Friday Worksheet **Name: ……**

Volumetric 1

1) 230ml of 0.753M $Mg(OH)_2$ is added to 172 mL of 0.570M H_3PO_4 What is the resulting pH of the final solution at 25 ^oC?

Step 1 write the chemical equation for this reaction

$3Mg(OH)_2(aq) + 2H_3PO_4(aq) => Mg_3(PO_4)_2(s) + 3H_2O(l)$

Step 2 Find the mols of each reactant

mols of $Mg(OH)_2$ = C x V = 0.753 X 0.230 = 0.1732

mols of H_3PO_4= C x V = 0.570 X 0.172 = 0.0980

Step 3 find the limiting reactant

If all the H_3PO_4 reacted we would need 1.5 X 0.0980 (0.147) mol of $Mg(OH)_2$
We have 0.1732 mol of $Mg(OH)_2$ clearly too much, hence it is in excess. The limiting reactant is H_3PO_4.

Step 4 Calculate the mol of $Mg(OH)_2$ in excess.

0.173 – 0.147 = .0.026

Step 5 calculate the mol of OH^- present after the reaction.

$Mg(OH)_2(aq) => Mg^{2+}(aq) + 2OH^-(aq)$
So for 0.026 mol of $Mg(OH)_2$ we will have 2 X 0.026 (0.052) mol of OH^-

Step 6 Calculate the $[OH^-]$ present

$[OH^-] = n/V = 0.052 / 0.402 = 0.13 = 10^{-0.89}$

Step 7 find the $[H_3O^+]$

$[OH^-][H_3O^+] = 10^{-14}$

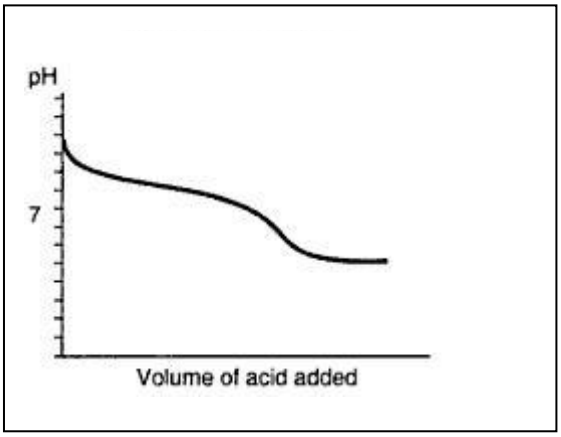
$[H_3O^+] = 10^{-14.00} / 10^{-0.89} = 10^{-13.11}$

Step 8 find the pH

pH= 13.1

2) Explain the difference between the terms end point and equivalence point?

The end point, during a titration is reached when the indicator changes colour. This indicates to the chemist that the reactants are mixed in the right stoichiometric ratio. The colour change, however, happens a little after the equivalence point. The equivalence point is exactly where the reactants are mixed in the right stoichiometric ratios, but this does not cause the indicator to change colour so another drop is added and at this point the colour change is observed.



3) Consider the titration curve shown on the right. Select from the words below to complete the following sentences.

Weak, strong, conical flask, volumetric flask, pipette, burette, concordant, equivalence point, end point.

a) This is a titration between a *weak* acid and a *weak* base.

b) The acid is placed in the *burette* while the base is placed in the *conical falsk*

c) Nearing the end of a titration the *equivalence* is reached just before the *end* point

d) When washing the glassware with water a student forgot to dry one of the apparatus before using it. Water left in the *volumetric flask* or *conical flask* would result in no change to the average titre.

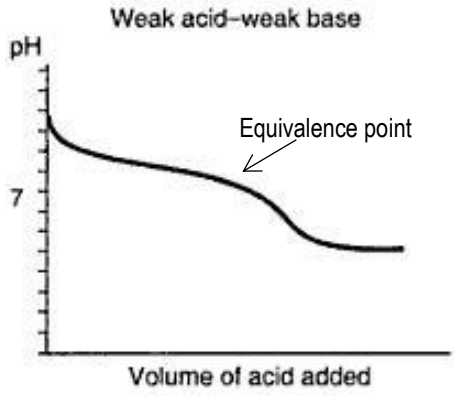
e) When washing the glassware with water a student forgot to dry one of the apparatus before using it. Water left in the *pipette* would result in a lower average titre.

f) When washing the glassware with water a student forgot to dry one of the apparatus before using it. Water left in the *burette* would result in a higher average titre.

g) Explain why none of the indicators below can be used during this titration?

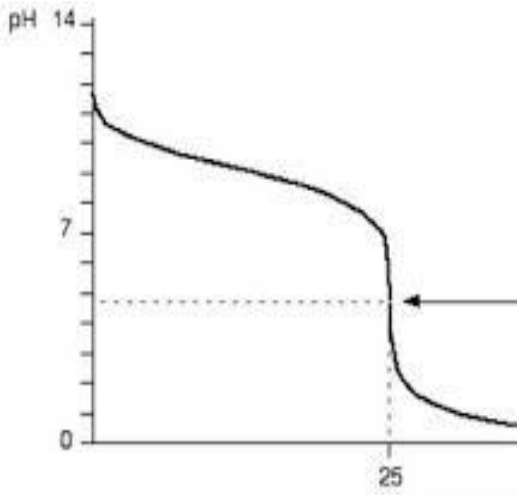
There is any steep bit on this graph just a point of inflexion.

Instead, there is jus It is difficult to conduct a titration of a weak base using a weak acid. The indicator will change colour at appoint not close to the equivalence point.



h) Consider the titration curve shown on the right. Select an appropriate indicator for this titration. Explain.

Methyl red. This indicator changes colour between pH of 4.2 and 6.3. The equivalence point lies within this range.



i) What is the colour change?

From yellow to red

Acid-base indicators

Name	pH range	Colour change		K_a
		Acid	Base	
Thymol blue	1.2–2.8	red	yellow	2×10^{-2}
Methyl orange	3.1–4.4	red	yellow	2×10^{-4}
Bromophenol blue	3.0–4.6	yellow	blue	6×10^{-5}
Methyl red	4.2–6.3	red	yellow	8×10^{-6}
Bromothymol blue	6.0–7.6	yellow	blue	1×10^{-7}
Phenol red	6.8–8.4	yellow	red	1×10^{-8}
Phenolphthalein	8.3–10.0	colourless	red	5×10^{-10}