PRACTICE: CALCULATING pH OF ACIDS
ANSWERS

1.

	$HCN(aq)$	$\rightleftharpoons$	$H^+(aq)$	+	$CN^-(aq)$
I	0.01		~0		0
C	–x		+x		+x
E	0.01–x		x		x

$$K_a = \frac{[H^+(aq)]\,[CN^-(aq)]}{[HCN(aq)]}$$

$6.2\times10^{-10} = \dfrac{(x)(x)}{0.01-x}$ {$K_a = 6.2\times10^{-10}$ from data table on p19 in course manual}

$6.2\times10^{-10} = \dfrac{x^2}{0.01-x}$

$6.2\times10^{-10} = \dfrac{x^2}{0.01}$ {small K_a ; assume $0.01-x = 0.01$}

$6.2\times10^{-12} = x^2$ {multiply by 0.01}

$2.4899...\times10^{-6} = x$ {square root}

$[H^+]_{eq} = x$ mol/L

$= 2.4899...\times10^{-6}$ mol/L

$pH = -\log [H^+]$

$= -\log (2.4899...\times10^{-6})$

$= 5.60$

2. $HBr(aq) \rightarrow H^+(aq) + Br^-(aq)$

strong acid

$[H^+] = 0.12$ mol/L

$pH = -\log [H^+]$

$= -\log (0.12)$

$= 0.92$

3.

	$HF(aq)$	$\rightleftharpoons$	$H^+(aq)$	+	$F^-(aq)$
I	0.25		~0		0
C	–x		+x		+x
E	0.25–x		x		x

$$K_a = \frac{[H^+(aq)]\,[F^-(aq)]}{[HF(aq)]}$$

$$6.6\times10^{-4} = \frac{(x)(x)}{0.25-x}$$ {$K_a = 6.6\times10^{-4}$ from data table on p19 in course manual}

$$6.6\times10^{-4} = \frac{x^2}{0.25-x}$$

$$6.6\times10^{-4} = \frac{x^2}{0.25}$$ {small K_a ; assume 0.25–x =0.25}

$$1.65\times10^{-4} = x^2$$ {multiply by 0.25}

$$1.2845...\times10^{-2} = x$$ {square root}

$[H^+]_{eq}$ = x mol/L

= $1.2845...\times10^{-2}$ mol/L

pH = – log $[H^+]$

= – log $(1.2845...\times10^{-2})$

= 1.89