**Ex 38A - Acidity**

**Question One**
For each of the following groups of molecules, rank them by their acidity. Is the difference due to size, inductive effects, resonance effects or electronegativity?

i)  

\[
\begin{align*}
\text{H}_3C-\text{C-} & \quad \text{H}_3C-\text{Sn-} \\
\text{H}_3C & \quad \text{H}_3C \\
\end{align*}
\]

Anion formed on C or Sn, same group. In this case the larger atom - Sn - will stabilize the charge making the tin compound more acidic.

ii)  

\[
\begin{align*}
\text{H}_3C-\text{C-} & \quad \text{H}_3C-\text{S}- \\
\text{O} & \quad \text{O} \\
\text{OH} & \quad \text{OH} \\
\end{align*}
\]

The conjugate base of the sulfonic acid has its negative charge delocalized over three O atoms while the carboxylate does so over only two. The sulfonic acid is therefore more acidic.

iii)  

\[
\begin{align*}
\text{Ph} & \quad \text{Ph} \\
\text{N-} & \quad \text{P-} \\
\text{H} & \quad \text{H} \\
\text{Ph} & \quad \text{Ph} \\
\end{align*}
\]

Anion formed on P or N, same group. In this case the larger atom - P - will stabilize the charge making the phosphorus compound more acidic.

iv)  

\[
\begin{align*}
\text{HClO} & \quad \text{HClO}_2 & \quad \text{HClO}_3 & \quad \text{HClO}_4 \\
\end{align*}
\]

These are listed in increasing order of acidity. The conjugate bases have 1, 2, 3 and 4 resonance structures respectively.

v)  

\[
\begin{align*}
\text{NH}_2 & \quad \text{NH}_2 \\
\end{align*}
\]

The conjugate base of aniline is resonance stabilized whereas that of cyclohexylamine is not. The former will be more acidic.

vi)  

\[
\begin{align*}
\text{FCH}_2\text{CO}_2\text{H} & \quad \text{FCH}_2\text{CH}_2\text{CO}_2\text{H} \\
\end{align*}
\]

The F atom will stabilize the conjugate base of both these acids, but will be more effective when closer to the carboxylate anion. The first molecule is therefore more acidic.