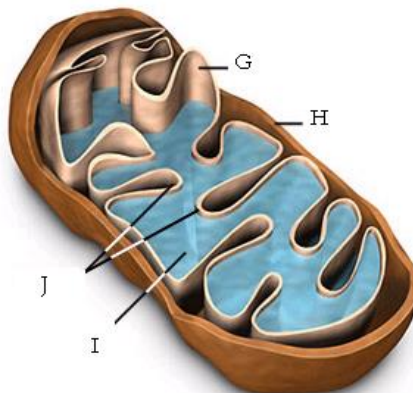


Cellular Metabolism And Fermentation Review

1. Where does glycolysis occur in the cell?
2. What goes in to glycolysis, what comes out? Which 2 high energy molecules are produced and how many of each?
3. A chain of carbons that is ____ carbons long enters glycolysis, and a chain of carbons that is ____ carbons long exits?
4. A net of ____ ATP and ____ NADH are produced in glycolysis?
5. Two 3-carbon pyruvate molecules exit glycolysis. What occurs during transition to Kreb's cycle?
6. What is gained during the transition between glycolysis and Kreb's Cycle? (How many?)
7. Where does cellular respiration occur in the cell?
8. What is anaerobic respiration?
9. What is the final product of fermentation as carried out by yeast?
10. During periods of intense activity, human muscles can become depleted of oxygen (localized anaerobic conditions). What is fermented?
11. What is aerobic respiration?
12. What two major processes will be undertaken when oxygen is present for respiration?
13. How many CO₂ are released every turn of the Kreb's Cycle?
14. Why is Kreb's Cycle also known as the Citric Acid Cycle?
15. A balance of how many carbon atoms must be maintained in the Citric Acid Cycle in order for it to continue to cycle?
16. Which 3 energy rich molecules are produced during Kreb's Cycle? (how many of each)
17. At the Electron Transport System (ETS), the NADH and FADH₂ produced in Kreb's Cycle, Transition, and Glycolysis are "cashed in" producing 36 ATP. Explain how this happens (the process is technically known as oxidative phosphorylation).
18. Why do animals like humans require oxygen?
19. One glucose is respired aerobically. Complete the chart.
- 20.

Process	Number & Type of Energy Rich Molecule	Number of ATP Produced
Glycolysis	1)	
	2)	
Transition	1)	
Kreb's Cycle	1)	
	2)	
	3)	

Label the following and indicate where each of the 3 stages of respiration occurs.



1. Where does glycolysis occur in the cell? **Cytoplasm**
2. What goes in to glycolysis, what comes out. What 2 high energy molecules are produced and how many of each? **1 glucose goes in and 2 pyruvate come out. Net gain of 2 ATP and 2 NADH are produced.**
3. A chain of carbons that is 6 carbons long enters glycolysis, and a chain of carbons that is 3 carbons long exits?
4. A net of **2 ATP** and **2 NADH** are produced in glycolysis?
5. Two 3-carbon pyruvate molecules exit glycolysis. What occurs during transition to Krebs's cycle? **Each of the two 3 carbon chains (called pyruvate) are shortened by one carbon turning into two 2 carbon chains. The carbons that are removed from each of the pyruvate are released as CO₂.**
6. What is "gained" during the transition between glycolysis and Krebs's Cycle? (How many?) **2 NADH (aka electron/proton taxi cabs) are produced.**
7. Where does cellular respiration occur in the cell? **mitochondria**
8. What is anaerobic respiration? **breakdown of pyruvate without oxygen**
9. What is the final product of fermentation as carried out by yeast? **ethanol**
10. During periods of intense activity, human muscles can become depleted of oxygen (localized anaerobic conditions). What is fermented? **lactic acid (lactate)**
11. What is aerobic respiration? **breakdown of pyruvate in presence of oxygen**
12. What two major processes will be undertaken when oxygen is present for respiration? **Kreb's cycle, ETS**
13. How many CO₂ are released every turn of the Krebs's Cycle? **2**
14. Why is Krebs's Cycle also known as the Citric Acid Cycle? **In the first step a 6 carbon molecule called citrate is formed.**
15. A balance of how many carbon atoms must be maintained in the Citric Acid Cycle in order for it to continue to cycle? **4**
16. Which 3 energy rich molecules are produced during Krebs's Cycle? (how many of each) **6 NADH, 2 GTP, 2 FADH₂**
17. At the Electron Transport System (ETS), the NADH and FADH₂ produced in Krebs's Cycle, Transition, and Glycolysis are "cashed in" producing 36 ATP. Explain how this happens (the process is technically known as oxidative phosphorylation).
The NADH and FADH₂ act like taxi cabs and drop their electrons and protons off at the ETS (they are oxidized back into NAD⁺ and FAD⁺).
 - i) **The dropped off electrons travel along the ETS pumping protons (H⁺) into the intermembrane space building the proton pressure (gradient). Eventually the electrons are picked up from the end of the ETS by an oxygen atom and join with 2 H⁺ to form water.**
 - ii) **The dropped off protons (H⁺) are pumped into the intermembrane space building the proton pressure (gradient). This proton pressure (gradient) provides the energy to convert 36 ADP into ATP.**

18. Why do animals like humans require oxygen?

Oxygen accepts the electrons from the electron transport system. Without oxygen to grab the electrons from the last carrier in the system, the entire ETS backs up. In turn there is no way for the NADH to hand over its electrons and it remains reduced instead of returning to the citric acid cycle. The citric acid cycle will eventually stop operating and the entire ATP production in the mitochondrion will cease.

19. One glucose is respired aerobically. Complete the chart.

Process	Number & Type of Energy Rich Molecule	Number of ATP Produced
Glycolysis	1) 2 ATP	2
	2) 2 NADH x 3	6
Transition	1) 2 NADH x 3	6
Kreb's Cycle	1) 6 NADH x 3	18
	2) 2 GTP x 1	2
	3) 2 FADH ₂ x 2	4

Mitochondria Structural Features

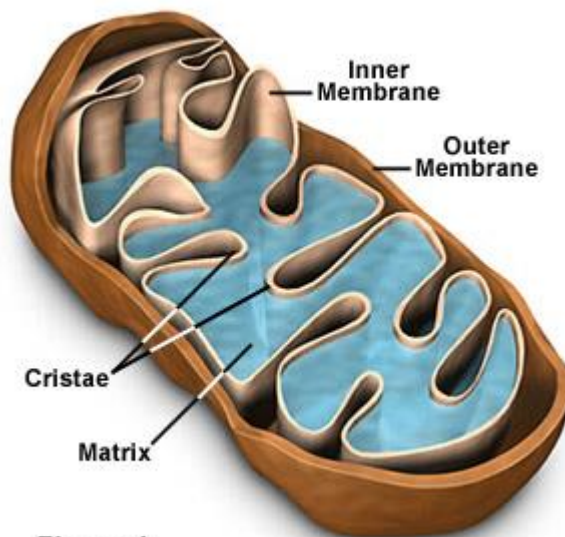


Figure 1