

Valley Forge Invitational Tournament

January 14, 2012

Protein Modeling Event:

School Name _____

School Number _____

Names _____

For Judges use only:

Prebuilt score _____

On-Site Build Score _____

Test Score _____

Tie Breaker _____

Total _____

Final Rank _____

Part 1: Pre-Build (40% of total score)

Your Pre-build Model should have been impounded this morning. You may pick up your prebuild model at the end of the day. Unclaimed models will be thrown away.

Part 2: The workstation should have the On-Site Model Competition open on the computer. Go to pdb.org and type 1g73 in the search box. Open in jmol.

Using the 314cm length of wire provided, construct a model of amino acids 1-157 of chain A of 1g73.pdb. The scale should be 2 cm per amino acid. A meter stick and markers have been provided for you. Your model should include the following:

A: Two amino acids: Ala1 and Glu 150 (use a marker and provide a key)

B: Mark the amino terminus (N-terminus end) of this protein

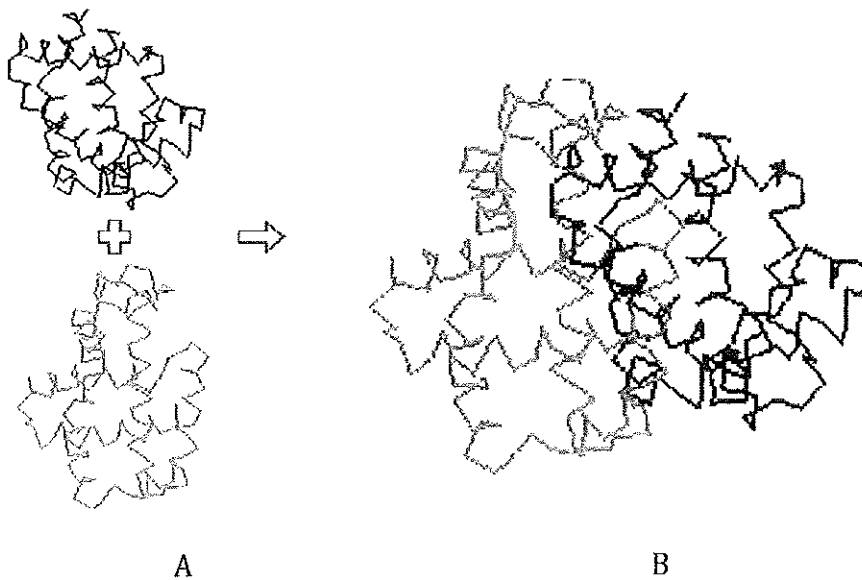
C: Mark the carboxylic terminus (C-terminus end) of this protein

Part 3: On-Site exam. You may use any materials provided at your workstation as well as 5 sheets you brought with you to answer these questions. You may not use the Internet to answer these questions.

Multiple Choice Questions: Please place your answers in the spaces provided.

- _____ 1. Which of the following amino acids have sulfur in their side chains?
- A. Serine and Cysteine
 - B. Serine and Proline
 - C. Cysteine and Leucine
 - D. Leucine and Proline
 - E. Cysteine only
- _____ 2. Which of the following amino acids are known as essential amino acids.
- A. Alanine
 - B. Asparagine
 - C. Aspartic acid
 - D. Cysteine
 - E. Histidine
- _____ 3. The basic amino acids lysine and arginine will be normally found in the interior or exterior of a protein structure?
- A. Interior
 - B. Exterior
 - C. Either
 - D. Basic amino acids do not exist
- _____ 4. Where is the protein Diablo, stored when a cell is not undergoing apoptosis?
- A. In the nucleus
 - B. In the cytoplasm
 - C. In the endoplasmic reticulum
 - D. In the mitochondria
 - E. In the chloroplast
- _____ 5. Which of the following combination of amino acids will form a salt bridge or ionic interaction?
- A. Aspartic acid and Leucine
 - B. Glutamic acid and Aspartic acid
 - C. Lysine and Glutamine
 - D. Arginine and Glutamic acid
- _____ 6. What bonds hold the primary structure of a protein together?
- A. Hydrogen
 - B. Disulfide bridge
 - C. Ionic attractions
 - D. Peptide bonds
 - E. Van der Waals forces

7. What role does Diablo play in regulating the apoptotic pathway?
- A. Diablo eliminate the inhibitory effect of inhibitor of apoptosis proteins such as XIAP by binding to inhibitor protein, preventing interaction with caspases
 - B. Diablo cleaves the zymogen form of caspase, thus activation the protein for the apoptotic pathway
 - C. Diablo binds to caspases, enabling the activation of the protein for the apoptotic pathway
 - D. Diablo cleaves the inhibitory proteins such as XIAP in order to activate the apoptotic pathway



8. Letter A in the figure above represents the
- A. Primary structure of the protein
 - B. Secondary structure of the protein
 - C. Tertiary Structure of the protein
 - D. Quaternary structure of the protein

9. Letter B in the figure above represents the
- A. Primary structure of the protein
 - B. Secondary structure of the protein
 - C. Tertiary Structure of the protein
 - D. Quaternary structure of the protein

10. The major stabilizing structure in the protein secondary structure is
- A. Hydrophobic interactions
 - B. Hydrogen bonds
 - C. Electrostatic interactions
 - D. Disulfide bonds

11. Peptide bonds are formed by what specific part of the two amino acids? (2 points)
12. What are the reaction products of a peptide bond? (1 point)
13. The peptide bonds are between which two atoms? (1 point)
14. What is the difference between a 3_{10} helix and a traditional alpha helix? (4 points tiebreaker)
15. What is a zymogen? (1 point)
16. What is the advantage of having a zymogen form of caspases? (3 points)
17. On your onsite build of Diablo you positioned Ala 1. What is the significance of this amino acid with respect to the function of Diablo? (4 points) Tiebreaker
18. What does the name Caspase tell you about this protein? (3 points)
19. Caspases cleave at very specific location. A short peptide sequence is given below (using the one letter codes for amino acids). Please circle the bond that would be cleaved by a caspase. (1 point)

A-F-G-H-D-Q-R-T- P-K