



Acids and Bases

The degree of **acidity (acid)** or **alkalinity (base)** is important in organisms. The body must constantly maintain a near neutral pH (7) in the blood and body tissues. To do this, the body produces **buffers** that can **neutralize acids**. Acidic and basic conditions in the body occur due to different **metabolic (chemical) reactions** taking place throughout the body. The pH scale is from 0-14 and represents the strength of the acid or base. Acids are from 0 up to 7. Bases are above 7-14.

1. What does alkalinity mean?
2. What pH must humans maintain?
3. What characteristic of life would maintaining this balance be? (See textbook, think back to unit 1)
4. What chemicals does the body produce to keep neutral pH?
5. Buffers _____ acids in the body.
6. Acidic and basic conditions occur due to _____ reactions in the body.
7. The pH scale is from _____ to _____.

Water is one of the most important molecules in the body. Cells are made mostly of water and water is required for almost every metabolic reaction in the body. The force of attraction between water molecules is so strong that the oxygen atom of one molecule can actually remove the hydrogen from other water molecules. This reaction is known as **dissociation**, and it takes place in our cells. Water (H_2O) dissociates into H^+ and OH^- ions. A charged atom or molecule is called an ion. The OH^- ion is called the **hydroxide ion**, while the H^+ ion is called the **hydrogen ion**. Free H^+ ions can react with another water molecule to form the H_3O^+ or **hydronium ion**. The human body requires a **neutral pH** for many reasons. One reason cells like a neutral pH is for proteins. **Basic or acidic solutions denature proteins (change their shape) so they no longer work.**

8. What is dissociation?
9. What is the chemical formula for water?
10. What is an ion?
11. Name the 2 ions form when water dissociates.
12. What is the hydroxide ion?

13. What is a hydrogen ion?

14. What is the hydronium ion and its formula?

Acidity or alkalinity is a measure of the relative amount of H^+ and OH^- ions dissolved in a solution. Neutral solutions have an equal number of H^+ and OH^- ions. Acids have more H_3O^+ ions (lots of free H^+ that were available to bind with water) than OH^- ions. Acids taste sour and can be corrosive. Digestive fluids in the body are acidic and must be neutralized by buffers. Bases contain more OH^- ions than H_3O^+ ions and very few free H^+ floating to make H_3O^+ . Bases taste bitter and feel slippery.

When an acid is combined with a base, **neutralization** occurs. The result of neutralization is a salt and water. Neutralization helps return our body pH to neutral. The process of our bodies maintaining neutral pH so that proteins can work properly without being denatured (unfolded) is known as **homeostasis**.

15. How do you measure for acidity or alkalinity?

16. What is a neutral solution?

17. Acids have more _____ ions and taste _____ and can be _____.

18. Bases contain more _____ ions than _____ ions.

19. _____ fluids are acid in the body and must be _____ by _____.

20. Bases taste _____ and feel _____.

21. What is neutralization?

22. What 2 things are produced by neutralization?

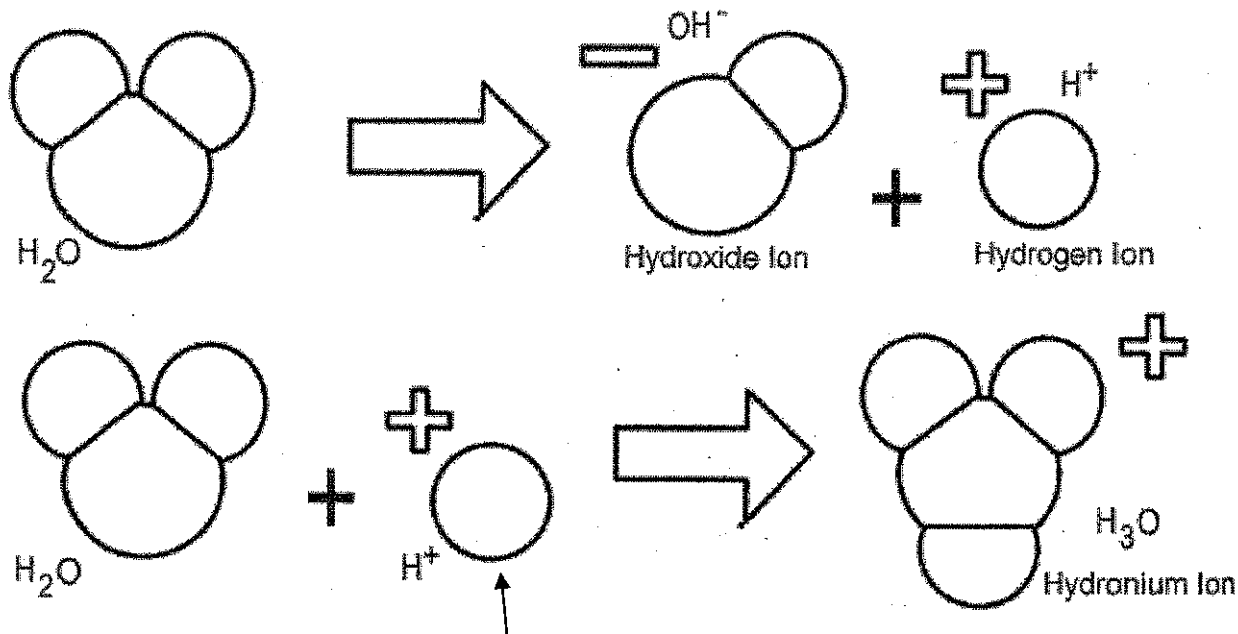
23. Neutralization keeps our pH at _____ and is an example of maintaining _____.

Color the following diagrams according to the key. Use the same colors for these elements throughout the entire worksheet.

DISSOCIATION OF WATER

HYDROGEN (yellow)

OXYGEN (red)



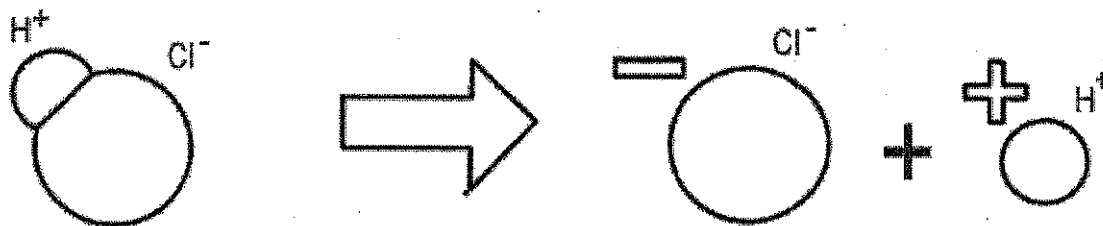
This free Hydrogen ion can join water to make a hydronium ion.

ACIDS & BASES

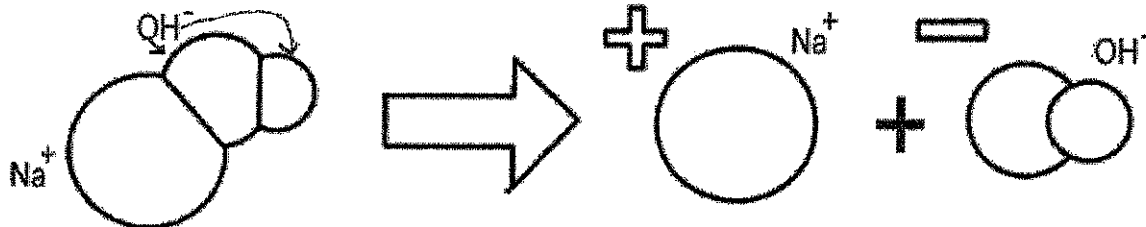
Chlorine (green)

Sodium (blue)

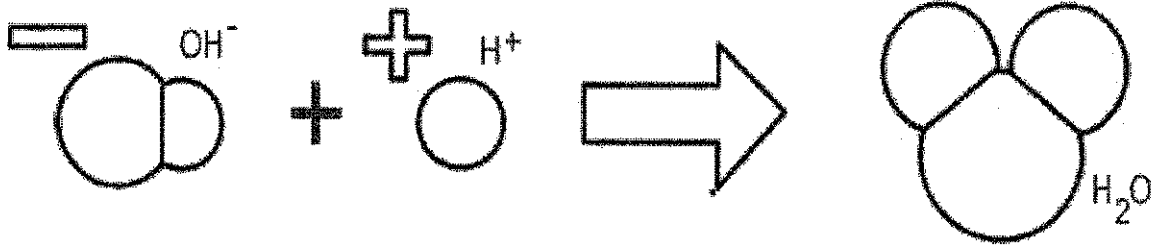
Hydrochloric Acid



Sodium Hydroxide



NEUTRALIZATION



Questions:

1. Why is the water molecule so important to organisms?

2. What ions form when water dissociates?

3. What is meant by the term alkalinity?

4. What is produced by the body to help neutralize acidic conditions?

5. What is the name for the OH^- ions?

6. What is the name for the H^+ ion?

7. How does the hydronium ion form? What is its formula?

8. Why do most proteins need near a neutral pH?

9. What two substances form from an acid-base neutralization?

10. Acids have an excess of _____ ions.