2/20/14

SI Session 8

1. Compare catabolic and anabolic pathways. What is an example of each?

catabolic = breaking down → glycolysis

anabolic = building up → protein synthesis

2. Catabolism is to anabolism as exergonic is to endergonic

3. Describe the difference between an isolated and an open system. Are cells an open or closed system?

isolated - no exchange in energy or matter with the surroundings

open - there is exchange in energy & matter with the surroundings

cells are open; closed systems reach equilibrium

4. What is the first law of thermodynamics? How is the 1st law of thermodynamics illustrated in organisms?

- energy can be transferred & transformed but cant be created or destroyed
- conversion of glucose/fat/protein into ATP

5. What is the second law of thermodynamics? How is it related to entropy?

energy transformation increases entropy

- entropy is disorder

6. What characterizes a spontaneous reaction? Are these reactions favored?

- a release of energy, increase in free energy, decrease in free energy

March 6th

7. If ΔG is negative a reaction will be exergonic. What does it mean that ΔG is negative? What happens to the system? How does free energy change in this reaction?

- (-)ΔG = energy is released
- there is lower free energy
- more stable
- this is a spontaneous reaction

8. If ΔG is positive a reaction will be endergonic. What does it mean that ΔG is positive? What happens to the system? How does free energy change in this reaction?

- (+) ΔG = energy is required/consumed
- free energy is stored (higher)

9. Enzymes are catalysts. What is a catalyst?

chemical agent that speeds up a rxn w/o being consumed itself

-enzymes are proteins (except for ribozyme)

10. What happens to the enzyme after it has catalyzed a reaction?

it is reused! enzymes are not affected by a reaction

SI Session 9

1. What is fermentation? How does it differ from aerobic respiration?

- partial degradation of sugars/organic fuel that occurs w/o the presence of O_2
- aerobic respiration uses O_2 & fully degrades compounds

2. What is an oxidation reaction? Reduction reaction?

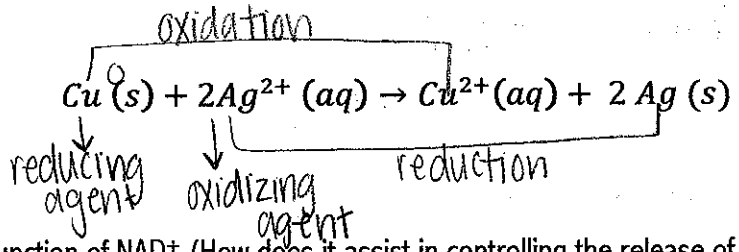
- oxidation = loss of e^-
- reduction = gain of e^-
- oxidizing agent = thing that is reduced
- reducing agent = thing that is oxidized

3. Why are redox reactions important to cellular respiration?

Redox reactions deal w/ the moving of e^-. You will notice as you go through the cycles that e^- are constantly being moved around. By oxidizing & reducing organic molecules, organic molecules can be completely broken down.

4. Label the element that is oxidized, the element that is reduced, the oxidizing agent, and the reducing agent:

OIL RIG
Oxidation Is Loss
Reduction Is Gain



5. What is the function of NAD^+ (How does it assist in controlling the release of energy)?

NAD^+ is an e^- acceptor
$NAD^+ + e^- \rightarrow NADH$
> NAD allows for the stepwise collection of e^-/energy

*energy cannot all be harvested @ once, this would be inefficient

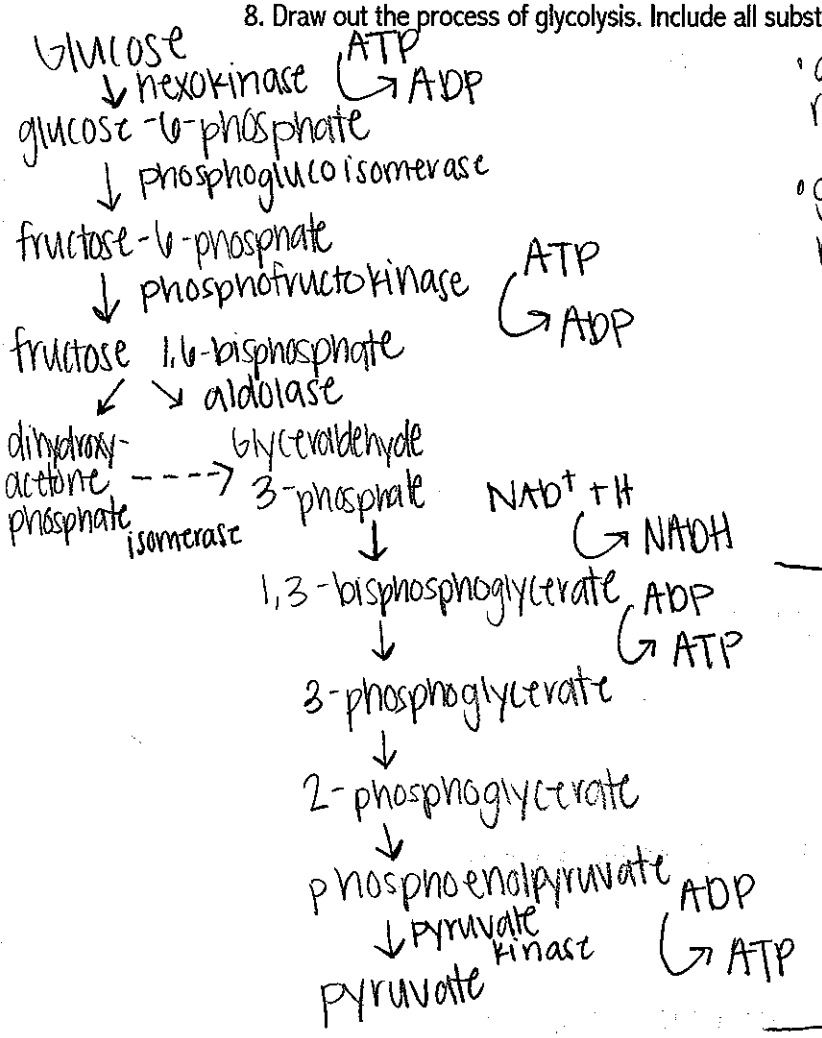
6. What is the difference between oxidative and substrate-level phosphorylation?

oxidative - the ATP that is collected via redox rxns (electron transport chain)

substrate - ATP that is formed by the transfer of a phosphate group to ADP

7. Glycolysis has two major parts: energy investment and energy payoff?

8. Draw out the process of glycolysis. Include all substrates and enzymes



- add P to substrates to make them more reactive
- glycolysis puts potential energy into the molecule

you have 2 glyceraldehyde 3-phosphate so do this x2

9. Complete the Table regarding **Glycolysis**

Where does this occur in the cell?	cytosol
What is the function?	breakdown glucose into pyruvate
What do you start with?	6-carbon glucose (need 2 ATP to make cycle go)
What do you end with?	2 pyruvate 4 ATP 2 NADH Net 2 ATP 2 NADH 2 pyruvate