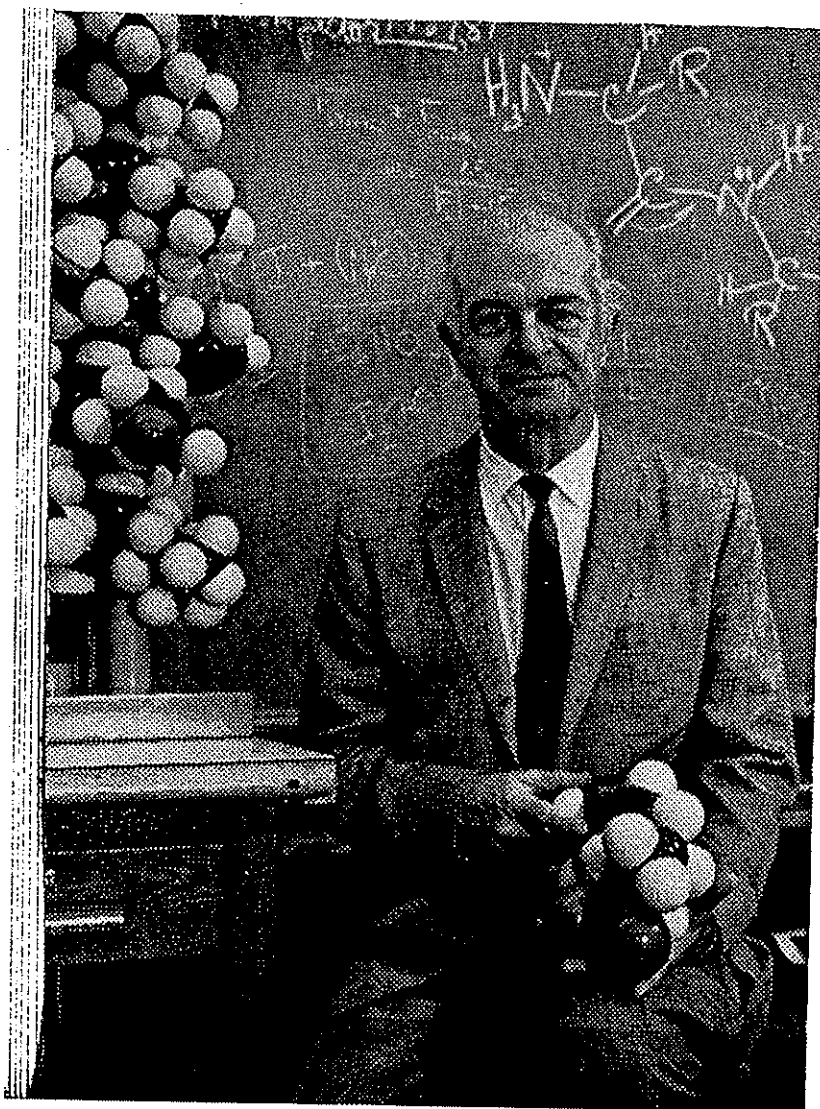


Biochemistry 5700
Fall, 2001
Exam 2
October 22, 2001

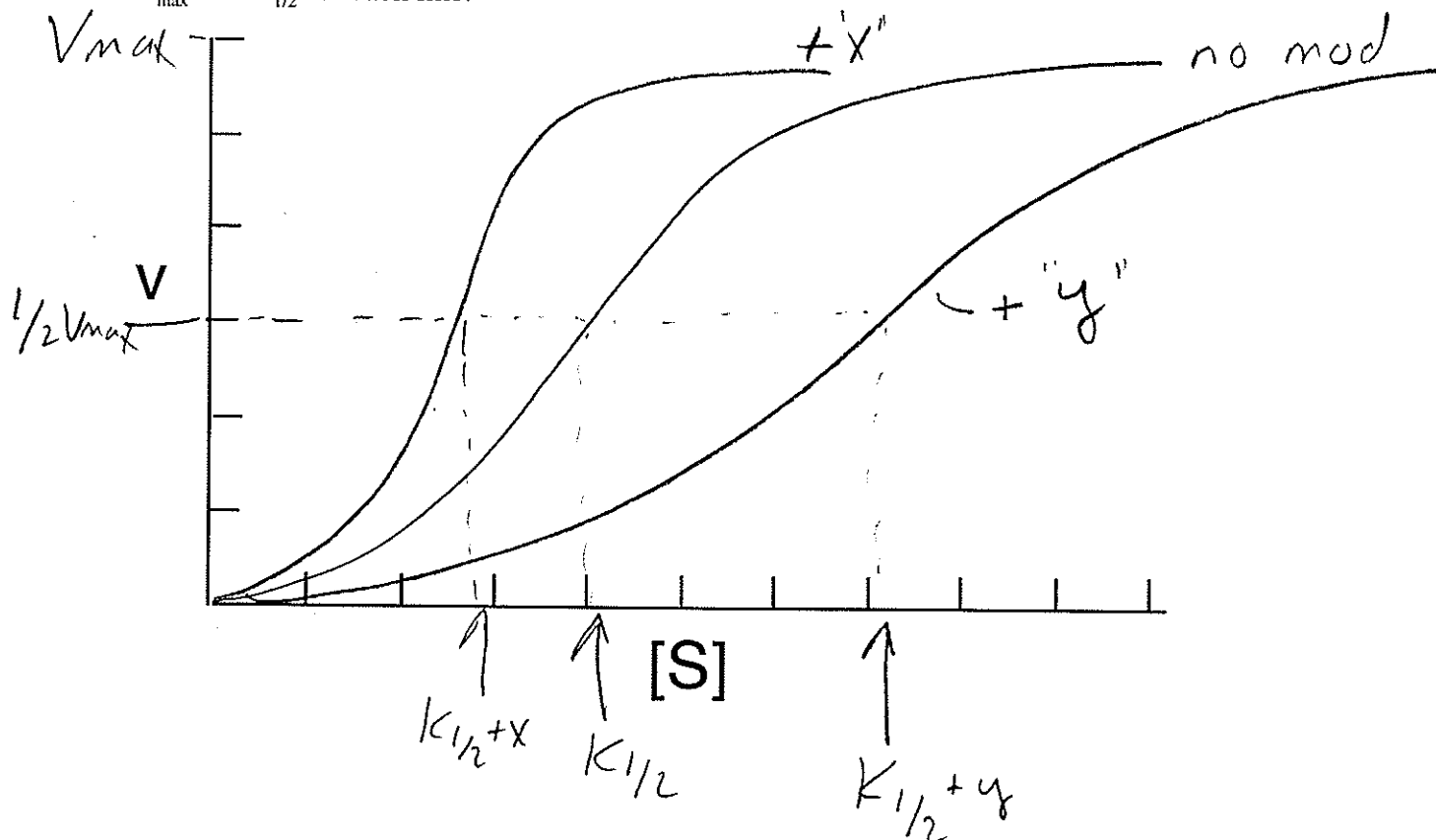
INSTRUCTIONS:

Do not begin until 10:30 AM. The exam must be turned in by 11:20 AM. This exam should have 9 questions and 7 pages. Please print your name at the top of each page of the exam. Answer **all** questions completely, concisely, and legibly in the spaces provided. Good Luck!!

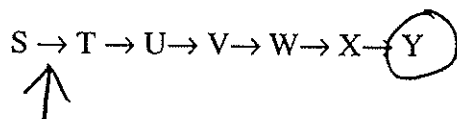
2 POINTS EXTRA CREDIT!!! ANSWER THIS WHILE WAITING TO START THE EXAM:
Consider the following picture of two-time nobel prize laureate Linus Pauling. In one sentence only, what is wrong with this picture?



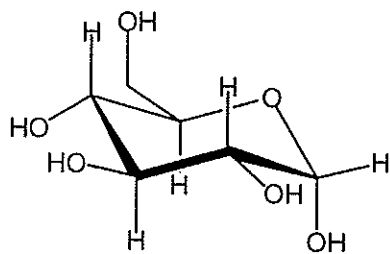
(1) 10 points. You have a multimeric allosteric enzyme for which molecule "X" is a positive heterotropic modulator and molecule "Y" is a negative heterotropic modulator. Both modulators perturb $K_{1/2}$ but not V_{max} . Draw and label the plots that would be observed for the enzyme in the absence of 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.



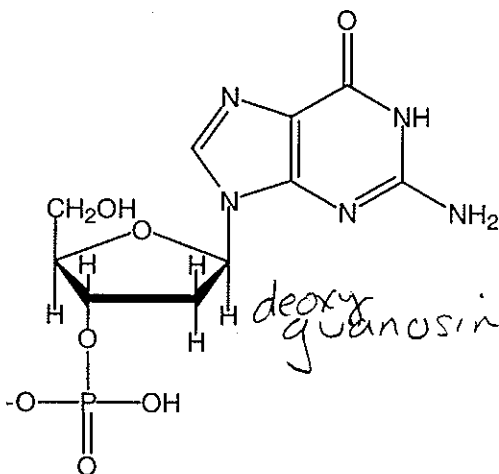
(2) 5 points. The scheme $S \rightarrow T \rightarrow U \rightarrow V \rightarrow W \rightarrow X \rightarrow Y$ represents a hypothetical pathway for the metabolic synthesis of compound Y. This pathway is regulated by feedback inhibition. Indicate with an arrow where the inhibition occurs and circle the compound which is the likely inhibitor.



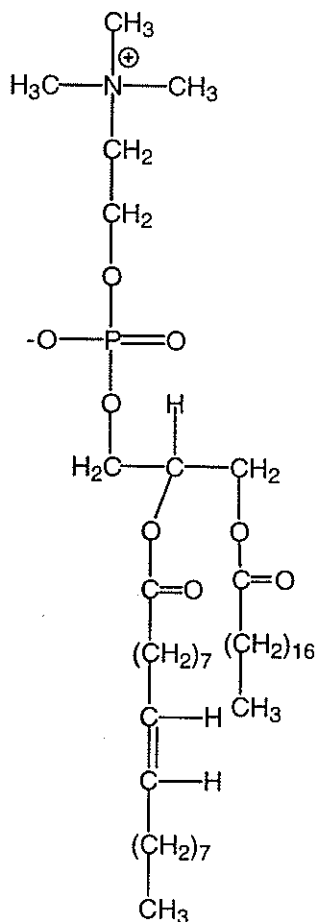
(3) 12 points. Name the six molecules shown below:



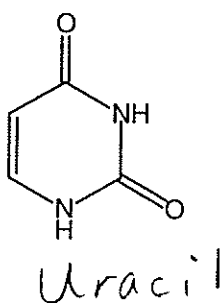
α -D-glucopyranose



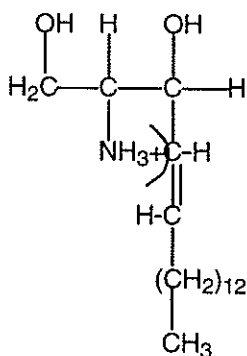
deoxyguanosine 3' monophosphate



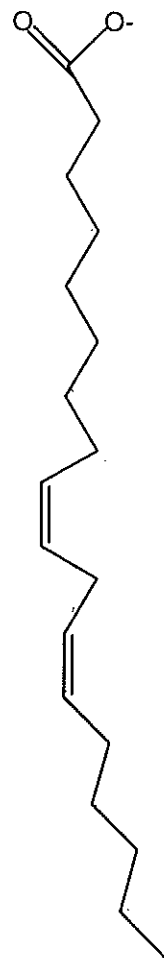
1-stearoyl-2-oleoyl-3-phosphatidylcholine



Uracil



sphingosine



linoleic acid

(4) (20 points) Answer the following questions using your knowledge of polysaccharide structure.

(a) Why can humans digest potatoes but not newspapers?

we are able to cleave the α 1,4 linkages of amylose, but not the β 1,4 linkages of cellulose

(b) Why can termites digest sawdust but not lobster shells?

They can cleave β 1,4 glc linkages, but not the β 1,4 bonds between N-acetylglucosamine

(c) Why do your tear ducts contain relatively high levels of the enzyme lysozyme? What does this enzyme do?

Lysozyme cleaves the β 1,4 - NAM - NAG linkage of bacterial cell wall peptidoglycan. High levels help to protect against bacterial invaders.

(d) Why is glycogen heavily branched rather than unbranched?

many non-reducing ends to be acted on by α -amylase enzymes simultaneously, mobilize / breakdown glycogen faster.

(e) What feature(s) of cellulose make it a better structural polymer than amylose?

In β -D-gluc, all OH groups are equatorial. Thus, β 1,4 linked glucose residues form extended chains that can stack easily & form extensive H-bonding. α 1,4 linkage is $\sim \perp$, so close stacking not allowed.

(5) 15 points Pot pourri of definitions.

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 _____.	bilayers, liposomes
Name a carbohydrate that is achiral	dihydroxyacetone
Name the simplest carbohydrate that is an aldose	glyceraldehyde
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 a ketone is called a _____	hemiketal
What type of bond joins the base and sugar of a nucleoside?	N-glycosidic
What molecule is a membrane plasticizer?	cholesterol
What type of membrane protein may be solubilized by high salt concentration or change in pH?	peripheral
What type of membrane protein may be solubilized by the addition of a detergent or organic solvent?"	integral
Which nitrogenous base is present in RNA but not DNA?	uracil
Name a specific passive (facilitated diffusion) transporter	glucose permease
Name a specific primary active transporter	Na ⁺ -K ⁺ ATPase
Ring-cyclized sugars that contain a free hydroxyl group at the anomeric carbon are called _____ sugars	reducing
Soap is formed from the hydrolysis of what type of lipid?	triacylglycerol

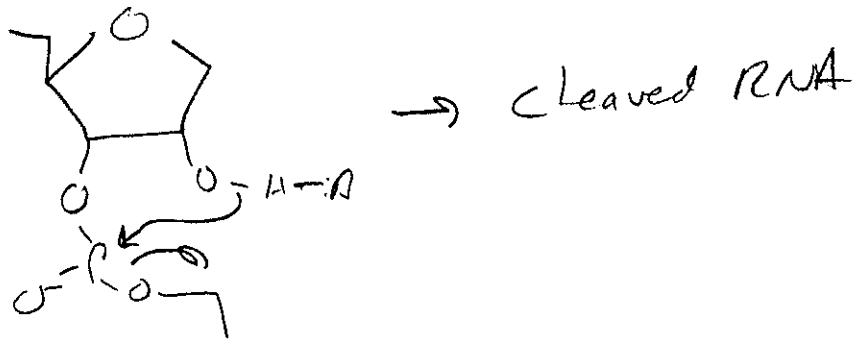
(6) (10 points) Imagine you are a bacterium, happily growing at 30°C. Suddenly some sadistic graduate student changes your growth temperature to 20°C. What consequence will this have on your membrane fluidity? How will you adapt to this temperature change to maintain proper fluidity?

membrane fluidity will decrease

- increase degree of unsaturation of FA side chains - makes
- more fluid

(7) (5 points) Which is more stable and why: DNA or RNA?

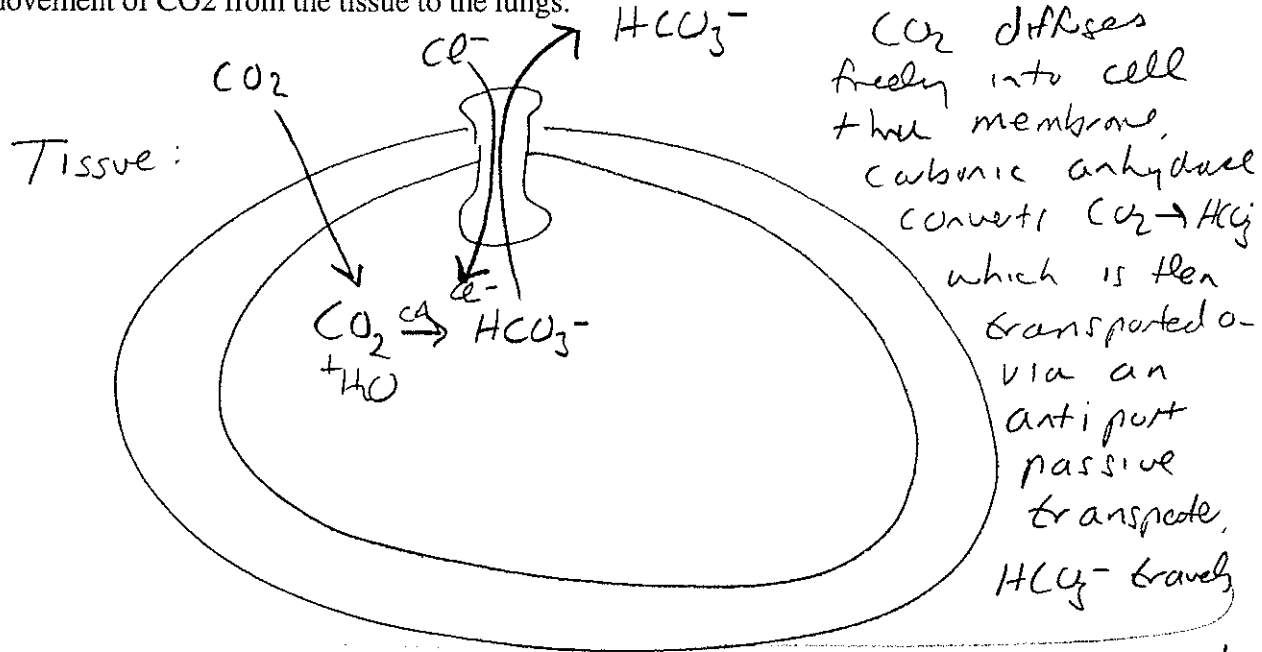
DNA. it lacks a 2'-OH on the ribose ring, which catalyzes hydrolysis via intramolecular phosphodiester bond cleavage.



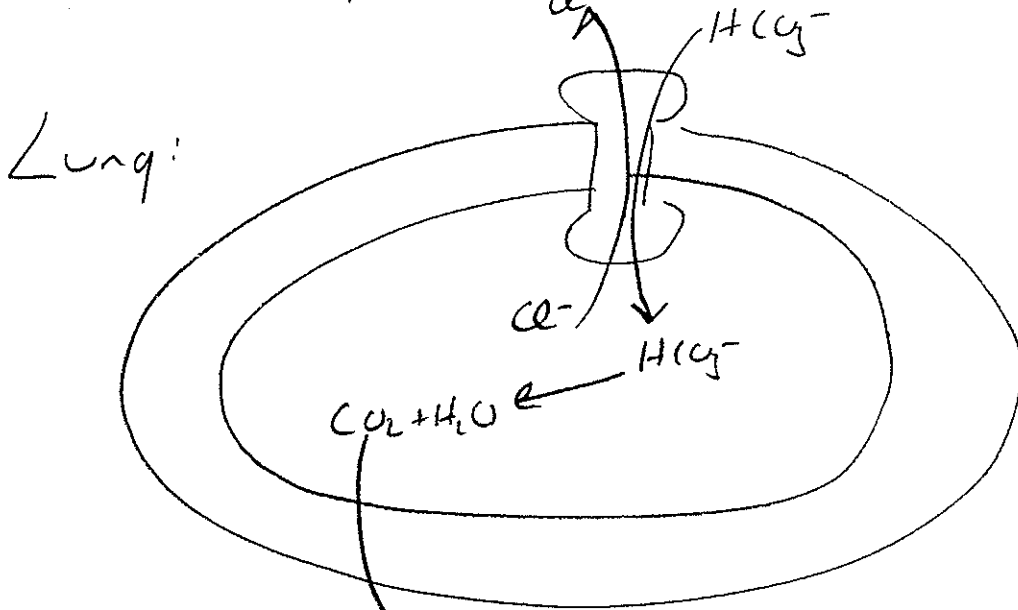
(8) (5 points) Why does RNA assume an "A"-conformation in solution rather than the "B" conformation of DNA?

Because the 2'-OH prevents C2' endo sugar pucker, which is required for B-DNA formation. Instead, the sugar pucker becomes C3' endo - which favors "A" conformation.

(9) 18 points. Provide a detailed explanation of how the chloride-bicarbonate exchange protein facilitates movement of CO₂ from the tissue to the lungs.



thru circ system to lungs. There the process is reversed:



CO₂ ⇒ expelled by breathing