Acids and Bases

Properties of Acids

* Sour tasting
* Corrosive
* Water Soluble
* Good Conductor of Electricity
* Contain H^+ atoms

Acids

* When mixed in with water release H^+ atoms

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  * HCl in H_2O -> H^+ + Cl^-

Reactions

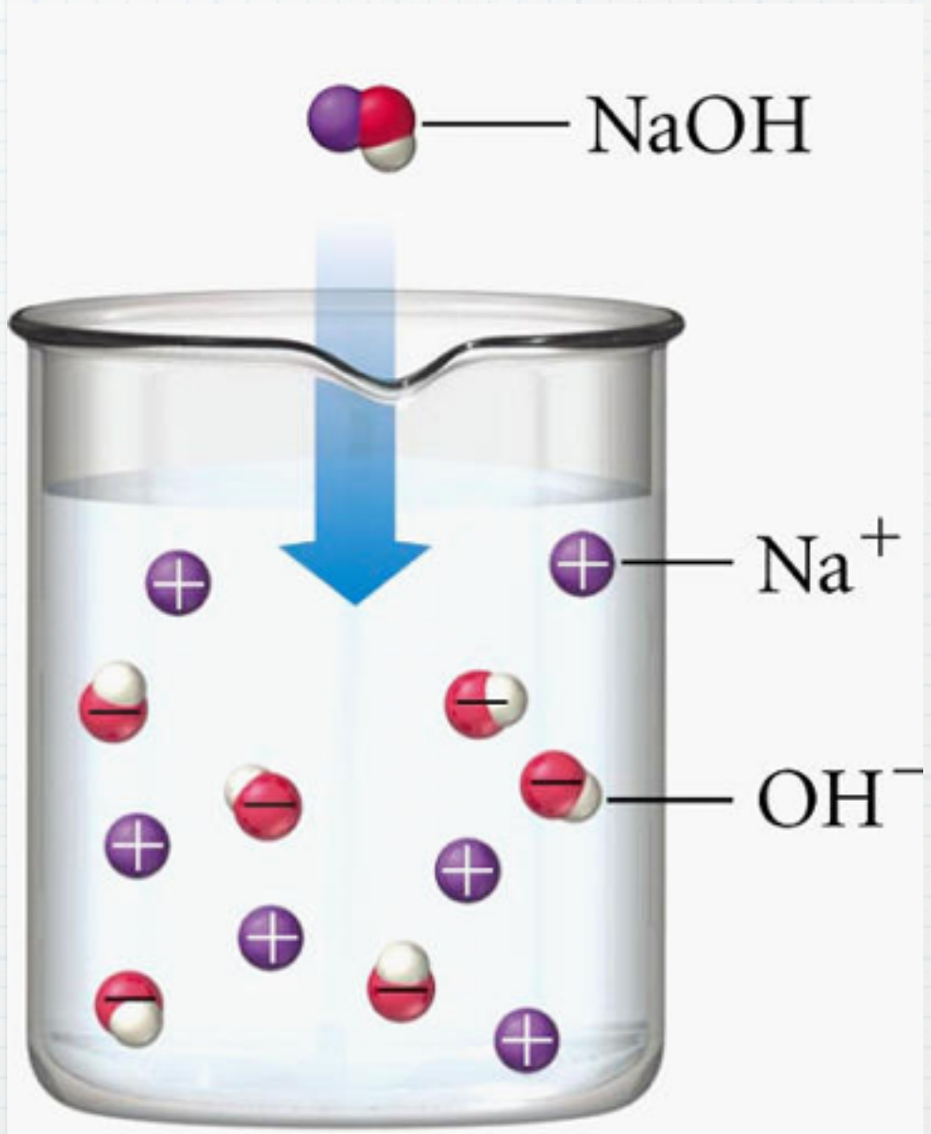
* When combined with metals, acids produce hydrogen gas
  * Example: $Zn + HCl \rightarrow ZnCl + H_2$

Reactions

* When combined with carbonates, they produce carbon dioxide gas
  * Example: $HCl + CaCO_3 \rightarrow CO_2 + H_2O + CaCl$

Properties of Bases

* Bitter tasting
* Corrosive
* Water Soluble
* Good Conductors of Electricity
* Contain OH^- atoms



Bases

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Bases

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  * $NaOH$ in H_2O -> $Na^+ + OH^-$

Reactions

* Bases react with protein (like those in your skin and eyes)

Class Poll. . .

* What do you think can do more damage to a Coke can, and acid or a base?

Is it an acid or a base?

* Usually acid starts with H
  * Examples
    * HCl : hydrochloric acid
    * HF: hyydroflouric acid
    * H_2SO_4 : sulphuric acid
    * HNO_3: nitric acid
    * H_3PO_4: phosphoric acid

* Sometimes bases will have OH.
  * NaOH: Sodium hydroxide
  * KOH: Potassium Hydroxide
  * NH_4OH: Ammonium hydroxide
  * Bicarbonates form OH in water
    * $NaHCO_3$: sodium bicarbonate

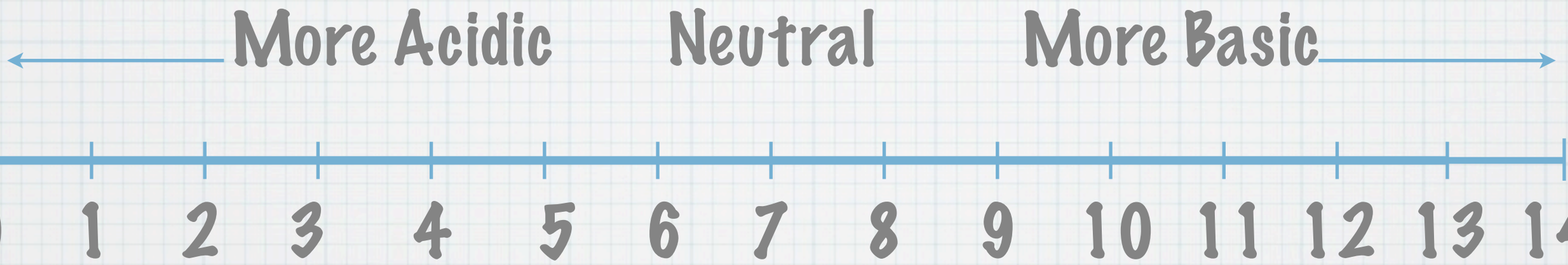
Acids and Bases

pH, Indicators, and Neutralization

pH Scale

* pH scale: a scale that represents the concentration of H+ ions
  * pH refers to 'power of hydrogen ion'

* The pH scale ranges from 0-14



* The pH scale ranges from 0-14

Concentration

* A factor that affects a rate of reaction
* The more concentrated the acid, the more corrosive

Neutralization

* **Neutralization:** an acid and base react to form a salt and a water.

Neutralization

* A special case of double displacement
  * $HCl + NaOH \rightarrow H_2O + NaCl$
  * $H_2SO_4 + KOH \rightarrow H_2O + K_2SO_4$

Neutralization

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  * $HCl + NaOH \rightarrow H_2O + NaCl$

Neutralization

* What happens:
  * The H^+ ion from acid and OH^- ion from base combine to form H_2O
    * $H^+ + OH^- \rightarrow H_2O$

Neutralization

* Example:
  * A fire extinguisher's reaction is as follows
  * $H_2SO_4 + NaHCO_3 \rightarrow Na_2SO4 + CO_2 + H_2O$
  * The carbon dioxide bubbles smother the flame

Neutralization

* Teacher Demo: What happens when you have a particularly acidic lunch?

Neutralization

* Teacher Demo: What happens when you have a particularly acidic lunch?
  * Acid + Alka seltzer -> CO_2 + salt + water
  * $HCl + NaHCO_3 \rightarrow CO_2 + NaCl + H_2O$
  * Compare to milk of magnesia
  * $Mg(OH)_2 + HCl \rightarrow MgCl + H_2O$

Concentration

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* BUT we have HCl in our stomach, why does it not burn?

Concentration

* a factor that affects a rate of reaction
* the more concentrated the acid, the more corrosive

DON'T WRITE THIS PART, JUST LISTEN :)

* BUT we have HCl in our stomach, why does it not burn?
* Acid is less concentrated, and our stomach lining protects from an acidic environment

Concentration

- The strength of an acid depends on the amount of H^+ ions found in the solution
  - Concentration of H^+ ions = $[H^+]$
  - The units of concentration are mol/L or M

Indicators

* **Indicators:** chemicals that change colour as the concentration of hydrogen ion [H^+] and hydroxide ion [OH^-] changes. They are typically one colour in and acid and a different colour in a base.

Indicators

* Eg. Phenophthalein, litmus blue, litmus red, bromothymol blue, universal indicator, pH paper.
* Indicators simply tell whether a substance is acidic or basic but not how acidic or basic (except for universal indicator)

* Balance each skeleton equation. Identify the acid or base by underlining.

* $Mg(OH)_{2(aq)} \rightarrow Mg^{2+}_{(aq)} + OH^{-}_{(aq)}$
* $H_2SO_{4(aq)} \rightarrow H^{+}_{(aq)} + SO_4^{2-}{}_{(aq)}$
* $HCl_{(aq)} \rightarrow H^{+}_{(aq)} + Cl^{-}_{(aq)}$
* $NaOH_{(aq)} \rightarrow Na^{+}_{(aq)} + OH^{-}_{(aq)}$
* $Ca(OH)_{2(aq)} \rightarrow Ca^{2+}_{(aq)} + OH^{-}_{(aq)}$
* $Be(OH)_{2(aq)} \rightarrow Be^{2+}_{(aq)} + OH^{-}_{(aq)}$
* $HI_{(aq)} \rightarrow H^{+}_{(aq)} + I^{-}_{(aq)}$
* $LiOH_{(aq)} \rightarrow Li^{+}_{(aq)} + OH^{-}_{(aq)}$
* $HF_{(aq)} \rightarrow H^{+}_{(aq)} + F^{-}_{(aq)}$