

Spring 2004 BCHS 3304 Exam III Review-

1). How many different stereoisomers are possible for a 5-carbon ketose sugar?

- a). 2
- b). 4
- c). 8
- d). 12
- e). 16

2). A healthy living cell maintains an overall thermodynamic value such that:

- a). $\Delta S^{\circ} > 0$
- b). $\Delta G^{\circ} > 0$
- c). $\Delta G^{\circ} = 0$
- d). $\Delta S^{\circ} < 0$
- e). $\Delta G^{\circ} < 0$

3). For the reaction catalyzed by adenylate kinase:



The overall $\Delta G^{\circ} \approx 0$ even though the cellular [AMP], [ADP], and [ATP] are far away from their equilibrium values. What is an alternative explanation for why this reaction operates with a $\Delta G^{\circ} \approx 0$?

- a). Adenylate kinase is altering the equilibrium of the reaction.
- b). Adenylate kinase is lowering the activation energy of the reaction such that a new step in the mechanism has become rate-limiting.
- c). Adenylate kinase catalyzes its reaction at a diffusion-controlled limit.
- d). There is no net synthesis of high-energy phosphoanhydride bonds, they are only being rearranged.
- e). ATP hydrolysis makes this non-spontaneous reaction freely reversible with a $\Delta G^{\circ} \approx 0$.

4). What happens if you add more enzyme to an enzyme-catalyzed reaction already operating at V_{max} ?

- a). K_M will decrease.
- b). No change.
- c). Observed rate will be faster.
- d). k_{cat} will increase.
- e). Observed rate will be slower.

5). Which two answer choices are not characteristics of a committed step of a metabolic pathway?

- a). Lies far from equilibrium
- b). Sensitive to equilibrium pressures.
- c). Usually has a considerably negative ΔG°
- d). Usually highly regulated
- e). Often have very complicated reaction mechanisms.

- 6). In enzyme catalysis, the proximity effect refers to:
- The effective increase in the concentrations of the reacting species by binding to the enzyme active site.
 - The approach of a substrate to an enzyme.
 - Close contacts made by neighboring enzyme monomers.
 - The increase in energy produced by bringing two or more reactants into van der Waals contact.
 - All of the above.

7). Which of the heterocyclic anomers of D-glucopyranose is more stable than the other and why?

8). What are the four methods of producing ATP (or its equivalent) in the body?

9). Given the following equation and definitions:



k_1 = the rate of formation of the Michaelis Complex.

k_{-1} = the rate at which the Michaelis Complex falls apart to E + S.

k_2 = the rate at which the Michaelis Complex forms E + P.

When $[E_T] = [ES]$, which of the following expressions defines the V_{max} ?

- $V_{max} = \frac{k_1 + k_2}{k_1}$
- $V_{max} = k_1[S]$
- $V_{max} = k_2[ES]$
- $V_{max} = k_{-1}[ES]$
- $V_{max} = \frac{[E][S]}{[ES]}$

10). Which of the following properties is not a characteristic of enzymes?

- Enzymes theoretically stabilize the transition state of the reaction they catalyze.
- Enzymes alter the equilibrium distribution of the substrate(s) and product(s) of the reaction they catalyze.
- Enzymes reduce the activation energy of the reaction they catalyze.
- Enzymes employ a wide variety of catalytic strategies.
- Enzymes vary widely in their catalytic efficiencies.

11). Some enzymes require a necessary metal ion cofactor for catalysis. Which of the following is not a potential property that a metal ion may impart to an enzymatically catalyzed reaction?

- a). May act as a super acid.
- b). May shield and stabilize charges.
- c). May facilitate redox reactions.
- d). May bind and orient substrates.
- e). May exclude inhibitors from the active site.

12). In eukaryotic cells, opposing metabolic pathways are confined to different cellular compartments. Which statement most accurately explains this arrangement?

- a). The enzymes for anabolic pathways only occur in the cytoplasm while the enzymes for catabolic pathways only occur in the organelles.
- b). There are not common metabolic intermediates between most opposing metabolic pathways.
- c). The flux for any one particular metabolic intermediate can reverse in either of the opposing pathways.
- d). Separating opposing metabolic pathways avoids the creation of a futile cycle.
- e). Separating opposing metabolic pathways alters the committed steps of the opposing pathways.

13). Which of the following is a characteristic of a phosphoanhydride bond?

- a). Has more resonance stabilization than the hydrolysis products.
- b). Has a larger solvation energy ($-\Delta H^\circ$) than the hydrolysis products.
- c). Stabilized by electrostatic interactions around the bond.
- d). All of the above.
- e). None of the above.

14). Catalysis by Lysozyme displays all of the following except:

- a). Substrate distortion.
- b). Transition state stabilization.
- c). Covalent catalysis.
- d). Water acting as a nucleophile.
- e). Stabilization of an unstable reaction intermediate.

15). Two different enzymes have the same value for V_{max} but very different K_M values. Which of the following is true?

- a). The enzyme with the lower K_M will approach V_{max} at lower $[S]$.
- b). The enzyme with the higher K_M will approach V_{max} at lower $[S]$.
- c). The V_{max} values cannot be the same if the enzymes have different K_M values.
- d). The V_{max} and K_M values for each enzyme will increase when more enzyme is added to their respective reactions.
- e). The steady-state $[ES]$ is the same for each enzyme at all $[S]$.