Mechanisms aren’t difficult to remember if you understand the principles behind them. Just learning the arrows doesn’t help, you need to develop chemical common sense and decide what is sensible based on electron flow. To do this you need to know areas of high electron density and low electron density.

1. Assign $\delta^+$ and $\delta^-$ to the following bonds. (6 marks)

2. Draw curly arrows to show how electrons move in the following transformations (you don’t need to have learnt these mechanisms, look at what’s happening and use your intuition!) (4 marks)
5.1.5

1. \[
\delta^+ \quad \delta^-
\]
   \[
   \begin{array}{c}
   \text{H-Br} \\
   \end{array}
   \]
   \[
   \delta^+ \\
   \delta^-
   \begin{array}{c}
   \text{C=O} \\
   \end{array}
   \]
   \[
   \begin{array}{c}
   \text{O-H} \\
   \delta^-
   \end{array}
   \]

   Two marks each

2. \[
\begin{array}{c}
\text{H} \\
\text{C=H} \\
\text{H}
\end{array}
\]
   \[
   \begin{array}{c}
   \text{Br-Br} \\
   \end{array}
   \]

   One mark each arrow

\[
\begin{array}{c}
\text{O} \\
\text{R} \\
\text{C=Cl}
\end{array}
\]

\[
\begin{array}{c}
\text{R} \\
\text{C=Cl} \\
\text{N=H} \\
\text{H} \\
\text{NH}_3
\end{array}
\]

One mark each arrow

5.1.6

<table>
<thead>
<tr>
<th>Electrophiles (electron deficient molecules and positive ions)</th>
<th>Nucleophiles (molecules with lone pairs and negative ions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( H^+ )</td>
<td>( \text{CH}_3\text{NH}_2 )</td>
</tr>
<tr>
<td>( \text{BF}_3 )</td>
<td>( \text{NH}_3 )</td>
</tr>
<tr>
<td>( \text{H}_3\text{O}^+ )</td>
<td>( \text{CN}^- )</td>
</tr>
<tr>
<td>( \text{AlCl}_3 )</td>
<td>( \text{H}_2\text{O} )</td>
</tr>
<tr>
<td>( \text{NO}_2^+ )</td>
<td>( \text{OH}^- )</td>
</tr>
</tbody>
</table>

5.2.1

1. \( \text{CH}_4 \) and LPG in Gases (2)
   
   Octane in petrol (1)
   
   \( \text{C}_{20-30} \) in lubricating oil (1)
   
   Fuel for ships in residues (1)

2. T C T C C (5)

5.2.2

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