NAME Key

CHEM 1451/ Quiz 5/ March 7, 2019

A 1. What is the conjugate base of $H_2PO_4^-$?

A) HPO_4^{2-}
B) PO_4^{3-}
C) H_3PO_4
D) H_3O^+
E) OH^-

(take one H^+)

E 2. Which of the following acids is the STRONGEST? The acid is followed by its K_a value.

A) HF, 3.5×10^{-4}
B) HCN, 4.9×10^{-10}
C) HNO_2, 4.6×10^{-4}
D) $HCHO_2$, 1.8×10^{-4}
E) $HClO_2$, 1.1×10^{-2}

largest K_a
(most dissociation)

B 3. Calculate the pH of a solution that contains 3.9×10^{-4} M H_3O^+ at 25°C.

A) 4.59
B) 3.41
C) 10.59
D) 9.41
E) 0.59

$-\log(3.9 \times 10^{-4}) = 3.41$

A 4. Calculate the hydroxide ion concentration in an aqueous solution with a pH of 9.85 at 25°C.

A) 7.1×10^{-5} M
B) 4.2×10^{-10} M
C) 8.7×10^{-10} M
D) 6.5×10^{-5} M
E) 1.4×10^{-10} M

$pOH = 14 - 9.85$
$= 4.15$

$10^{-4.15} = 7.1 \times 10^{-5}$ M

1. (6 Points) Calculate the pH of a 1.00M HF solution. ($K_a = 3.5 \times 10^{-4}$).

$HF(aq) + H_2O(l) \rightleftharpoons F^-(aq) + H_3O^+(aq)$

I	1.00	0	0
C	$-x$	$+x$	$+x$
E	$1-x$	x	x

$3.5\times10^{-4} = \frac{x^2}{1-x}$ small

$x = \sqrt{3.5\times10^{-4}} = .019M$ ← valid? yes!

$pH = -\log(.019)$

$= \boxed{1.73}$

a) (4 Points) What is the percent ionization for the HF solution above?

$\frac{.019}{1.00} \times 100 = \boxed{1.87\%}$

2. (8 Points) Find the pH of a mixture of 0.150 M $HC_2H_3O_2$ ($K_a = 1.8 \times 10^{-5}$) and 0.050 M HCl.

$HCl + H_2O \longrightarrow H_3O^+ + Cl^-$

I	.050M	ø	ø
F	ø	.050 M	.050M

$HC_2H_3O_2(aq) + H_2O(l) \rightleftharpoons H_3O^+(aq) + C_2H_3O_2^-(aq)$

I	.150M	.050M	ø
C	$-x$	$+x$	$+x$
E	$.150-x$	$.050+x$	x

$1.8\times10^{-5} = \frac{(.050+x)(x)}{(.150-x)}$

$5.4\times10^{-5} = x$

$[H_3O^+] = .05 + 5.4\times10^{-5}$

$\boxed{pH = 1.30}$