This is ACA # 19. It is OK to use your textbook, but if you can answers the questions without it that is OK too.

I recommend you print out this page and bring it to class. Click here to show a set of five ACA19 student responses, randomly selected from all of the student responses thus far, in a new window.

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

1a. Acetic acid has the formula CH_3COOH, or $HC_2H_3O_2$ and acts as an acid when it is added to water. According to the Arrhenius definition to be an acid what ion does acetic acid form when it dissociates in water?

15% CH_3COO^- & H^+ in b)

H^+(aq) 75%

All Arrhenius acids dissociate to produce H^+ in aqueous solution.

b) What is the other ion that acetic acid forms when it dissociates in water?

C2H3O2^-

65%

The other ion formed is $C_2H_3O_2^-$.

2. Below is RICE table where the first row is the reaction, the second row the initial concentrations, followed by the third row for the change in concentrations and finally the fourth row with the equilibrium concentrations. Complete each row step-by-step.

a) Step 1: write the equation showing how acetic acid acts as an Arrhenius acid when dissolved in water in the first row.

b) Step 2: Assume you initially have an aqueous solution of 0.250 M acetic acid (assume that the the acetic acid has not dissociated at all when you complete the second row.)

c) Step 3: We do not know how much acetic acid dissociates so lets assume 'x' in the concentration of acetic acid that dissocates, and complete the third row in the table.

d) Step 4: In terms of initial concentration and the change in concentration, determine the equilibrium concentration of all species.

n x n 20% Reaction change 10% formula 20%	HC2H3O2(aq) $HC_2H_3O_2$	⇌	H^+(aq) H^+	C2H3O2^-(aq) $C_2H_3O_2^-$
Initial Concentration 100%	0.250 M		0 M	0 M

	0.250 M		~0 M	0 M
Change in Concentration	-x M - x		+x M + x	+x M + x
Equilibrium concentration	0.250-x M 0.250 M - x		0+x M 0 + x	0+x M 0 + x

3. Using a pH meter similar to the pH meter you used in the simulation this week, the pH of the 0.250 M acetic acid solution was determined to be 2.68.

a) calculate the $[H^+]$ of a solution of acetic acid with a pH = 2.68. Remember to express this number as 2.09e-3 instead of 2.09 x 10^{-3}.

must use 2.09e-3
do not use 2.09x10^-3
2.09xe-3
} expert will mark wrong on PS

$[H^+]$ = 2.08e-3 M

pH = -log $[H^+]$

-2.68 = log $[H^+]$

$[H^+] = 10^{-2.68} = 2.09e^{-3}$ M

b) What does this concentration correspond to in the RICE table above? (As the $[H^+]$ initially, the change in $[H^+]$ or the equilibrium $[H^+]$?)

the equilibrium [H^+]

This $[H^+]$ corresponds to the equilibrium concentration. The pH was measured after the acetic acid was added to water.

4. What are the equilibrium concentrations of each species in the RICE table?

$[HC_2H_3O_2]$= 0.248 M

According to the RICE table the $[HC_2H_3O_2]$ at equilibrium is 0.250 M - x.

Since x is $2.09e^{-3}$ M than the equilibrium concentration of $HC_2H_3O_2$ is .250 M - $2.09e^{-3}$ M = 0.248 M

$[H^+]$ = 2.08e-3 M

$[H^+]$ = 2.09e^{-3} M As calculated in Q3a

$[C_2H_3O_2^-]$ = 2.08e-3 M 80%

$[C_2H_3O_2^-]$ = 2.09e^{-3} M as determined in the RICE table.

5. Write the equilibrium expression for the reaction you wrote in the first row of the RICE Table.

K = Ka = [H^+][C2H3O2^-]/[HC2H3O2] 60%

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

6. Now calculate the equilibrium constant for the reaction using the equilibrium concentrations you determined in Q4.

K = 1.74e-5 65%

$K = [H^+][C_2H_3O_2^-]/[HC_2H_3O_2] = [2.09e^{-3}][2.09e^{-3}]/[0.248] = 1.76e\text{-}5$

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

nothing

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

nothing

must understand the words I use to ask questions.