CHEM 352
SPRING 2006
Test # 2

Name:_____

1. Provide the missing electron acceptor in each of the following sequences:

   a) NADH : _____ : Fe/S : CoQ

   b) $CoQ^{\cdot -}$: Cyt b_L : Cyt b_H : _____

   c) $CoQH_2$: Fe/S : _____ : Cyt C

   d) Cu_A : Cyt a : Cyt a_3-Cu_B : _____

2. Identify each of the following:

_____ a) The tissue with the highest level of gluconeogenesis

_____ b) The tissue with the highest level of hexose monophosphate shunt activity

_____ c) The major products of the hexose monophosphate shunt (i.e. the raison d'etre)

_____

_____ d) The number of H^+'s that must pass through the F_0F_1-ATPase per ADP phosphorylated.

_____ e) A ubiquitous enzyme used to drive many biosynthetic reactions irreversibly in the forward direction.

3. List the positive and negative allosteric modulators (if any) of each of the following enzymes:

Enzyme	Positive Modulators	Negative Modulators
Glucose-6-PO_4 Dehydrogenase		
Glucose-6-PO_4 Phosphatase		
Fructose-1,6-Bisphosphatase		
Phosphorylase b		
Glycogen Synthase b		
Pyruvate Carboxylase		
Phosphorylase b Kinase		

4. Match each of the following enzymes with its cofactor:

_____ a) Phosphorylase — A. Thiamine pyrophosphate

_____ b) Phosphoglucomutase — B. Biotin

_____ c) Glucose-6-PO_4 Dehydrogenase — C. $NADP^+$

_____ d) Transketolase — D. Pyridoxal phosphate

_____ e) Pyruvate Carboxylase — E. GTP

_____ f) Phosphoenol pyruvate carboxykinase — F. Glucose-1,6-bisphosphate

5. Provide the intracellular location of each of the following:

a) gluconeogenesis _____

b) glycogen synthesis _____

c) clectron transport _____

d) cytochrome C _____

e) ATP Synthase _____

f) pentosephosphate pathway _____

6. Draw each of the following:

a) The intermediate in the reaction catalyzed by ribulose-5-phosphate epimerase.

b) Sedoheptulose-7-phosphate

c) The enzyme-bound intermediate which reacts with Glyceraldehyde-3-PO4 in the reaction catalyzed by transaldolase.

d) The products of the reaction catalyzed by UDP-Glucose Pyrophosphorylase

7. Briefly explain each of the following:

a) The driving force for the transport of ATP out of the mitochondrial matrix.

b) The driving force for the transport of phosphate into the mitochondrial matrix.

c) The reason electron transport ceases even in the presence of oxygen when no ADP is available.

8. The standard reduction potential for ubiquinone is + 0.100V and for FAD is – 0.219V. Using these values, show that the oxidation of $FADH_2$ by ubiquinone theoretically liberates enough energy to drive the synthesis of ATP from ADP under standard conditions.

9. The concentration of Ca^{2+} inside a vertebrate cell is about 20 mM and a typical cell has a transmembrane potential of – 0.070V (negative inside). If these cells are bathed in blood plasma containing 5.0 mM Ca^{2+}, what is the free energy change associated with transporting 1 mole of Ca^{2+} out of the cell at 37°C?

   Note: Calcium concentrations inside cells must be kept fairly low because of the insolubility of calcium phosphates. Recall that the intracellular buffer in biological systems is phosphate.