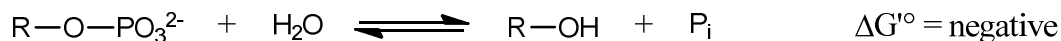


- Which of the reactions of a metabolic pathway would you expect to be regulated? List all that apply:
 - the 1st committed step of the pathway
 - the last step of the pathway
 - a highly spontaneous reaction
 - a rate-limiting reaction
 - a reaction in which [products]/[reactants] is close to K_{eq}
 - a very fast reaction (relative to others in the pathway)
 - a reaction with a large, positive ΔE°
 - a reaction involving a phosphoryl transfer from phosphoenolpyruvate
 - a reaction that is used in the reverse pathway

- Consider the structure of inorganic phosphate (P_i)
 - Does P_i act as a nucleophile or electrophile in biochemical reactions?
 - Briefly explain your answer for part a (15 words or fewer).
 - The hydrolysis of phosphorylated compounds is generally spontaneous:



What property of P_i favors this reaction? Briefly explain (15 words or fewer).

- List three factors that contribute to the large release of free energy when ATP is hydrolyzed.
- What information would you need to determine whether a compound containing phosphate has a high or low phosphoryl transfer potential?
- We discussed different redox energy currencies, such as NAD, NADP, and FAD. Why does the cell have so many different redox currencies? Why isn't one sufficient?
- Which of the following catalytic mechanisms are likely to be important in the isomerization of glucose-6-phosphate to fructose-6-phosphate:
 - general acid catalysis
 - general base catalysis
 - covalent catalysis
 - electrostatic catalysis
 - metal-ion catalysis
- Define 'isozyme.'
- True or False? Glucosephosphate isomerase and triosephosphate isomerase are isozymes.
- Does glucose or ATP act as a nucleophile in the reaction catalyzed by hexokinase? Briefly explain your answer (15 words or fewer).
- Generalize your answer to question 9 by selecting the correct words to completing the following sentence:
In phosphoryl transfer reactions, the phosphoryl donor is the (nucleophile/electrophile) and the phosphoryl acceptor is the (nucleophile/electrophile).

11. Which one of the following sets most likely represents amino acids found in the active site of phosphoglucose isomerase (PGI)?
 - a. Arg, Ser, Met, Val
 - b. Phe, Val, Ile, Thr
 - c. Ser, Cys, His, Gln
 - d. Tyr, Thr, Trp, His
 - e. Gly, Ala, Cys, Pro

12. Which of the following catalytic mechanisms are used by aldolase?
 - a. general acid catalysis
 - b. general base catalysis
 - c. covalent catalysis
 - d. electrostatic catalysis
 - e. metal-ion catalysis

13. Many enzymes of glycolysis require metal ion cofactors. Why? How do these cofactors aid in catalysis?

14. The ATP made in glycolysis is said to be made via 'substrate-level phosphorylation.' Which enzymes of glycolysis are involved in substrate-level phosphorylation? What do these enzymes (and the reactions they catalyze) have in common?