Oranges

$[H^+_{(aq)}] = 5.5 \times 10^{-3} M$

$[OH^-_{(aq)}] = ?$

$pH = ?$

$pOH = ?$

$pH = -\log[H^+_{(aq)}]$

$pH = -\log[5.5 \times 10^{-3}]$

$\boxed{pH = 2.26}$

$K_w = [H^+][OH^-]$

$pH + pOH = 14.00$

$pOH = 14.00 - 2.26$

$\boxed{pOH = 11.74}$

$[OH^-_{(aq)}] = 10^{-pOH}$

$[OH^-_{(aq)}] = 10^{-11.74}$

$\boxed{[OH^-_{(aq)}] = 1.8 \times 10^{-12} M}$

$pH < 7$ ACIDIC

$pH > 7$ BASIC

$pH = 7$ NEUTRAL

$K_w = [H^+][OH^-] = 1.0 \times 10^{-14}$

$H_2O \Rightarrow [H^+] = 1.0 \times 10^{-7} M$

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

Strong Acids

Calculate the concentration of the hydroxide ions, pH and pOH of a 0.15 mol/L solution of hydrochloric acid at 25°C.

Strong acids will always completely ionize

$HCl_{(aq)} \rightarrow H^+_{(aq)} + Cl^-_{(aq)}$

0.15mol/L 0.15mol/L

$[OH^-_{(aq)}] = ?$

pH = ?

pOH = ?

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

$pH = -\log[0.15]$

$pH = 0.82$

$pH + pOH = 14.00$

$pOH = 14.00 - 0.82$

$pOH = 13.18$

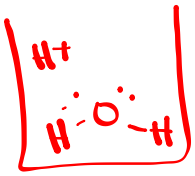
$[OH^-_{(aq)}] = 10^{-pOH}$

$[OH^-_{(aq)}] = 10^{-13.18}$

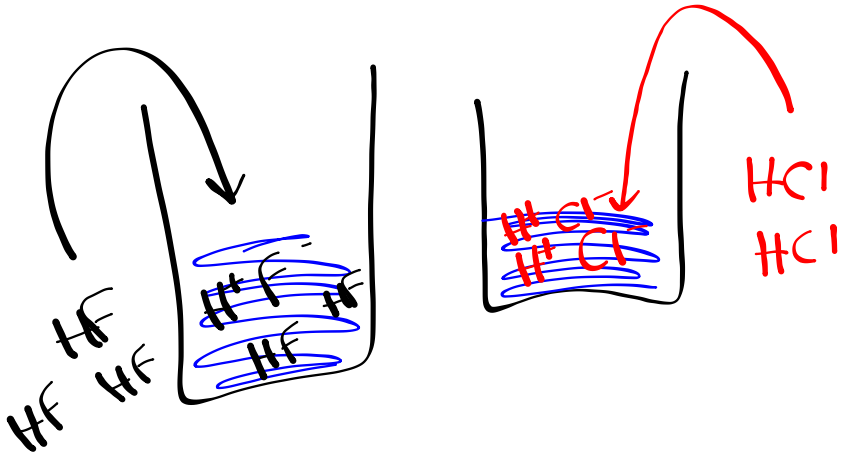
$[OH^-_{(aq)}] = 6.6 \times 10^{-14} M$

$$H_2SO_{4(aq)} \longrightarrow 2H^+_{(aq)} + SO_4^{2-}{}_{(aq)}$$

0.10 M 0.20 M



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


HF
HF
HF
HF
HF
HF
HF
HCl
HCl

Strong Bases
(Ionic Hydroxides)

Calculate the hydrogen ion concentration in a 0.25 mol/L solution of barium hydroxide.

$Ba(OH)_{2(s)} \longrightarrow Ba^{2+}_{(aq)} + 2OH^-_{(aq)}$

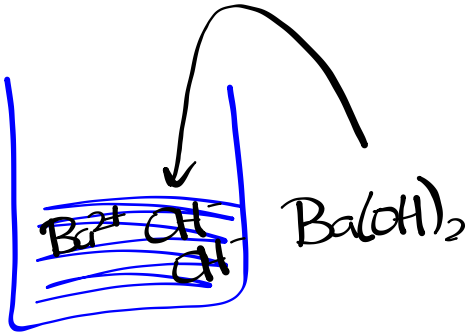
0.25M 0.50M

$[H^+_{(aq)}] = ?$

$K_w = [H^+_{(aq)}][OH^-_{(aq)}] = 1.0 \times 10^{-14}$

$[H^+_{(aq)}] = \frac{1.0 \times 10^{-14}}{0.50\,M}$

$[H^+_{(aq)}] = 2.0 \times 10^{-14}\,M$


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

H^+