An Extensive Review of Metabolism

(Try these with others and don't fret, some of these are quite hard but by trying to answer them you will gain a fuller understanding of metabolism.)

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 synthetase (not mentioned in class) is perhaps the major rate-limiting enzyme in the Krebs cycle while phosphofructokinase is for glycolysis. What would you predict about the relative activities 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 over fatty acid oxidation

4. Make a qualitative graph of the following variables with respect to time:

- panel 1: [C~P] and [ATP],
- panel 2: [lactate],
- panel 3: arterial venous difference in oxygen content (assume about 40% at rest) -- take a guess on this one since we haven't covered it yet!
- panel 4: power output as movement, ~P flux, and total power (input),
- panel 5: $\dot{V}_{O_2}$ and $\dot{V}_{CO_2}$ for a vertebrate.

Show what happens to each of these variables in a transition from rest to moderately heavy exercise until a steady-state is reached.
What will happen if the exercise load is kicked up to a heavy, non-sustainable level?

5. What are phosphagens and what do they do?

6. 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)?