Name _____

I.D. _____

Score _____

Exam 2, BICH 440, Section 500, Monday, October 22, 2001

Write your name on each page. 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. (9 pts) Draw the structure of cholesterol.

2. (10 pts) Draw the structure of the following hypothetical disaccharide:
   β-D-galactopyranosyl-(1 → 2)-α-D-glucopyranose
   (galactose) (glucose)

Name _____

3. (12 pts) Draw the structure of an adenine-thymine base pair. Clearly indicate by dotted lines the positions of the hydrogen bonds. In addition, with arrows, show the position on each base that would be used to make glycosidic bonds to the deoxyribose sugars.

4. (10 pts) Draw the structure of the nucleotide, 5′-phospho-3′-phospho-2′-deoxyguanosine. Be sure to show the correct ionization at pH 7, and the entire structure of the guanine base.

Name _____

5. (6 pts) Briefly discuss the entropic (ΔS) and enthalpic (ΔH) effects that both favor and disfavor the folding of a protein.

6. (10 pts) The resting membrane potential of a neuron at 37C is –60 mV (inside negative). If the free energy change associated with the transport of Na^+ from outside to inside is –10.0 kJ/mole, and $[Na^+]$ outside the cell is 260mM, what is $[Na^+]$ inside the cell?

Name _____

7. (12 pts) Compare/contrast the structures and chemical properties of phosphatidylcholine (a glycerophospholipid containing choline) and a cerebroside. You need not draw the structures of these molecules, but discuss the components of each, including charged/polar vs. nonpolar characteristics, and the types of chemical linkages that connect these components.

8. (31 pts) Short answer questions

a) (3 pts) What is the amino acid repeat pattern in the triple-helical portion of collagen?

b) (3 pts) Name three chemically-distinct types of lipid anchors used to embed proteins within the lipid bilayer.

c) (3 pts) Draw the structure of the simplest ketose.

d) (3 pts) What are Chargaff's Rules describing the base composition in double-stranded DNA?

e) (2 pts) What is the general structure of a wax?

f) (2 pts) What is plotted on a Ramachandran diagram?

g) (2 pts) What two amino acids are prevalent in beta turns?

h) (2 pts) What is the type of protein structure that constitutes the membrane spanning region of a bacterial porin protein?

i) (4 pts) Briefly describe the peptidoglycan stucture of the bacterial cell wall.

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

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

l) (2 pts) What chemical feature distinguishes the polysaccharide backbones of starch and cellulose?