**5. Cellular Respiration homework**

Name and date submitted (3 pts):

Instructions: Using this template, type or write your answers below, and turn in by the due date.

(33 questions, 100 points)

Questions 1-7: these can all be researched from your textbook, although you are free to use the Internet.

1. A “catalyst” serves to speed up a chemical reaction. In living organisms, catalysts are called “enzymes”. Research and explain what an enzyme is and how it works, in 3-4 well-written sentences.
2. The ATP molecule is called the “battery of the cell” because it supplies energy for all the cell’s needs. (ATP = adenosine triphosphate). Describe the structure of ATP.
3. Why does your body need ATP? Why can’t your cells just take their energy directly from Glucose, for example? (Glucose is blood sugar).
4. How does ATP work?
5. Cellular Respiration is the 3-stage process that occurs in all animal and plant cells to obtain energy from Glucose.

The overall reaction for cellular respiration is:

C6H12O6 + 6O2 → 6H2O + 6CO2 + 36-38 ATP (energy)

Give the names for the first four (4) compounds in the reaction above, going left-to-right:

i.

ii.

iii.

iv.

1. True/False questions.
2. Cellular respiration occurs in all plant and animal cells.
3. Cellular respiration is the process by which plant and animal cells (eukaryotic cells) obtain the energy needed to grow, repair, reproduce, and function.
4. Cellular respiration describes the process by which glucose is broken down into smaller pieces within the cells, releasing energy for the organism to function
5. In cellular respiration, glucose is combined with oxygen to produce water, carbon dioxide, and energy.
6. The waste products of cellular respiration are water and carbon dioxide, which must be removed from the cells.
7. Six (6) molecules of oxygen are needed to “burn” one (1) molecule of glucose.
8. Six (6) molecules of carbon dioxide are produced by the break-down of each one (1) molecule of glucose.
9. 36-38 molecules of ATP (adenosine triphosphate) molecules are created with the break-down of each one (1) molecule of glucose.
10. Some Biology students placed living freshwater Algae cells (an aquatic plant) in a covered test tube containing water and nutrients. The beginning pH of the water was carefully measured at pH = 8.0. (Below 7.0 is acidic, above 7.0 is basic, and exactly 7.0 is neutral). They placed the test tube in a dark box to prevent Photosynthesis from occurring. The students then carefully measured the pH of the water in the test tube every 5 minutes over a period of 2 hours, and plotted the results on graph paper.
11. Assuming that cellular respiration takes place in the Algae cells, will the CO2 concentration in the surrounding water increase or decrease? You can refer to the reaction in question #3, above.
12. The students recalled from a lab in Biology class that increasing CO2 levels in water lead to more acidity. On the flip side, decreasing CO2 levels in water lead to more basicity. In this experiment, will the students see the pH in the Algae-water gradually increase with time, or decrease with time?

Questions 6-31: Refer to the 4-minute ‘Cellular Respiration Bioflix’ video posted in Unit 5.

1. Why does the bike rider’s breathing rate need to increase? Explain from the standpoint of biology. (0:05 and following)
2. Where is his breakfast “fuel” burned? (0:05 and following)
3. How is fuel and oxygen delivered to his muscle cells? (0:05 and following)
4. Exactly how does the glucose molecule and oxygen molecule enter his muscle cell? (0:43 and following)
5. How many carbon atoms are in a raw glucose molecule? (around 0:46)
6. The first step of cellular respiration is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_ (around 0:50). Where does this first step take place in the muscle cell?
7. In the “energy investment phase”, how many ATP molecules (the yellow stars) must be used for a single glucose molecule? (around 0:55)
8. The glucose molecule is then split in half to form 2 molecules of \_\_\_\_\_ (a number) carbon atoms each. (around 0:58)
9. NAD+ molecules called “electron carriers” are loaded with electrons and become \_\_\_\_\_\_\_\_\_\_\_\_. (1:00 and following)
10. In the final step of glycolysis, called the “payoff phase”, how many NET ATP molecules are produced for each glucose? By NET, I mean how many are produced in the “payoff phase” LESS the “investment phase”? (1:17 and following)
11. The 3-carbon molecules are called \_\_\_\_\_\_\_\_\_\_\_\_\_. (around 1:30)
12. How does the 3-carbon molecule then enter the mitochondrion? (1:37)
13. What happens to the 3-carbon molecule right after entering the mitochondrion? (1:45 and following)
14. What is the byproduct formed? (around 1:46)
15. What does Coenzyme-A do to the 2-carbon molecule? What does it form? (1:55)
16. How many carbon dioxide molecules are produced right away from the new 6-carbon molecule? (about 2:15-2:25)
17. What happens to this carbon dioxide? (2:25 and following)
18. How many additional ATP’s are produced from the Krebs Cycle (also called the Citric Acid Cycle) from each original glucose molecule? (2:30 and following)
19. Only a few ATP’s are produced in the Krebs Cycle, but the real energy being extracted at this point is being carried in the form of what? (2:36 and following)
20. The Electron Transport Chain is located precisely where? (2:55 and following)
21. The Chain consists of what, exactly? Describe. (3:08 and following)
22. Explain, as best you can, what’s going on in the Electron Transport Chain. I know this is complicated, but study this section of the video and describe as best you can. (3:22-3:50)
23. Study the ATP Synthase turbine (3:50 and following). What powers the turbine?
24. Specifically what does the spinning turbine do? (4:03 and following)
25. Cellular respiration generates or “charges up” how many ATP’s per second in each cell? (4:08)
26. Why does the biker (and you) need ATP? (4:17-4:25)