

2018 Protein Modeling Exam

/ 40 pts

Multiple Choice:

1. Which of the following amino acids has a negative charge at pH 7?
 - a. Gln
 - b. Glu
 - c. Ser
 - d. Cys

2. Which of the following is an example of secondary structure?
 - a. Salt Bridge
 - b. Disulfide Bond
 - c. Hydrophobic Effect
 - d. Alpha Helix

3. In which of the following types of enzyme inhibition does the inhibitor bind to the enzyme-substrate complex?
 - a. Competitive inhibition
 - b. Noncompetitive inhibition
 - c. Uncompetitive inhibition
 - d. Mixed inhibition

4. How many amino acids are directly encoded by the universal genetic code?
 - a. 9
 - b. 22
 - c. 21
 - d. 20

5. Which of the following amino acids is not always used in the L stereoisomer?
- Glycine
 - Glutamic Acid
 - Alanine
 - Cystine
6. Which of the following amino acids is most important for tertiary structure?
- Serine
 - Arginine
 - Phenylalanine
 - Cystine
7. Which of the following amino acids does NOT absorb light in the near-ultraviolet region of the spectrum?
- Tyrosine
 - Tryptophan
 - Histidine
 - Phenylalanine
8. Which of the following estimates is closest to the number of genes in the human genome?
- 10,000
 - 20,000
 - 30,000
 - 40,000

9. Which of the following amino acids is most likely to be encountered in the interior of an unknown protein?

- a. Proline
- b. Serine
- c. Lysine
- d. Leucine

10. How many base pairs are in one turn of a DNA helix?

- a. 5
- b. 8
- c. 10
- d. 12

11. Which of the following is a DNA palindrome?

- a. ACCTATAGGT
- b. ACGACGACG
- c. ATTATCGGCG
- d. ATGCTTCGTA

12. Which of the following individuals gave CRISPR its name?

- a. Philippe Harvarth
- b. Francisco Mojica
- c. John van der Oost
- d. Jennifer Doudna

13. Which of the following supplies the DNA found as CRISPR spacers?

- a. Archae
- b. Bacteria
- c. Viruses
- d. *C. elegans*

14. Which of the following scientists optimized the Cas9 system for use in mammals?
- Feng Zhang
 - John van der Oost
 - Francisco Mojica
 - Raj Paul
15. Which of the following is not one of the domains of Cas9?
- HNH
 - RuvC
 - CTD
 - PAM
16. Which of the following amino acids in AcrIIA4 does NOT mimic the backbone of DNA?
- Asp37
 - Lys18
 - Asp69
 - Glu70
17. In what organism were CRISPR sequences FIRST identified?
- E. coli*
 - H. sapiens*
 - S. pyogenes*
 - H. volcanii*
18. Which of the following scientists was a pioneer in the understanding of tracrRNA?
- Philippe Harvarth
 - Francisco Mojica
 - Emmanuelle Charpentier
 - Feng Zhang

19. Which of the following three base sequences is found after CRISPR spacers in *S. pyogenes*?

- a. GTT
- b. NGG
- c. AAC
- d. GCG

20. Which of the following RNA types controls where Cas9 cleaves DNA by acting as a template?

- a. tracrRNA
- b. sgRNA
- c. mRNA
- d. snRNA

Short Answer:

1. Consider the following peptide:

Ile - Ala - His - Thr - Tyr - Gly - Pro - Phe - Glu - Ala - Met - Cys - Lys - Trp - Glu - Ala -
Gln - Ala - Asp - Gly - Met - Glu - Cys - Ala - Phe - His - Asp

a. At what position/s might beta turns or bends occur in the peptide? Briefly explain your answer.

b. Where might a pi helix form?

c. Where might inter-chain disulfide bonds form?

2. What happens if you replace some of the Asp and Glu amino acids in the loops between beta sheets of AcrIIA4 with Ala? What happens if you replace them with Lys and Arg?

3. What is the role of Asn25 in the beta 1-2 loop of AcrIIA4?

4. What activity will Cas9 have if its two nuclease domains are inactivated and a pyrimidine deaminase is attached to it?