Name:

**Acids and Bases**

ACT/MME prep

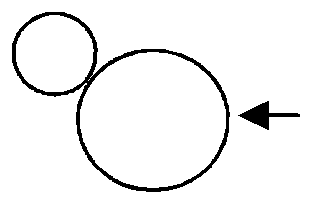
**Acids Bases**

Acids are compounds that add H+ ions to a water solution.

Cl-

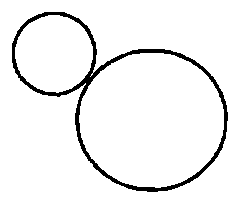
Bases are compounds that add OH- ions to a water solution.

Na+



H+

Cl-



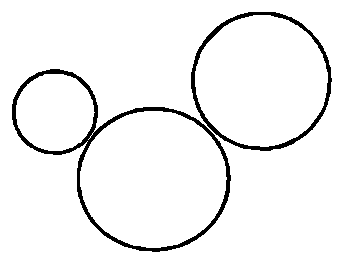
In water

H+ H+ ion

Na+

H

O-



In water

H

O- OH– ion

HCl— Hydrochloric acid: a very strong acid.

In water HCl breaks up (dissociates) making H+ ions.

NaOH— sodium hydroxide: a very strong base.

In water it breaks up (dissociates) making OH– ions.

Many of our foods are acidic: citric

(lemons; oranges); apples; tomato sauce.

Acids taste **sour** and feel “**squeaky**”

when you rub your fingers together.



Many of our cleaning products are basic (ammonia [Windex]; soap; bleach) because they neutralize acidic food.

Bases taste **bitter** and feel **slippery**.



**Strong acids and bases** —ionize almost completely in water, contributing many ions.

Strong acids and bases can burn your skin or eyes.

**Weak acids and bases**—ionize incompletely, contributing just a few ions.

**pH—The Measure of Acids and Bases**

*Strong acids*

**Acids**

*Weak acids*

**Neutral**

*Weak bases*

**Bases**

*Strong bases*

0 1 2 3 4 5 6

7 8 9 10 11 12 13 14

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Concentrated | Lemon | Vinegar | Distilled | Baking | Bar | Ammonia | Concentrated |
| HCl | juice |  | water | soda | soap |  | NaOH |

**Neutralization (Titration)**

When acids and bases are mixed they ***neutralize*** each other. Equal concentrations of acids and bases make neutral salt water.

**Diluting Acids**

***Never add water to a concentrated acid!***

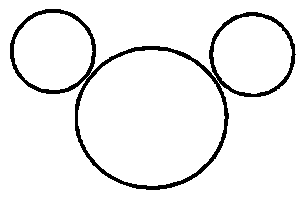
H

H+ + O-



H+ H+

→ O-



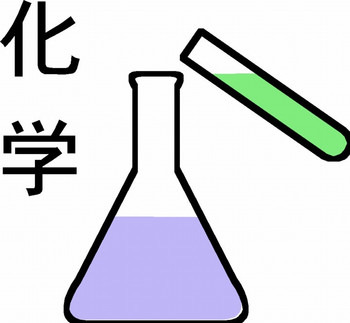
When acid compounds are dissolved in water, heat is produced (sometimes a lot of heat). Acids are more dense than water, so if you add water to

a concentrated acid, water sits on top and can

**H+ + OH−** → **H2O**

***A typical neutralization reaction:*** HCl + NaOH → NaCl + H2O Acid + Base → Salt Water

water



acid

flash boil (quickly boil). The boiled water can splash up burning you with hot water and acid. If the acid is added to water it sinks thru the

water and is diluted

*Chemists call ANY ionic compound a salt. NaCl is a special salt: table salt.*

*One of the products*

*of a titration*

*is always water!*

safely.

***Always add acids to water!***

*cstephenmurray.com*

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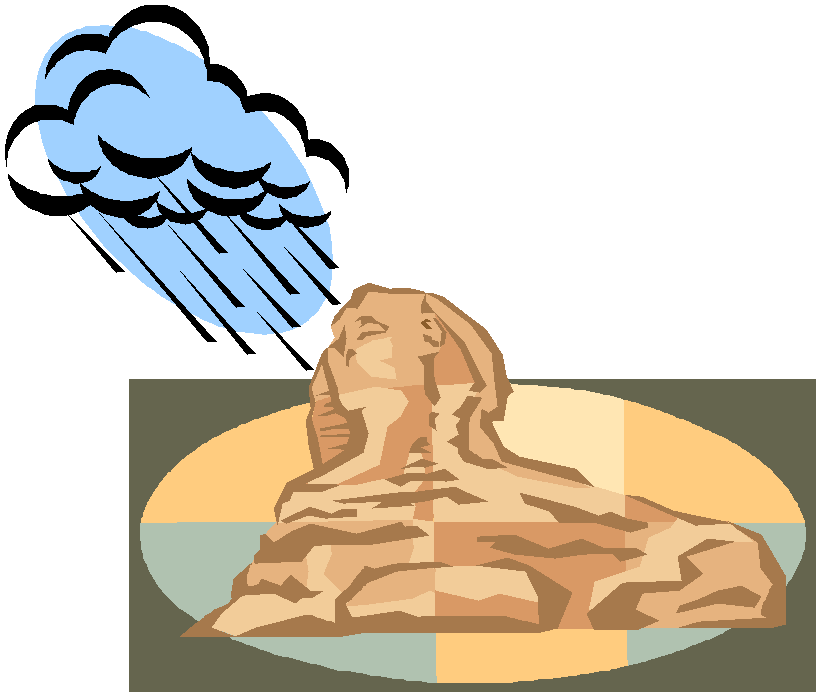
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Name:

Plants and animals need water close to neutral (pH 7) to survive.

Due to pollution from combustion reactions, rain today can be acidic. Raid less than pH 5.6 we call  **acid rain**.

Acid rain can kills plants, cause asthma and other physical problems.



**pH and Acid Rain**

ACT/MME prep

Acid rain also eats away statues and historical landmarks.

The Roman ruins, the pyramids of Egypt, and other treasures of the world are being slowly dissolved away by acid rain. More damage has been done in the last century than in the last 2,000 years.

Without stopping pollution (and acid rain)

these treasures may be lost forever.

1. Acid

2. Base

3. Neutral

4. Neutralize

5. Acid Rain

6. A Salt

7. Table salt

A. To mix acids and bases to cancel each other out and make salt water.

B. A compound that adds H+ ions to water. C. Any ionic compound.

D. Equal number of H+ and OH– ions;

water is an example.

E. A compound that adds OH– ions to water.

F. A compound of sodium and chlorine.

G. When pollution causes rain to be acidic

(pH of less than 5.6).

1. pH

2. Salt Water

3. Strong Acid

4. Weak Base

5. Weak Acid

6. Titration

A. The measure of acids and bases.

B. A compound that adds a few OH– ions to water.

C. To neutralize an acid with a base.

D. The product of a neutralization reaction between an acid and a base.

E. A compound that adds a few H+ ions to water.

F. A compound that adds a lot of H+ ions to water.

HCl

H2(SO4)

Mg(OH)2

*Acid or Base?*

H2(CO3)

NaOH

Ca(OH)2

*Acid or Base?*

H3PO4

LiOH

HNO3

*Solution A (pH 4); Solution B (pH 2)*

Which one has more H+ ions? Which one has less OH– ions? Which one is more basic? Which one is more acidic?

*Solution A (pH 11); Solution B (pH 13)*

Has fewer OH– ions

Has more H+ ions

Feels squeaky clean

Has fewer H+ ions

Tastes bitter

Has more OH- ions

pH of 0 to 7

pH of 7 to 14

Feels slippery

Tastes sour

Which one has more OH- ions? Which one has less H+ ions? Which one is more acidic? Which one is more basic?

What is the product of every titration?

*Should you add an acid or a base?*

You need a pH of 6.2; you have a pH of 5.1. You need a pH of 12; you have a pH of 13.4. You need a pH of 7; you have a pH of 11.2. You need a pH of 4; you have a pH of 2.3.

Antacids neutralize stomach acid. What is an antacid really?

Finish these neutralization reactions: (balance the salt, too).

HBr + Mg(OH) →

HS + Li(OH) →

How do you safely dilute a concentrated acid?