Lab: Reactions of Alkanoic Acids and the Salts of Alkanoic Acids

Use ethanoic (acetic) acid except where otherwise stated.

1. Note appearance of methanoic (formic) acid , ethanoic acid benzoic acid.
2. Test solubility/miscibility of a small amount of ethanoic acid and 1g of benzoic acid in the following way:
    a) water
    b) hot water (test the pH in this case by dipping pH paper quickly into the solution – if left for long the dye dissolves from the paper)
1. Test separate portions o dilute ethanoic acid with $Na_2CO_{3(aq)}$, Mg ribbon, $CuO_{(s)}$ (warm).
2. Heat a **small** amount of **each** acid on a metal spatula tip. Note flame appearance. Explain the difference from the paper
3. To 1 mL of glacial acetic acid in a test, add a little PCL_5. What gas is evolved?
4. To 1 mL of **each** of the acids in separate test tubes add 1 m of concentrated H_2SO_4 (**care!)**. Note the reaction, if any. If a gas is evolved , test with a lighted splint.
5. Test for alkanoic acids:
   Make a neural solution of iron (III) chloride, by adding 2m ammonia solution to 5 mL of its solution until the precipitate just forms, then adding more iron (III) chloride solution until the precipitate just dissolves. Neutralise a few mL of the acid with 2M ammonia. Then add the neural solution to the neutral $FeCl_{3(aq)}$. A red colour indicates the presence of an alkanoic acid (basic iron (III) acetate formed).
6. Preparation of an ester:
   Mix equal volumes (5 mL) of acetic acid and 2-methylbutan-1-ol (isoamyl alcohol), add 2-3 drops of con. H_2SO_4. Heat the test tube in a beaker of boiling water, and finally pour into a beaker of cold water. Note the smell of the ester formed. (Try: pentyl acetate, methyl salicylate!)

Salt of the Alkanoic Acids

Use sodium acetate, formate, oxalate, benzoats

1. Heat sodium salt mixed with equal amounts of soda lime – total about 1"- in dry pyrex test tube. Test gas evolved with lighted splint Decarboxylation occurs. Test residue for carbonate.

   CH_3COONa + 'NaOH' → $CH_4 + Na_2CO_3$
2. Heat sodium formate in a pyrex test tube. Test for H_2 and CO.
   $2\ HCOONa \rightarrow (NaCOO)_2 + H_{2(g)}$
3. Heat solid salt with conc. H_2SO_4.
   Test formate for CO, oxalate for CO and CO_2
4. Heat calcium acetate gently in pyrex it. Smell vapour evolved (acetone). Test residue for carbonate. General reaction for all calcium salts of carboxylic acids.
   $Ca(CH_3COO)_2 \rightarrow CaCO_3 + CH_3COCH_{3(g)}$
5. Heat ammonium acetate – some sublimate occurs, but also some decomposition occurs to acetamide – note "mousy" smell.
   $CH_3COONH_4 \rightarrow CH_3CONH_2 + H_2O$
   Repeat with ammonium benzoate – alkaline $NH_{3(g)}$ and speckled fumes of benzoic acid.
6. To a strong solution of each of the four sodium salts, add a little $KmnO_{4(aq)}$ and acidify. Leave part cold and warm the rest.
7. Repeat Test 7 above + 1 mL of sodium $acetate_{(aq)}$, instead of acetic acid. Note: warm, red colour.