

Name _____

Score _____

Exam 2, BICH 440, October 24, 2005

You **MUST** sign the following academic integrity statement:

On my honor, as an Aggie, I have neither given nor received unauthorized aid on this academic work. Signed: _____

Write concise answers to demonstrate effectively your mastery of the subject. Show your work in order to receive maximum credit where applicable.

gas constant R 8.315 J/mol-K

Faraday constant F 96.5 kJ/mol-volt

1) (12 pts) Draw the structure of a hypothetical **nonreducing** disaccharide containing a beta-beta linkage composed of D-mannose and D-galactose. Each monosaccharide is in the pyranose form.

2) (12 pts) Draw the structure of a guanine-cytosine base pair at pH7. Clearly delineate hydrogen bonds with dotted lines and draw all hydrogen atoms.

Name _____

3) (12 pts) Draw the structure of cardiolipin (diphosphatidylglycerol) that contains identical phosphatidic acid parts with one 18:0 fatty acid and one 18:3(9,12,15) fatty acid. Assume pH7. HINT: diphosphatidylglycerol contains two phosphoglycerides that are esterified through their phosphates to opposite ends of a single glycerol.

4) (12 pts) Draw the structure of 2',3'-dideoxy thymidine 5'-diphosphate with the thymine base in the enol form. For the ionization of the phosphates, assume that the pH is 7.

Name _____

5) (15 pts) The osteoclast proton pump acidifies the outside of the cell to pH 3, from a pH value inside the cell of 7. The potential across the osteoclast plasma membrane is 60mV (inside more negative). Given intracellular concentrations of ADP = 1mM and phosphate = 0.5 mM, what ATP concentration is necessary to drive the transport of two moles protons outside the cell per mole ATP hydrolyzed? The temperature is 37C, and the standard free energy change for ATP hydrolysis is -30.5 kJ/mole .

Name _____

6) (10 pts) Briefly describe the Anfinsen experiment involving the denaturation and refolding of ribonuclease and explain its significance in protein folding (i.e., what is the simple “take-home” lesson?)

7) (27 pts) Short answer

a) (4 pts) Using a simple diagram, describe the structure of an immunoglobulin G molecule. Point out the location(s) of the antigen combining site(s).

b) (3 pts) Draw the steroid ring structure.

Name _____

c) (3 pts) Draw the structure of the isoprene unit found in terpenes.

d) (2 pts) Number of fatty acids joined in an ester linkage in one ganglioside molecule:

e) (2 pts) Name of a substance that you would use to release an integral membrane protein from the lipid bilayer:

f) (3 pts) Give an example of a membrane transport protein that is involved in an antiport process. Also, name the molecules that are transported.

g) (2 pts) How many nucleotides in a single-stranded piece of DNA with a molecular weight of 9900?

h) (3 pts) Structure of the D-isomer of the simplest aldose:

i) (3 pts) Name three examples of glycosaminoglycans.

j) (2 pts) Name two examples of ionophores.