BIOLOGY 205 **Name _____**
Midterm II - 10 November 2005

Multiple choice questions – 3 points each. Pick the single best answer.

1. Ribosomes are a collection of:

A. small proteins that function in translation
B. proteins and rRNAs that function in translation
C. proteins and tRNAs that function in transcription
D. proteins and mRNAs that function in translocation
E. mRNAs and tRNAs that function in transformation

2. When eukaryotic DNA is hybridized with mature (i.e., processed) mRNA, the hybrid molecules contain loops of double-stranded DNA. These regions of DNA are called:

A. retroviruses
B. exons
C. introns
D. UTRs
E. transposons

3. The enzyme that charges the tRNA molecules with appropriate amino acids and thereby acts as the universal code translator is:

A. tRNA isomerase
B. amino-tRNA chargeatase
C. reverse transcriptase
D. aminoacyl-tRNA synthetase
E. tRNA primase

4. An enveloped virus that has become integrated into the host cell's chromosome is called...?

A. provirus
B. transposons
C. prophages
D. T-even bacteriophages
E. plasmids

5. The universal genetic code is best described as:

A. ambiguous but not redundant
B. degenerate but not ambiguous
C. both ambiguous and redundant
D. neither ambiguous nor redundant
E. missense but not nonsense

6. The TATA box is:

A. a sequence rich in A's and T's common to the promoter region of many genes
B. an operator site that aids in the regulation of transcription
C. an enhancer consensus sequence
D. an activator sequence necessary for proper translation
E. an enricher sequence needed for translocation

7. Which of the following enzymes caused a modification of the central dogma?

A. reverse transcriptase
B. aminoacyl-tRNA synthetase
C. taq polymerase
D. RNA polymerase
E. DNA polymerase

8. Imagine that a novel life form is found deep within Europa's Ocean. Evaluation of its DNA yields no surprises. However, it is found that a codon for this life form contains just two bases. How many different amino acids maximum could this organism be composed of?

A. 4
B. 8
C. 16
D. 32
E. 64

9. The rules formulated by Erwin Chargaff state that

A. A = T and G = C in any molecule of DNA
B. A = C and G = T in any molecule of DNA
C. A = G and C = T in any molecule of DNA
D. A = U and G = C in any molecule of RNA
E. DNA and RNA are made up of the same four nitrogenous bases

10. Which of the following correctly ranks the structures in order of **size**, from *smallest* to *largest*?

A. chromosome ➜ gene ➜ codon ➜ nucleotide
B. gene ➜ chromosome ➜ codon ➜ nucleotide
C. nucleotide ➜ codon ➜ gene ➜ chromosome
D. nucleotide ➜ chromosome ➜ gene ➜ codon
E. chromosome ➜ codon ➜ gene ➜ nucleotide

11. The molecular biological method that takes advantage of thermostable DNA polymerase?

A. sequencing B. RFLP C. PCR
D. cloning E. hydridization

12. **Match** the single best answer of biological macromolecule that best describes each statement below (i.e., put the correct # next to the statement). The choices may be used once, more than once, or not at all **(2 points each)**.

Your choices are:

1. **mRNA**
2. **tRNA**
3. **rRNA**
4. **Amino Acid**
5. **Nucleoside triphosphate**
6. **Polypeptide (i.e., Protein)**

_____	The product of translation	_____	Substrate for RNA polymerase
_____	The product of transcription	_____	Substrate for a ribosome
_____	A transcription initiation factor	_____	Most volatile type of RNA
_____	A translation termination factor	_____	Energy carrier in the cell
_____	Location of a codon	_____	Location of an anticodon

Short answer – Number of points in parentheses.

13. **(8 points)** Consider the Meselson and Stahl experiment regarding bacteria with heavy ^{15}N DNA grown in light ^{14}N media. **(A)** Upon CsCl density gradient ultracentrfugation of the first generation DNA, which **model(s)** of DNA replication is/are supported **if** the resulting DNA is both *heavy* and *light* in density? **(B)** Which **model(s)** of DNA replication is/are supported after the second generation **if** the resulting DNA is both *intermediate* and *light* in density?

14. **(4 points)** What are three different types of **posttranslational modifications** that are possible with a newly synthesized protein?

15. **(6 points)** Briefly describe the **three** steps involved during the **elongation stage of translation**? Make sure to include any supporting factors and/or energy molecules that might be needed.

16. **(6 points)** What are three different **major features** (i.e., characteristics) that are considered when attempting to classify viruses?

17. **(6 points)** Consider the differences between the **DNA replication** on the lagging strand and on the leading strand. What enzymes are required <u>that are in addition</u> to the enzymes used on the leading strand to solve the problem of Okazaki fragments on the lagging strand?

18. **(8 points) (A)** Briefly describe the difference among the following point mutations: **silent, missense, nonsense, and frameshift** in terms of a single base pair change. **(B)** How many amino acids would be affected in a potentially translated polypeptide that is 12 amino acids long (i.e., a 12-mer that includes methionine), if the point mutations you described above occurred somewhere in the 3rd codon?

19. **(9 points)** What are three specific mechanisms (<u>AND when do these occur</u>) for introducing genetic variation from one generation to the next in sexually reproducing organisms?

20. **(Extra credit, 5 points possible)** Briefly, what is meant by the term **catabolite repression**?

21. **(Extra credit, 10 points possible) (A)** How many ATPs, and **(B)** how many GTPs are required to produce a complete 20-mer polypeptide from its amino acid monomers? You must tell me where, or at what step these nucleoside triphosphates are used to receive full points.