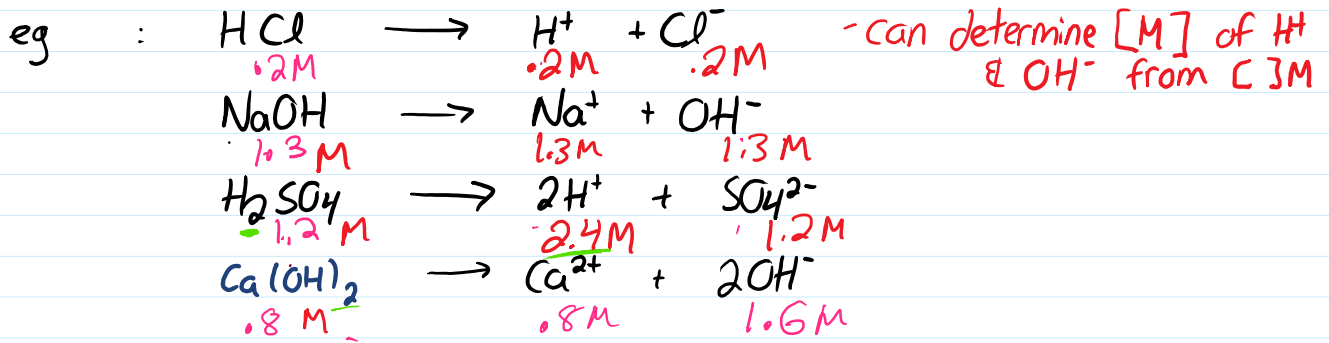


4.6 Strong vs. Weak Acids & Bases

Strong = 100% ionized in solution

= equilibrium is 100% \rightarrow (all ion side)

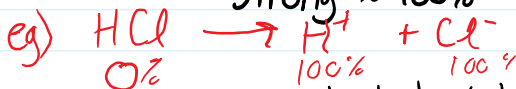
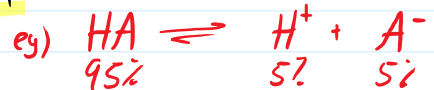


In Chemistry "Strong" is NOT interchangeable with concentrated!

- strong / weak = % of ionization

strong \approx 100%

weak \approx 5%



eg) vinegar: acetic acid CH_3COOH
 carbonic acid: H_2CO_3 (pp)

- concentrated / dilute = refers to Molarity
 conc. = 12.0M HCl dilute = 1.0M HCl

- Strong acids & Bases are good conductors of electricity b/c they form more Ions!

Strong acids - Top 6 in table ; 100% ionized

- HClO_4
 - HI
 - HBr
 - HCl
 - HNO_3
 - H_2SO_4
- } all considered equally strong b/c all 100% ionized

one way arrow \rightarrow not \rightleftharpoons equil

- Never act as bases

strong = 100% ionized means



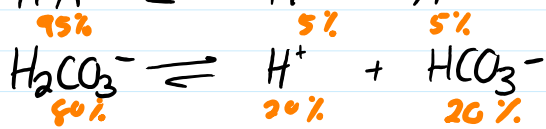
Strong Bases - Bottom 2 on table

- OH^- } - from metal hydroxides ; NaOH , KOH , Ca(OH)_2 , Mg(OH)_2 , Fe(OH)_3
- NH_3 } - Bottom 2 on table

- 100% ionized ; Never act as acids (one way arrow) \rightarrow

Weak Acids < 100% ionized ; usually < 50% ionized

- equilibrium ; eg) $HA \rightleftharpoons H^+ + A^-$



- not as good conductors of electricity ; less ions

Weak Acids - Look down left side of table ; in order

HIO_3 - Strongest (top) ; higher % ionized ... say 50%
 \downarrow
 H_2O - Weakest (bottom) ; Lower % ionized < 5%

Weak Bases - Look down right side of table (opposite order)

H_2O - weakest (top)
 \downarrow
 PO_4^{3-} - strongest (bottom)
 - Bases are the conj pairs of the acids
 $HP_4^{3-} \xrightarrow{\text{Acid}} H^+ + PO_4^- \xrightarrow{\text{conj. Base}}$

Which is the stronger base? HSO_3^- vs HPO_4^{2-} - stronger!

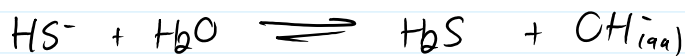
The equations in the table are simplified



remember this is (aq) so $H^+ + H_2O \rightarrow H_3O^+$

the stronger the acid the greater $[H_3O^+]$

the stronger the base the greater $[OH^-]$



Relationships in Table

- Strongest acids on Top

- Strongest bases on Bottom
- The stronger an acid, the weaker its conjugate base (vice versa)
- When comparing acid strengths look on Left side
- " comparing Base " " " Right

The Levelling Effect

- All strong acids are 100% dissociated in water (top 6 in table)
- ∴ all strong acids are equivalent $[H_3O^+]$
- Water is said to have "levelled" all strong acids to the same strength

$$H^+ + H_2O \rightleftharpoons H_3O^+$$
- All 6 strong acids have "identical strengths"
- Same is true of strong bases ... 2 have identical strengths

Do IV.6 Pg. 125 → 21-27