Chemistry 1010

Acids and Bases II

Review

What is an acid? a compound that reacts with water to form H_3O^+

What is a base? a compound that reacts with water to form OH⁻ (or already contains OH⁻)

What are some common acids, and where are they found?

What are some common bases, and where are they found?

What is the difference between a strong acid and a weak acid?

all molecules of a strong acid react with water only some molecules of a weak acid react with water

Measuring How Acidic or Basic a Solution Is

The pH scale is used to measure how acidic or basic a solution is.



very acidic mildly acidic neutral mildly basic very basic

The pH of a solution depends on two different things:

- 1) how strong the acid or base is
- 2) how much of the acid or base is present

pH can be measured accurately using a pH meter.



You can also get a pretty good idea of the pH using indicators.

indicator: a compound that changes color depending on pH

The earliest indicator was litmus.

acid – pink

base – blue



Phenolphthalein is often used in chemistry labs.

acid – clear

base – pink



Some foods have natural indicators: grape juice, red cabbage, blueberries, and rose petals.









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pH paper combines several different indicators to give a rainbow of colors from pH 1 to 12.



Reactions of Acids and Bases

The most important reactions of acids and bases are their reactions with each other.

When an acid and a base react, it is called a neutralization reaction.

HCI + NaOH \longrightarrow H₂O + NaCI

In these reactions, water and an ionic compound are formed.

If the acid and base are present in equal amounts, the final solution is neutral.

Example: reaction of stomach acid with an antacid

$$2 \text{ HCl} + \text{CaCO}_3 \longrightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2$$



Why would you want to neutralize stomach acid? How are antacids different from acid blockers? Why might antibiotics be useful? Example: reaction of baking soda with vinegar

$NaHCO_3 + C_2H_4O_2 \longrightarrow NaC_2H_3O_2 + H_2O + CO_2$



What other acids could baking soda react with? Why is baking soda a good leavening agent? What happens if you forget to add baking soda? **Example: removing hard water deposits**

 $2 H_{3}PO_{4} + 3 CaCO_{3} \longrightarrow Ca_{3}(PO_{4})_{2} + 3 H_{2}O + 3 CO_{2}$





Bases are good for cutting grease and oils, but you need an acid for removing hard water deposits.

Why can't you have an acid and a base in the same cleaning solution?

Why shouldn't you ever mix cleaning solutions?

In addition to reacting with bases, acids also react with metals.

Example: hydrochloric acid etching zinc

$$Zn + 2 HCI \longrightarrow ZnCl_2 + H$$



Why does it seem like the acid is eating away the metal?

What precautions does this reaction suggest you should take with acidic cleaning products?

How could this cause a fire or explosion?