Acids and Bases

The degree of acidity or alkalinity (basic) 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.

1. What does alkalinity mean? ____________________________

2. What pH must organisms maintain? _________________

3. What characteristic of life would maintaining this balance be? ____________________________

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.

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 (H₂O) 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.

7. What is dissociation? ____________________________

8. What is the chemical formula for water? ____________________________

9. What is an ion? ____________________________

10. Name the 2 ions that form when water dissociates. ____________________________

11. What is the hydroxide ion? ____________________________

12. What is a hydrogen ion? ____________________________

13. What is the hydronium ion and its formula? ____________________________
Acidity or alkalinity is a measure of the relative amount of $\text{H}^+$ and $\text{OH}^-$ ions dissolved in a solution.

Neutral solutions have an equal number of $\text{H}^+$ and $\text{OH}^-$ ions. Acids have more $\text{H}_3\text{O}^+$ ions ($\text{H}^+$) than $\text{OH}^-$ ions. Acids taste sour and can be corrosive. Digestive fluids in the body are acidic and must be neutralized by buffers. Bases contain more $\text{OH}^-$ ions than $\text{H}_3\text{O}^+$ ions. 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 denaturated (unfolded) is known as homeostasis.

14. How do you measure for acidity or alkalinity? __________________________________________

15. What is a neutral solution? _______________________________________________________

16. Acids have more _________ ions and taste _____________. And can be ________________.

17. Bases contain more _______________ ions than ______________ ions.

18. ______________ fluids are acid in the body and must be ________________ by _____________.

19. Bases taste _______________ and feel ____________________.

20. What is neutralization? ____________________________________________________________

21. What 2 things are produced by neutralization? ______________________________________

22. Neutralization keeps our pH at _____ and is an example of maintaining ______________.
Color the following diagrams according to the key.

**Dissociation of Water**

HYDROGEN (yellow)
OXYGEN (red)

\[ \text{H}_2\text{O} \rightarrow \text{H}^+ + \text{OH}^- \]

Hydroxide Ion
Hydrogen Ion

\[ \text{H}_2\text{O} + \text{H}^+ \rightarrow \text{H}_3\text{O}^+ \]

Hydronium Ion

**Acids & Bases**

Chlorine (green)
Sodium (blue)

Hydrochloric Acid

\[ \text{H}^+ + \text{Cl}^- \rightarrow \text{Cl}^- + \text{H}^+ \]

Sodium Hydroxide

\[ \text{Na}^+ + \text{OH}^- \rightarrow \text{Na}^+ + \text{OH}^- \]
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 $\text{OH}^-$ ions?
   ________________________________________________________________

6. What is the name for the $\text{H}^+$ 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.