01 → W
03 → Th
02 → M

Acids & Bases III 2019 in-class worksheet Name: _____

1. Calcium hydroxide is a strong base that undergoes 100% dissociation in water. Find the pH of a solution made by dissolving 1.60g in 1.00 L of water.

$\frac{1 \text{ mol } Ca(OH)_2}{x} = \frac{74.10 g}{1.60 g}$

$x = 0.02159$ mol $Ca(OH)_2$

$Ca(OH)_2 \rightarrow Ca^{2+} + 2OH^-$

$[OH^-] = \frac{0.02159 \times 2}{1L} = 0.04318M$

$pOH = -\log [OH^-]$
$= -\log 0.04318$
$pOH = 1.365$

$pH = 14 - pOH$
$= 12.64$
$pH = 12.6$

$\boxed{pH = 12.6}$

2. A 0.0030M solution if HX, a hypothetical weak acid, is found to have a pH of 3.0. Calculate the ionization constant (K_a).

	HX	→ H^+	+ X^-
I	0.0030	0	0
C	$-x$	$+\cancel{x}$ 0.0010	$+\cancel{x}$ 0.0010
E	0.0030 − 0.0010 = 0.0020	0.0010	0.0010

$[H^+] = 10^{-3.0} = 1.0 \times 10^{-3}$
$[H^+] = x = 0.0010$

$K_a = \frac{[H^+][X^-]}{[HX]}$
$= \frac{(0.0010)^2}{0.0020}$

$\boxed{K_a = 5.0 \times 10^{-4}}$

3. What is the pH of a solution prepared by mixing 25 ml of 0.50 M NaOH with 20.0 ml of 0.10M HCl?

NaOH $\frac{0.50 \text{ mol}}{1000 \text{ mL}} = \frac{x}{25 \text{ ml}}$
$x = 0.0125$ mol OH^-

HCl $\frac{0.10 \text{ mol}}{1000 \text{ mL}} = \frac{x}{20.0 \text{ mL}}$
$x = 0.0020$ mol HCl

0.0125 OH^-
− 0.0020 H^+
0.0105 OH^- in excess

$[OH^-] = \frac{0.0105 \text{ mol}}{0.045 L} = 0.23M$

$pOH = -\log [OH^-]$
$= -\log 0.23 = 0.6320$

$pH = 14 - pOH$
$= 14 - 0.6320$
$= 13.38$

$\boxed{pH = 13}$

4. It takes 22.7 mL of a 0.20M NaOH solution to titrate 15.8 ml of HCl solution. What is the concentration of the HCL? $NaOH + HCl \rightarrow NaCl + H_2O$

$M_A V_A = M_B V_B$

$(0.20M)(22.7mL) = M_B = (15.8mL)$

$M_B = 0.29M$ NaOH

$\boxed{0.29M}$

5. It takes 30.5 mL of 0.53M $Ba(OH)_2$ solution to neutralize 50.0 mL of HCl. What is the concentration of the HCL?

$1 Ba(OH)_2 + 2HCl \rightarrow 1 BaCl_2 + 2H_2O$

$\frac{M_A V_A}{n_A} = \frac{M_B V_B}{n_B}$

$\frac{(M_A)(50.0 mL)}{2} = \frac{(0.53M)(30.5mL)}{1}$

$M_A = 0.6466M$ HCl

$\boxed{M_A = 0.65M \text{ HCl}}$