2/9/07 Bio 98A Midterm Name _____ ***score***

) If one combines 0.1 moles of NaH_2PO_4 and 0.2 moles of Na_2HPO_4 in 900 ml of water, the final pH will be _____7.16 or 7.2_____. --------

log R = □, so log (0.2/0.1) = 0.301,
The basic form prevails around the pKa of 6.86
So pH = 6.86 + 0.30 = 7.16

) At pH 6.0, the net charge on the peptide shown below is ____-1.5_____. --------

+0.5 -1 -1

+1 A H M E D -1

) The □-chain of human hemogobin contains 141 amino acids and the □-chain contains 146 amino acids. A single heme group (including the Fe) has a mol. wt. of 614. What is the estimated molecular weight of a hemoglobin molecule?

_____65,596_____ grams per mole. --------

2 alpha chains + 2 beta chains + 4 hemes

2x141x110 + 2x146x110 + 4x614 = 65,596

) Goat myoglobin is 2/3 saturated with O_2 at $\mathbf{P}O_2$ = 60 mm Hg. The $\mathbf{P}_{50}$ of this myoglobin is _____30 - 31_____ mm Hg. --------

$$\square = \frac{PO_2}{P_{50} + PO_2}, \qquad \frac{2}{3} = \frac{60}{P_{50} + 60}$$

$2P_{50} + 120 = 180, \quad P_{50} = 30$

) The table below shows kinetic data for a reaction catalyzed by 0.01 µM enzyme. From these data, estimate the enzyme's V_{max}, K_m, and k_{cat}.

[S], mM	Vo, µM/min
0.5	14.0
0.8	20.0
2.0	35.0
4.0	48.0
8.0	56.0
20.0	64.0
400.0	69.5
2,000.0	70.0

V_{max} = _____70.0_____ µM/min --------

K_m = _____2.0_____ mM --------

) 30 µg of pure enzyme X (mol. wt. = 60,000) can catalyze the formation of 4.5 µmoles of product per minute when saturated with substrate. The k_{cat} (turnover #) of X is

_____9,000_____ min^{-1} --------

Kcat = (mols prod/min) / mols enzyme
µmols enzyme = 30µg x (1µmol/60,000µg) = $5x10^{-4}$ µmol
Kcat = 4.5 µmol/min / $5x10^{-4}$ µmol = 9,000 min^{-1}

) An enzyme (E) catalyzes the reversible formation of B from A: (A ⇌ B). To start the reaction, A is dissolved in a buffer at 25°C. Enzyme is then added and the reaction is allowed to proceed to equilibrium, whereupon, the concentrations of A and B are found to be $1.5x10^{-5}$ M and $4.5x10^{-4}$ M, respectively. Calculate K_{eq} for the reaction, the starting concentration of A, and the value of ΔG° for this reaction. (At 25°C, RT = 2.479 kJ/mol)

K_{eq} = _____30_____ --------

Keq = $4.5x10^{-4}M/1.5x10^{-5}M$ = 30
$[A]_{init}$ = $1.5x10^{-5}M + 4.5x10^{-4}M$
= 46.5 $x10^{-5}$ M

$[A]_{initial}$ = _46.5x10^{-5} or 4.65x10^{-4}_____ M ---------

ΔG° = _____-8.43_____ kJ/mol --------

ΔG° = -RTlnKeq = -2.479 (kJ/mol) x ln30 = -8.43 kJ/mol

The strongest, angle-independent force of attraction between the side-chains of glutamate and lysine within a protein is likely to be -----

a electrostatic
b H-bonding
c hydrophobic interaction
d van der Waals
e a peptide bond

Catalytic efficiency is defined as -----

a the factor by which an enzyme enhances a chemical reaction
b K_m/k_{cat}
c k_{cat}/K_m
d V_{max}/K_m
e V_{max}/k_{cat}

To sequence a protein, it is often cleaved into several peptide fragments which are (these days) most often separated by which method? -----

a SDS polyacrylamide gel electrophoresis
b isoelectric focusing
c gel filtration
d ion-exchange chromatography
e reversed-phase HPLC

In a right-handed □-helix, -----

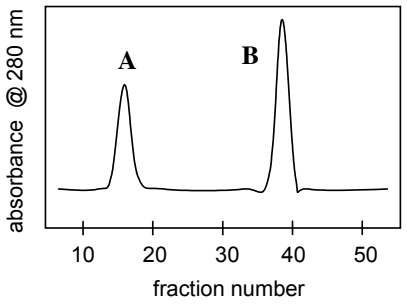
a all the psi angles are the same for all participating residues
b all the phi angles are the same for all participating residues
c a and b are both true
d a and b are both false
e the psi and phi angles vary with each residue

Enzymes accelerate reactions by ... -----

a increasing the free energy of the overall reaction
b decreasing the free energy of the overall reaction
c altering the equilibrium constant
d destabilizing the transition state
e stabilizing the transition state

Here is the elution pattern of two proteins separated by size-exclusion chromatography (SEC; also known as gel filtration). Compared with B, protein A has -----

a a lower isoelectric point
b more hydrophobic amino acids
c fewer hydrophobic amino acids
d a larger molecular diameter
e a smaller molecular diameter



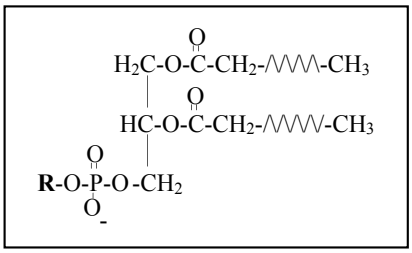
If $\Delta G^\circ < 0$ for reaction, the *in vivo* enzyme catalyzed reaction will -----

a always be favored in the forward direction
b never be favored in the forward direction
c sometimes be favored in the forward direction
d always be at exactly at equilibrium

Phosphorylation of enzymes often occurs at the side chain of _____ and is used to _____ the enzyme. -----

a Asp, irreversibly inhibit
b Asp, reversibly inhibit
c Gly, feedback inhibit
d Ser, irreversibly inhibit
e Ser, reversibly activate

The compound shown to the right is a -----



a steroid
b glycerophospholipid
c sphingolipid
d fatty acid
e triacylglycerol

Myoglobin shows a high content of -----

a α-helix
b β-turn
c parallel β-sheet
d anti-parallel β-sheet

An amino acid that has no asymmetric carbon. -----

a Pro
b Arg
c Ala
d Gly
e Glu

Excluding mirror images, and α-, β- anomeric forms, the number of distinct ketohexoses is -----

a 16
b 8
c 6
d 4

The pH of Ms. Tran's stomach was found to be 2.3. This is equivalent to an HCl concentration of -----

a 0.01 mM
b 0.20 mM
c 5.0 mM
d 12.0 mM
e 15.0 mM
