Grossmont College Name: \_\_\_\_\_\_\_\_KEY\_\_\_\_\_\_\_\_\_\_\_ Section Number \_\_\_\_\_\_\_\_\_\_\_Date: \_\_\_\_\_\_\_\_\_\_\_\_

Chemistry 102, Spring 2017 protein (34 points)

1. (4 points)Place the following amino acids next to the appropriate labels below by writing out their full names: Leu, Arg, Asn, Asp

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| 1. nonpolar side chain – Leu | 1. polar neutral side chain – Asn |
| 1. polar acidic side chain – Asp | 1. polar basic side chain – Arg |

1. (6 points) Draw the structural formula of alanine as it is likely to exist:

**a.** in an acidic solution **b.** in an alkaline solution **c.** in neutral solution

  

1. (6 points) Write an equation to show the formation of a dipeptide (in this order) isoleucine and theronine (labelling the N and C terminus) at pH 2 and name the type of reaction



1. (10 points) Explain what is meant by the primary, secondary and tertiary structures of a protein. Clearly outline the bonding type involved at each level of protein structure.
   * Primary structure refers to the sequence of amino acids in a protein by formation of peptide bonds (amide bond formed between the carboxyl group of one amino acid and the amino group of the next amino acid.)
   * The secondary structures of proteins describes the type of structure that forms when amino acids form hydrogen bonds within a single polypeptide chain. Hydrogen bonds between the H of an —NH group and the O of C═O in the backbone of a peptide chain
   * Tertiary structure is the overall three-dimensional shape of a protein which involves the attractions and repulsions of the R groups of the amino acids of the peptide chain. The type of interactions involve are hydrophobic and hydrophilic interactions, salt bridges, hydrogen bonds, and disulfide bonds.
2. (6 points) Explain the difference between a competitive and a non-competitive inhibitor

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| **Competitive Inhibition** | **Non-competitive inhibition** |
| 1. The structure of inhibition molecule is similar to that of the substrate. | 1. The Structure of the inhibitor molecule is entirely different. |
| 1. The inhibitors get attached to the active site of the enzyme. | 1. The inhibitor forms complex at a point other than the active site. |
| 1. It competes with the substrate molecule or for the enzyme. | 1. It does not complete with the substrate. |
| 1. It does not alter the structure of the enzyme. | 1. It alters the structure of the enzyme in such a way that the substrate may get attached to the active site but products are not formed. |
| 1. The reaction can be reversed by increasing the substrate concentration. | 1. The reaction cannot be reversed by increasing the substrate concentration. |

1. (2 points) Which of the following statements about enzyme-catalyzed reactions is FALSE?
   1. The rate of the reaction is directly proportional to enzyme concentration.
   2. **The rate of the reaction decreases with increasing substrate concentration**.
   3. The rate of the reaction varies with temperature.
   4. The rate of the reaction is dependent on the pH of the reaction.
   5. The rate of the reaction would be decreased by non-competitive inhibitors.

