Acids & Bases

What are Acids & Bases

Neutralization

pH & Acid Rain

Sulfur Dioxide and the Combustion of Coal

Nitrogen Oxides and the Acidification of Los Angeles

Acid Deposition & Impact on Materials

Control Strategies

The Politics of Acid Rain

© Ted Spiegel/Corbis

Acids: Chemical Definition

In general: $HX + H_2O \rightarrow H_3O^+ + X^-$ (we won't use H^+ for acid
                                                            although the book does)

Acids produce **hydronium cation** (H_3O^+) when dissolved in H_2O solution
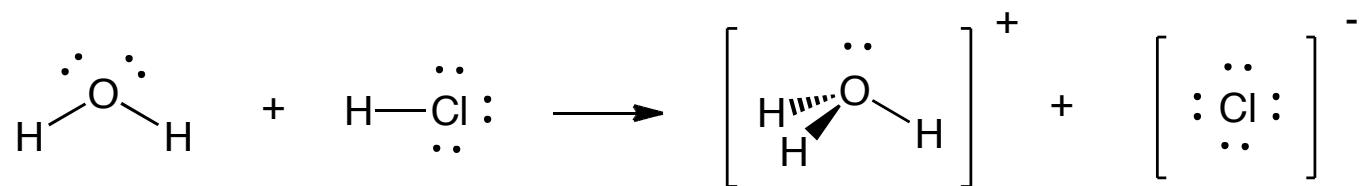
Noble gas configuration maintained

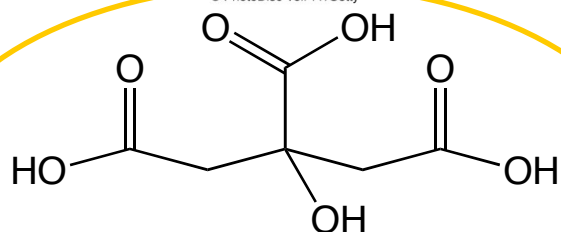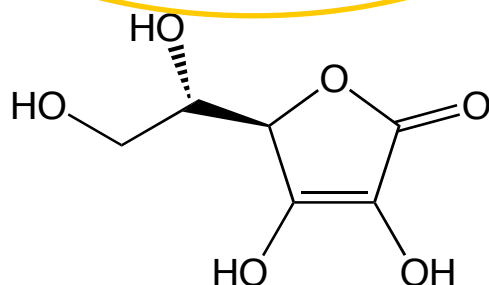$CO_2 + H_2O \rightleftharpoons H_2CO_3$ Carbonic acid

$H_2CO_3 + H_2O \rightleftharpoons H_3O^+ + HCO_3^-$ bicarbonate ion

$HCO_3^- + H_2O \rightleftharpoons H_3O^+ + CO_3^{2-}$ carbonate   polyatomic ions that we talked about in Chapter 5
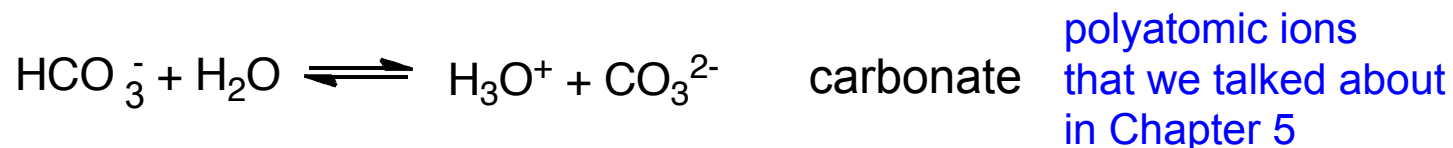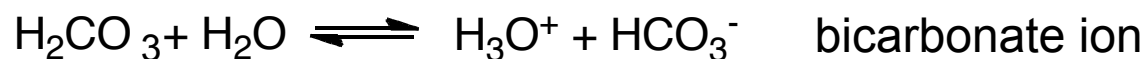
Some Organic Acids

© PhotoDisc Vol. 77/Getty

Acids are sour…

Malic acid

Citric acid: (prevents scurvy)

Ascorbic acid (vitamin C): antioxidant

SHOCK YOUR BUDS
FORMULA SOUR
CAN U HANDLE IT?
ARTIFICIAL FLAVORS
LIQUID CANDY
NET WT. .88 OZ (25g)
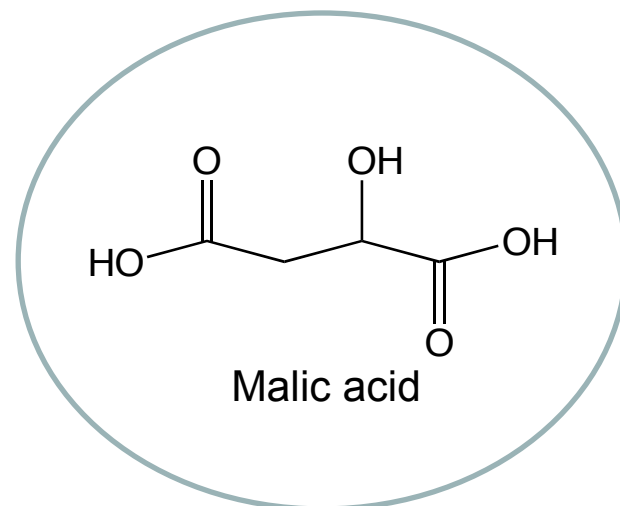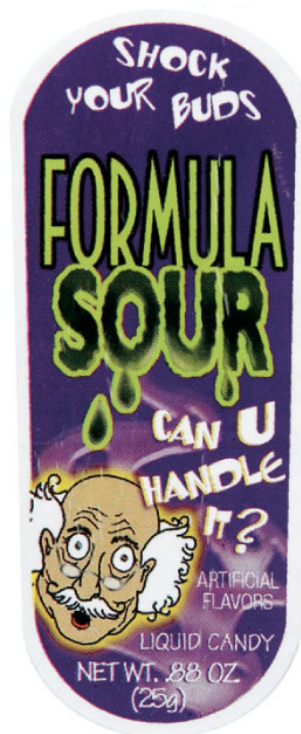
Ingred.: cane sugar, water, malic acid, citric acid, natural and artificial flavors, sodium benzoate, FD&C Yellow 5, Yellow 6, Blue 1, Yellow 5 Lake, Blue 2 Lake, Red 40 Lake
Mfg. by Squire Boone Village
New Albany, IN 47150
For nutrition info, call 1-800-234-1804

Bases: Chemical Definition

Bases are anti-acids (antacids)

Bases produce **hydroxide anion** (OH⁻) when dissolved in H_2O solution

In general: $YOH \rightarrow Y^+(aq) + OH^-(aq)$

$NaOH \rightarrow Na^+(aq) + OH^-(aq)$

$NH_3(aq) + H_2O \rightarrow NH_4^+(aq) + OH^-(aq)$

Bases are bitter

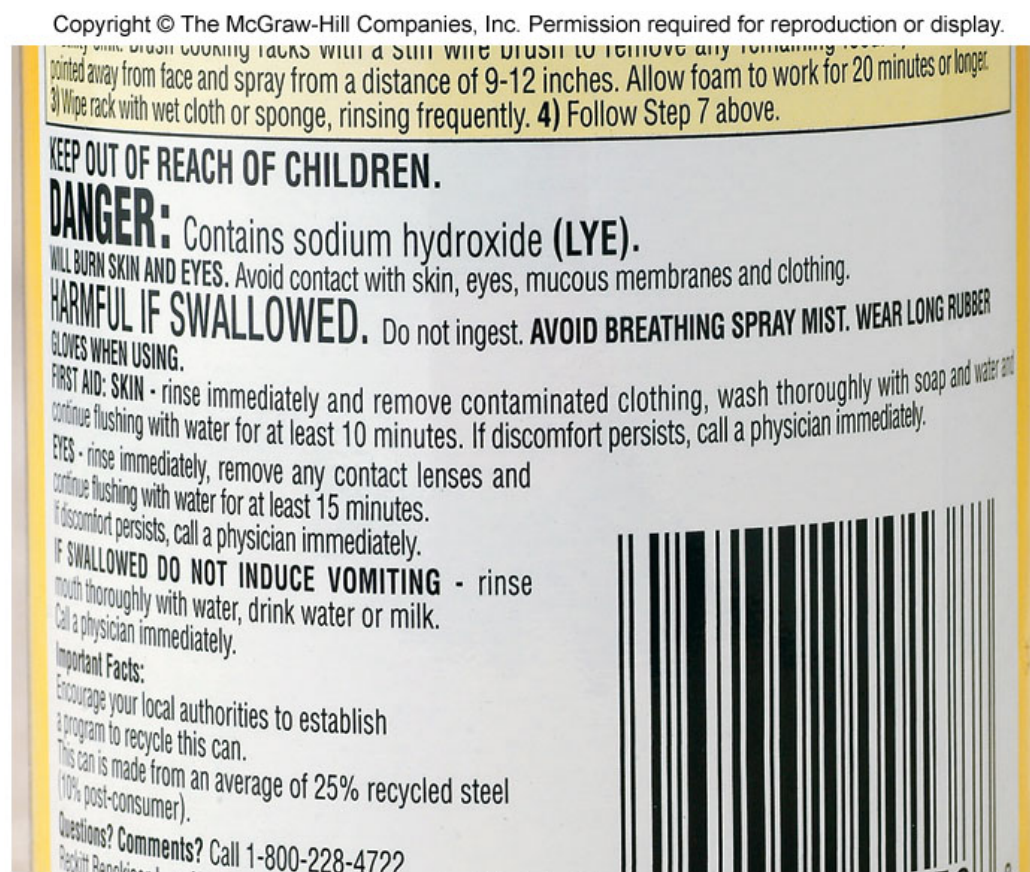...only drink. Brush cooking racks with a stiff wire brush to remove any remaining food. / pointed away from face and spray from a distance of 9-12 inches. Allow foam to work for 20 minutes or longer. 3) Wipe rack with wet cloth or sponge, rinsing frequently. **4)** Follow Step 7 above.

KEEP OUT OF REACH OF CHILDREN.

DANGER: Contains sodium hydroxide **(LYE).**

WILL BURN SKIN AND EYES. Avoid contact with skin, eyes, mucous membranes and clothing. **HARMFUL IF SWALLOWED.** Do not ingest. **AVOID BREATHING SPRAY MIST. WEAR LONG RUBBER GLOVES WHEN USING.**

FIRST AID: **SKIN** - rinse immediately and remove contaminated clothing, wash thoroughly with soap and water and continue flushing with water for at least 10 minutes. If discomfort persists, call a physician immediately. **EYES** - rinse immediately, remove any contact lenses and continue flushing with water for at least 15 minutes. If discomfort persists, call a physician immediately. **IF SWALLOWED DO NOT INDUCE VOMITING** - rinse mouth thoroughly with water, drink water or milk. Call a physician immediately.

Important Facts:
Encourage your local authorities to establish a program to recycle this can. This can is made from an average of 25% recycled steel (10% post-consumer).

Questions? Comments? Call 1-800-228-4722

$$2H_2O \rightleftarrows H_3O^+ + OH^-$$

- reaction proceeds in both directions at the same time
- adding more of a reagent will cause it to react faster
- this causes the equilbrium to shift towards the other side

$$K_{eq} = \frac{[\text{Products}]}{[\text{Reactants}]}$$

$$K_{H_2O} = \frac{[H_3O^+][OH^-]}{[H_2O]} \Rightarrow K_{H_2O}[H_2O] = [H_3O^+][OH^-] \Rightarrow 1x10^{-14} = [H_3O^+][OH^-]$$

$$[H_2O] = \frac{\text{moles } H_2O}{\text{L solution}}$$

$$1\,L\,H_2O \times \frac{1000\ g\ H_2O}{1\,L\,H_2O} \times \frac{\text{mole } H_2O}{18\ g\ H_2O} = 55.6 \text{ mole } H_2O \Rightarrow [H_2O] \text{ is } 55.6 \text{ M}$$

What is pH and Why Does it Matter?

pH stands for power of hydrogen
pH = –log[H_3O^+] (negative of the power of 10)
[H_3O^+] = 10^{-pH}
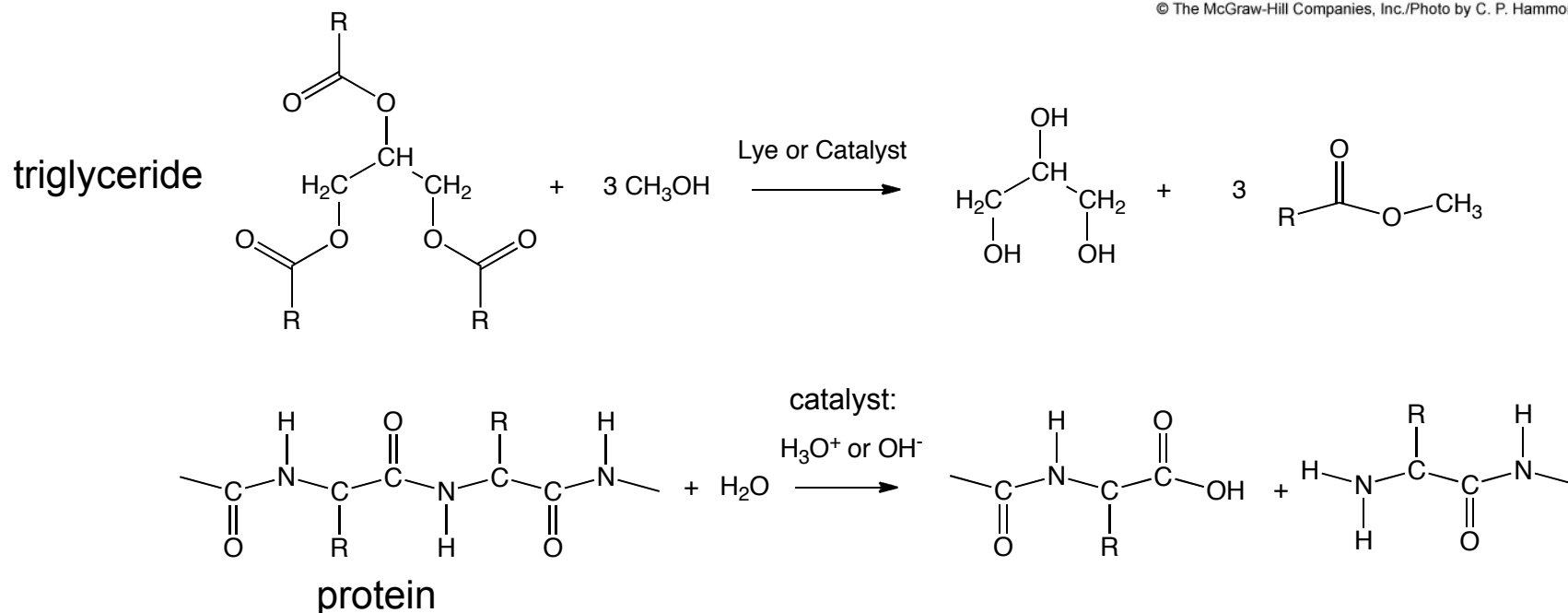
if [H_3O^+]=1x10^{-4} then pH= 4
if [H_3O^+]=1x10^{-9} then pH= 9
if [H_3O^+]=1x10^{-7} then pH= 7

Acids & bases can break bonds in molecules of life

perfectly normal™
balancing shampoo

Salon Selectives Perfectly Normal balancing shampoo is designed to cleanse and enhance your hair's natural vitality, leaving it shiny and healthy looking.

The perfect start for creating whatever look you want today.

• Vitamins A, E and C enriched formula helps bring out your hair's natural vitality

• pH-balanced formula enriched with Chamomile helps maintain your hair's natural moisture balance

Congratulations! You are "Perfectly Normal"™

triglyceride   + 3 CH_3OH → (Lye or Catalyst) + 3

protein + H_2O → (catalyst: H_3O^+ or OH^-)