**Acids, Bases and Buffers**

**Acids** are compounds that dissociate in water and **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_-**

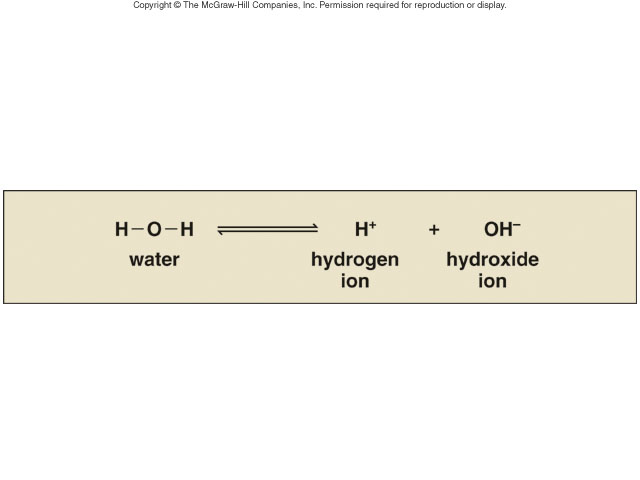
* Eg. HCl, H2CO3, H2O, CH3COOH, lemon juice, tomatoes, coffee.
* Strong acids dissociate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

HCl 🡪 H+ + Cl-

**Bases** are compounds that dissociate in water and **release OH- ions**.

* Eg NaOH, KOH, H2O.
* Strong bases dissociate completely.

NaOH 🡪 Na+ + OH-

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_and releases hydrogen ions (H+) and hydroxide ions (OH-).

**pH** is a measure of the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** in solution and

ranges from 0 to 14.

The **\_\_\_\_\_\_\_\_\_\_\_\_\_**the number the more **acidic** the solution. pH < 7.0 is acidic.

The **\_\_\_\_\_\_\_\_\_\_\_\_\_**the number the more **basic** (alkaline) the solution. pH of >7.0 is basic.

A pH of 7.0 is neutral. Pure water is neutral.

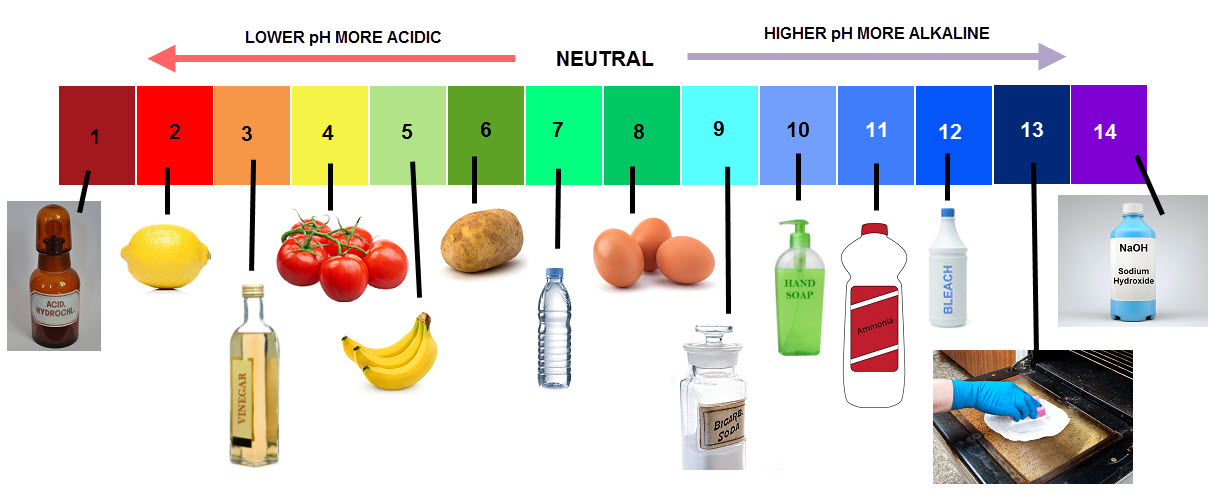
pH is **a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ scale**.

* Each number on the pH scale represents a difference of magnitude of 10.
* pH of 2 is ten times more acidic than a pH of 3.
* pH of 3 is 100 times more acidic than 5.
* **moles/liter**

1 x 10 –6 [H+] = pH 6

1 x 10 –7 [H+] = pH 7

1 x 10 –8 [H+] = pH 8



**Most bodily functions operate within a very narrow range of pH**.

* Small change in pH can cause **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** (change shape).
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**are substances that resist a change in pH
* The normal pH value for the body fluids is between **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.
* pH value of body fluids is < 7.35, the condition is called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**
* the pH is > 7.45, it is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* A rise or drop greater than 0.05 (on a pH scale) would require hospitalization



**What are the signs and symptoms?**

**Acidosis** can cause **depression** of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Alkalosis** can cause **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**of the nervous system.

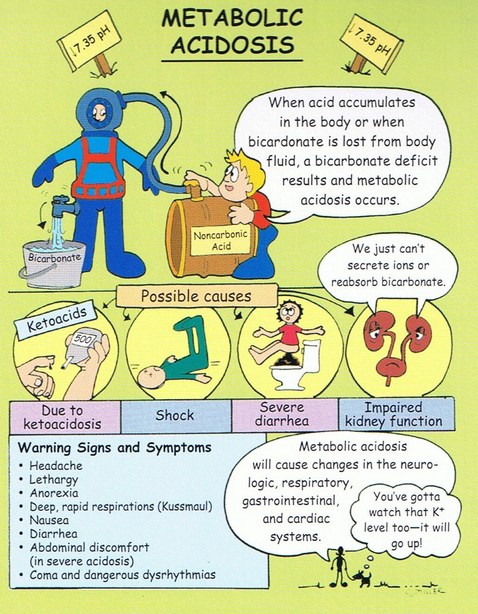
* Muscle spasms, \_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4 Main types of imbalances:

**metabolic**  **respiratory**

acidosis acidosis

alkalosis alkalosis

**Metabolic Acidosis**

* kidneys can’t eliminate enough \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Eating acidic foods, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* lipid metabolism produces fatty acids.
* carbon dioxide, a by-product of metabolism, combines with water to form \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** 🡪lactate and acid
* \_\_\_\_\_\_\_\_\_ acidosis occurs in people with diabetes.

**Risk Factors include**:

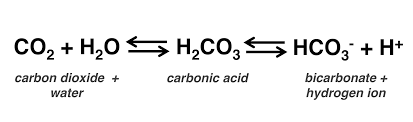
* high-fat diet low in carbohydrates
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* obesity
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Diabetic ketoacidosis (DKA)**

* life-threatening problem that affects people with diabetes.
* occurs when the body **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** (glucose) as a fuel source because there is **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** or not enough insulin.
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**is used for fuel instead.
* when fat is broken down to fuel the body, chemicals called **\_\_\_\_\_\_\_\_\_\_\_\_\_** build up in the body.

**Metabolic alkalosis**

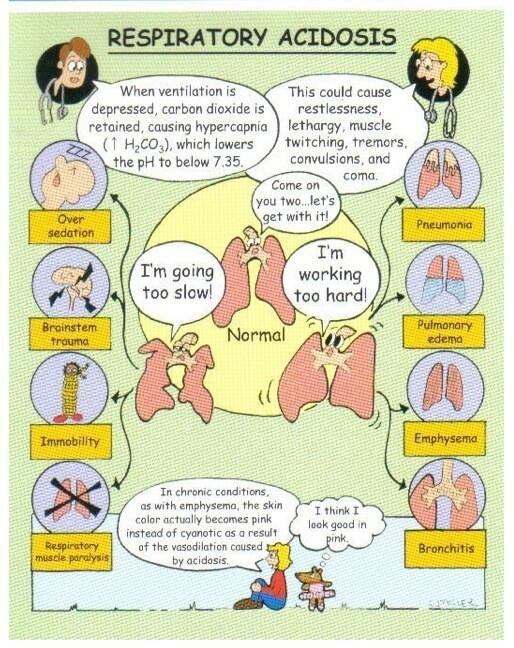
* May be caused by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, diuretic use.

**Respiratory** imbalances are caused by \_\_\_\_\_\_\_\_\_\_\_\_\_ of the respiratory system.

**Respiratory acidosis** occurs when too much CO2 builds up in the body.

* Lungs not removing fast enough.
* Excess CO2 reacts with water to form carbonic acid.
* carbonic acid dissociates to form hydrogen ions and bicarbonate ions.
* increased hydrogen ion concentration causes the pH of the body fluids to decrease.

Respiratory acidosis can be caused by:

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_to the chest
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, which can make breathing difficult

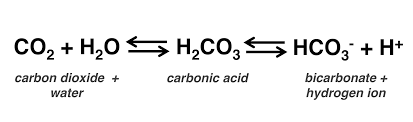
**Respiratory alkalosis**

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: increases the rate carbon dioxide elimination, decreasing [CO2] in the body, raising the pH. The reaction is pushed to the left.

Prolonged acidosis may lead to:

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**How do we compensate?**



**Buffers in our blood:**

* Extracellular buffers: \_\_\_\_\_\_\_\_\_\_\_\_,\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_,\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Intracelluar buffers: proteins, phosphate

**Respiratory System**

* Reduced pH stimulates the respiratory center to begin hyperventilation, eliminating CO2 at a greater rate. In turn also eliminates excess hydrogen ions.

**Kidneys**

* help compensate for failure of the lungs by adjusting the \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_into the filtrate and reabsorption of bicarbonate ion.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ response time than buffers and respiratory

**Questions**

* 1. What is the normal range for our blood pH?
  2. Hyperventillation may cause our blood pH to \_\_\_\_\_\_\_\_?
  3. What is the name for this condition?
  4. What condition may be caused by eating a high protein diet low in carbohydrates?
  5. What organ works to compensate for this?
  6. What may happen if the condition persists?
  7. Name two risk factors for metabolic acidosis.
  8. What are the three most important systems in our body that keep our blood pH within normal range?
  9. Describe diabete ketoacidosis.