SHOW ALL CALCULATIONS. USE PROPER SIGNIFICANT FIGURES AND UNITS

Multiple Choice Questions: Circle the single best answer. No penalty for guessing.

1. Which of the following may not be oxidized to make a carboxylic acid? (5 points)
   A) CH₃CHO  B) CH₃CH₂OH  C) CH₃CH₂CHO  D) CH₃COCH₃  E) None of these

2. Which of the following is a secondary amine? (5 points)
   A) NH₂CHO  B) NH₂CH₂CH₃  C) CH₃OH  D) (CH₃)₂N  E) CH₃NHCH₂CH₃

3. How many g of NaOH (MW = 40.0) are required to titrate 10.0 g of CH₃COOH (MW = 60.0) to a neutral pH? (5 points)
   A) 60.0 g  B) 40.0 g  C) 15.0 g  D) 10.0 g  E) 6.67 g

4. What is the C–C–O bond angle in a CH₃CHO molecule? (5 points)
   A) 180°  B) 120°  C) 109°  D) 90°  E) 45°

5. Which of the following is a ketopentose? (5 points)
   A) CH₂OHCOCHOHCH₂OH  B) CH₂OHCHOHCHOHCHOHCHO
   C) CH₂OHCHOHCHOHCHO  D) CH₂OHCHOHCHOHCOCH₂OH  E) CH₂OHCOCH₂OH

6. When an aldohexose (such as glucose) undergoes ring closure, what is formed? (5 points)
   A) hemiacetal  B) acetal  C) hemiketal  D) ketal  E) muck

7. Which of the following molecules is non-saponifiable? (5 points)
   A) steroid  B) esters  C) triacylglyceride
   D) sphingolipid  E) waxes

8. Draw the structure that is formed when CH₂OHCHOHCHOHCHOHCHO (shown below) undergoes ring closure. (6 points)

   ![Structure](image)
9. Draw two different isomers that are amines (one tertiary and one primary) and have the formula $C_5H_{11}N$ (5 points each)

10. Describe (use pictures and words) the structure of a lipid bilayer and how such a structure is used by a cell to create a cell membrane. (10 points)

11. Describe (in pictures and words) the difference between an $\alpha$(1-4) and an $\alpha$(1-6) linkage between two glucose rings: (15 points)
12. What are the products when the following lipid is saponified with excess NaOH. (15 points)

![Lipid structure]

13. Write the products of the following reactions: (14 points)

\[
\text{CH}_2=\text{CH}-\text{COCH}_3 + \text{HOCH}_2-\text{CH}_2-\text{CH}_2\text{OH} \rightarrow \]

\[
\text{CH}_2=\text{CH}-\text{COCH}_3 + \text{[O]} \rightarrow \]

14. In your own words describe how unsaturated fatty acids differ from saturated fatty acids and why (chemically) one or the other is better for your health. (15 points)