neutralization reaction

acid + base → water + salt

$HCl + NaOH \rightarrow H_2O + NaCl$

HA
H^+A^-
HCl

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

More H^+, stronger acid

base

$NaOH \rightarrow Na^+ + OH^-$ ✓

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

$HCl \rightarrow H^+ + Cl^-$

$NH_3 \rightarrow NH_4^+$

H_3O^+ - kind of like H^+, but is combined with water

Acid

proton donor

pH is a measure of acidity

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

- Strong acids dissociate completely in water
- Weak acids partially dissociate in water

HCl

H^+ Cl^-
Cl^- H^+

CH_3COOH

H^+ CH_3COO^-
CH_3COOH

Base

proton acceptor

pOH is a measure of basicity

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

Strong bases dissociate completely

weak do not

$pX = -\log[X]$

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

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

$pH + pOH = 14.00$

$-\log[H^+] + (-\log[OH^-]) = 14.00$

$-\log[H^+][OH^-] = 14.00$

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