This is BCE#23.

I recommend you print out this page and bring it to class. [Click here](#) to show a set of five BCE23 student responses randomly selected from all of the student responses thus far in a new window.

John , here are your responses to the BCE and the Expert's response.

Consider a titration where 0.250 M NaOH is added to 50.0 mL of 0.400 M $HC_2H_3O_2$.

1. How many moles of $HC_2H_3O_2$ are in the original 50.0 mL sample?

0.0200 mol 76% 12% 0.400M for moles.

(0.0500 L)*(0.400 mol/1 L) = 0.0200 mol $HC_2H_3O_2$

2. Calculate the volume required to reach the equivalence point when 0.250 M NaOH is added to 50.0 mL of 0.400 M $HC_2H_3O_2$.

80.0 mL 65%

At the equivalence point the moles of $HC_2H_3O_2$ are equal to the moles of NaOH. In Q1 we calculated the moles of $HC_2H_3O_2$ to be 0.0200 mol. So we must add 0.0200 moles of NaOH to reach the equivalence point. The volume is,

0.0200 mol NaOH*(1 L/0.250 mol) = 0.0800 L (80.0 mL)

3. What volume of 0.250 M NaOH is required to react with exactly one half of the moles of $HC_2H_3O_2$?

40.0 mL 53%

80.0 mL/2 = 40.0 mL

4. Calculate [H^+] concentration when exactly half of the $HC_2H_3O_2$ has been neutralized by the NaOH.

[H^+] = 1.8e-5 M 18%

Reworded this question is asking you to calculate the $[H^+]$ when 40.0 mL of 0.250 M NaOH are added to 50.0 mL of 0.400 M $HC_2H_3O_2$. To solve this we must write the neutralization equation and set up the IF table.

mol $HC_2H_3O_2$ = 0.0500 L *(0.400 mol/1 L) = 0.0200 mol

mol NaOH= 0.0400 L *(0.250 mol/1 L) = 0.0100 mol

	$HC_2H_3O_2(aq)$ +	NaOH(l)	$\rightleftarrows$	$C_2H_3O_2^-(aq)$ +	$H_2O(l)$
I	0.0200 mol	0.0100 mol		0	-
F	0.0100 mol	0		0.0100 mol	-

After completing the IF table we look at the Final row to determine what type of system we have. Looking at the Final row we have 0.0100 mol of a weak acid and 0.0100 moles of its conjugate base. This is a common ion system. So now we must set up an ICE table to calculate the $[H^+]$ for this common ion system.

We need to calculate the $[HC_2H_3O_2]$ and the $[C_2H_3O_2^-]$ first.

$[HC_2H_3O_2]$ = 0.0100 mol/0.0900 L = 0.111 M

$[C_2H_3O_2^-]$= 0.0100 mol/0.0900 L = 0.111 M

	$HC_2H_3O_2(aq)$ +	$\rightleftarrows$	$C_2H_3O_2^-(aq)$ +	$H^+(aq)$
I	0.111		0.111	~0
C	-x		+x	+x

E	0.111 - x		0.111 + x	+x

$K_a = [C_2H_3O_2^-][H^+]/[HC_2H_3O_2]$

$1.75 \times 10^{-5} = [0.111 + x][x]/[0.111 - x]$

assume 0.111 - x = 0.111

$1.75 \times 10^{-5} = [0.111][x]/[0.111]$

$1.75 \times 10^{-5} = [x] = [H^+]$

5. What is interesting about the concentration of $[H^+]$ in Q4?

The [H^+] at the half-equivalence point is the same as the magnitude of the equilibrium constant.

At the half equivalence point the $[H^+] = K_a$ for the weak acid.....cool!

6. Is there anything about the questions that you feel you do not understand? List your concerns/questions.

nothing

7. If there is one question you would like to have answered in lecture, what would that question be?

nothing