 Name Key

Biochemistry 5700
Fall, 2006
Exam 2
October 25, 2006

INSTRUCTIONS:

Do not begin until 10:30 AM. The exam must be turned in by 11:20 AM. This exam should have 12 questions and 9 pages. Answer **all** questions completely, concisely, and legibly in the spaces provided. Good Luck!!

 Name key

(1) Definitions. 20 points.

When relatively high concentrations of fatty acids are placed in water they form structures known as _____.	micelles
When relatively high concentrations of glycerophospholipids are placed in water they form structures known as _____.	liposomes
How many stereoisomers are possible for the family of D-aldoses with seven carbon atoms?	$2^{7-2}/2 = (16)$
Name the simplest carbohydrate that is an aldose	glyceraldehyde
Linear sugars that are structurally identical except for the orientation of the hydroxyl and hydrogen at one position are called what?	epimers
The compound resulting from the nucleophilic addition of an alcohol to an aldehyde is called what?	hemiacetal
What is the orientation of the nitrogenous base to the sugar in B-DNA?	anti
What molecule is a membrane plasticizer?	cholesterol
The combination of nitrogenous base bonded to ribose is called a _____	nucleoside
The reaction of the side chain of lysine with acetone would produce what type of compound?	schiff base
Which nitrogenous base is present in RNA but not DNA?	uracil
What type of sugar pucker is present in B-DNA?	C 2' endo
Name a carbohydrate that is achiral	dihydroxyacetone
Ring-cyclized sugars that contain a free hydroxyl group at the anomeric carbon are called _____ sugars	reducing
Name the specific D-aldose in which ALL hydroxyl groups lie in the equatorial plain	B-D-glucopyranose
What vitamin is associated with vision?	A
What vitamin is associated with regulating calcium uptake for bone formation?	D
The relations A = T and G =C are called what?	Chargaff's rules
Name a general role for lipids other than serving as an energy reserve or structural component of membranes	hormone, detergent, insulation
What conformation does double stranded RNA form in solution?	A

(2) (15 points) In the space provided, describe the structural properties and biological functions of the following polysaccharides. You need not draw structures.

(a) peptidoglycan

heteropolymer of N-acetylglucosamine & N-acetylmuramic acid residues in β1,4 linkages, individual strands crosslinked by tetra & penta peptide. Structural component of bacterial cell wall

(b) chitin

linear unbranched homopolymer of N-acetyl-glucosamine residues in β1,4 linkages. Structural component of exoskeletons of invertebrates

(c) glycosaminoglycan

linear polymer of repeating modified disaccharides where sugar units are modified by addition of negatively charged groups. Found in extracellular matrix of animal tissue w/ proteins

(d) amylopectin

linear polymer of glucose residues in α1,4 linkages with α1,6 branches every ~24-30 residues. One of 2 forms of starch - plant energy reserve cmpd.

(e) cellulose a linear unbranched homopolymer of glucose residues in β1,4 linkages. Structural component of plant cell walls

 Name _____

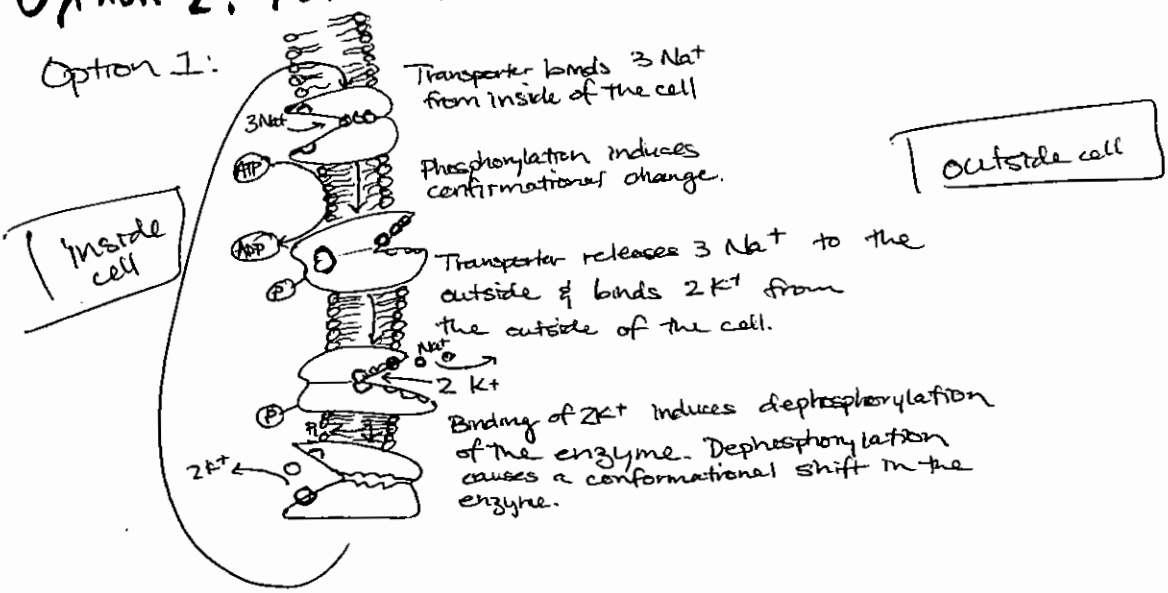
(3) (10 points) Membrane transport. Answer either of the following questions in the space provided. You choose which question to answer. ANSWER ONLY ONE OF THEM! Feel free to use diagram(s) to assist in answeringthe question

Option 1: Provide a detailed description of the transporter mechanism employed to transport Na^+ out of cells and K^+ in.

Option 2: Provide a detailed description of how CO_2 produced in the tissue is processed and exported to the lung where it is expelled in your breath.

Option 2: full 01 exam 2 # 9 : Cl^- bicarbonate

Option 1:



(4) (3 points) Briefly list three features that, in general, distinguish an ion channel from an ion transporter.

1) Ion channels have very high substrate affinities
2) not saturable by substrate
3) gated, or regulated

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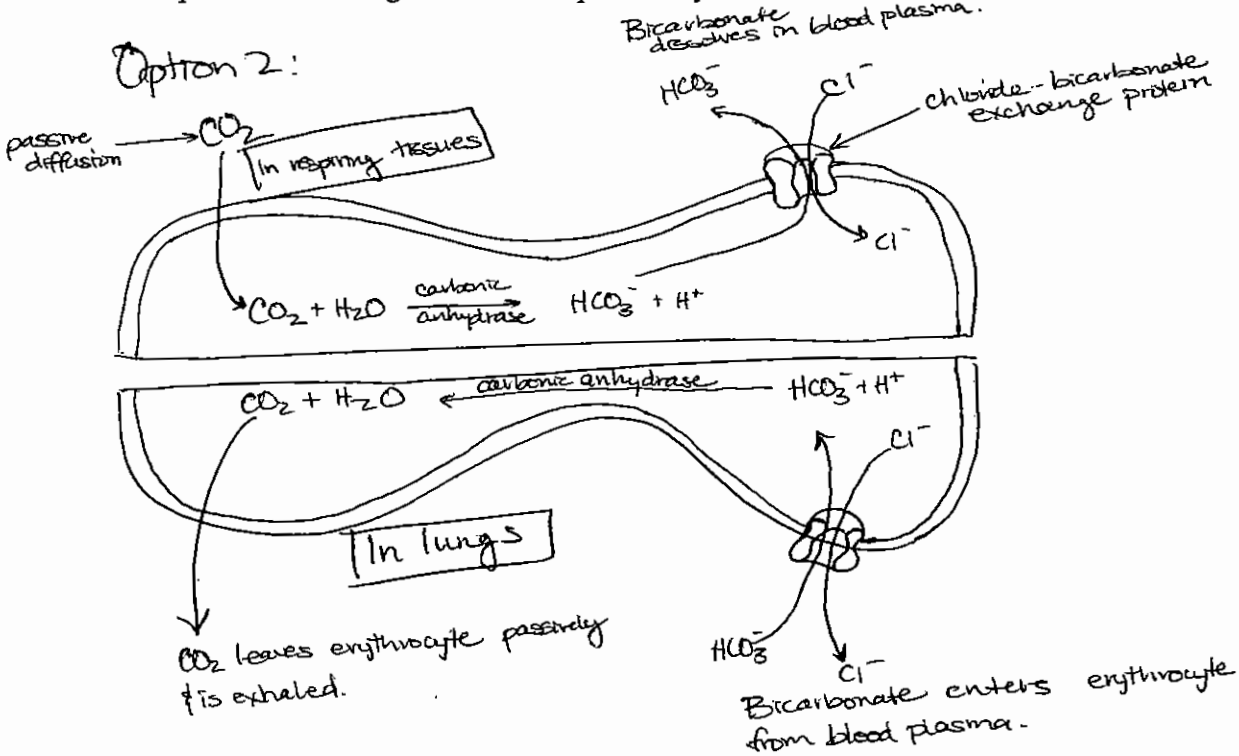

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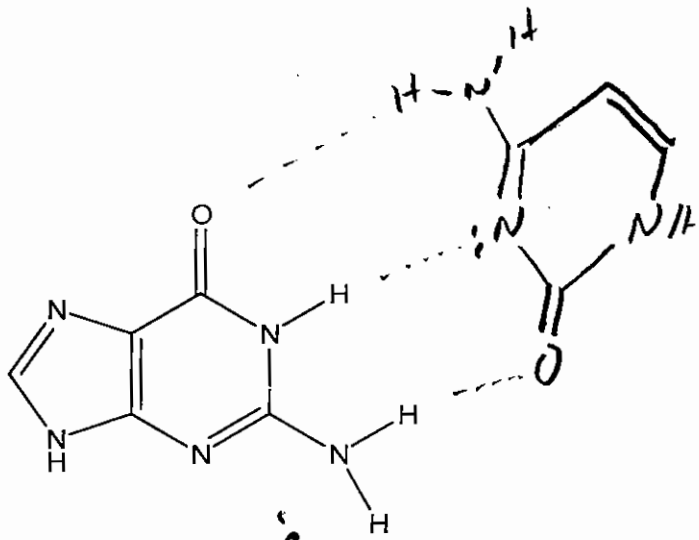
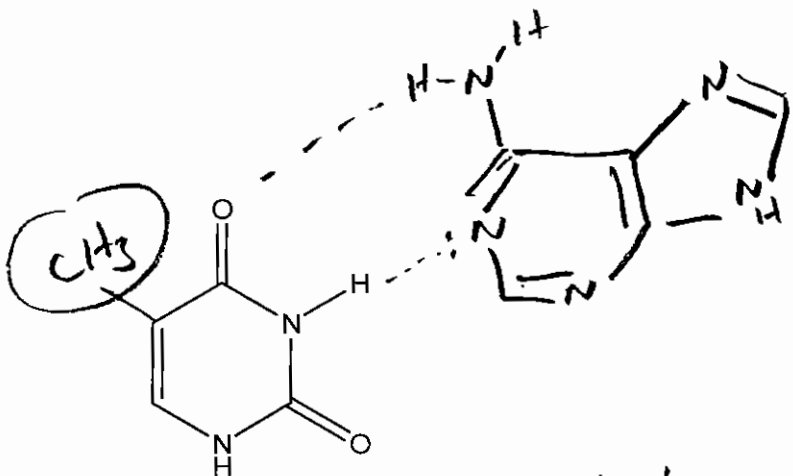
(5) (4 points) Write the base sequence of the RNA strand that is complimentary to a strand of DNA with sequence (5') AATCGCAGCTTGGACTTAG (3')

5'- CUAAGUCCAAGCUGCGAUU 3'

(6) (8 points) Shown below are two nitrogenous bases that you are familiar with. Write their names directly below them. Then, to the right of each base, draw the structure of its complimentary base in the correct orientation to form a correct Watson-Crick base pair, and provide the name for the complimentary base. Once you have drawn the complimentary base, add the appropriate hydrogen bonds that form in the Watson-Crick base pair.



guanine

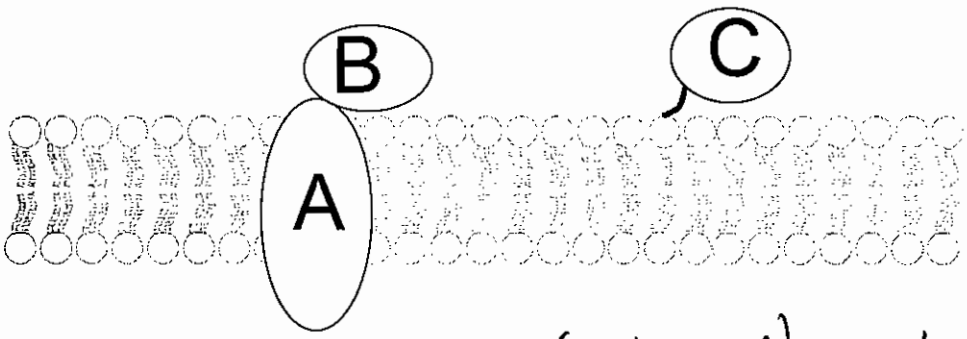


uracil w/o methyl

thymine w/ methyl

 Name _____

(7) (9 points) What types of membrane proteins are shown below? Identify them by letter. Suppose you wanted to solubilize these proteins from the membrane in a cell free lysate. Explain what conditions you would use to solubilize each protein, and briefly describe the biochemical basis for why that solubilization strategy would work.



A- transmembrane (integral) protein solubilize w/ organic solvent or detergent- need a hydrophobic environment to maintain structure of hydrophobic portion of protein when removed from lipid bilayer

B- peripheral protein - salt, urea, chelator, change in pH disrupt weak dipole-dipole, ion-dipole, & salt bridge interactions between peripheral protein (water soluble) & the integral membrane protein

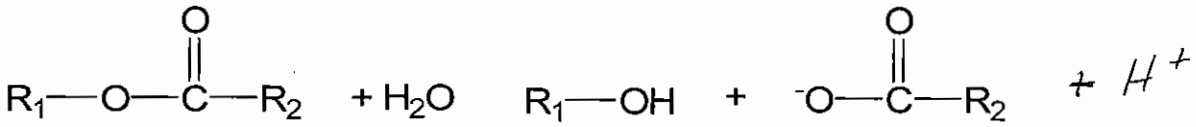
C- lipid-linked protein Use a lipase- enzyme that cleaves the lipid-AA linkage covalently attaching the protein to the lipid

(8) (4 points) Name four amino acid residues that will have positive ΔG° hydrophobicity values.

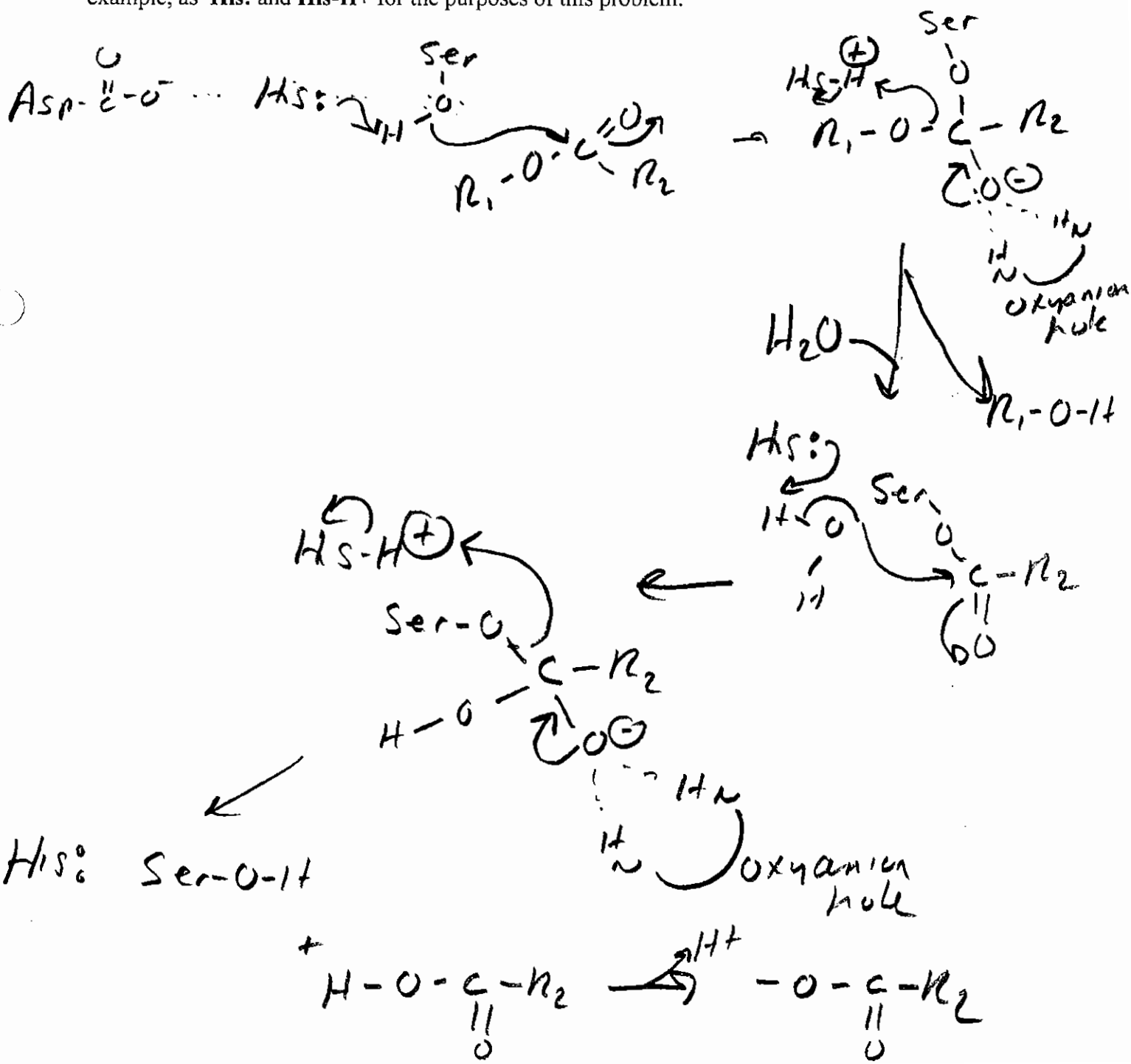
hydrophobic AA's, e.g. Gly, Ala, Val, Ile, Leu, Phe, trp, Met, Cys, tyr Pro?

 Name _____

(9) (10 points) Many hydrolases contain catalytic triads that play a role identical to that of the catalytic triad of chymotrypsin. Based on your knowledge of chymotrypsin-catalyzed amide bond hydrolysis, propose an analogous mechanism for the lipase-catalyzed hydrolysis of a triacylglycerol as shown below:

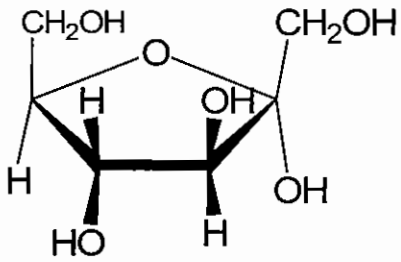


Please include all of the important features of chymotrypsin catalysis (covalent catalysis, catalytic triad, general acids/bases, oxyanion hole, etc) in your proposed mechanism. NOTE: you need not draw the compete structure of amino acid side chains--it is perfectly fine to abbreviate histidine, for example, as **His:** and **His-H+** for the purposes of this problem.

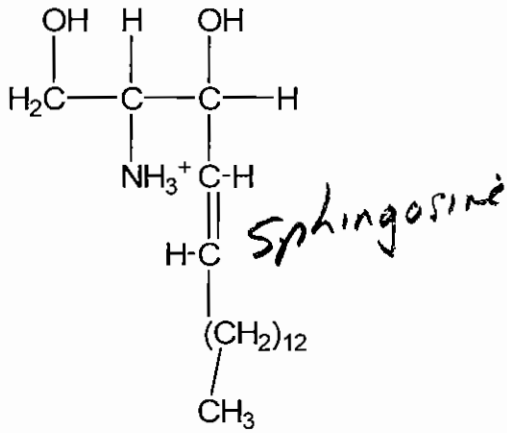


 Name _____

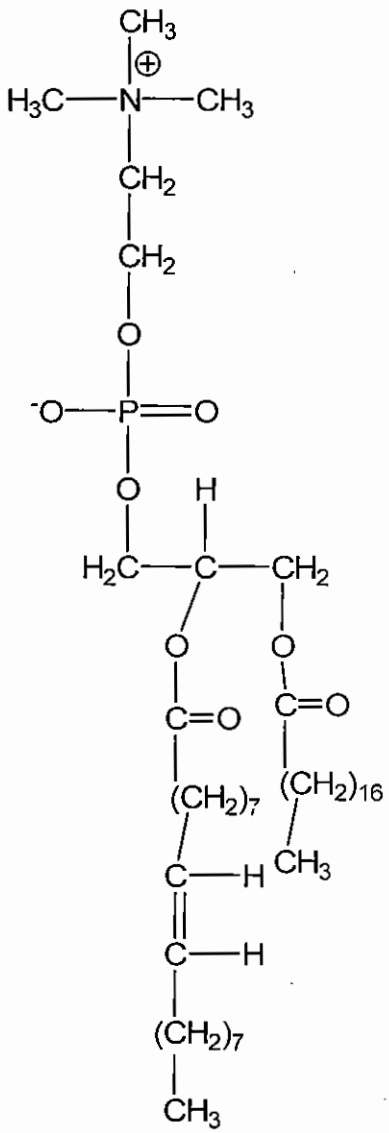
(10) (5 points) Provide proper names for each of the molecules shown below. Be sure each name is complete and unambiguous.



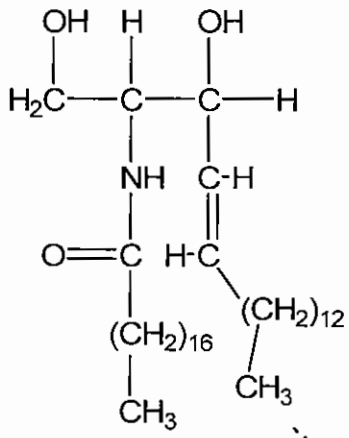
α- D-fructopyranose



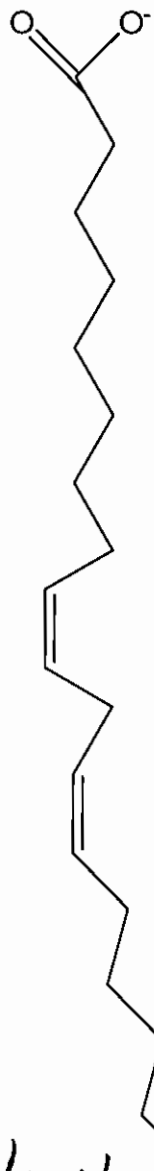
Sphingosine



1- stearoyl- 2-oleoyl- 3- phosphatidylcholine



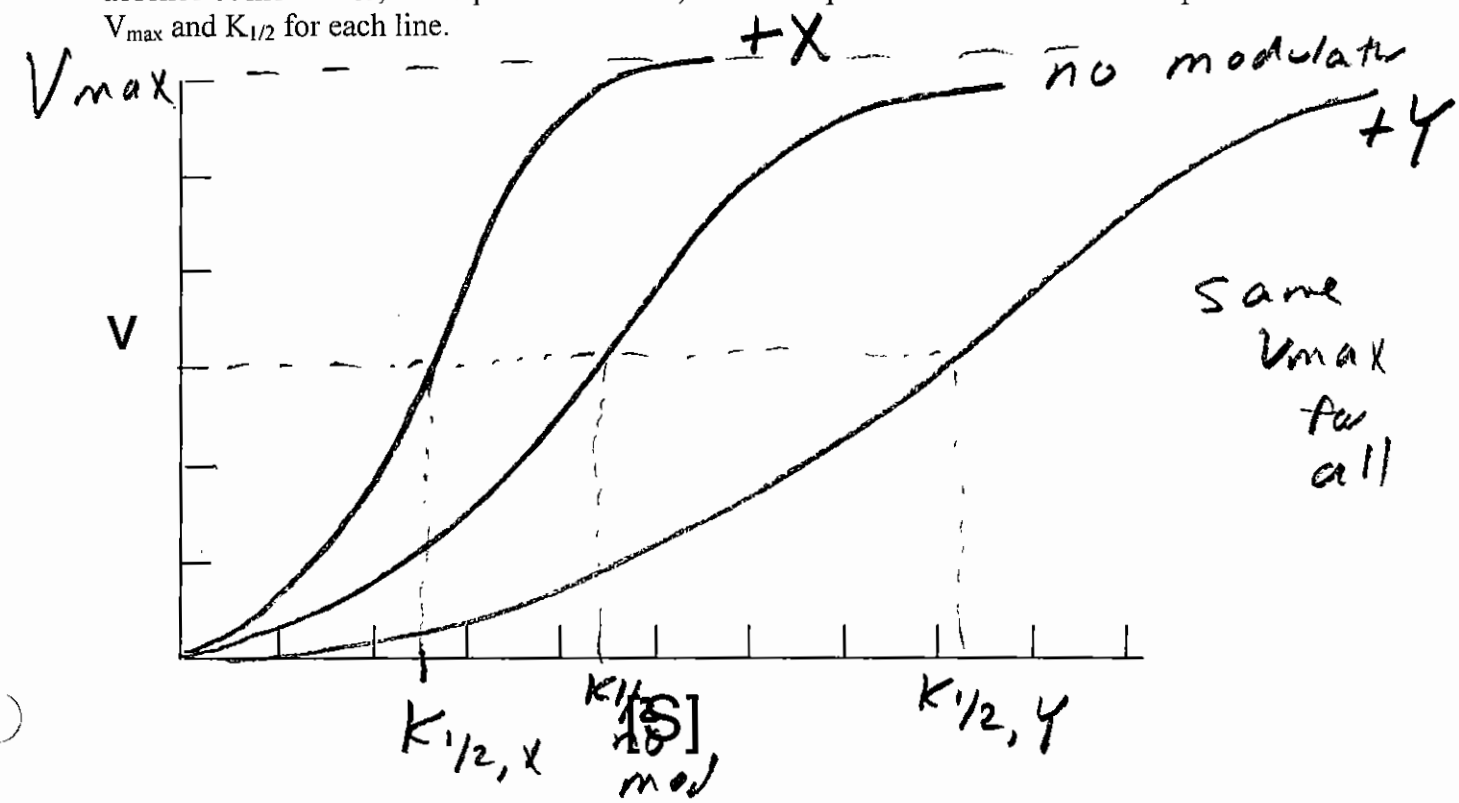
ceramide



linoleic acid

 Name _____

(11) (6 points.) You have a multimeric allosteric enzyme for which molecule "X" is a positive heterotropic modulator and molecule "Y" is a negative heterotropic modulator. Both modulators perturb $K_{1/2}$ but not V_{max}. Draw and label the plots that would be observed for the enzyme in the absence of modulator, in the presence of "X", and in the presence of "Y". Label the positions of V_{max} and $K_{1/2}$ for each line.



12 (6 points) Draw the structures of D-altrose and alpha-D-altropyranose (draw BOTH the linear and cyclic forms), given that D-altrose is a C-3 epimer of D-mannose, and D-Mannose is a C-2 epimer of D-glucose