An Extensive Review of Metabolism[1]

Biology 390 -- Physiology

(All of these except for #4 are review -- #4 is a bit involved but should be fun to do.)

1. What products of glycolysis can link it with mitochondrial processes?
2. Given:

- the ~P flux increases many fold,
- the [ATP] ↘
- the [ADP] ↗
- O_2 supply (delivery) is not changed
- the cell has typical mitochondrial development

If the cell has a low activity of lactic dehydrogenase and the "given" situation (above) occurs, what will be the effect on:

- Cytosol redox?
- Mitochondrial redox?
- Will ~P generation stop?

If the cell has a high activity of LDH, what will be the effect on:

- cytosol and mitochondrial redox?
- On glycolytic flux?

3. Citrate syntase (CS) (not mentioned in class) is the major rate-limiting enzyme for the Krebs cycle as phosphofructokinase (PFK) is for glycolysis. What would you predict about the **relative activities**[2] of each of these enzymes in two different muscle cells -- one that receives an abundant supply of oxygen and the other that does not. In formulating your answer, keep in mind that all muscle cells prefer glycolysis to fatty acid oxidation

4. What are phosphagens and what do they do?

65 If the efficiency for some activity is 20% and the metabolic rate is 50W what is the useful power? If the same activity is continued for an hour, what is its metabolic cost (J)?

[2] **Activity** is a term that refers to the total number of a type of enzyme molecule (e.g., PFK or CS) that is present – a measure of capacity or maximum rate of reaction under ideal conditions for a particular step.