1. (12 pts) Answer the following questions.

a) Under aerobic conditions, there is a net production of \(6\) ATP in glycolysis from one glucose molecule.

b) Under anaerobic conditions in muscles pyruvic acid is converted to what molecule?

Lactate

c) Glucose consists of six carbons, but in glycolysis two acetyl coenzyme A molecules are produced which total four carbons, account for the missing two carbons.

Two are lost from CO\(_2\) production.

d) In the electron transport chain what metal is bound to proteins to act as an electron carrier? \(\text{Fe}\)

e) Which two molecules go from the citric acid cycle to the electron transport chain?

NADH \(\quad\) FADH\(_2\)

f) How many ATPs are produced from one glucose molecule and what is the molecule that is produced at the end of metabolism?

\(36\) ATP \(\quad\) \(\) H\(_2\)O

g) How many ATPs are produced from NADH and FADH\(_2\) in the electron transport chain?

\(3\) ATP \(\quad\) \(2\) ATP
h) Why does the NADH produced in glycolysis only produce two ATPs?

It has to be converted to FADH2 to cross the membrane.

b) Explain and account for the 6 ATPs that are produced when 2 pyruvates are transformed to 2 acetyl CoA.

Two NADH are produced which are converted to 6 ATP.

2. Show how many ATPs are produced from a ten carbon fatty acid?

-2 ATP Initiation

4 oxidation cycles

\[ 4 \times \text{FADH}_2 = 8 \text{ ATP} \]

\[ 4 \times \text{NADH} = 12 \text{ ATP} \]

5 Acetyl-CoA

\[ 5 \times 12 = 60 \text{ ATP} \]

Total = 78 ATP

3. (8 pts) Label the products as being oxidized or reduced. (put an O or R)

a)

\[
\text{FAD} + \begin{array}{c}
\text{C} \\
\text{H} \\
\text{H}
\end{array} \rightarrow \begin{array}{c}
\text{C} \\
\text{C}
\end{array} + \text{FADH}_2
\]

\[ \_O \_ \_ \_ \_R \_ \_ \_ \]

b)

\[
\text{NAD}^+ + \begin{array}{c}
\text{OH} \\
\text{H}
\end{array} \rightarrow \begin{array}{c}
\text{C} \\
\text{O}
\end{array} + \text{NADH} + \text{H}^+
\]

\[ \_O \_ \_ \_ \_R \_ \_ \_ \]
4. (8 pts) Predict the products of the following reaction.

a) 
\[ \text{Transaminase} \quad H_3C-C-C-CO\text{O}^- + \text{NH}_3^+ \rightarrow \text{NH}_3^+ \quad \text{OOC-C-C-C-CO}_2^- + H_3C-C-C-CO\text{O}^- \]

b) 
\[ 2\text{NH}_4^+ + \text{CO}_2 \rightarrow H_2N-C-NH_2 + 2\text{H}^+ + 2\text{H}_2\text{O} \]

5. (12 pts) Answer the following questions based on the following compound.

\[ \text{Compound} \]

a) What is the name of this compound? **Coenzyme Q**

b) Draw arrows to the portion of this molecule that reacts and write the species it reacts with.

c) What is the function of this compound?

**To transport H and e' from FMNH}_2 or FADH}_2 between the first and second complex in the e' transport chain.**

6. Answer the following questions.

a) What type of bonding holds the two, strands of DNA together as a double helix?

**H-bonding.**

b) Which form of RNA carries the needed amino acids to the ribosomes for use in protein synthesis?

**t-RNA**
c) Name the structures on which protein synthesis occurs.
   mRNA, tRNA, rRNA

d) What are the three parts of a nucleotide?
   Ribose sugar, phosphate, base

e) Which pyrimidine base is normally found in RNA but not in DNA?
   Uracil

7. a) If a gene had the nucleotide sequence what would the sequence of the mRNA be?

   5’- TACCTAGCTCTCTGG-3’
   3’- AUGGAUCGAGAGACC-5’

b) What does the 5’ and 3’ symbols represent?

   5’ refers to carbon 5 on the ribose sugar that is attached to the phosphate.
   3’ refers to carbon 3 on the ribose sugar is the free hydroxy group (-OH).