**Cellular Respiration questions**

Instructions: Using this template, type or write your answers below. KEEP THE SAME NUMBERING SYSTEM or you will have points deducted! The questions come right out of the BJU Biology book. Upload your completed work to Canvas by the due date.

(50 questions, 100 points, average 2 points per question)

1. Organisms that make their own food are called A\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. Organisms that depend on other organisms for their energy are called H\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
3. “Plants” are which one of the above two?
4. “Humans” are which one of the above two?
5. “Bacteria” are which one of the above two?
6. “Algae” are which one of the above two?
7. The energy currency in cells is \_\_\_\_\_\_\_\_\_\_\_\_.
8. What is adenosine triphosphate known as?
9. What is going on in this reaction? Explain what’s going on.

ATP → ADP + P + energy

1. What is going on in this reaction? Explain what it is.

ADP + P + energy → ATP

1. ATP and muscle cells:
   1. Why do muscles need ATP?
   2. Why can’t ATP be brought to the muscles through the blood?
2. A normal adult male uses about 2800 kcals of energy each day…
   1. requiring about \_\_\_\_\_\_\_\_\_ kg of ATP to be made in his cells each day.
   2. This requires about \_\_\_\_\_\_\_\_\_\_\_ molecules of ATP to be used and regenerated every second in a typical muscle cell.
3. Why do your cells need little ATP “batteries”? Why can’t your cells just take their energy directly from starch or lipids you eat? Because \_\_\_\_\_\_\_\_\_\_\_\_

SKIP “PHOTOSYNTHESIS” (for now). GO TO 4.3 “CELLULAR RESPIRATION”

1. True/false: Aerobic cellular respiration can be compared to burning.
2. The process of combining water, carbon dioxide, and light energy to form glucose is known as \_P\_\_\_\_\_\_\_\_\_\_\_\_\_.
3. The process of using oxygen to break down glucose in the cell, and release carbon dioxide and water is known as A\_\_\_ \_\_\_C\_ \_\_\_\_\_R\_ \_.
4. The process of capturing light energy and converting it to stored chemical energy is known as P\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
5. 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. True/False questions.
   1. The waste products of cellular respiration are water and carbon dioxide, which must be removed from the cells.
   2. Six (6) molecules of oxygen are needed to “burn” one (1) molecule of glucose.
   3. Six (6) molecules of carbon dioxide are produced by the break-down of each one (1) molecule of glucose.
   4. 36-38 molecules of ATP (adenosine triphosphate) molecules are created with the break-down of each one (1) molecule of glucose.
7. Step 1 of cellular respiration is known as “Glycolysis”:
   1. It involves the breakdown of one glucose molecule into p\_\_\_\_\_\_\_\_\_\_\_\_\_ acid.
   2. Because this step doesn’t require oxygen, it’s considered \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
   3. The products of glycolysis are shuttled to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to continue cellular respiration.
   4. The ‘net’ energy production of glycolysis is \_\_\_\_\_\_ molecules of ATP and \_\_\_\_\_\_\_\_\_\_ molecules of NADH
8. Step 2 of cellular respiration is known as the “Krebs Cycle”:
   1. The pyruvic acid produced by glycolysis diffuses into the M\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. (the name of an organelle)
   2. In this organelle, the pyruvic acid is broken down with enzymes all the way down to CO2 and additional energy. Where does the CO2 go?
9. Step 3 of cellular respiration is known as the “electron transport chain” (sometimes the term ‘oxidative phosphorylation’ is used).
   1. The electron carrier molecules FADH2 and NADH finally release their ‘high energy electron cargo’. This energy is used to spin a mechanical turbine which charges up lots of ATP batteries. This mechanical turbine made of protein molecules is known as \_\_\_\_\_\_\_\_\_\_ Synthase.
   2. So, for each glucose molecule which enters the cell, Glycolysis produces a net 2 ATP batteries, the Krebs Cycle produces another net 2 ATP batteries, and the electron transport chain produces another \_\_\_\_\_\_\_\_\_\_\_\_\_ ATP batteries.

NOW CONSIDER THIS SCENARIO:

1. 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. (Remember that < 7.0 is acidic, > 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.
2. Assuming that cellular respiration takes place in the Algae cells (yes, it should), will the CO2 concentration in the surrounding water increase or decrease?
3. The students recalled from a lab in Biology class that increasing CO2 levels in water lead to more acidity. 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?

FINAL QUESTIONS: Watch the ‘Cellular Respiration Bioflix’ video posted on the student portal.

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)