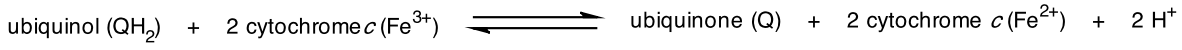
Name _____

Chem 352 - Fall 2013
Quiz 4

Use constants: Ideal gas law constant, R = 0.08206 (l•atm)/(mol•K) = 8.314 (J/(mol•K); Faraday's constant, $\mathcal{F}$ = 9.659 x 10^4 J/(V•mol); Planck's constant, h = 6.626 x 10^{-34} J•s.

1. Later this semester we will discuss the electron transport chain and oxidative phosphorylation in which the reoxidation of reduced NADH + H^+ by O_2 is coupled to the phosphorylation of ADP to form ATP. One of the steps in the electron transport chain involves the reduction of cytochrome *c* by ubiquinol, which occurs at Complex III:



Using the data in the table below, calculate the standard reduction potential and the standard free energy change for this oxidation-reduction reaction. (Show your calculations)

Reduction half-reaction	***E*°′ (V)**
Oxaloacetate + 2 $H^{\oplus}$ + 2$e^{\ominus}$ → Malate	–0.17
Cytochrome b_5 (microsomal). Fe^{3+} + $e^{\ominus}$ → Fe^{2+}	0.02
Fumarate + 2 $H^{\oplus}$ + 2$e^{\ominus}$ → Succinate	0.03
Ubiquinone (Q) + 2 $H^{\oplus}$ + 2$e^{\ominus}$ → QH_2	0.04
Cytochrome *b* (mitochondrial), Fe^{3+} + $e^{\ominus}$ → Fe^{2+}	0.08
Cytochrome c_1, Fe^{3+} + $e^{\ominus}$ → Fe^{2+}	0.22
Cytochrome *c*, Fe^{3+} + $e^{\ominus}$ → Fe^{2+}	0.23
Cytochrome *a*, Fe^{3+} + $e^{\ominus}$ → Fe^{2+}	0.29

$\Delta E°' =$ _____ $\Delta G°'$ _____

2. When a mixture of glucose 6-phosphate and fructose 6-phosphate is incubated with the enzyme glucose 6-phosphate isomerase, the final mixture at equilibrium contains twice as much glucose 6-phosphate as fructose 6-phosphate. Calculate the value of $\Delta G°'$ for this reaction.

3. What distinguishing characteristic is shared by members of the biological molecules referred to as lipids.

4. Fatty acids are components or the starting material for a number of lipids having a variety of functions. Name the class of lipids that fits each of the following descriptions:
   a. A major component of biological membranes that self assemble into lipid bilayers when mixed with water. _____
   b. The gangliosides and cerebrosides are members of this group. _____
   c. A long-term storage form of chemical energy _____
   d. Prostaglandins are a member of this class. _____

5. Safflower oil and coconut oil are both vegetable oils. At room temperature, safflower oil is a liquid while coconut oil is a soft buttery solid. Explain the structural differences between the molecules that make up these two oils that explains this difference.

6. In signal transduction, what role does cyclic-AMP (cAMP) play?

7. Draw the structural formula for the membrane phospholipid phosphatidyl serine, which contains the fatty acids stearate (18:0) at the C1 position, and palmitoleate (16:1-Δ^9) at the C2 position.