CHEM 352
Spring 2006
Test #1

Name:_____

1. Match the following terms with the appropriate vitamin from the list below:

A. niacin	D. riboflavin
B. thiamine	E. pantothenate
C. biotin	F. lipoic acid

_____ a) Vitamin B_3

_____ b) Beriberi

_____ c) Isoalloxazine Ring

_____ d) Reactions involving acyl group transfer

_____ e) Pellagra

_____ f) Reactions involving active aldehyde transfer

_____ g) Avidin

2. Identify each of the following:

_____ a) Negative modulator of hexokinase

_____ b) Usual form of reducing equivalents in anabolic pathways

_____ c) The intracellular location of glycolysis

_____ d) The intracellular location of the Krebscycle

_____ e) The enzyme which catalyzes the rate-determining step for glycolysis

_____ f) The enzyme which catalyzes the rate-determining step for the citric acid cycle

_____ g) The enzyme which catalyzes the main anaplerotic reaction for the tricarboxylic acid cycle

_____ h) A positive modulator for the enzyme in g above

_____ i) An enzyme that requires K^+ as a cofactor.

_____ j) The enzyme which catalyzes a reversible substrate-level phosphorylation of ADP in glycolysis

_____ k) The enzyme which catalyzes a substrate level phosphorylation in the citric acid cycle

_____ l) The feed-forward positive modulator of pyruvate kinase

_____ m) The number of ATPs (net) formed per glucose under anaerobic conditions in muscle

_____ n) The number of ATP's per glucose under aerobic conditions in liver

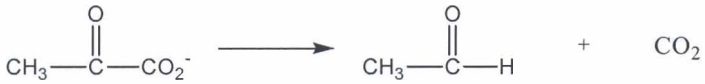
3. Briefly describe each of the following:

a) How protein kinase A is activated (single step, not cascade)

b) How activated G-protein is inactivated

c) How anabolic pathways are usually regulated

4. Provide the most likely vitamin-derived cofactor for the enzyme-catalyzed reactions below:

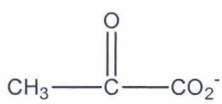
_____ a) 

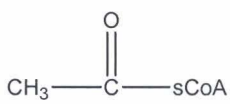
_____ b) 

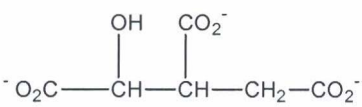
_____ c) 

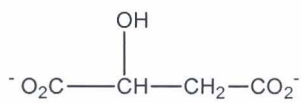
_____ d) 

5. Indicate (with an asterisk, *) any carbons in the intermediates below which would be labeled with C-14 if glucose labeled with C-14 in its aldehyde carbon passes through the glycolytic pathway and <u>one</u> round of the Krebs cycle.

a) 

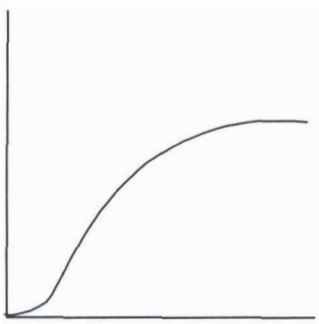
b) 

c) 

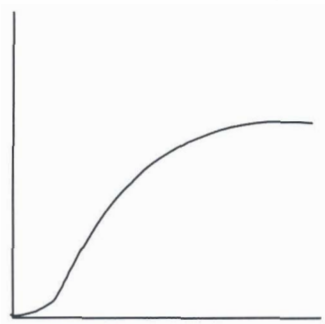
d) 

6. Modify the following kinetic curves for phosphofructokinase as directed:

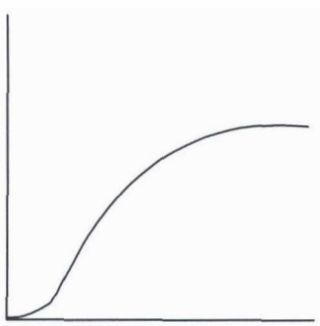
a) Additional ATP



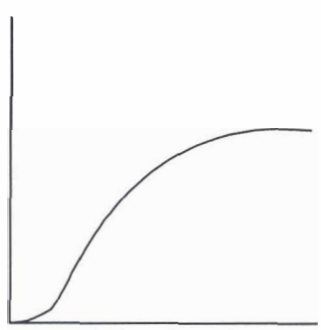
b) Additional FRuctose-2, 6-BisPO4



c) Less ATP



d)



7. Draw complete structures for each of the following:

a) NADH

b) The reactant in the reaction catalyzed by pyruvate kinase

c) The product in the reaction catalyzed by isocitrate dehydrogenase

d) The product in the reaction catalyzed by glucose-6-phosphate isomerase

e) The products in the reaction catalyzed by isocitrate lyase

f) The intermediate in the reaction catalyzed by triosephosphate isomerase

The following table contains some potentially useful standard free energies of hydrolysis:

Compound	ΔG°, kcal/mole	ΔG°, kJ/mole
ATP (to ADP)	-7.3	-30.5
ADP (to AMP)	-8.5	-35.7
ATP (to AMP, PP_i)	-8.5	-35.7
PP_i (pyrophosphate)	-8.0	-33.6
Phosphoenol Pyruvate	-14.8	-61.9
Glucose-6-Phosphate	-3.3	-13.8
Glucose-1-Phosphate	-5.0	-20.9
Fructose-1-Phosphate	-4.2	-16.0
Glycerol-3-Phosphate	-2.2	-9.2
Creatinephosphate	-10.3	-43.1

8. Consider the following reaction catalyzed by phosphoglucomutase:

Glucose-6-Phosphate $\rightleftharpoons$ Glucose-1-Phosphate

a) What is the standard free energy of hydrolysis for the reaction?

b) At equilibrium, what is the ratio glucose-1-phosphate to glucose-6-phosphate?

c) By analogy to a similar reaction in glycolysis, what compound is likely to be a required cofactor this enzyme?

9. The concentrations of ATP, ADP and P_i differ with cell type. Consequently, the release of free energy with the hydrolysis of ATP to ADP + P_i will vary with cell type. Use the data below to calculate ΔG for the hydrolysis of ATP in brain cells.

	ATP, mM	ADP, mM	P_i, mM
Brain	2.60	0.70	2.70

10. Account for the magnitude of the ΔG° for hydrolysis of phosphoenol pyruvate.

11. Fibrinogen contains tyrosine—O—S(=O)(=O)—O$^-$ groups. Propose an activated form of sulfate that could react in vivo with the aromatic hydroxyl group of a tyrosine residue in a protein to form tyrosine-O-sulfate.