1. Give the IUPAC name for each of the following compounds.

- 3-methoxy-2-methylpentanal
- 4-hydroxybutanoic acid
- Propionyl chloride
- 3-isopropyl-4,5-dimethylhex-2-one
- Sodium benzoate
- Acetic butanoic anhydride
- L-levulinyl L-methylpropionate
- N,N-dimethylbenzylamide

2. Which is the stronger acid, acetic acid or chloroacetic acid? Explain your answer.

Chloroacetic acid is stronger. The Cl is electron withdrawing and so the C-O is weaker. This weakens the O-H bond of the acid and hence makes it donate the H+ more easily.
3. Give a general mechanism and the products of the following reactions. What type of reaction is each? Why are the reactions so different?

a) 
\[ \overset{\text{Nu}}{\text{R}} + H+ \rightarrow RCHH + O^- \quad \overset{\text{Nu addition}}{\text{Nu addition occurs because there is no good L.E.}} \]

b) 
\[ \overset{\text{Nu}}{\text{R}} + O\text{O}^{-} \rightarrow RCONu + O\text{O}^{-} \quad \overset{\text{Nu Substitution}}{\text{Nu substitution occurs there is a good L.E.}} \]

4. Rank the following in order of their reactivity in nucleophilic substitutions (1=most reactive, 4=least reactive). Explain your reasoning.

\[ \overset{\text{O}}{\text{C}} \overset{\text{Cl}}{\text{O}} \overset{\text{NH}_2}{\text{C}} \]

H6. Reactivity is dependent on the basicity of the H6. The weaker the base the better the L.E. The more reactive the derivative is.

5. Identify the following as an acetal, hemiacetal or neither. For the acetals and hemiacetals show the compound(s) that would be used to form them.

\[ \overset{\text{acetal}}{\text{acet}} \quad \overset{\text{neither}}{\text{neither}} \quad \overset{\text{hemiacetal}}{\text{hemiacetal}} \]
6. Show how you would make the following alcohols using a Grignard reaction. **Show all the possibilities!**

![Grignard reaction diagram]

7. Give the products of the reaction of acetaldehyde with each of the following reagents.

![Acetaldehyde reactions diagram]

8. Give the products of the reaction of the acid chloride with each of the following reagents.

![Acid chloride reaction diagram]
9. Give the products of the following hydrolysis reactions.

\[
\begin{align*}
\text{O} & \xrightarrow{\text{H}_3\text{O}^+} \text{H}_2\text{O} + \text{CH}_3\text{OH} \\
\text{OH} & \xrightarrow{\text{NaOH}} \text{Na}^+ + \text{CH}_3\text{OH} \\
\text{O} & \xrightarrow{\text{H}_3\text{O}^+} \text{H}_2\text{O} + \text{CH}_3\text{NH}_3 \\
\text{OH} & \xrightarrow{\text{NaOH}} \text{Na}^+ + \text{CH}_3\text{NH}_2
\end{align*}
\]

10. Complete the following reactions by providing either the necessary reagents or the products.

\[
\begin{align*}
\text{H}_3\text{O}^+ & \xrightarrow{\text{OH}} \text{H}_2\text{O} + \text{CO}_2 \\
\text{MgBr} & \xrightarrow{\text{H}^+} \text{OH} \\
\text{PCC} & \xrightarrow{\text{NH}_3} \text{H} \\
\text{H}_2 & \xrightarrow{\text{Pt}} \text{C} \xrightarrow{\text{NH}_2} \text{D}
\end{align*}
\]