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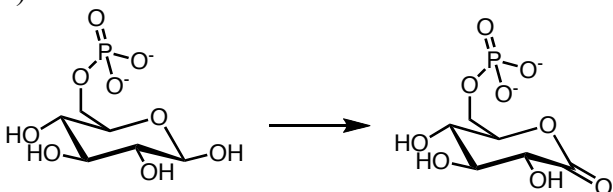
### Problem Set 5

C484 Fall 2012

Due Friday November 9 at the *beginning* of class

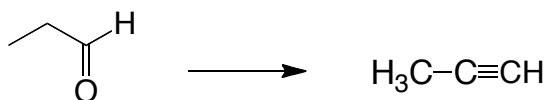
1) State whether each of the following reactions is an oxidation, reduction, or neither *in the direction indicated*. You may find it useful to keep track of how many hydrogens are found at each carbon.

a)



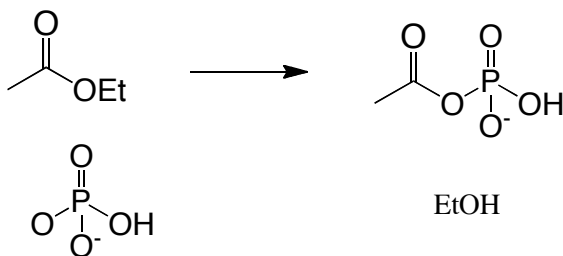
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b)



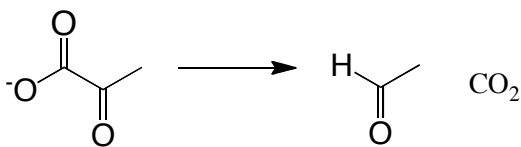
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c)



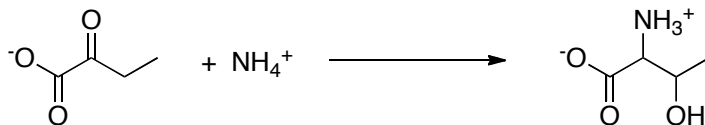
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d)



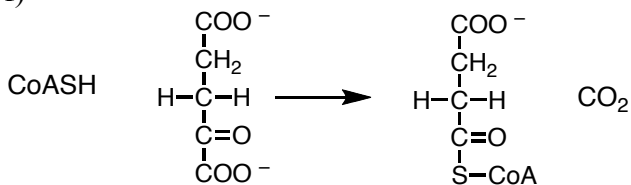
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e)



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f)



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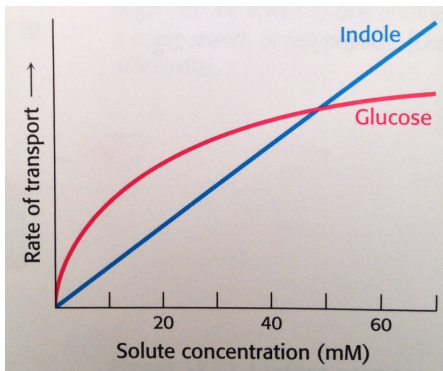
Name:

2) Glucose labeled with  $^{14}\text{C}$  at C-6 is subjected to the glycolytic pathway.

a) At which position in pyruvate will the label be found? Explain your reasoning.

b) If all of the glucose molecules used contain  $^{14}\text{C}$  (at only the 6 position), what percentage of the pyruvate molecules generated will be radioactively labeled?

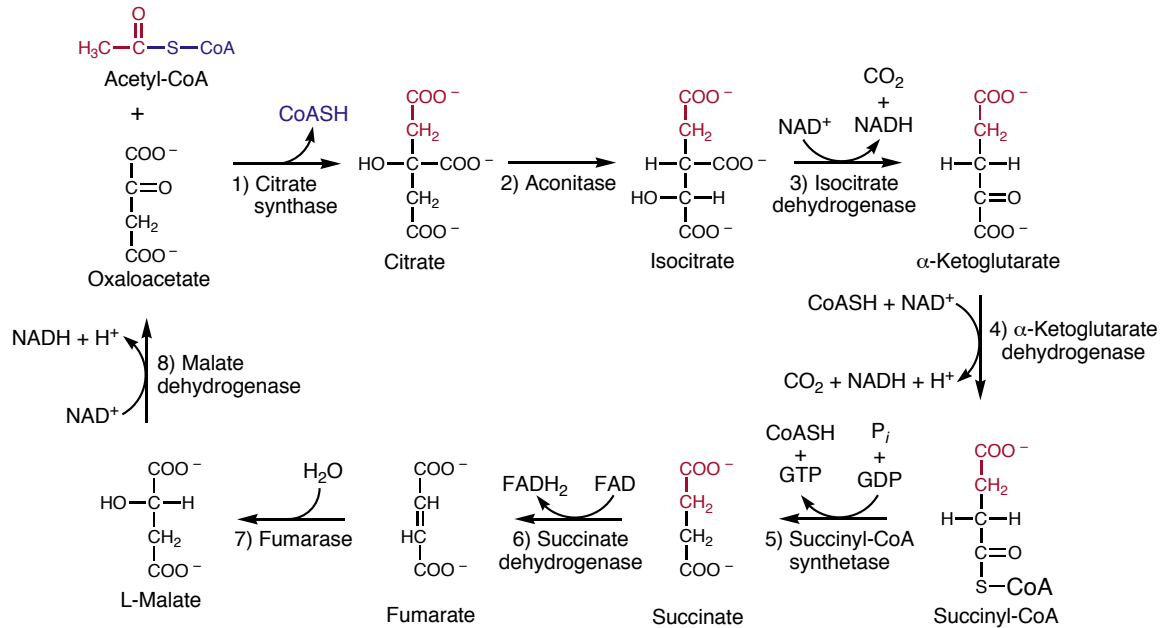
3) The rate of transport of two molecules, indole and glucose, across a cell membrane is shown below. What are the differences between the transport mechanisms of the two molecules?



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4) Hint: you should be able to do this problem before we study the citric acid cycle. If oxaloacetate labeled at position 3 (see below) is used in the citric acid cycle, then:

a) Where is the label at the end of one complete cycle? If the original oxaloacetate was 100% labeled, to what extent is each position in oxaloacetate labeled at the end of the first cycle?



b) Where is oxaloacetate labeled and to what extent is each carbon labeled after the second round of the cycle? Briefly explain your reasoning. You may want to show the path of the label for the second round on the above diagram with a different color or symbol than you used in part a.

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5) a) Write the balanced equation for the conversion of glucose to pyruvate by the glycolytic pathway.

b) How would the above equation change in an organism where triose phosphate isomerase was mutated so that it was inactive? What sorts of metabolic consequences would result for an organism that has completely inactive triose phosphate isomerase?

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6) For the following hypothetical metabolic pathway:

Enzyme	Reactant(s)	Product(s)	$\Delta G^{\circ}$ (kJ/mol)	$\Delta G'$ (kJ/mol)
1	A	B	+12.6	+1.2
2	B	C	-1.7	-11.2
3	C	D	+13.2	-1.2
4	D	E	-2.7	-2.8

- Which step is the most likely to be regulated?
- Which is more abundant under cellular conditions, B or C?
- What is the ratio of D to C under cellular conditions? Show your work.

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7) Phosphoglucose isomerase (PGI) performs a reaction similar to triose phosphate isomerase (TIM). Draw a reasonable mechanism for the transformation that PGI performs based upon your knowledge of TIM.

