organisms. (2 points)

16. What makes the prokaryotic initiator tRNA distinct from the one used for internal methionines? (2 points)

17. List examples of macromolecular “machines” described in class. (3 points)

18. From the class lecture material, provide an example of structural mimicry. (1 point)

19. Potential new targets for antibiotic development were mentioned during our discussion of translation. Name one such target and describe the step in which it is involved. (2 points)

Long Answer - answer the following questions using several sentences and/or diagrams; continue on the back of the page if necessary – 6 points total

20. Describe with some detail the translational regulation that occurs in association with the production of *E. coli* release factor 2 (RF-2). (4 points)

21. What two major findings made by Nissen *et al* (The Structural Basis of Ribosome Activity in Peptide Bond Synthesis) support the view of the ribosome being a ribozyme? (2 points)

Bonus Questions - Answer only one of the following; each is worth the same number of points. If you answer both, only the first will be considered – 3 points total

1. Diagram the protein ubiquitination cycle.

2. Certain organisms have significantly fewer tRNAs than the number of codons that make up the standard genetic code. Explain how this is possible using diagrams and short comments. Use enough detail so that your reasoning is clear.