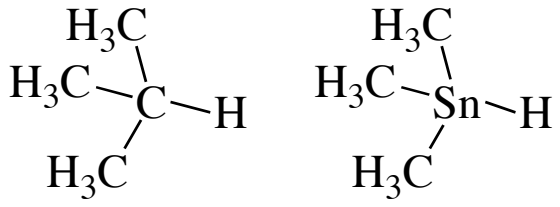
Ex 38A - Acidity

Question One

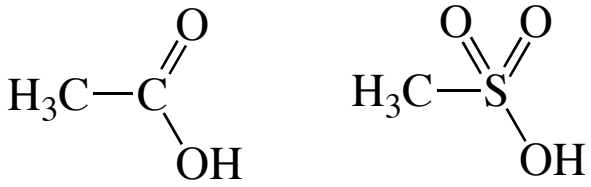
For each of the following groups of molecules, rank them by their acidity. Is the difference due to size, inductive effects, resonance effects or electronegativity?

i)



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)



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)

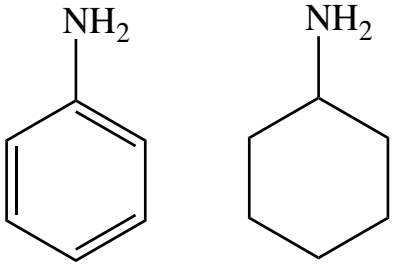
Anion formed on P or N, same group. In this case the larger atom - P - will stabilize the charge making the phosphorus compound more acidic.

iv)

$HClO$ $HClO_2$ $HClO_3$ $HClO_4$

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

v)



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

vi)

FCH_2CO_2H $FCH_2CH_2CO_2H$

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.