CHEMISTRY 326 NAME_____Key_____

Summer 2005 EXAM 2

1. Which of the following reactions listed below are catalyzed by an isomerase, lyase, hydrolase, lygase, or oxidoreductase or transferase? (10pts)

a. Gyl-Ala-Glu → Gly + Ala-Glu____hydrolase_____

b. Glyceraldehyde → dihydroxyacetone_____Isomerase_____

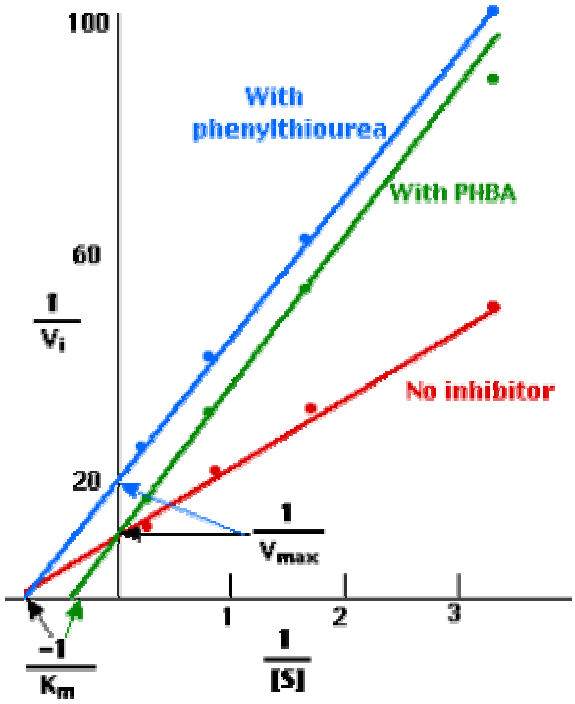
c. Pyruvate + NAD^+ → Lactate + NADH___Oxidoreductase____

d. Glucose + ATP → ADP + Glucose-6-phosphate___transferase__

e. $H_3CCOCOOH$ → H_3CCHO + CO_2 ___lyase_____

2. Alcohol dehydrogenase is involved with the oxidation of both methanol and ethanol. How might ethanol work as an antidote for methanol poisoning? (5pts)
Ethanol can act as a competitive ihibitor since ethanol and methanol differ only in chain length by one carbon.

3a. Sketch an appropriately labeled curve (Lineweaver Burk) to show how the rate of a reaction varies with the substrate concentration. Assume the enzyme concentration remains constant and the reaction operates under saturation kinetics. (5pts)



b. Under the same conditions sketch another labeled curve (Lineweaver Burk) that reflects competitive inhibition. (5pts)

see above graph

4. 2,3BPG influences the oxygen-binding of hemoglobin. (15pts)

a. What type of influence does 2,3BPG have on the oxygen-binding of adult Hb vs fetal Hb?

It maintains the deoxyHb state so that oxygen will not diffuse back onto the Hb. In fetal Hb it cannot fit into the central opening of the Hb molecule so it will increase the oxygen affinity for oxygen.

b. How does 2,3BPG exert its influence on Hb?

It fits into the central opening and is held by electrostatic interactions. The distal His will be locked in position blocking the Fe and decreasing the probability of Oxygen binding.

c. Why doesn't 2,3BPG have the same influence on the oxygen-binding of Myoglobin?

It has NONE because there is only one polypeptide chain and no central opening for the molecule to insert.

d. What does 2,3BPG stand for?

2,3-Bisphosphoglycerate

e. What happens to the iron of the heme group when oxygen binds to it? What is the ultimate effect of this?

It is pulled into the plan of the ring and the protein to which the iron is bound moves with it changing the molecular conformation and facilitating oxygen uptake in each of the other subunits.

5. Briefly state the influence that pH has on the oxygen-binding for hemoglobin at the peripheral tissue. (5pts)

This is the Bohr effect. In the presence of low pH the oxygen affinity for the Hb is decreased and the oxygen diffuses to the tissues.

6. Describe 3 ways of enzyme control. (15pts)

Compartmentalization; covalent modification; channeling; allosterism; Control proteins; genetics

7. Match the levels of protein structures given with the appropriate description given below: (5pts)

Levels of Protein structures:

a.Primary_____3_____

b.Secondary_____2_____

c.Tertiary_____4_____

d.Quaternary___1_____

Descriptions of:

1. Association of protein subunits
2. Spatial arrangement of amino acids near each other in the linear sequence
3. Linear amino acid sequence
4. Fibrous or globular spatial conformation

8. Indicate whether the following statements are True or False: (30pts)

__T__1. The K_M for an enzyme reflects the affinity the enzyme and the substrate have for each other.

_ F__2. LDH is an example of an Zymogen.

_F__3. If the concentration of 2,3-DPG increase the oxygen affinity for hemoglobin also increases.

__T_4. At alkaline pH levels the oxygen affinity for hemoglobin is increased.

__F___5. The Bohr Effect applies to myoglobin as well as hemoglobin.

__F___6. Configurational isomers can be interconverted by rotation around single bonds.

__T__7. Rotation about peptide bonds is restricted.

__F___8. Hemoglobin and myoglobin are examples of fibrous proteins.

__F___9. The oxygen dissociation curve of myoglobin is sigmoidal, that of hemoglobin is hyperbolic.

_T___10. Lowering the pH increases the release of O_2 from hemoglobin.

_F___11. The acidic environment of an exercising muscle allows hemoglobin to bind O_2 more strongly.

_F___12. In the lung, high concentrations of H^+ and CO_2 allows hemoglobin to become oxygenated.

_T__13. In the lung, the presence of higher concentrations of O_2 promotes the release of CO_2 and H^+.

__F__14. Alllosteric enzymes exhibit classical Michaelis-Menten kinetics.

__F__15. Isoenzymes are different forms of the same enzyme that work

on different substrates with the same affinity.

_F_16. The higher the K_M value, the greater the affinity of an enzyme for its substrate.

_F__17. An inhibitor that does not alter the K_M of an enzyme is a competitive inhibitor.

_F__18. Competitive inhibition can be overcome by increasing the enzyme concentration.

_F__19. Multienzyme complexes are the same as multifunctional enzymes.

_T__20. Allosteric enzymes exhibit sigmoidal plots of V vs. S

_F__21. All digestive enzymes are lyases.

__T_22. LDH catalyzes the oxidation of pyruvate to lactate

_F__23. Configurational isomers can be interconverted by rotation around single bonds.

_T__24. Rotation about peptide bonds is restricted.

_T__25. The keratins found in hair are stabilized by disulfide bridges.

_F__26. Beta pleated sheets can only assume antiparallel orientations.

_T/F__27. Tertiary structures are stabilized by hydrogen bonds.

_F__28. A helical conformation is an example of tertiary structure.

_T__29. Secondary structures are direct consequences of the primary structure.

_F__30. Fibrous proteins are soluble in water.

9. You are studying the enzyme alcohol dehydrogenase, which catalyzes the oxidation of ethanol to formaldehyde. You discover that mercury ion in a concentration of 1mM inhibits the enzyme by 95%. You find by appropriate kinetic experiments that the enzyme's K_M for ethanol is the same in the presence or absence of mercury ion. What does this tell you about the kind of inhibition caused by mercury? Explain. (5pts)

Noncompetitive inhibition. K_M stays the same