1. (6 pts) Give the IUPAC name for following compounds

- \[
\begin{align*}
\text{pentanal} \quad &\quad \text{pentanal} \\
\text{4-heptanone} \quad &\quad 4\text{-heptanone}
\end{align*}
\]

2. (4 pts) a. Draw the structure of an amide that has a molecular formula of \( C_4H_7NO \). Be sure to depict all lone pair electrons.

   b) (4 pts) Show how this amide would hydrogen bond with water (show \( \delta^+ \) and \( \delta^- \) on the appropriate atoms)

3. (8 pts) For the compound below circle and name all the functional groups

   a. (3 pts) If NaOH (sodium hydroxide) were added to this compound show which functional group would react with the base to form a salt. Draw the carboxylate salt that would be formed in the space on the right.
4. (4 pts each) For the reactions below, draw the products.

\[
\begin{align*}
\text{C}_{6}H_{5}COOCH_{2}CH_{3} + H_{2}O & \xrightarrow{H+} \text{C}_{6}H_{5}COH + HOC_{2}H_{5}CH_{3} \\
\text{CH}_{3} \text{CH} & \xrightarrow{H+} \text{CH}_{3}CH_{2}OCH_{2}CH_{3} + H_{2} \\
\text{C}_{6}H_{11}COCH_{3} & \xrightarrow{HCl} \text{C}_{6}H_{11}COCH_{3} + \text{H}_{2} \\
\text{C}_{6}H_{11}COCH_{3} + H_{2}O & \xrightarrow{H+} \text{C}_{6}H_{11}COH
\end{align*}
\]

5. (5 pts) Draw the amino acids tyrosine (Tyr) **Show both possible** enantiomeric forms, D and L (you can use Fisher projections).

Make sure it is in the Zwitterion form

\[
\begin{align*}
\text{(L)} & \quad \text{(D)}
\end{align*}
\]
6. (8 pts) Draw the structure of the tripeptide Ser-Phe-Leu

**Circle** the peptide bond(s). **Note which end** is the C terminus and which is the N terminus.

7. a. (4 pts) Name the peptide below by the 3 lettered abbreviated amino acid notation (as in the previous question).

b. (6 pts) If the peptide above was reacted with water under acidic conditions (hydrolysis), show the products that would be formed.

Cys - Gly - Phe - Ala

→ Breaks down into individual Amino acids
8 (5 pts) For each compound shown below, circle all the ‘chiral’ carbons (some may not have any)

9 (10 pts) For the statements below circle true or false:

(T/F) A Chiral object does not have a plane of symmetry
(T/F) A Chiral object (or molecule) is not superimposable upon its mirror image.
(T/F) Enantiomers are mirror images of each other and are superimposable.
(T/F) The amino acid glycine has a chiral carbon.
(T/F) A chiral carbon atom does not have a plane of symmetry.

10 (5 pts) List 3 biological functions of Proteins.
11 (10 pts) Circle what is true or false about proteins.

(T/F) The α helix is considered a secondary structure of a protein
(T/F) The B-Pleated sheet is considered a primary structure of a protein.
(T/F) Hydrogen bonding occurs in both an α helix and B-Pleated sheet
(T/F) The α Helix is held together by hydrogen bonding.
(T/F) Proteins are amino acid bonded together by ester bonds.

12. (2 pts) Which amino acid is responsible in forming a disulfide link in a protein?  

Cysteine

13. (4 pts) In the depictions below state which are α helixes and B-Pleated sheets.