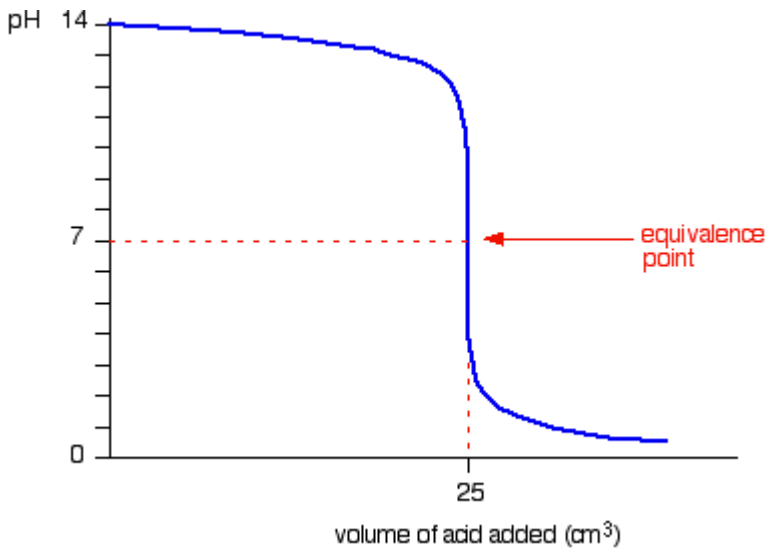
pH CURVES

1. a) The equivalence point is where you have mixed the sodium hydroxide and the hydrochloric acid in exactly equation proportions.

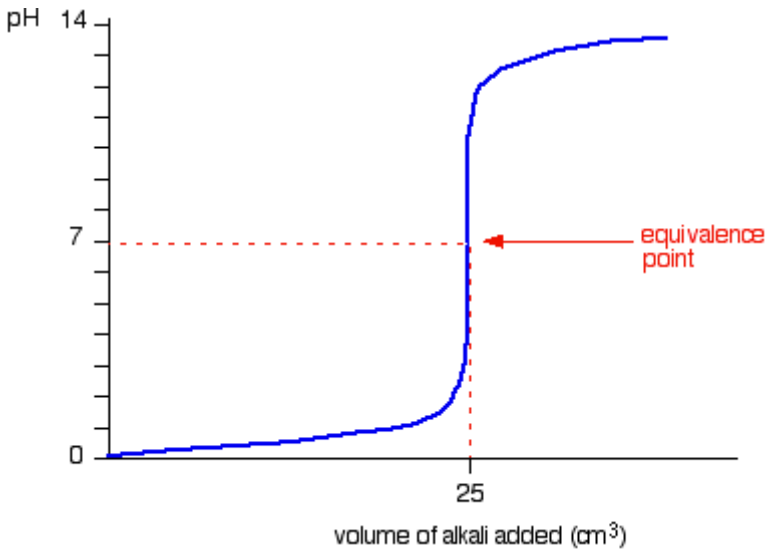
$$NaOH_{(aq)} + HCl_{(aq)} \longrightarrow NaCl_{(aq)} + H_2O_{(l)}$$

So they would be there in a molar ratio of exactly 1:1

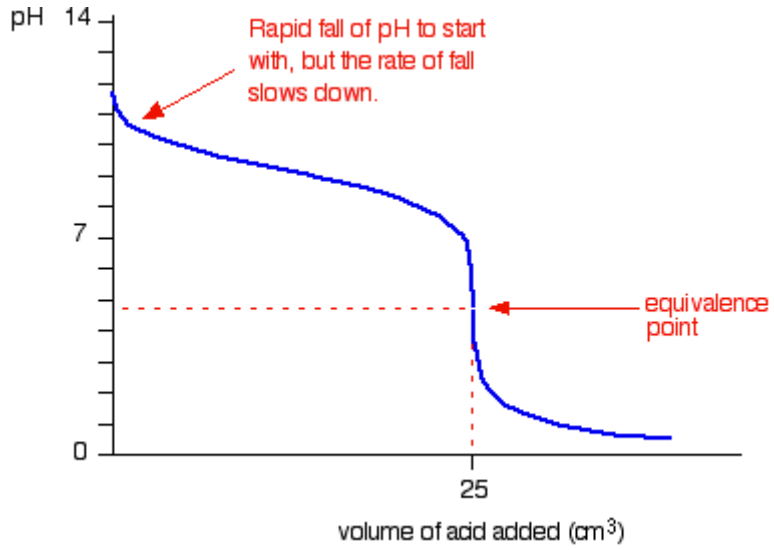
b)



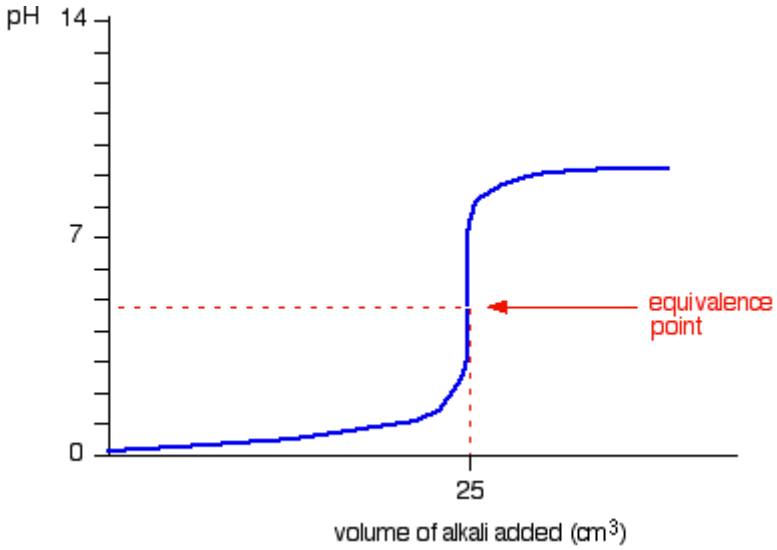
c)



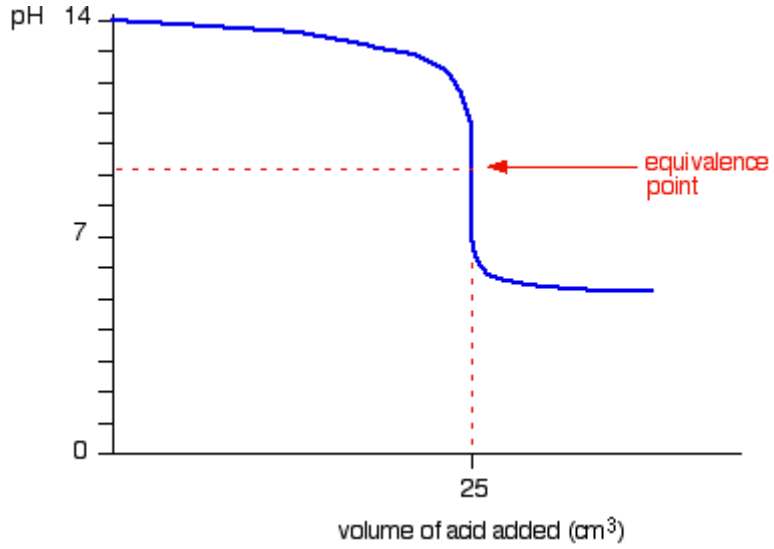
2. a)


pH
14
7
0
Rapid fall of pH to start with, but the rate of fall slows down.
equivalence point
25
volume of acid added (cm3)

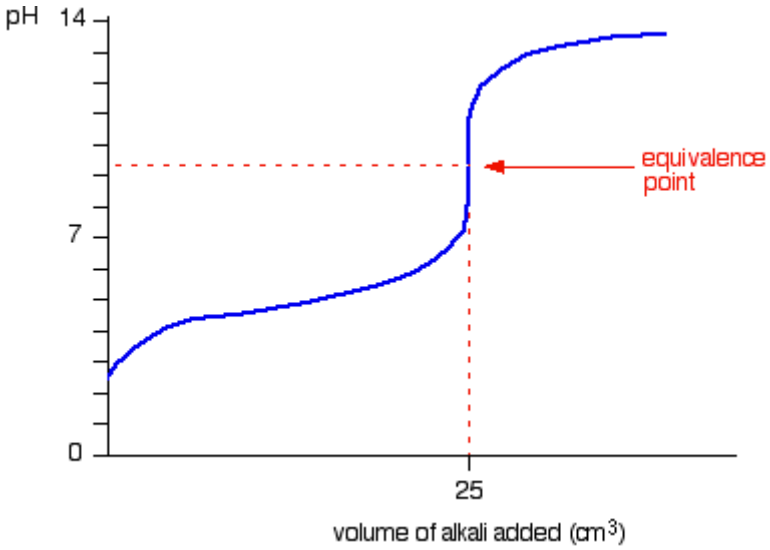
b)


pH
14
7
0
equivalence point
25
volume of alkali added (cm3)

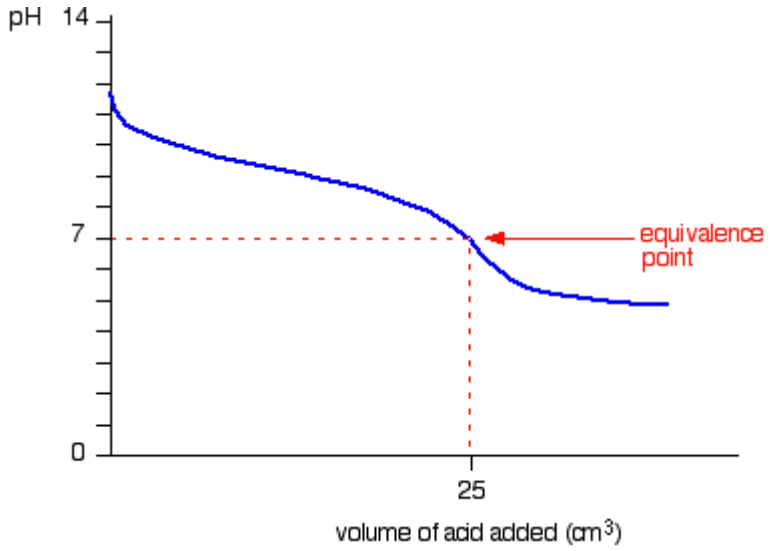
c)


pH
14
7
0
equivalence point
25
volume of acid added (cm3)

d)



e)



3. a) $Na_2CO_{3(aq)} + HCl_{(aq)} \longrightarrow NaCl_{(aq)} + NaHCO_{3(aq)}$

b) $NaHCO_{3(aq)} + HCl_{(aq)} \longrightarrow NaCl_{(aq)} + CO_{2(g)} + H_2O_{(l)}$

Or you could give the overall equation for the reaction for part (b):

$$Na_2CO_{3(aq)} + 2HCl_{(aq)} \longrightarrow 2NaCl_{(aq)} + CO_{2(g)} + H_2O_{(l)}$$

c) (i) A diprotic has two protons (or hydrogen ions) which it can donate to a base.

(ii) $\begin{matrix}COOH\\|\\COOH_{(aq)}\end{matrix} + NaOH_{(aq)} \longrightarrow \begin{matrix}COONa\\|\\COOH_{(aq)}\end{matrix} + H_2O_{(l)}$

(iii) $\begin{matrix}COONa\\|\\COOH_{(aq)}\end{matrix} + NaOH_{(aq)} \longrightarrow \begin{matrix}COONa\\|\\COONa_{(aq)}\end{matrix} + H_2O_{(l)}$

(You don't need to colour-code the hydrogens.)