General Chemistry with Dr. Mattson
Friday, 10/2/15

Today: 4.7-4.9 + electro to redox

Sunday: Monika at 7pm Eppley 110

Monday: Chp 4

Tuesday: meet in HL 2424
precipitation → watch video
Expt 6

Wednesday: Start Chp 5
Nomenclature Quiz

Thursday: Review @ 7 pm Eppley 110

Friday: CK 3!

Strong Acids	
HCl	HNO_3
HBr	$HClO_3$
HI	H_2SO_4

Strong Bases
LiOH
NaOH
KOH
RbOH
CsOH
~~CaOH~~

produce OH^-
associate 100% in H_2O

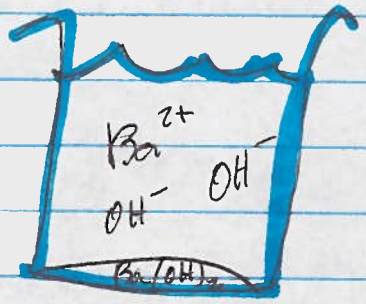
All group I salts are soluble

Know These

Strong base

$Ca(OH)_2$ (s, aq)
$Sr(OH)_2$ (s, aq)
$Ba(OH)_2$ (s, aq)

Mostly solid, but part that dissociate, dissociate into ions completely



$$Ca(OH)_{2(s)} \rightleftharpoons Ca^{2+}_{(aq)} + 2\,OH^-_{(aq)}$$

Weak base

$$NH_{3(aq)} + H_2O \rightleftharpoons OH^-_{(aq)} + NH_4^+{}_{(aq)}$$

Acid - base reactions

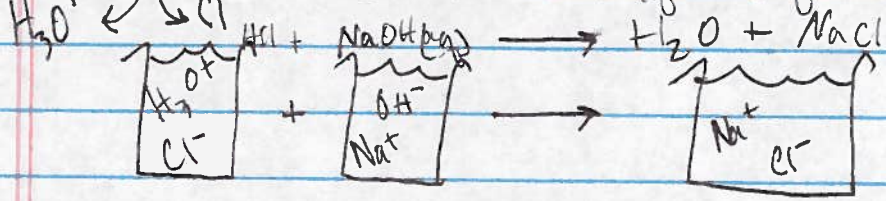
$$HCl_{(aq)} + NaOH_{(aq)} \longrightarrow H_2O_{(l)} + NaCl_{(aq)}$$

strong acid — strong base

strong ($\longrightarrow$)

$$HCl_{(aq)} + H_2O_{(l)} \xrightarrow{100\%} H_3O^+_{(aq)} + Cl^-_{(aq)}$$

H_3O^+ ← $HCl_{(aq)}$ → Cl^-



$H_3O^+ + Cl^- + Na^+ + OH^- \rightarrow Na^+ + Cl^- + H_2O$

Net Ionic Eqn (NIE): $H_3O^+ + OH^- \rightarrow H_2O$

Weak acid in water

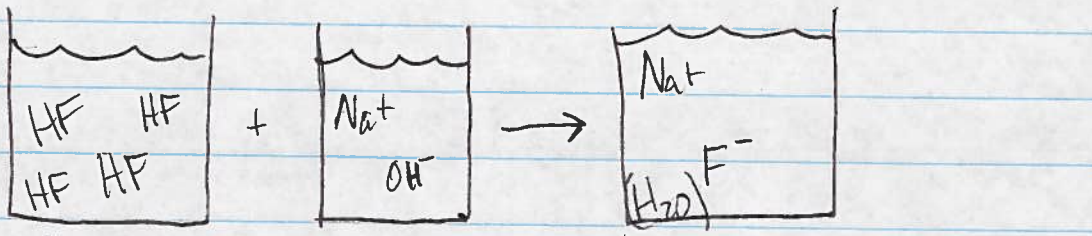
$HF_{(aq)} + H_2O_{(l)} \rightleftharpoons H_3O^+_{(aq)} + F^-_{(aq)}$

weak acid

weak acid $+ OH^-$

$HF_{(aq)} + NaOH_{(aq)} \xrightarrow{\sim 100\%} H_2O_{(l)} + NaF_{(aq)}$

weak acid strong base



$HF_{(aq)} + Na^+_{(aq)} + OH^-_{(aq)} \rightarrow H_2O_{(l)} + Na^+_{(aq)} + F^-_{(aq)}$

NIE: $HF_{(aq)} + OH^- \rightarrow H_2O_{(l)} + F^-_{(aq)}$

HNO_3	Nitric acid	H_3PO_4	phosphoric acid
HNO_2	Nitric acid	H_3PO_3	phosphorous acid
H_2SO_4	sulfuric acid		
H_2SO_3	sulfurous acid		

What Volume of .1234 M NaOH is needed to react completely with 500 ml .0841 M HCl (aq)?

neutralize
titrate
stoichiometrically

$HCl_{(aq)} + NaOH_{(aq)} \rightarrow H_2O + NaCl_{(aq)}$

Go Moles! $n = MV \quad \frac{.0841\ mol}{L} \Big| .0500\ L = .004205\ mol\ HCl$

$n = .004205\ mol\ HCl \Big| \frac{1\ mol\ NaOH}{1\ mol\ HCl} = .004205\ mol\ NaOH$

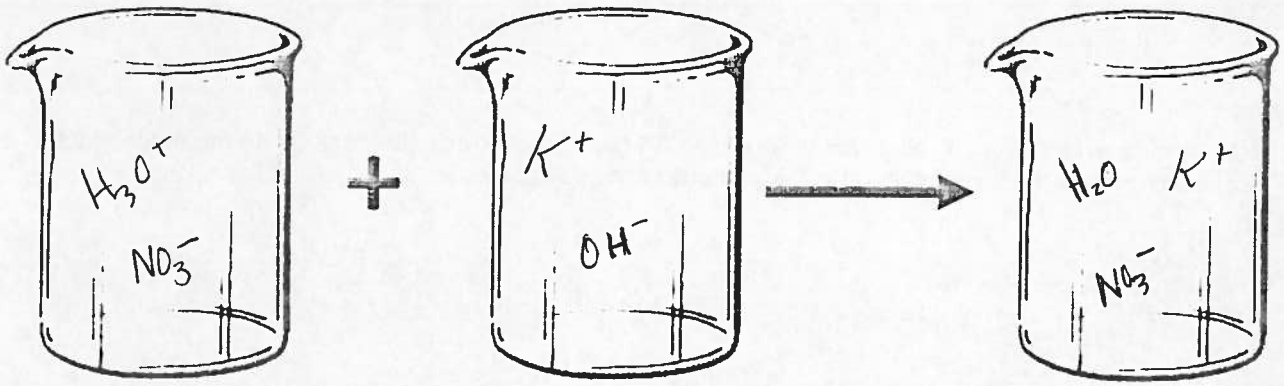
$V = \frac{n}{M} = .004205\ mol\ NaOH \Big| \frac{1\ L\ NaOH}{.1234\ mol\ NaOH}$

$= .03408\ L = 34.08\ mL\ NaOH$

Folder Activity Chapter 4 Day 3 2 October 2015

Printed Name: Monika Satkauskas Chm 203 Student number: TA

1. In the first beaker sketch $HNO_3(aq)$ – remember, like HCl, it dissociates 100% into ions – one of which is H_3O^+. In the second beaker sketch KOH(aq). In the third beaker sketch what happens when the two solutions are mixed. Write the overall reaction and the net ionic reaction below the beakers.

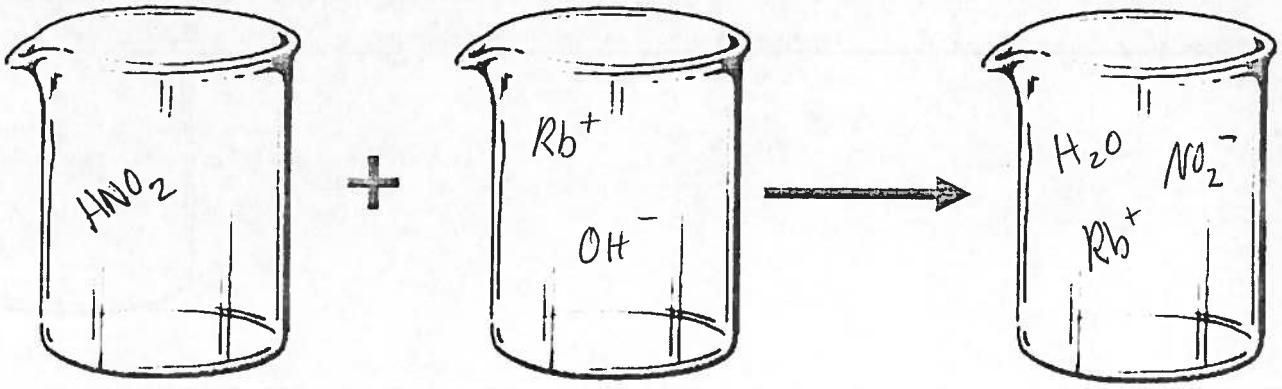


Balanced overall chemical equation: $HNO_{3(aq)} + KOH_{(aq)} \rightarrow H_2O_{(l)} + KNO_{3(aq)}$

Balanced ionic equation: $H_3O^+_{(aq)} + NO_3^-{}_{(aq)} + K^+_{(aq)} + OH^-_{(aq)} \rightarrow H_2O_{(l)} + K^+_{(aq)} + NO_3^-{}_{(aq)}$

Balanced net ionic equation: $H_3O^+_{(aq)} + OH^-_{(aq)} \rightarrow H_2O_{(l)}$

2. In the first beaker sketch $HNO_2(aq)$ – a weak acid that does not dissociate 100% into ions. In the second beaker sketch RbOH(aq). In the third beaker sketch what happens when the two solutions are mixed. Write the overall reaction and the net ionic reaction below the beakers.



Balanced overall chemical equation: $HNO_{2(aq)} + RbOH_{(aq)} \rightarrow H_2O_{(l)} + RbNO_{2(aq)}$

Balanced ionic equation: $HNO_{2(aq)} + Rb^+_{(aq)} + OH^-_{(aq)} \rightarrow H_2O_{(l)} + Rb^+_{(aq)} + NO_2^-{}_{(aq)}$

Balanced net ionic equation: $HNO_{3(aq)} + OH^-_{(aq)} \rightarrow H_2O_{(l)} + NO_2^-{}_{(aq)}$

3. What volume of 0.0788 M ~~NaOH~~ LiOH(aq) is required to react with 0.370 mol H_2SO_4 according to the reaction:

$$H_2SO_4(aq) + 2\ LiOH(aq) \rightarrow Li_2SO_4(aq) + 2\ H_2O(aq)$$

$$.370\ mol\ H_2SO_4 \left| \frac{2\ mol\ LiOH}{1\ mol\ H_2SO_4} \right. = .74\ mol\ LiOH \left| \frac{1\ L\ sol'n}{.0788\ mol\ LiOH} \right.$$

$$= 9.39\ L\ of\ .0788\ M\ LiOH$$

4. A 25.00 mL sample of acetic acid was titrated with 0.1199 M NaOH(aq). If it took 30.44 mL of the NaOH solution to titrate the solution, what is the molarity of the solution?

$$\frac{.1199\ mol\ NaOH}{1\ L} \times .03044\ L\ NaOH\ sol'n = 3.65 \times 10^{-3}\ mol\ NaOH$$

$$3.65\times10^{-3}\ mol\ NaOH \left| \frac{1\ mol\ acetic}{1\ mol\ NaOH} \right. = 3.65\times10^{-3}\ mol\ acetic\ acid$$

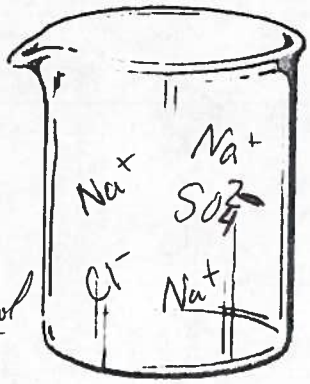
$$\frac{3.65\times10^{-3}\ mol}{.02500\ L} = .14\ M\ acetic\ acid$$

5. What mass of nitric acid is in 22.2 mL of 0.2027 M HNO_3?

$$.2027\ M = \frac{.2027\ mol\ HNO_3}{1\ L\ sol'n} \times .0222\ L = 4.50\times10^{-3}\ mol\ HNO_3 \times (1+14+48)\ g/mol$$

$$= .284\ g\ HNO_3$$

6. Flash-back from our first day on Chapter 4: Suppose 50.0 mL of 0.200 M NaCl(aq) is mixed with 100.0 mL 0.300 M Na_2SO_4(aq). Is a precipitate formed? Sketch what things are present in the beaker. What is the molar concentration (molarity) of each ion?



$$Na^+ + Cl^- + 2Na^+ + SO_4^{2-} \rightarrow \text{no reaction}$$

$$.200\ mol\ NaCl \times .050\ L = .01\ mol\ NaCl \left| \frac{1\ mol\ Na^+}{1\ mol\ NaCl} \right. = .01\ mol\ Na^+$$

$$.01\ mol\ NaCl \left| \frac{1\ mol\ Cl^-}{1\ mol\ NaCl} \right. = .01\ mol\ Cl^-$$

$$\frac{.300\ mol\ Na_2SO_4}{1.0\ L} \times .1000\ L = .03\ mol\ Na_2SO_4 \left| \frac{2\ mol\ Na^+}{1\ mol\ Na_2SO_4} \right. = .06\ mol\ Na^+$$

$$Na^+ = \frac{.01\ mol + .06\ mol}{.100 + .050\ L} = .467\ M\ Na^+$$

$$.03\ mol\ Na_2SO_4 \left| \frac{1\ mol\ SO_4^{2-}}{1\ mol\ Na_2SO_4} \right. = .03\ mol\ SO_4^{2-}$$

$$Cl^- = \frac{.01\ mol}{.15\ L} = .067\ M\ Cl^-$$

$$SO_4^{2-} = \frac{.03\ mol}{.15\ L} = .2\ M\ SO_4^{2-}$$