BCMB 8020 Exam I **Name _____**

Dr. Schmidt's Lectures (30 points total)

February 2, 2006

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

1. Regarding, open reading frames (ORFs):
   ____ they always are non-overlapping.
   ____ *in vitro* translation can occur without an ATG.

2. Regarding tRNAs:
   ____ amino acids are coupled to a tRNA via a phosphate bond.
   ____ their three-dimensional shape resembles a cloverleaf.

3. Regarding the ribosome:
   ____ the 50S subunit refers to the prokaryotic large ribosomal subunit.
   ____ RNA/RNA interactions mediate the binding of eukaryotic mRNAs to the small ribosomal subunit.

4. Regarding methionine:
   ____ it is retained at the N-terminus on approximately half of all mature *E. coli* proteins.
   ____ it must be coupled to at least two distinct tRNAs.

Multiple Choice and One-Two Word Answers (1 point each) – 5 points total

5. Which of the following does not promote proper alignment of a prokaryotic mRNA?

   A) Shine-Delgarno sequence
   B) 16S ribosomal RNA
   C) 23S ribosomal RNA
   D) RNA/RNA interactions

6. Which of the following is not true of a prokaryotic initiator Met-tRNA^{Met}?

   A) it is charged with a formylated methionine
   B) binding to the ribosomal small subunit depends on codon-anticodon interactions
   C) it is not recognized by EF-TU
   D) it has dimensions that are roughly 20 x 80 Å

7. Which of the following is not an example of a macromolecular "machine"?

   A) amino-acyl tRNA synthetase
   B) ribosome
   C) GroEL/ES
   D) proteasome

8. Regarding eukaryotic protein turnover, which of the following is false?

   A) the output of the proteasome is amino acids and oligopeptides.
   B) ubiquitination is an ATP dependent event.
   C) polyubiquitination is a recognition determinant for degradation.
   D) ubiquitin marks the leucine side chains of proteins that are "condemned."

9. Which of the following cannot be used as a nucleophile to abort translation?
   A) puromycin
   B) water
   C) amino acids
   D) GTP

Short Answer - These can be answered using lists or a couple of sentences - 9 points total

10. Based on course materials, list six different types of covalent post-translation modification?
    (3 points)

11. List three distinct macromolecular complexes discussed in class or your readings and define their functional role(s).
    (3 points)

12. Given your knowledge about the function of EF-Ts, what do you envision is the mechanism by which GrpE facilitates nucleotide exchange on DnaK?
    (1 point)

13. Define structural mimicry and provide a specific pair of examples that are based from class discussion and/or your readings.
    (2 points)

Long Answer - answer the following questions using several sentences and/or diagrams; continue on the back of the page if necessary - 12 points total

14. The sequestration of eIFs can be used as a mechanism for repressing host polypeptide translation. Provide an example (from course discussion or the text). Be as specific as possible and describe the event(s) required for regulating sequestration in your example.
(3 points)

15. In theory, wobble rules would allow a $tRNA^{Trp}$ with a UCA anticodon to interact with the Trp codon. Why is this tRNA not commonly used in organisms that use the standard genetic code? If it were used, how would this impact the organism's usage of other codons?
(2 points)

16. Why is a tetracycline-producing *Streptomyces* species not adversely affected by the antibiotic that it produces? Be as detailed as possible.
(2 points)

17. Based on your readings, answer only one of the following. Circle the question that you are answering. If you answer both, only the first will be graded.
(3 points)

A) Provide a summary of Selkoe's article on amyloidoses.
B) Summarize the experimental approach used to identify SPP as reported by Weihofen et al.

18) You have identified a virus that makes infected individuals highly susceptible to cancer of all types. The cancer-promoting element in the viral genome encodes a viral protein that you have determined is associating with an E3 protein ligase. What do you hypothesize is the mechanism by which the cancer is occurring?
(2 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. Why is eating hot dogs and other processed meat products potentially dangerous with respect to human health? Keep your answer within the context of our class discussion and associated readings.

2. You have identified a novel virus and suspect that one of the viral protein products interferes with translation initiation, specifically methyl-cap recognition. Describe an experiment that will help confirm your hypothesis. Base your methodology on that described for assessing the activity of PKR as detailed in lecture.