- Draw the constitutional formula(s) of the major organic product(s) formed in each of the following reactions.

<table>
<thead>
<tr>
<th>Reaction</th>
<th>Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\text{CH}_2=\text{CH}_2 + \text{HBr}$</td>
<td>$\text{CH}_3\text{CH}(_2\text{CH}_2\text{CH}_3)\text{CH}_3\text{CH}_2\text{Br}$</td>
</tr>
<tr>
<td>$\text{CH}_3\text{CH}(_2\text{OH})\text{CH}_3 + \text{conc. H}_2\text{SO}_4$</td>
<td>$\text{CH}_3\text{CH}(_2\text{CH}_2\text{CH}_3)$</td>
</tr>
<tr>
<td>$\text{OH}$ $\text{Cr}_2\text{O}_7^{2-}$ / $\text{H}^+$ / $\text{H}_2\text{O}$</td>
<td>$\text{H}_2\text{O}$</td>
</tr>
</tbody>
</table>
- Compound Z can readily be identified by \(^1\)H NMR spectroscopy.

\[ Z \]

How many signals would you expect to see in the \(^1\)H NMR spectrum of compound Z?

Write the letters a, b, c, etc on the diagram of compound Z to identify each unique hydrogen environment giving rise to a signal in the \(^1\)H NMR spectrum.

Sketch the \(^1\)H NMR spectrum for compound Z. Label each signal in the spectrum with a, b, c, etc to correspond with your assignments on the diagram of Z above. Make sure you show the relative number of hydrogens and the splitting pattern (number of fine lines) you would expect to see for each signal.
• Draw the constitutional structure of the major organic product formed in the following reactions. Indicate the correct isomer where appropriate.

\[ \text{Cyclic alcohol} + \text{Cr}_2\text{O}_7^{2-} / \text{H}^+ \rightarrow \]
• Draw the constitutional formula of the major organic product formed in each of the following reactions.

\[ \text{OH} \quad \text{Cr}_2\text{O}_7^{2-} / \text{H}^+ \]

\[ \text{OH} \quad \text{conc. HBr} \]

THE REMAINDER OF THIS PAGE IS FOR ROUGH WORKING ONLY.