

Biochemistry 5700
Fall, 2002
Exam 2
October 21, 2002

INSTRUCTIONS:

Do not begin until 10:30 AM. The exam must be turned in by 11:20 AM. This exam should have 10 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. FEEL FREE TO USE DIAGRAMS/FIGURES, WHEN APPROPRIATE, IN ANSWERING QUESTIONS. Good Luck!!

0 POINTS EXTRA CREDIT!!! ANSWER THESE WHILE WAITING TO START THE EXAM:

How much more sensitive (in %) are redheads to pain than normal, genetically inferior people?

What two compounds are responsible for producing acrylamide in fried food?

What famous celebrity had a birthday yesterday?

(1) Definitions. 20 points.

Name the branched form of starch
When relatively high concentrations of glycerophospholipids are placed in water they form structures known as _____.
How many stereoisomers are possible for the family of D-aldoses with seven carbon atoms?
Name the simplest carbohydrate that is a ketose
Linear sugars that are structurally identical except for the orientation of the hydroxyl and hydrogen at one position are called what?
The compound resulting from the nucleophilic addition of an alcohol to an aldehyde is called what?
What type of bond joins two sugar units in a disaccharide?
What molecule is a membrane plasticizer?
What is the repeating sugar unit and linkage in chitin?
What is the repeating sugar unit and linkage in peptidoglycan?
Which nitrogenous base is present in DNA but not RNA?
What is the name of the family of derivatized polysaccharides that associate with proteins in the extracellular matrix of animal cell tissue
What types of sugar linkages are found in glycogen?
Ring-cyclized sugars that contain a free hydroxyl group at the anomeric carbon are called _____ sugars
Name the specific D-aldose in which ALL hydroxyl groups lie in the equatorial plain
What vitamin is associated with vision?
What vitamin is associated with regulating calcium uptake for bone formation?
The relations $A = T$ and $G = C$ are called what?
Name a general role for lipids other than serving as an energy reserve or structural component of membranes
What conformation does double stranded DNA form in solution?

(2) (10 points) Draw generalized structures (long chain hydrocarbons can be abbreviated) for phosphatidylcholine and sphingomyelin (containing choline) in orientations that highlight how the two different lipids can assume similar overall structures within bilayers. Label and name the linkages between the side groups and the main chains for both molecules.

(3) (10 points)

(a) Explain what soap is and the molecular basis for its ability to make you clean and fresh-smelling after a morning shower.

(b) Briefly explain why soap sometimes leaves a residue in the sink while synthetic detergents don't.

(4) (10 points) Write the base sequence for a double stranded DNA fragment [use short hand nomenclature (i.e. ATCG)-don't draw structures] that contains a six-nucleotide palindrome separated by four intervening bases.

(5) (10 points) Draw the dinucleotide that has the short hand abbreviation ppdApdT

(6) (10 points) For each of the following, name a specific "transporter" representing that type, and name the molecule(s) transported:

Transport type	Name of transporter	molecule(s)
(a) passive uniport		
(b) passive antiport		
(c) primary active transport: ATP driven		
(d) primary active transport: light driven		
e) secondary active transport		

(7) (5 points) Write the kinetic mechanism for a passive transporter (T) effecting the transformation
 $\text{Substrate}_{\text{outside cell}} \rightarrow \text{Substrate}_{\text{inside cell}}$

(8) (5 points) What are three features that, in general, distinguish an ion channel from an ion transporter?

(9) 10 points. Briefly define the following terms as they relate to DNA structure:

(a) major groove

(b) two periodicities

(c) glycosidic bond orientation

(d) base tilt

(e) sugar pucker

(10) 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.

