$\overset{0}{Cu}(s) + 2\overset{(+1)}{Ag}NO_3(aq) \longrightarrow \overset{+2}{Cu}(NO_3)_2(aq) + 2\overset{(0)}{Ag}(s)$

oxidized (loss of e^-) — reduced - gained e^-'s.

$$pH = -\log_{10}[H^+]$$

$$[H^+] = 10^{-pH}$$

ex @ 25°C, pure H_2O is neutral.

$[H_3O^+] = 1.0 \times 10^{-7} M$ (2 s.f.) — #s.f.

$pH = -\log_{10}[H^+] = -\log[1.0 \times 10^{-7}]$

$= 7.00$ (2 dp) — #dp

@ 25°C: $pH = 7.00$ (neutral).

ex: if $[H^+] = 1.0 \times 10^{-6} M$

$pH = -\log[1.0 \times 10^{-6}] = 6.00$

acid/basic?

$[OH^-]$?

@ 25°C $K_w = 1.0 \times 10^{-14}$

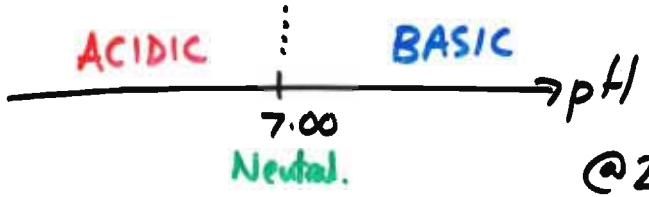
$= [H^+][OH^-]$

$\Rightarrow [OH^-] = \frac{K_w}{[H^+]} = \frac{1.0 \times 10^{-14}}{1.0 \times 10^{-6}}$

$= 1.0 \times 10^{-8} M$

$[H^+]$		$[OH^-]$
$1.0 \times 10^{-6} M$	>	$1.0 \times 10^{-8} M$

acidic



@25°C

Q. What's pH of conc HCl(aq) w/ $[H^+] = 12\ M$

2sf.

$pH = -\log_{10}[12]$

$= -1.08$

2dp

other 'p' scales $p = -\log_{10}$

$pH = -\log_{10}[H^+]$

$pOH = -\log_{10}[OH^-]$

$pNa = -\log_{10}[Na^+]$

$pF = -\log_{10}[F^-]$

we'll find pOH convenient! in calculating pH

@25°C

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

$1.0\times10^{-14} = [H^+][OH^-]$

$-\log_{10}$

$-\log_{10}(1.0\times10^{-14}) = -\log_{10}([H^+][OH^-])$

$14.00 = -\log_{10}[H^+] \oplus -\log_{10}[OH^-]$

remember $\log(A\cdot B) = \log A + \log B$

$\Rightarrow$ $14.00 = pH + pOH$ @25°C

ex: we have an aq. soln @25°C where $[OH^-] = 3.5\times10^{-4}\ M$. $pH = ?$

can find pOH!

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

$= -\log_{10}[3.5\times10^{-4}]$

$= 3.45$

pH?

$pH + pOH = 14.00$

$pH = 14.00 - pOH$

$= 14.00 - 3.45$

$= \boxed{10.55}$

Basic (@25°C, $pH > 7$)

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other way... $[OH^-] = 3.5\times10^{-4}\,M$. pH?

$K_w = [H^+][OH^-] \Rightarrow [H^+] = \frac{K_w}{[OH^-]}$

$\Rightarrow [H^+] = \frac{1.0\times10^{-14}}{3.5\times10^{-4}} = 2.86\times10^{-11}M$

$pH = -\log[2.86\times10^{-11}] = 10.54$

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ex: if we have sol'n w/ pOH of 8.50. (@25°C)

Q. What's pH?

Q. What's $[H^+]$? $[OH^-]$?

Q. Acidic / Basic / Neutral.

① $pH + pOH = 14.00$ (25°C)

$pH = 14.00 - pOH = 5.50$

② $pH = -\log_{10}[H^+]$

$\Rightarrow \log_{10}[H^+] = -pH$

$\Rightarrow [H^+] = 10^{-pH}$

$[H^+] = 10^{-5.50}$

$= 3.2\times10^{6}M$

$pOH = -\log_{10}[OH^-]$

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

$\Rightarrow [OH^-] = 10^{-pOH}$

$[OH^-] = 10^{-8.50}$

$= 3.2\times10^{-9}M$

ACIDIC

$pH < 7$

$[H^+] > [OH^-]$

Strengths of Acids + Bases

6-strong acids : 100% dissociation

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

$HBr_{(aq)} + H_2O_{(l)} \longrightarrow$ " $+ Br^-_{(aq)}$

$HI_{(aq)} + H_2O_{(l)} \longrightarrow$ " $+ I^-_{(aq)}$

perchloric acid $HClO_{4(aq)} + H_2O_{(l)} \longrightarrow$ " $+ ClO_4^-{}_{(aq)}$

nitric acid $HNO_{3(aq)} + H_2O_{(l)} \longrightarrow$ " $+ NO_3^-{}_{(aq)}$

sulfuric acid $H_2SO_{4(aq)} + H_2O_{(l)} \longrightarrow$ " $+ HSO_4^-{}_{(aq)}$

- Most acids are WEAK.
- only partially dissociate in water.

ex: HF, CH_3CO_2H, H_2SO_3, NH_4^+, HCO_2H, ...