Strong Acids

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

0.200M 0.400M

$pH = -\log[H_3O^+_{(aq)}]$

$pH = -\log[0.400]$

$pH = 0.398$

Weak Acids

$$HCN_{(aq)} + H_2O_{(l)} \rightleftharpoons CN^-_{(aq)} + H_3O^+_{(aq)}$$

0.200M

$$K_a = \frac{[CN^-_{(aq)}][H_3O^+_{(aq)}]}{[HCN_{(aq)}]}, \quad [CN^-_{(aq)}] = [H_3O^+_{(aq)}]$$

$$K_a = \frac{[H_3O^+_{(aq)}]^2}{[HCN_{(aq)}]}$$

$$[H_3O^+_{(aq)}] = \sqrt{(6.2\times10^{-10})[0.200]}$$

$$[H_3O^+_{(aq)}] = 1.11\times10^{-5}\,M$$

$$pH = -\log[H_3O^+_{(aq)}]$$

$$pH = -\log[1.11\times10^{-5}]$$

$$pH = 4.955$$

Strong Bases

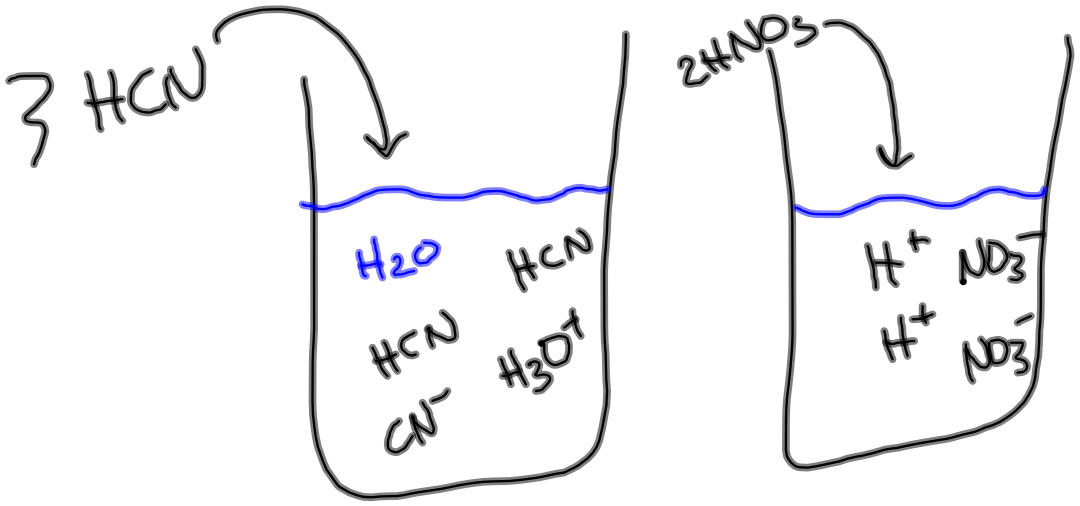
$Ba(OH)_2 \rightarrow Ba^{2+} + 2OH^-$

$NaOH_{(aq)} \longrightarrow Na^+_{(aq)} + OH^-_{(aq)}$

0.200M 0.200M

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

$pH + pOH = 14.000$


HCN
H_2O
HCN
HCN
CN^-
H_3O^+
$2HNO_3$
H^+
NO_3^-
H^+
NO_3^-

Weak Bases

$$NH_{3(aq)} + H_2O_{(l)} \rightleftharpoons NH_{4(aq)}^{+} + OH_{(aq)}^{-}$$

0.200M

$$K_b = \frac{[NH_{4(aq)}^{+}][OH_{(aq)}^{-}]}{[NH_{3(aq)}]}, \quad [NH_4^+] = [OH^-]$$

$$K_b = \frac{[OH_{(aq)}^{-}]^2}{[NH_{3(aq)}]}$$

$$K_aK_b = K_w$$

$$K_b = \frac{K_w}{K_a}$$

$$[OH_{(aq)}^{-}] = \sqrt{(1.72\times10^{-5})(0.200M)}$$

$$K_b = \frac{1.0\times10^{-14}}{5.8\times10^{-10}}$$

$$[OH_{(aq)}^{-}] = 1.86\times10^{-3}M$$

$$K_b = 1.72\times10^{-5}$$

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

$$pOH = -\log[1.86\times10^{-3}]$$

$$pOH = 2.730$$

$$pH + pOH = 14.000$$

$$pH = 14.000 - 2.730$$

$$\boxed{pH = 11.270}$$

Worksheet