1. Circle the compound with higher boiling/melting point in the following pairs. (6 pts)

a) \[ \text{CH}_2\text{COOH} \quad \text{CH}_2\text{COONa} \]

b) \[ \text{O}_2\text{N-CH}_2\text{COOH} \quad \text{CH}_2\text{COOH} \]

c) \[ \text{HO-CH}_3 \quad \text{HO-CH}_3 \]

2. Digoxin (below) is used for congestive heart failure. Write the Kier – Hall electronegativity value and hybridization state of each non-hydrogen atom marked ‘a’ through ‘f’ (6 pts)

3. A hydrogen – bond is formed between two strongly electronegative atoms that sandwich a hydrogen atom. For example, structures of the type N-H….O and F…..H-N represent hydrogen bonds. (4 pts)
4. Rank these molecules according to their pKa values. (1 for least pKa value and 4 for highest). NOTE: Each structure shown is a salt form of the parent amine. (8 pts)

\[
\begin{align*}
&\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_3\text{Cl} \quad \text{O}_2\text{NCH}_2\text{CH}_2\text{CH}_2\text{NH}_3\text{Cl} \quad \text{CH}_3\text{CH}_2\text{NO}_2\text{CHNH}_3\text{Cl} \quad \text{CH}_3\text{NO}_2\text{CHCH}_2\text{NH}_3\text{Cl} \\
&4 \quad 3 \quad 1 \quad 2
\end{align*}
\]

5. In stomach, haloperidol (below) will primarily exist in the acid (acid/base) form. (4 pts)

![Haloperidol](image)

(Antipsychotic drug)

6. Rank the following molecules according to their acidity (1 for the least acidic and 3 for the most) (6 pts)

\[
\begin{align*}
&\text{Br} \quad \text{NO}_2 \quad \text{CHO} \\
&1 \quad 3 \quad 2
\end{align*}
\]

7. In the following structures, circle an ionizable functional group(s) (pH range 0 – 14) and indicate their approximate pKa value. Please NOTE. -1 point for every wrong answer! (8 pts)

![Functional Groups](image)

8. Write the common name of the following natural amino acid residues. (8 pts)

\[
\begin{align*}
&\text{alanine} \quad \text{serine}
\end{align*}
\]