Key: High 98 (2), Low 25, Ave 71

Quiz 3
BI-102-2, Fall '07, Dr. C. S. Tritt

Please keep your answers concise (more words will not necessarily lead to more points). Use the amount of space provided as a guide as to how detailed to make your answers. **Answer any 6 of the following 7 questions!** Each question is worth the same amount.

1. Describe active transport being sure to state its fundamental feature and correctly use the concept of electrochemical gradient in your answer.

Active transport is the transport of a substance against its electrochemical gradient. Active transport fundamental feature is that it requires some source of energy to drive it. Just describing facilitated transport -5. Not mentioning electrochemical gradient -3.

2. Explain the relationship between the spontaneity of chemical reactions and the algebraic sign of Gibbs free energy of the reactions and using terms like endergonic and exergonic.

Reactions with negative Gibbs free energies (ΔGs) of reaction are called exergonic and can be spontaneous. Reactions with positive ΔGs are called endergonic and are not spontaneous. Getting either ΔG or words backwards was -4, getting both backwards was -6. Forgetting to mention ΔG or words, but getting everything else correct was -2.

3. Name and briefly describe one of the two types of enzyme inhibition mentioned in your textbook.

Either

Competitive inhibition involves a substance that decreases the activity of an enzyme by occupying its active site in place of its normal substrate (or product). Accepted active site inhibition, but I would prefer if you call this competitive.

or

Allosteric inhibition involves a substance that attaches to an enzyme that someplace other than its active site and decreases the activity of an enzyme by changing the enzymes shape. Accepted non-competitive, but I would prefer you call this allosteric.

4. Describe, in rather specific terms, the role of NAD^+/NADH in cellular respiration.

NAD^+/NADH acts as an electron shuttle in cells. NAD^+ is reduced to NADH in some, generally energy liberating, reactions. For these reactions to continue the NADH must be oxidized back to NAD^+. In eukaryotic cells and in the presence of oxygen, this is done by passing its electrons to oxygen via the electron transport chain. -2 if answer did not address NAD^+ regeneration or energy liberation (the point of cellular respiration).

5. Describe, in some detail, the importance of acetyl-CoA in metabolism.

Acetyl-CoA is a metabolic crossroads molecule. It is formed by the oxidation of pyruvate which in turn is formed from glucose via glycolysis. It can also be formed by the β oxidation of fatty acids. It can enter the Krebs cycle to produce ATP for cellular processes or converted into fatty acids and other useful molecules. I wanted the role of Acetyl-CoA as a metabolic crossroads molecule, but apparently didn't stress this enough this year. Not addressing its formation -4.

6. Describe the Krebs cycle in terms of what enters it and what it produces. Note that you don't have to state quantities in your answer.

Acetyl-CoA + ADP + Pi + NAD^+ + FAD → CO_2 + ATP + NADH + $FADH_2$

ADP, Pi and CO_2 not required for full credit. -4 if overall reactions (like glucose and oxygen to CO_2, water and ATP) was given.

7. Name two common organic products of fermentation.

Lactic acid (or lactate) and ethanol (or simply alcohol). 5 points each.