Cellular Respiration (Ch.9) and Photosynthesis (Ch. 10)
Review

Ch. 9

1. What is the relationship between photosynthesis and aerobic cellular respiration?

2. In cellular respiration, what is oxidized and what is reduced?

3. What is the role of electron carrier molecules in energy processing systems? Why are they necessary?

4. Is glucose the only molecule that can be catabolized during cellular respiration? Why do we use glucose as the model?

5. Why do hydrogen atoms accompany electrons as they are transferred in biological systems?

6. Why is it thought that glycolysis is the first catabolic pathway to have evolved in the metabolism of all cellular systems?

7. Can a cell produce enough ATP to persist by using glycolysis alone? Why or why not?

8. Why do anaerobic cellular systems use fermentation? What would happen if they didn't?

9. Why do mammalian muscle cells perform lactic acid fermentation (instead of, say, ethanol fermentation)?

10. Why food molecules need to be broken down into smaller molecules for energy to be harvested from them.

11. List the molecule that is oxidized and the molecule that is reduced in any REDOX reaction.

12. List the starting materials, end products and eventual fates of all of the molecules used and produced in glycolysis, lactic acid fermentation and ethanol fermentation.

13. Why are pyruvates converted into acetyl-coA prior to entering the Kreb's cycle? What does this conversion do to the pyruvate molecules?

14. Oxygen is not used in the Kreb's cycle, so why must the Kreb's cycle occur in aerobic cellular respiration?

15. Where in the mitochondria does oxidative phosphorylation occur? Why does it occur there?

16. What products of the prior phases of cellular respiration are used in the electron transport chain? How are they used?

17. Diagram the movement of an electron through the electron transport chain in a mitochondrion. Include its source, destination, and all products made directly and indirectly.

18. Compare and contrast the processes of chemiosmosis in aerobic cellular respiration and photosynthesis.

19. How much more energy is produced by aerobic cellular respiration than by anaerobic cellular respiration?

20. Compare and contrast the metabolism of glucose with the metabolism of complex carbohydrates, proteins & fats.

    a. Explain where each molecule (or component of the molecule) enters the aerobic cellular respiration pathway, and order each in terms of the amount of energy they produce for the cell.

21. The starting materials, end products, and eventual fates of all of the molecules used and produced in the acetyl-coA cycle, the Kreb's cycle and oxidative phosphorylation.

22. The relationship between the evolution of photosynthesis, the evolution of oxidative phosphorylation, and the evolution of multi-cellular life.

23. The meaning of the term "proton-motive force".

24. The relationship between the catabolic pathways of cellular respiration and the anabolic pathways of biosynthesis.

Ch. 10

1. Explain the relationship between the light reactions and the Calvin cycle in photoautotrophs.

2. What is the function of the Magnesium atom in a chlorophyll molecule?

3. Where do replacement electrons come from in photosystem II?

4. Diagram the flow of an electron from photosystem II to eventually winding up in a molecule of NADPH.

5. Explain how ATP is produced in photosynthesis.

6. Why are plants green in color?

7. Compare and contrast cyclic and non-cyclic photophosphorylation. Include the products of each and the fates of those products.

8. Why is water necessary for photosynthesis?

9. Why is oxygen produced during the light reactions?

10. What happens during the Calvin cycle? How does the Calvin cycle depend on the Light reactions?

11. Explain the function of Ribulose BisPhosphate Carboxylase (aka Rubisco) in the Calvin Cycle.

12. What is G3P?

13. Looking at the net equation for photosynthesis of one molecule of glucose, what molecules are oxidized, and what molecules are reduced?

14. Why do plants need to control the loss of water? How is this done?

15. Explain the phenomenon of photorespiration, why it is thought to occur (evolutionarily speaking), and why plants have evolved to minimize its occurrence.

16. Why are C4 and CAM plants typically found in hot climates?