

Points

- (6) 1. The free energy change of a chemical reaction varies with the concentration of reactants and products. The relationship is given by the **reaction isotherm**:

$$\Delta G = \Delta G^{o'} + RT \ln Q'$$

- (a) What is the significance of the **prime** (') in $\Delta G^{o'}$ and Q' ?

- (b) What is the relationship between Q' and K'_{eq} for a spontaneous reaction?

- (10) 2. Reactions near equilibrium have ΔG values low, near zero, while reactions that are irreversible or far from equilibrium have large negative ΔG values. In the list of enzymes of glycolysis and the TCA cycle listed below, but a **check** by the enzymes that operate **near equilibrium**.

_____ hexose phosphate isomerase	_____ citrate synthase
_____ triose phosphate dehydrogenase	_____ isocitrate dehydrogenase
_____ succinate dehydrogenase	_____ malate dehydrogenase
_____ phosphoglycero mutase	_____ alpha keto glutarate dehydrogenase
_____ 3-phosphoglycerate kinase	_____ phosphofructokinase

- (8) 3. Pyruvate kinase has a very large negative $\Delta G^{o'}$, and so the reaction operates with a large negative ΔG and is essentially irreversible. How does the cell carry out the conversion of pyruvate to phosphoenol pyruvate? (Give the reaction intermediates and the name of the enzyme(s) involved.)

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1	_____
2	_____
3	_____
4	_____
Total	_____

- (15) 4. You have studied three enzymes that have **thiamine pyrophosphate** as a prosthetic group. Give the names of these enzymes, the overall reaction catalyzed by each (names or structures of reactants and products are okay), and identify additional prosthetic groups if there are any.
- (6) 5. In the **Cori cycle**, muscle converts glucose to lactate, while the liver converts the lactate back to glucose. Give the **overall stoichiometry** of each of these pathways by **adding the additional reactants and products to the equations below**:
- (a) in muscle: **glucose** → **2 lactate**
- (b) in liver: **2 lactate** → **glucose**
- (12) 6. You have studied three reactions involving malic acid: **malate dehydrogenase**, **malate synthase**, and **malic enzyme**. Give the reaction catalyzed by each enzyme (structure or name of reactants and products) and the function served by each enzyme in metabolism.

- (12) 7 **Phosphofructokinase-1** and **phosphofructokinase-2** both catalyze a reaction between fructose-6-phosphate and ATP. Compare and contrast these two enzymes with respect to:
- (a) structure of the product of each reaction (draw structure).

 - (b) further metabolism of the product of each reaction (i.e. what enzyme(s) act on each product?)

 - (c) regulation of the activity of each enzyme.
- (6) 8. **Wernicke-Korsakoff** syndrome is a mental disorder coupled with loss of memory and partial paralysis. It is an example of a condition dependent on both genetic and environmental factors. Explain the genetic and environmental factors involved.
- (7) 9 What is the purpose of an **anaplerotic reaction**? Give an example of such a reaction, including the name of the enzyme and its substrates and products (structure or names okay).

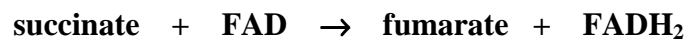
(12) 10 Give the **names** or **structures** of the reactant and product of each of the following isomerases:

(a) triose phosphate isomerase

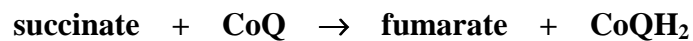
(b) pentose phosphate isomerase

(c) hexose phosphate isomerase

(6) 11. Your textbook gives the reaction catalyzed by succinate dehydrogenase as:



Your instructor prefers to write the reaction as:



Explain why.