CHMG-142 Name(s):_____
In-class
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Piece #1 Write the K_a reaction for HCNO

$HCNO\ (aq) + H_2O\ (l) \leftrightarrow H_3O^+\ (aq) + CNO^-\ (aq)$

Piece #2 (1/2 pt) Write the equilibrium constant expression for the dissociation of HCNO

$$K_a = \frac{[H_3O^+][CNO^-]}{[HCNO]}$$

Piece #3 Construct (don't solve) the ICE chart for the acid dissociation of 0.100 M HCNO.

	HCNO (aq) +	H_2O (l)	↔	H_3O^+ (aq)	+ CNO^- (aq)
I	0.100 M	-		0	0
C	-x	-		+x	+x
E	0.100-x	-		x	x

Puzzle #1 – What is the pH of a 0.100 M HCNO solution?

	HCNO (aq) +	H_2O (l)	↔	H_3O^+ (aq)	+ CNO^- (aq)
I	0.100 M	-		0	0
C	-x	-		+x	+x
E	0.100-x	-		x	x

$$K_a = \frac{[H_3O^+][CNO^-]}{[HCNO]} = 2 \times 10^{-4}$$

$$\frac{[x][x]}{[0.100 - x]} = 2 \times 10^{-4}$$

Assume x<<0.100

$$\frac{[x][x]}{[0.100]} = 2 \times 10^{-4}$$

$$x^2 = 2 \times 10^{-5}$$
$$x = 4.47 \times 10^{-3} M$$

Test the assumption

$$\frac{0.100}{20} = 0.005$$

$$0.00447 < 0.005, passes\ (barely)$$

	HCNO (aq) +	H_2O (l)	↔	H_3O^+ (aq)	+ CNO^- (aq)
I	0.100 M	-		0	0
C	-0.00447	-		+0.00447	+0.00447
E	0.099553	-		0.00447	0.00447

$$pH = -\log(0.00447) = 2.35$$

Piece #1 Write the base dissociation reaction of $HONH_2$

$HONH_2\ (aq) + H_2O\ (l) \leftrightarrow OH^-\ (aq) + HONH_3^+\ (aq)$

Piece #2 Write the equilibrium constant expression for the base dissociation of $HONH_2$

$$K_b = \frac{[OH^-][HONH_3^+]}{[HONH_2]}$$

Piece #3 Construct (don't solve) the ICE chart for the acid dissociation of 0.250 M $HONH_2$.

	$HONH_2\ (aq)$ +	$H_2O\ (l)$	↔	$OH^-\ (aq)$	+ $HONH_3^+\ (aq)$
I	0.250 M	-		0	0
C	-x	-		+x	+x
E	0.250-x	-		x	x

Puzzle #2 – What is the pH of 0.250 M $HONH_2$?

	$HONH_2$ (aq) +	H_2O (l)	↔	OH^- (aq)	+ $HONH_3^+$ (aq)
I	0.250 M	-		0	0
C	-x	-		+x	+x
E	0.250-x	-		x	x

$$K_b = \frac{[OH^-][HONH_3^+]}{[HONH_2]} = \frac{(x)(x)}{(0.250 - x)} = 1.1 \times 10^{-8}$$

Assume x<<0.250

$$\frac{(x)(x)}{(0.250)} = 1.1 \times 10^{-8}$$
$$x^2 = 2.5 \times 10^{-9}$$
$$x = 5 \times 10^{-5} M$$

	$HONH_2$ (aq) +	H_2O (l)	↔	OH^- (aq)	+ $HONH_3^+$ (aq)
I	0.250 M	-		0	0
C	$-5 \times 10^{-5} M$	-		$+5 \times 10^{-5} M$	$+5 \times 10^{-5} M$
E	0.250	-		$5 \times 10^{-5} M$	$5 \times 10^{-5} M$

Test assumption

$$\frac{0.250}{20} = 0.0125$$

Good assumption

$$pOH = -\log(5 \times 10^{-5}) = 4.30$$

$$pH = 14 - pOH = 14 - 4.30 = 9.70$$

Dissociation constants of acids:

HOAc $K_a=1.78\times10^{-5}$

H_2SO_4 $K_{a1}=1\times10^{7}$ $K_{a2}=1.0\times10^{-2}$

HCNO $K_a=2\times10^{-4}$

H_2CO_3 $K_{a1}=4.3\times10^{-7}$ $K_{a2}=5.6\times10^{-11}$

H_2O $K_a=1.0\times10^{-14}$

HIO $K_a=2.3\times10^{-11}$

HIO_3 $K_a = 1.7\times10^{-4}$

HCl $K_a=1\times10^{8}$

HNO_3 $K_a=1\times10^{6}$

HF $K_a = 3.5\times10^{-4}$

$H_2C_2O_4$ $K_{a1} = 6.0\times10^{-2}$ $K_{a2} = 6.1\times10^{-5}$

Dissociation constants of bases:

NH_3 $K_b=1.76\times10^{-5}$

CH_3NH_2 $K_b=4.4\times10^{-4}$

$HONH_2$ $K_b=1.1\times10^{-8}$

$C_2H_5NH_2$ $K_b = 5.6\times10^{-4}$