Biochemistry Quiz Review 4

1. The pyruvate dehydrogenase complex performs complex functions in the cell. What are all of the reactants and products of the PDC? Then, name three molecules that inhibit the activity of the PDC.

2. Show the three reactions in the citric acid cycle in which NADH is produced, including the structures. None of these reactions involves molecular oxygen (O2), but all three reactions are strongly inhibited by anaerobic conditions; explain why.

3. You are in charge of genetically engineering a new bacterium that will derive all of its ATP from sunlight by photosynthesis. Will you put the enzymes of the citric acid cycle in this organism? Briefly explain why or why not.

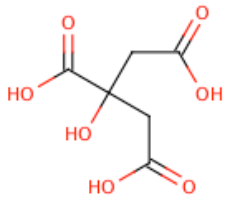
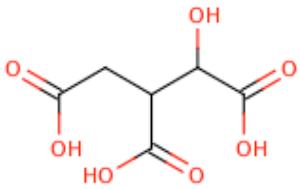
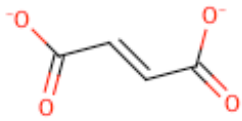
4. Glucose labeled with ^{14}C in C-3 and C-4 is completely converted to acetyl-CoA via glycolysis and the pyruvate dehydrogenase complex. What percentage of the acetyl-CoA molecules formed will be labeled with ^{14}C, and in which position of the acetyl moiety will the ^{14}C label be found?

5. What is the reaction of the citric acid cycle that is most similar to the pyruvate dehydrogenase complex-catalyzed conversion of pyruvate to acetyl-CoA?

6. The conversion of 1 mol of pyruvate to 3 mol of CO2 via pyruvate dehydrogenase and the citric acid cycle yields what amount of NADH, $FADH_2$, and ATP?

7. Glycolysis takes place primarily in the _____, while the citric acid cycle takes place primarily in the _____.

8. Completing reactions. Fill in the blanks for each reaction with reactants, enzyme, or products.

	_____ ⇆	
_____	Succinate dehydrogenase ⇆	
_____	α-ketoglutarate dehydrogenase complex ⇆	_____
_____	_____ ⇆	Phosphoenolpyruvate
_____	Triose phosphate isomerase ⇆	_____

9. The majority of the oxygen we breathe in is ultimately converted into what molecule? What enzyme or complex performs this reaction?

10. If Antimycin A were added to a suspension of intact mitochondria, along with an excess of NADH and O_2, what molecule would you expect to build up in high excess? Why?

11. In Complex III of the electron transport chain, coenzyme QH_2 is oxidized to coenzyme Q. What happens to the electrons that were on QH_2? Why does the "Q Cycle" require 2 molecules of QH_2 per cycle?

12. Explain what is meant by the term "electrochemical gradient" as it relates to electron transfer and oxidative phosphorylation.

13. What is the role of thermogenin in brown fat? What class of compound is thermogenin?

14. Briefly explain the mechanism of ATP synthase. What drives this reaction? What are the reactants and products?

15. Using a simple diagram of the chemiosmotic theory, explain why anything that makes the mitochondrial membrane leaky stops ATP synthesis in the mitochondria.

16. What reaction does a lipase enzyme catalyze?

17. Ketone bodies are largely formed in what tissue? What are the most common ketone bodies?

18. If a patient came in for a routine physical, but their blood test indicated a low blood pH and their breath had an uncharacteristic sweet smell, what disease might the patient have?

19. Stomach peptidases are produced largely as zymogens. Why is this the case?

20. There are many molecules used to transfer electrons in biological systems. Name three.