Protein Modeling Regionals Qualifier

Name: _____

Date: _____

Name of Pre-Model: _____ (1 pt)

- Test MUST be taken with a proctor
- 30 minutes allowed to take test
- Test Consists of 10 Multiple Choice and 5 Short Answer
- Highest Score Wins and Will be Selected for Regionals A-Team
- Any Score Below 50% Results in a Punishment
- Good Luck!

Test By A. Hamelberg

Part 1: Multiple Choice (1 point each)
Write the letter of your choice on the line provided. Use capital letters.

_____ 1. How many nitrogen atoms are found in the backbone of each amino acid?

A. 1
B. 2
C. 3
D. 4

_____ 2. Where do Salt Bridges form?

A. Between Hydrogen Bonds
B. Between Positively Charged Amino Acids
C. Between Negatively Charged Polypeptides
D. Between Oppositely Charged Amino Acids

_____ 3. What structure allows for inhibition of SpyCas9?

A. Alpha Helix
B. Beta Pleated Sheets
C. 3_{10} Helix
D. Disulfide Bonds

_____ 4. What is the Molecule of the Month (February 2019)?

A. Fluorescent RNA Aptamers
B. Initiation Factor eIF4E
C. Telomerase
D. Phytase

_____ 5. If you are discussing the sequence of amino acids in a polypeptide chain then you are talking about the protein's …

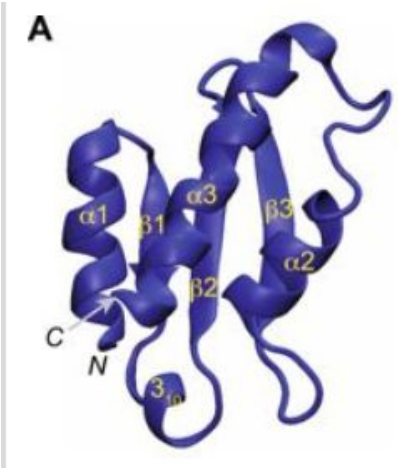
A. Primary Sequence
B. Secondary Sequence
C. Tertiary Sequence
D. Quaternary Sequence

_____ 6. Which of the following bond is the strongest

A. Hydrogen Bond
B. Covalent Bond
C. Ionic Bond
D. Electrostatic Bond

_____ 7. Which statement accurately describes AcrIIA4?

A. Enzyme that catalyzes the breakdown of viral DNA by interfering with the hydrogen bonds between nitrogenous bases
B. Endonuclease that binds to 3' end of viral DNA that contain a protospacer adjacent motif
C. Endonuclease that makes double-strand breaks in DNA sequences matching known viral DNA
D. Enzyme that catalyzes complementary base-pairing between sgRNA and the PAM regions of the bacterial DNA



_____ 8. Which part of this Anti-Crispr Protein in the image above allows for inhibition of Spy-Cas9?

A. α1 (alpha helix 1)
B. β1 - β2 (beta pleated sheet 1-2)
C. 3_{10} Helix
D. β3 - α2

_____ 9. Which amino acids form disulfide bridges?

A. Glutamic Acid
B. Cysteine and Methionine
C. Tryptophan
D. Cysteine

_____ 10. What is the name of the reaction in which a peptide bond is formed?

A. Oxidative-reductive Reaction
B. Hydrolysis
C. Dehydration Synthesis
D. Single Replacement

Part 2: Short Answer (20 points total)

11. What other scientific uses might CRISPR have beyond genome editing?(4pts)

12. Draw an Alanine Amino Acid and how it would react in water. Explain the bonds that would interact with Alanine and why? (4pts)

13. A. What 3 secondary structures are found in AcrIIA4? (2pts)

B. Describe how these structures form? (1 pt)

C. How would low pressure affect these structures? (2 pts)

14. Explain the inhibition process of SpyCas9? (4 pts)

15. Protospacer adjacent motif (PAM) is a base pair DNA sequence immediately following the DNA sequence targeted by the Cas9 nuclease in the CRISPR bacterial adaptive immune system. PAM is a component of the invading virus or plasmid, but is not a component of the bacterial CRISPR locus.

A. What is the nucleotide sequence in a characteristic PAM? (2 pts)

B. How many base pair sequences immediately follow the DNA sequence targeted by the Cas9 nuclease? (3 pts)