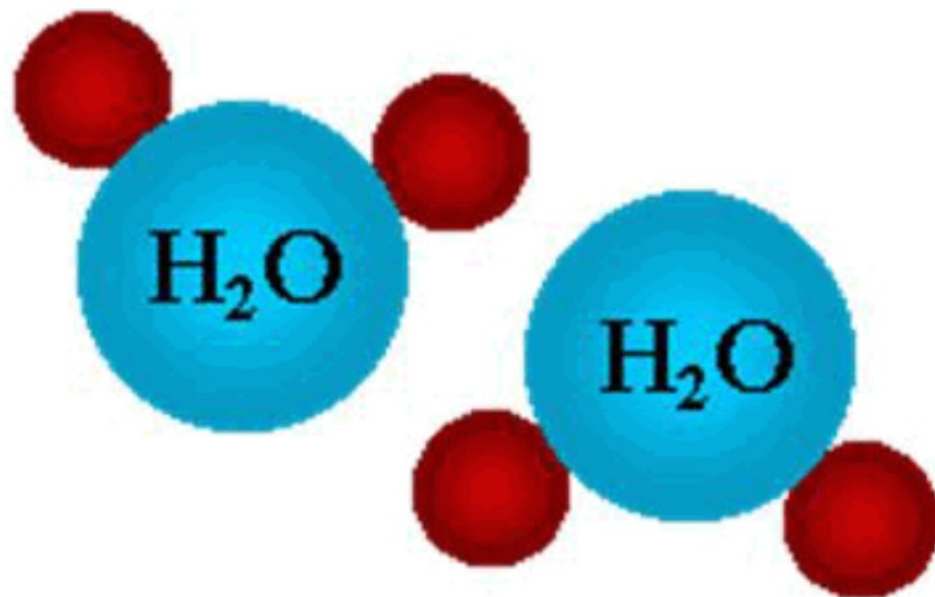


Acids and Bases



Can you name some common acids and bases that we use everyday?

Properties of Acids and Bases

Acids

Produces H^+ ions in a solution (soon combines w/ H_2O to form hydronium ions H_3O^+).

Examples: HCl , HF

Bonds with non-metals

Caustic – another word for acid



Bases

Produces OH^- ions in a solution (hydroxide ions)

Examples: $NaOH$, KOH

Bonds with metals

Alkali – another word for base

Both can be electrolytes producing electricity

Taste of Acids and Bases



Acid

Have you ever taken a bite out of a lemon? Lemon juice is an acid, and acids can taste **sour**.



Base

Baking soda has a bitter taste that most people do not like. Baking soda is a base, and bases can taste **bitter**.

Neutral



Water is not an acid or a base, it is neutral and has no particular taste.



Please do not ever taste strong acids or strong bases or any other chemicals that are not food!

How Do Acids and Bases Feel?



If you are slicing lemons and some of the juice gets into a cut on your finger, it stings. Acids **sting!**



If you have ever spilled bleach or soap on the floor, you may have noticed that it is slippery. Bases are **slippery.**



A neutral substance such as water is a good choice for cleaning up acids and bases because it does not sting and it is not slippery.



Please do not ever touch strong acids or strong bases because they can be harmful to your skin and may damage sensitive tissues such as your eyes.

Common **Acids** and **Bases**

Acids

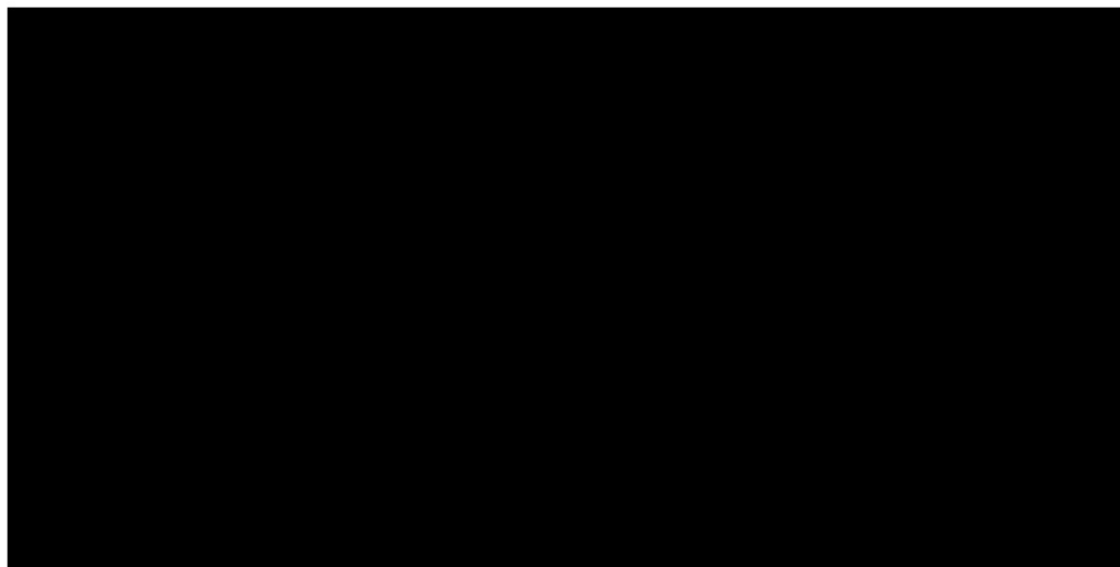
- gastric juice in stomach
- batteries
- cleaners
- vinegar
- citrus
- carbonated drinks
- Aspirin
- fertilizers

Bases

- soaps
- ammonia
- deodorants
- laxatives
- fertilizers
- lime-sweetens soil
- lye-oven cleaner

ACID

BASE



Strength of Acids

Strong Acids –

pH low - between 0-3

Strong – release a **lot** of H^+ ions in water

Examples:

- HNO_3 – nitric acid
- HCl – hydrochloric acid

Corrosive Acids – react with metals

Examples:

- H_2SO_4
- HCl

Weak Acids –

pH between 3-6

Weak – release a **FEW** H^+ ions in water

Examples:

- Citric Acid in Fruits
- Carbonic Acid – Soda
- Vinegar



Strength of Bases

Strong Bases –

pH high - between 10-14

Strong – release a **lot** of OH⁻ ions in water

Examples:

- NaOH – Drano
- Bleach

Corrosive bases react with metals

Weak Bases –

pH between 8-10

Weak – release a **FEW** of OH⁻ ions in water

Examples:

- Mg(OH)₂ – Milk of Mg
- NH₄OH – household ammonia

Bases react with fats, grease and oils – that's why they make good cleaners.



Is there a difference?

Strength-depends on how completely a compound is pulled apart to form ions when dissolved in water. (weak or strong)

Concentration-refers to the amount of acid or base dissolved in solution. (dilute or concentrated)

It is possible to have diluted strong acids & bases as well as solutions of concentrated weak acids and bases.

Indicators

...are scientific aids that tell whether something is an acid, a base or neutral substance.

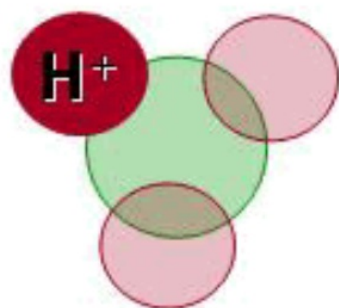
...can sometimes tell the concentration of H^+ or OH^- ion in the solution.



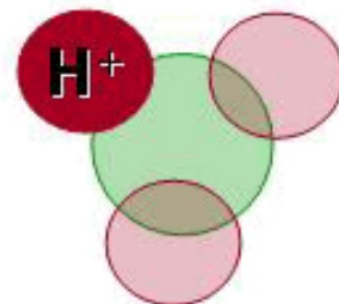
To determine if a substance is an acid or a base we use the tool called the ...

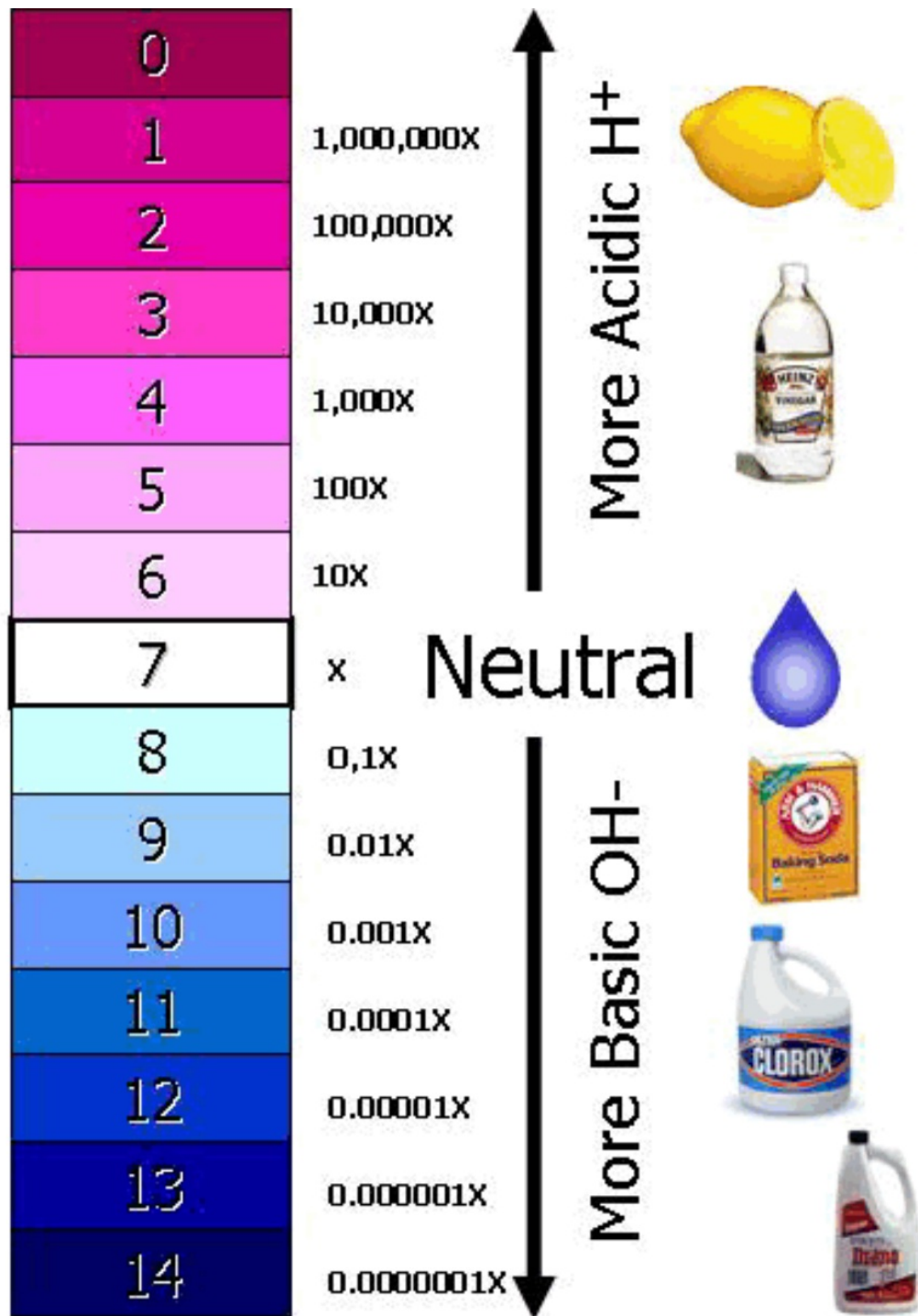
The pH Scale

pH is based on the concentration of **H⁺ ions** in solution



pH scale is based on powers of **10**



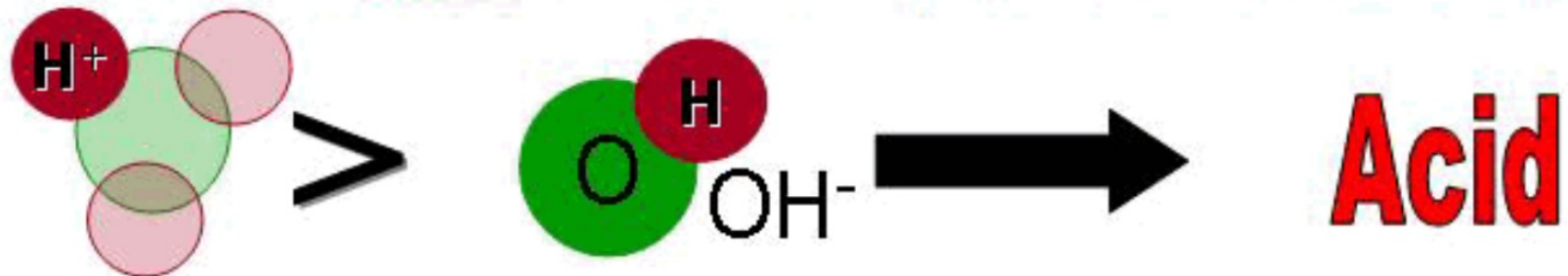


The stronger the acid –
the lower the number.

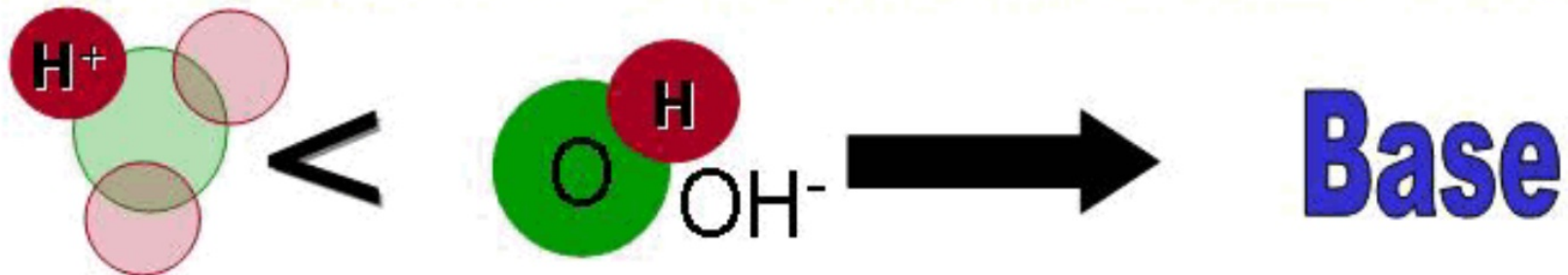
The pH Scale

The stronger the base –
the higher the number.

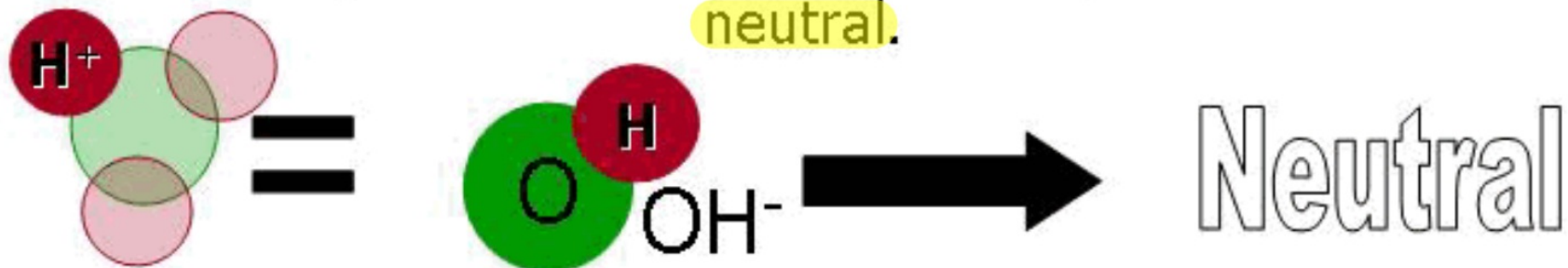
If there are **more** H^+ than OH^- , then the chemical is an acid.



If there are **Less** H^+ than OH^- , then the chemical is a base.



If there are **equal** amounts of H^+ and OH^- , then the chemical is **neutral**.

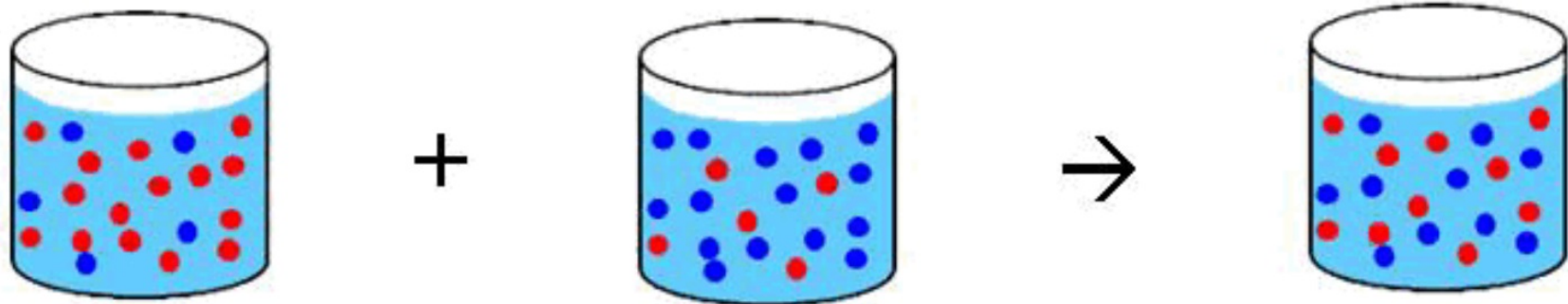


Types of Indicators

- pH meter-used to determine pH by immersing electrodes into solution and read a dial indicating strength of acid or base.
- Litmus paper is used as an natural paper indicator made from moss for acids and bases.
 - ✓ Acidic turns blue litmus → to red
 - ✓ Basic turns red litmus → to blue
- pH indicator - a chemical that changes color at different pH values, ex. Phenolphthalein
 - ✓ Acid → turns Clear / Colorless
 - ✓ Base → turns Pink/Purple



Neutralization of Acids and Bases

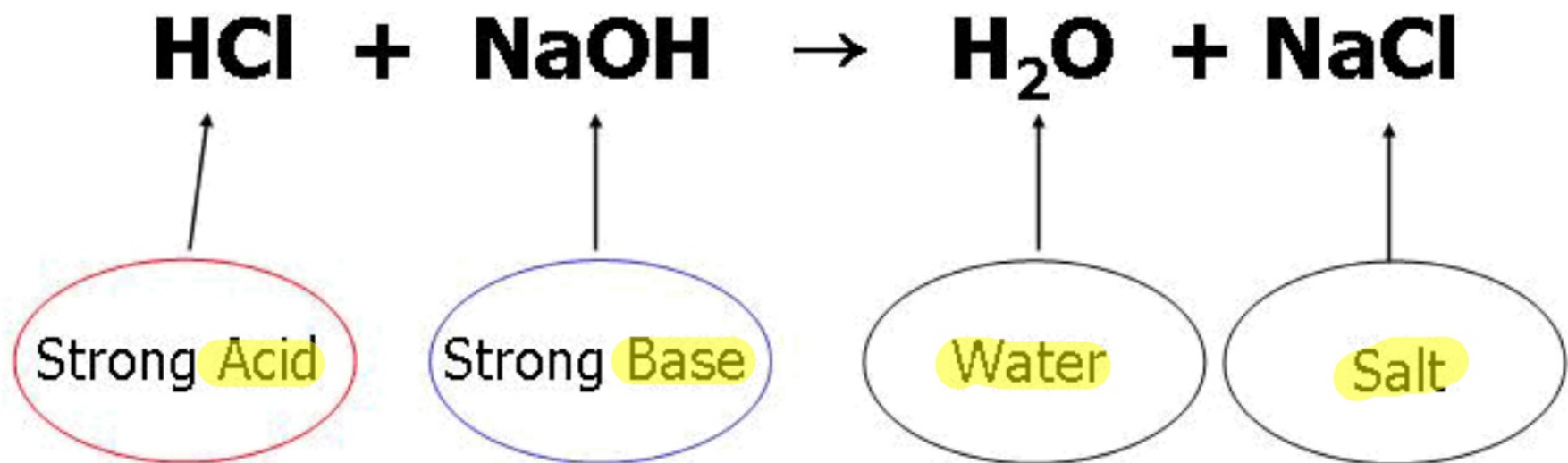


Acid + **Base** = Neutral

Bases and acids neutralize each other.
Mixing equal amounts of similar strength acids
and bases produces a neutral substance.

The neutral substance that it produces is **SALT** and **WATER**.

Example:



Ionization

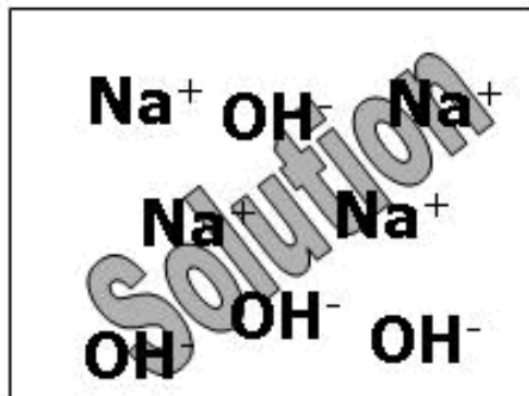
- breaking apart of certain polar substances (such as an **acid**) to **form ions**

HCl breaks into H⁺ and Cl⁻

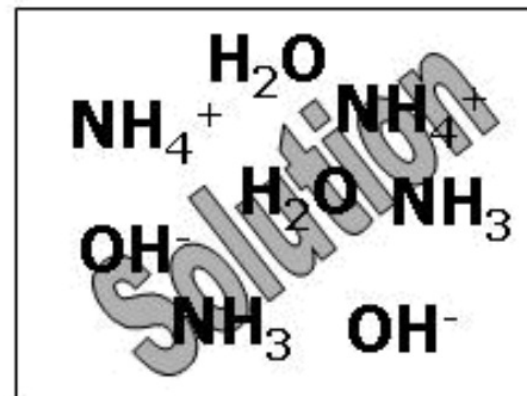
Dissociation

- **Breaking apart** of an ionic compound (such as a **base**) **to form ions**

Strong Base



Weak Base



Producing Electricity

- **Electrolytes**-a substance that separates into ions or forms ions in a solution, and conducts electricity (both acids and bases do this)
- **Nonelectrolytes**-substances that do not form ions when dissolved in a solution, does not conduct electricity

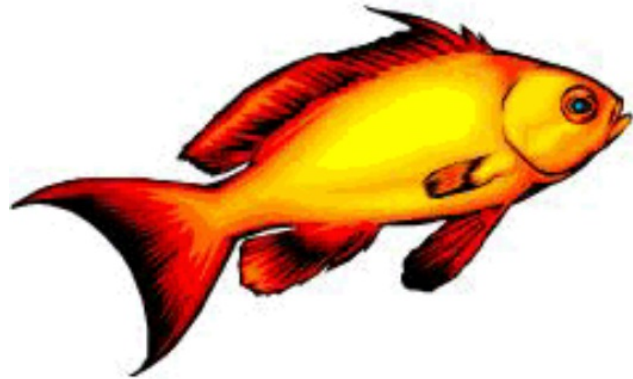
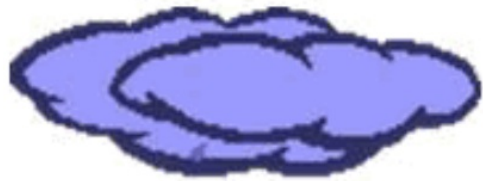


Acid Rain



- Unpolluted rain is slightly acidic about pH 5.6
- Each point you drop on the pH scale is 10 times stronger.
- Any rain below 5.6 is called acid rain. Rain in urban areas is usually 4.5 and can even get as low as 4.2.

Acid Rain



- Rain or any other precipitation is naturally acidic because it mixes with carbon dioxide and forms carbonic acid.
- However, **gases released into the atmosphere from burning fuels** such as coal and oil increase the acidity in rain.
- Sulfur oxides from factories
- Nitrogen oxides from autos
- These **combine with** oxygen and H_2O to form sulfuric acid and nitric acid.


What effects does acid rain have?

- Food Chain
 - can kill animals that live in water.
 - can kill plants which rely on rain as their water source.
 - dissolve away nutrients for plant growth
- Effects Buildings and Statues
 - Marble, limestone will react to acid by dissolving it away



How acid rain affects stonework.
The picture on the left was taken in 1908.
The picture on the right was taken in 1968



 [click here for a 2 minute video](#)

How A Dead Lake Is Created

Acid rain causes the pH of the lake to become more acidic which will kill the plankton(food) and some fish. The other fish and animals have no food(plankton) left and soon die too.

