

Cellular Respiration Concept Questions

1. Describe how photosynthesis and cellular respiration are reverse processes.
2. How are mitochondria adapted to carry out cellular respiration?
3. Cells that are more active have a higher number of mitochondria. Why would this be?
4. Cellular respiration uses glucose, a high energy molecule and produces CO₂ and water, low energy molecules.
 - a) Is it spontaneous?
 - b) Is it exergonic?
 - c) What happens to the energy released from glucose?
5. Why is it important for energy-releasing reactions to take place in living cells?
6. Differentiate between oxidation and reduction reactions.
7. a) Describe how ADP is converted into ATP.
 - b) Why are oxidation reactions often coupled to the production of ATP?
8. Cellular respiration provides the energy for the synthesis of ATP but the first steps of glycolysis actually use ATP. Why is this so?
9. Explain how the citric acid (Krebs) cycle contributes to the production of ATP.
10. When you exhale, your breath contains carbon dioxide. Where did this come from?
11. Why is an electron transport system important to living organisms?
12. Explain how energy is released in a slow, controlled fashion through the ETC.
13. Why is cellular respiration considered to be more efficient than glycolysis alone?
14.
 - a) When do animal cells perform photosynthesis?
 - b) When do plant cells perform photosynthesis?
 - c) When do animal cells perform cellular respiration?
 - d) When do plant cells perform cellular respiration?
15. Compare and contrast alcoholic fermentation in yeast cells, lactic acid fermentation (in human cells), and glycolysis.
16. Think of the difference between alcohol fermentation in yeast and lactic acid fermentation in humans. What would be the result if an enzyme in your body removed the carbon dioxide from pyruvate before lactic acid formed?
17. a) Under what conditions does lactic acid fermentation occur in muscles?
 - b) How can we tell that the fermentation is occurring?
18. After a heart attack, small amounts of lactic acid can be found in heart muscle cells. What does this evidence suggest about the nature of a heart attack?
19. Complete the chart below:

| | Aerobic Respiration | Anaerobic Respiration |
|-------------------------------|---------------------|-----------------------|
| a) net amount of ATP produced | | |
| b) terminal electron acceptor | | |
| c) location in cell | | |
| d) final products | | |

20. Hard (or distilled) liquor is available at concentrations of up to 75% alcohol but the maximum alcohol concentration in wine is usually no more than 12-14%. Explain.
21. If yeast cells were large organisms, they could not live anaerobically. Explain.

22. a) What happens to the NADH produced by yeast cells that are living in anaerobic conditions?
b) Why is it important for this to happen?
23. Identify the use of each of the reactants in cellular respiration and the source of each of the products.
24. How can a cell use noncarbohydrate foods such as proteins and fats as a source of energy?
25. Why is it useful for AMP to stimulate cellular respiration and ATP to inhibit it?