1. A. Complete the following reactions to form a glycoside: (4 pts)

\[
\text{CH}_2\text{O}H + \text{CH}_2\text{OH} \rightarrow \text{CH}_2\text{O}H + \text{H}_2\text{O}
\]

\[
\beta-\text{D-glucose in Haworth or chair form}
\]

B. Show the alternative reaction sequence that you could use to assure that only the beta-glycoside of the above was formed? (2 pts) (Use Haworth or chair forms)

2. A. Draw both chair conformations of the alpha-pyranose form of an aldohexose that is epimeric to D-glucose at C3 and C4. (3 pts)

B. What is the name of this sugar? ________________

3. Complete the following reaction: (5 pts)

\[
\text{HCN} \rightarrow \text{Ac}_2\text{O}
\]

The starting material above is a:
A. L-aldotriose  B. D-aldotriose  C. L-ketotriose  D. D-ketotriose

4. Complete the following reactions: (4 pts)

\[
\text{Ac}_2\text{O} \rightarrow \text{Cu}^{+2}, \text{NaOH}
\]

\[
\alpha-\text{D-fructose}
\]
5. A disaccharide forms a silver mirror with Tollens’ reagent and reacts with a β-glycosidase (an enzyme that catalyses the hydrolysis of β-glycoside linkages). When the disaccharide is treated with excess methyl iodide in the presence of Ag₂O and then hydrolyzed with water, two products are formed: 2,3,4-tri-O-methylmannose and 2,3,4,6-tetra-O-methylgalactose. **Show the reactions** (both Tollen’s and with CH₃I) **and draw the chair or Haworth structures of the disaccharide and products.** (Mannose is epimeric to glucose at C-2; Galactose is epimeric to glucose at C-4). (4 pts)

6. Compare and contrast amylose and cellulose. (Show chair structures with at least 3 units showing repeatability; compare properties. (6 pts)

<table>
<thead>
<tr>
<th>Amylose Structure</th>
<th>Cellulose Structure</th>
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<tbody>
<tr>
<td>Properties</td>
<td>Properties</td>
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7. Dextran is a polysaccharide of D-glucose with predominately α-1,6 linkages. Draw a segment of dextran. (Show chair structures with at least 3 units showing repeatability) (2 pts)