CARBOXYLIC ACIDS: ACID PROPERTIES

1. Ethanoic acid is an acid because it donates hydrogen ions (protons) to other things. In this case it is donating a hydrogen ion to a water molecule. It is weak in the sense that the reaction is far from complete. The reaction is reversible, and at any instant only a very small proportion of the acid is in the form of ions.

2. a) Colourless dilute ethanoic acid and colourless sodium hydroxide solution give a colourless solution. (If you do the reaction with a thermometer in the tube, the temperature will have gone up a bit.)

$$CH_3COOH + NaOH \longrightarrow CH_3COONa + H_2O$$

b) Colourless dilute ethanoic acid and silvery magnesium ribbon produce bubbles of a colourless gas (which pops with a lighted splint). If there is an excess of acid, the magnesium will all react to leave a colourless solution.

$$2CH_3COOH + Mg \longrightarrow (CH_3COO)_2Mg + H_2$$

c) Colourless dilute ethanoic acid and white sodium carbonate produce bubbles of a colourless gas (which turns lime water milky). A colourless solution is formed.

$$2CH_3COOH + Na_2CO_3 \longrightarrow 2CH_3COONa + H_2O + CO_2$$

d) Colourless dilute ethanoic acid and white sodium hydrogencarbonate produce bubbles of a colourless gas (which turns lime water milky). A colourless solution is formed.

$$CH_3COOH + NaHCO_3 \longrightarrow CH_3COONa + H_2O + CO_2$$

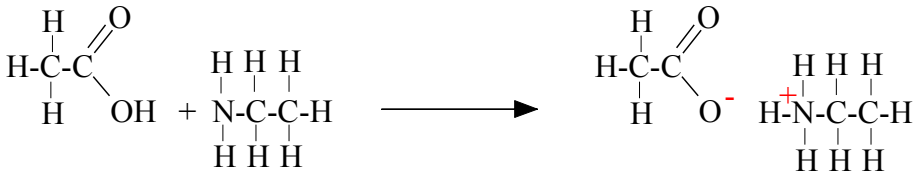
e) The white solid calcium oxide dissolves in the colourless dilute ethanoic acid to give a colourless solution.

$$2CH_3COOH + CaO \longrightarrow (CH_3COO)_2Ca + H_2O$$

f) Two colourless solutions produce another colourless solution.

$$CH_3COOH + NH_3 \longrightarrow CH_3COONH_4$$

g) Two colourless solutions produce another colourless solution containing ethylammonium ethanoate.



(Make sure that the positive charge in the ethylammonium ion is on the nitrogen. You can write the ethylamine the other (more normal) way around if you want, but having the NH_2 group next to the -OH group makes it easier to see what is happening.)

These are mostly trivial equations, and you will make yourself look pretty incompetent if you get them wrong in an exam. If you did get anything wrong, sort it out!