CHM152 Quiz 4 25 Pts Spring 2015 Name: Key

Show all work to receive credit.

1. (2 Pts) Identify the conjugate acid-base pairs in the reaction:

HSO_4^- + HF ⇋ H_2SO_4 + F^-

Base Acid C, A C.B

2. (3 Pts) Which of these acids is stronger, H_3As_3 or H_3AsO_4 ? H_3AsO_4

Which of these is the stronger acid, HCl or HBr? HBr

Which is the stronger base NaOH or $Al(OH)_3$? NaOH

3. (4 Pts) Calculate the pH, pOH, $[H_3O^+]$ and $[OH^-]$ of a 0.025 M $Ba(OH)_2$ solution.

$Ba(OH)_2 \xrightarrow{H_2O} Ba^{2+} + 2OH^-$

$[OH^-] = 2 \times 0.025 = 0.050\ M\ OH^-$ pOH = 1.30

pH = 12.70 $[H_3O^+] = 10^{-12.70} = 2 \times 10^{-13}$

4. (6 Pts) Calculate the pH of a 0.20 M solution of the weak base pyridine (C_5H_5N $K_b = 1.7 \times 10^{-9}$). Be sure to write a chemical equation representing the equilibrium.

$C_5H_5N + H_2O \rightleftharpoons C_5H_5NH^+ + OH^-$ $K_b = \frac{[BH^+][OH^-]}{[B]}$

	C_5H_5N	H_2O	$C_5H_5NH^+$	OH^-
I	0.20	NA	0	0
C	−x		+x	+x
E	0.20 − x		x	x

"5% rule?"

$1.7 \times 10^{-9} = \frac{x^2}{0.20 - x}$ ←

$x = [OH^-] = 1.844 \times 10^{-5}$

pOH = 4.73 pH = 9.27

5. (6 Pts) Calculate the pH of a 0.15 M solution of HIO, hypoiodous acid ($K_a = 2.3 \times 10^{-11}$) Be sure to write a chemical equation representing the equilibrium.

$HIO + H_2O \rightleftharpoons H_3O^+ + IO^-$ $K_a = \frac{x^2}{0.15 - x}$

	HIO	H_2O	H_3O^+	IO^-
I	0.15		0	0
C	−x		+x	+x
E	0.15 − x		x	x

$x = 1.857 \times 10^{-6} = [H_3O^+]$

pH = 5.73

If worked as strong acid: pH = −Log 0.15 = 0.82

6. (4 Pts) Calculate the pH of 150 mL of 0.015 M hydrobromic acid, HBr.

Strong acid: pH = −Log 0.015 = 1.82

CHM152 Quiz 4b 25 Pts Spring 2015 Name: Key

Show all work to receive credit.

1. (2 Pts) Identify the conjugate acid-base pairs in the reaction:

HSO_4^- + HF ⇋ H_2SO_4 + F^-

Base Acid C.A. C.B

2. (3 Pts) Which of these acids is weaker, H_3As_3 or H_3AsO_4 ? H_3AsO_3

Which of these is the weaker acid, HCl or HBr? HCl

Which is the weaker base NaOH or $Al(OH)_3$? $Al(OH)_3$

3. (4 Pts) Calculate the pH, pOH, $[H_3O^+]$ and $[OH^-]$ of a 0.035 M $Ba(OH)_2$ solution.

Strong Base: $Ba(OH)_2(s) \xrightarrow{H_2O} Ba^{2+} + 2OH^-$

$[OH^-] = 2 \times 0.035 = 0.070\ M\ OH^-$ pOH = 1.15

pH = 12.85 $[H_3O^+] = 10^{-12.85} = 1.43 \times 10^{-13}$

4. (6 Pts) Calculate the pH of a 0.25 M solution of the weak base pyridine (C_5H_5N $K_b = 1.7 \times 10^{-9}$). Be sure to write a chemical equation representing the equilibrium.

$C_5H_5N + H_2O \rightleftharpoons C_5H_5NH^+ + OH^-$ $K_b = \frac{x^2}{0.25 - x}$ ← "5% rule"

	C_5H_5N	H_2O	$C_5H_5NH^+$	OH^-
I	0.25	NA	0	0
C	−x		+x	+x
E	0.25 − x		x	x

$x = [OH^-] = 2.06 \times 10^{-5}$

pOH = 4.69

pH = 9.31

5. (6 Pts) Calculate the pH of a 0.12 M solution of, HIO, hypoiodous acid ($K_a = 2.3 \times 10^{-11}$) Be sure to write a chemical equation representing the equilibrium.

$HIO(aq) + H_2O \rightleftharpoons H_3O^+ + IO^-$ $K_a = \frac{x^2}{0.12 - x}$ ← "5% rule"

	HIO(aq)	H_2O	H_3O^+	IO^-
I	0.12	NA	0	0
C	−x		+x	+x
E	0.12 − x		x	x

$x = [H_3O^+] = 1.66 \times 10^{-6}$

pH = 5.78

6. (4 Pts) Calculate the pH of 180 mL of 0.025 M hydrobromic acid, HBr.

Strong acid $HBr + H_2O \rightarrow H_3O^+ + Br^-$

$pH = -\log 0.025 =$ 1.60