KNOCKHARDY NOTES

A LEVEL CHEMISTRY

ACIDS & BASES

A T A G L A N C E

TWO THEORIES

LEWIS	ACIDS	**LONE PAIR ACCEPTORS**
	BASES	**LONE PAIR DONORS**
BRØNSTED-LOWRY	ACIDS	**PROTON DONORS**
	BASES	**PROTON ACCEPTORS**

TYPES OF ACID

STRONG **Completely dissociate into ions** *HCl, H_2SO_4*

$$HA_{(aq)} \longrightarrow H^+_{(aq)} + A^-_{(aq)}$$

WEAK **Partially dissociate into ions** *CH_3COOH*

$$HA_{(aq)} \rightleftharpoons H^+_{(aq)} + A^-_{(aq)}$$

MONOPROTIC HCl, CH_3COOH, HNO_3

DIPROTIC H_2SO_4

TYPES OF BASE

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

WEAK $NH_{3\,(aq)} + H_2O_{(l)} \rightleftharpoons NH_4^+{}_{(aq)} + OH^-_{(aq)}$

pH

- $pH = -\log_{10} [H^+_{(aq)}]$
- $[H^+_{(aq)}] = \text{antilog}(-pH)$

[ ] = concentration in mol dm^{-3}

$[H^+]$	1	10^{-1}	10^{-2}	10^{-3}	10^{-4}	10^{-5}	10^{-6}	10^{-7}	10^{-8}	10^{-9}	10^{-10}	10^{-11}	10^{-12}	10^{-13}	10^{-14}
$[OH^-]$	10^{-14}	10^{-13}	10^{-12}	10^{-11}	10^{-10}	10^{-9}	10^{-8}	10^{-7}	10^{-6}	10^{-5}	10^{-4}	10^{-3}	10^{-2}	10^{-1}	1
pH	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	strongly acidic			weakly acidic				neutral		weakly alkaline			strongly alkaline		

IONIC PRODUCT OF WATER K_w

Water dissociates $H_2O_{(l)} \rightleftharpoons H^+_{(aq)} + OH^-_{(aq)}$

$$\mathbf{K_w = [H^+_{(aq)}][OH^-_{(aq)}]} = 10^{-14}\ \text{mol}^2\ \text{dm}^{-6} \quad (\text{at } 25°C)$$

The value of **K_w varies with temperature** - it is based on an equilibrium

Temperature / °C	**0**	**20**	**25**	**30**	**60**
K_w / 10^{-14} mol^2 dm^{-6}	0.11	0.68	1.0	1.47	5.6

K_a DISSOCIATION CONSTANT FOR A WEAK ACID

$$K_a = \frac{[H^+_{(aq)}][A^-_{(aq)}]}{[HA_{(aq)}]} \quad \text{mol dm}^{-3}$$