This is BCE#18.

I recommend you print out this page and bring it to class. Click here to show a set of five BCE18 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.

A second definition of acids and bases is the Bronsted-Lowry definition. According to this definition an acid is a proton, H^+, donor and a base is a proton acceptor.

1. In the following equation, label the Bronsted-Lowry acid and base (on the reactants side) and the Bronsted-Lowry acid and base on the product side;

$$NH_3(aq) + HNO_{3(aq)} \rightleftarrows NH_4^+(aq) + NO_3^-(aq)$$

Your Response:	base 100% Base	acid 100% Acid	conjugate acid 100% conjugate acid	conjugate base 100% conjugate base

2. A Bronsted-Lowry conjugate acid/base pair differ by ONLY a proton, H^+. In Q1 there are two Bronsted-Lowry conjugate acid/base pairs? Write the pair using the following format....acid/base.

HNO3/NO3^- conjugate acid/base pair #1 70% 18% charge

NH_3/NH_4^+ are a conjugate acid/base pair because they differ by a proton.

NH4^+/NH3 conjugate acid/base pair #1 70% 18% charge

HNO_3/NO_3^- are a conjugate acid/base pair because they differ by a proton.

3. For the reaction in Q1, the equilibrium constant, K, is VERY large. Using the chemical equation in Q1, and knowing that K is very large, identify the strongest acid and the strongest base in the equation.

HNO3 formula of the strongest acid 76%

HNO_3 is the strongest acid. Since K for the reaction is very large, the products will be present in the larger amount compared to the reactants. HNO_3 is the strongest acid because there is very little of it in solution, the stronger acid (HNO_3 or NH_4^+) will be present in the smallest amount.

NH3 formula of the strongest base 76%

NH_3 is the strongest base. Since K for the reaction is very large, the products will be present in the larger amount compared to the reactants. NH_3 is the strongest base because there is very little of it in solution, the stronger base (NH_3 or NO_3^-) will be present in the smallest amount.

You are given a solution with the label 0.500 M formic acid (HCOOH). Formic acid is known to be a weak acid. Answer the following questions.

5. Is the concentration of HCOOH in the solution actually 0.500 M? Explain.

No, the concentration of formic acid is slightly smaller 94%

No. The concentration of HCOOH will not be 0.500 M. Since formic acid is a weak acid a small amount of it will dissociate according to the chemical equation

$HCOOH(aq) \rightleftarrows H^+(aq) + HCOO^-(aq)$

6. Write an Arrhenius or a Bronsted-Lowry chemical equation which describes how formic acid behaves as an acid.

47% removed the wrong H^+

HCHO2(aq) --> H^+(aq) + CHO2^-(aq) 47%

The Arrhenius chemical reaction for formic acid acting as a weak acid is

$HCOOH(aq) \rightleftarrows H^+(aq) + HCOO^-(aq)$

The Bronsted-Lowry chemical reaction for formic acid acting as a weak acid is

$HCOOH(aq) + H_2O(l) \rightleftarrows H_3O^+(aq) + HCOO^-(aq)$

7a. The pH of the 0.500 M HCOOH solution is 2.02, calculate the $[H^+]$ in this solution.

pH = 9.55e-3 94%

pH = -log [H^+]

-2.02 = log [H^+]

[H^+] = $10^{-2.02}$ = 9.55 x 10^{-3} M

b. If formic acid were a strong acid, what would be the pH of the solution? (Hint: You may want to set up an ICE table.)

pH = 0.301 60%

To calculate the pH of the solution we have to know the [H^+]. Assuming HCOOH completely dissociates we can set up the ICE table,

	HCOOH(aq)	H^+(aq)	+ $HCOO^-$(aq)
I	0.500 M	~0	0
C	-0.500 M	+0.500 M	+0.500 M
E	0	+0.500 M	+0.500 M

If formic acid behaves as a strong acid all of the formic acid dissociates into hydrogen ions and formate ions.

pH = -log [H^+]

pH = -log (0.500)

pH = 0.301

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

nothing

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

nothing