

Part I - Multiple choice - 1 pt. each.

1. Assuming that each is used only once, how many tRNA molecules are necessary to build a protein containing 300 amino acids? A) 100 B) 150 C) 300 D) 600 E) 900
2. The sequence of substances in the backbone chains (not the side groups) of a DNA molecule is: A) base-phosphate-sugar-base-phosphate-sugar... B) phosphate-base-phosphate-base... C) base-sugar-base-sugar... D) phosphate-sugar-phosphate-sugar... E) base-sugar-phosphate-base-sugar-phosphate...
3. When bacteriophages labeled with P^{32} were allowed to infect bacterial cells, the phosphorus was: A) found only in the outer shell of the virus B) attached to the bacterial cell wall C) in the cytoplasm of the bacterial cells D) found in bacterial proteins E) none of the above

In questions 4-6 use the diagram below depicting one strand of a DNA molecule.

4. The solid circles represent: A) ribose B) deoxyribose C) phosphate D) bases E) amino acids
5. A complementary strand produced in transcription would have the base sequence: A) UACGCAUUAU B) ATGCGTATA C) ATATGCGTA D) AUGCGUAUA E) none of the above
6. If the strand were being transcribed, the enzyme would likely be: A) peptidyl transferase B) DNA primase C) DNA polymerase D) Okazaki transferase E) RNA polymerase
7. If 20% of the bases in an mRNA molecule were uracil, what percentage would be guanine? A) 20 B) 30 C) 60 D) 60 E) not enough information to answer the question
8. Both DNA and RNA: A) are single stranded B) contain thymine bases C) are polymers of amino acids D) contain phosphates E) can contain protein codes F) more than one of the above
9. A tRNA molecule has the anticodon AGC. What DNA sequence was used to transcribe the codon to which it will bind? A) AGC B) TCG C) UCG D) TGC E) UGC

10. Structurally, tRNA and mRNA differ in that mRNA is usually the _____ of the two. A) more folded B) shorter
C) both of the above D) none of the above
11. All else being equal, the least efficient way to control gene expression would be to control: A) translocation
B) translation C) enzyme function D) transcription
E) RNA production
12. The fact that DNA bases come in pairs with equal concentrations was first discovered by: A) Carey
B) Chargaff C) Watson and Crick D) Pauling E) Hershey and Chase
13. During which of the following processes are introns eliminated? A) DNA replication B) transcription of mRNA
C) processing of RNA before translation D) translation of mRNA
E) transcription of tRNA
14. In an operon, which DNA segment is not transcribed?
A) inducer B) promoter C) structural gene D) cistron
E) corepressor

Part II - True-false - 1 pt. each.

1. In an individual plant, barring mutations, parenchyma cells and epidermal cells would be genetically identical.
2. A repressor is always a protein in procaryotes.
3. In DNA adenine binds to thymine with 2 hydrogen bonds.
4. A schematic outline of purine structure would look like-
5. Each base pair in a DNA molecule is made up of 2 pyrimidines or 2 purines.
6. Often the third base in a codon is superfluous when it comes to specifying an amino acid in a protein.
7. A single mRNA molecule is often associated with more than one ribosome in the cytoplasm of a cell.
8. An Okazaki fragment is an area in a DNA molecule in which a stop codon region has mutated.

Part III - Fill-in - 1 pt. each blank.

1. In building a protein, there are _____ different amino acids that could be used.

2. If ACU is a codon for valine, then it is also likely that _____ will code for valine.
3. Meselson and Stahl's experiment tested hypotheses attempting to explain the process of _____ in DNA. They used different isotopes of _____ to distinguish old and new DNA chains by weight. After one generation of replication, their results rejected the _____ hypothesis because they did not find _____ in their centrifuge tubes. After 2 generations of replication, their results supported the _____ hypothesis.
4. A(n) _____ is usually composed of 3 parts: 1) a _____ containing one or more cistrons, 2) _____, the binding site for a repressor, and 3) _____, the binding site for RNA polymerase. This genetic model is a good explanation of _____ control in procaryotic organisms.
5. In order to be translated, messenger RNA's in _____ cells must have _____ added to one end of the molecule and _____ added to the other end.

Part IV - Short answer - Pts. As indicated.

1. Define: (3 pts each)
 - A. antiparallel
 - B. exon
 - C. helix
 - D. frameshift mutation
 - E. corepressor
 - F. transcription
2. Explain how Griffith's work on pneumococcus bacteria was used to support the hypothesis that DNA was the genetic material. (10 pts)

5. Describe the protein production functions that occur at the "A" site, the "P" site, and the "E" site on a ribosome. (13 pts)