1. Write the systematic name for the following heterocycles.

- For the first heterocycle:

- For the second heterocycle:

- For the third heterocycle:

- For the fourth heterocycle:

2. Rank the following according to their stability to ring opening conditions, e.g., high temperature, strong acids, etc. Use 1 for least stable and 3 for most stable. **NOTE: The entire sequence has to be correct, otherwise zero points.**

3. Rank the following according to their stability to acidic conditions, e.g., H₂O/H⁺. Use 1 for least stable and 3 for most stable. **NOTE: The entire sequence has to be correct, otherwise zero points.**

4. Whereas ________________________ isomers can be obtained by mere rotation around single bonds, to interconvert ________________________ isomers one has break bonds.
4. Draw the structure of products formed in the following reactions. If no product is formed, write none.

\[
\text{Hydrolytic Enzyme} \quad \begin{array}{c}
\text{pH 7.2 - 7.4} \\
\end{array}
\]

\[
\text{Epoxide Hydrolase} \quad \begin{array}{c}
\text{pH 7.2 - 7.4} \\
\end{array}
\]

6. Following is a chair form of a monosaccharide. Draw its conformational isomer that might exist in equilibrium. Circle the conformation that is expected to be more stable. Justify your choice in not more than 2 or 3 sentences.

\[
\text{HOCH}_2
\]

7. For the structure below, draw the appropriate tautomer that may exist in equilibrium. What is this tautomerism called?

\[
\text{HO}
\]

8. Circle each chiral center in the following molecule. **Please mark each center clearly and distinctly.**

\[
\text{H}_3\text{C}
\]

\[
\text{H}_3\text{C}
\]

\[
\text{H}_3\text{C}
\]

\[
\text{H}_3\text{C}
\]

\[
\text{H}_3\text{C}
\]
9. What is the Cahn-Ingold-Prelog identification (the R or S form) of the following stereoisomer?

![Chemical Structure]

10. Clearly define the following terms in not more than 2 to 3 sentences.

Enantiomers: ________________________________________________________________

___________________________________________________________________________

___________________________________________________________________________

Diastereomers: _____________________________________________________________

___________________________________________________________________________

___________________________________________________________________________