

AP Biology Cell Respiration Quiz Study Guide

Reading—reading for this chapter comes from chapter 8. General reading about ATP and electron transport chains comes from chapter 6.

Questions to think about...these questions are geared strictly toward preparing for your quiz. The other list you were provided has material that should help guide your reading and prepare more for the full AP exam.

- How much ATP and NADH is made with each respiratory pathway (anaerobic and aerobic)?
 - From 1 molecule of glucose, you get...
 - Glycolysis = 2 NADH, 2 ATP (net)
 - Oxidation of Pyruvate = 2 NADH
 - Krebs = 6 NADH, 2 FADH₂, 2 ATP
 - ETC = ~32-34 ATP
- Which process/processes are common to both aerobic and anaerobic pathways?
 - Glycolysis is common to both pathways and all organisms
- What causes muscle fatigue?
 - Muscle fatigue occurs when the cells run out of oxygen. Mitochondria rely on oxygen to function because the molecule is the final electron acceptor of the ETC. Without oxygen present the animal muscle cell switches to Lactic Acid fermentation. Lactate is acidic so it burns the muscles causing pain and fatigue. Also, the lack of ATP causes fatigue and cramping.
- How do FADH₂ and NADH function similarly? How are they different?
 - NADH and FADH₂ are both intermediate electron carriers for the Krebs Cycle and the ETC (NAD⁺ and FAD⁺ are considered electron acceptors—they become carriers when the H is attached)
 - FADH₂ is a carrier for lower energy electrons; it is generated in Krebs and donates its H⁺ and e⁻ to the ETC
 - NADH is a carrier for higher energy electrons; it is generated in glycolysis, pyruvate oxidation, and Krebs; donates H⁺ and e⁻ to the ETC
- What is the final electron acceptor in the electron transport chain?
 - Oxygen (it accepts the e⁻ from the membrane bound electron carriers and it accepts the H⁺ ions from ATP synthase)
- From what macromolecules would you obtain the highest amount of ATP?
 - Triglycerides (fats) - actually the breakdown of fats has a different name. It's not on your test, but for future reference, it is called Beta Oxidation ☺
- What is chemiosmosis?
 - The process where a H⁺ gradient powers (pumped thru ATP Synthase) is used to generate ATP from ADP and inorganic phosphate (already existing in the cell)
 - The H⁺ ions have their own potential energy that provides the energy for chemiosmosis
- Which respiratory process generates the most ATP?
 - The ETC (electron transport chain) followed by chemiosmosis
- Why is ATP such a useful energy storage/transfer molecule?
 - The amount of potential energy in ATP is good
 - The energy of ATP can be easily converted to a form capable of carrying out cellular work.
 - Be advised, ATP is NOT a good energy storage molecule (it is unstable) and it is not the smallest energy molecule known.
- How is the electron transport chain energized?
 - The ETC is energized by the electrons; as the electrons pass from each membrane bound carrier to the next (the cytochrome proteins), they transfer some of their energy; each protein in the ETC is more and more electronegative to encourage e⁻ to be attracted to them
 - The transfer of energy from electrons moves the H⁺ ions through the membrane into the intermembrane space

Other practice questions...some of these are relevant for the quiz, but they are more intended to guide your general studying.

Choose the one most appropriate answer for each.

- a. Produces NADH and CO_2 ; changes pyruvate
- b. Produces ATP, NADH, and CO_2
- c. splits glucose into two pyruvate molecules
- d. regenerates NAD^+ as pyruvate; is converted to ethanol or lactate
- e. uses a membrane-bound system that contains cytochromes to produce ATP

- _____ 1. glycolysis
- _____ 2. fermentation
- _____ 3. acetyl-CoA formation
- _____ 4. the Krebs cycle
- _____ 5. electron transport phosphorylation

Five Processes

Use the five processes listed below to answer the following descriptions.

- a. glycolysis
 - b. aerobic respiration
 - c. anaerobic electron transport
 - d. alcoholic fermentation
 - e. lactate fermentation
6. Refer to Five Processes. In this process the energy yield is equal to 2 molecules of ATP and the final product is ethanol.
7. Refer to Five Processes. In this process the final product is lactate.
8. Refer to Five Processes. This process yields the most energy.
9. Refer to Five Processes. This process involves electron transport phosphorylation.
10. Refer to Five Processes. This process precedes the Krebs cycle.

Five Compounds

Use the five compounds listed below to answer the following descriptions.

- a. ethanol
 - b. pyruvate
 - c. lactate
 - d. citrate
 - e. acetaldehyde
11. Refer to Five Compounds. This compound is utilized in alcoholic fermentation and lactate fermentation.
12. Refer to Five Compounds. This compound is the most likely end product of a human runner experiencing an oxygen debt.
13. Refer to Five Compounds. This compound is an intermediate product of alcoholic fermentation, but not lactate fermentation.
14. Refer to Five Compounds. This compound is the end product of glycolysis.
15. Refer to Five Compounds. This compound is an end product of anaerobic respiration in exercising muscle.

16. Four of the five answers listed below are hydrogen acceptors. Select the exception.
- Oxygen
 - Cytochrome
 - ATP
 - NAD⁺
 - FAD
17. Four of the five answers listed below are compounds associated with anaerobic respiration. Select the exception.
- Pyruvate
 - lactic acid
 - Ethanol
 - oxaloacetic acid
 - phosphoglyceraldehyde
18. Four of the five answers listed below are compounds in the glycolysis reactions. Select the exception.
- fructose-1,6-bisphosphate
 - 3-phosphoglycerate
 - Pyruvate
 - Phosphoenol pyruvate
 - Isocitrate
19. Four of the five answers listed below are intermediates in the Krebs cycle. Select the exception.
- Succinate
 - Citrate
 - Malate
 - Fumarate
 - Acetyl-CoA
20. Four of the five answers listed below are compounds in the Krebs reactions. Select the exception.
- oxaloacetate
 - Isocitrate
 - alpha-ketoglutarate
 - Pyruvate
 - succinyl-CoA
21. Four of the five answers listed below are molecules that donate hydrogens to NAD⁺. Select the exception.
- Pyruvate
 - alpha-ketoglutarate
 - Isocitrate
 - Succinate
 - Malate
22. Four of the five answers listed below are degradation processes for carbon compounds. Select the exception.
- Calvin-Benson cycle
 - Krebs cycle
 - fermentation
 - Respiration
 - Glycolysis

ANSWER KEY:

1. C
2. D
3. A
4. B
5. E
6. d
7. e
8. b
9. b
10. a
11. b
12. c
13. e
14. b
15. c
16. C
17. D
18. E
19. E
20. D
21. D
22. A