**ACIDS and BASES**

**ACIDS:**  always contain a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ion.

Here are some common acids:

|  |  |  |
| --- | --- | --- |
| **Formula** | **Chemical Name** | **Examples of Uses** |
| **HCl(aq)** |  | * Produced in stomach to help digest food
 |
| **H2SO4(aq)** |  | * Used in automobile batteries
* Used to clean metals
 |
| **HNO2(aq)** |  | * Used to make fertilizers
 |

BASES:usually contain a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ion.

Here are some common bases:

|  |  |  |
| --- | --- | --- |
| **Formula** | **Chemical Name** | **Examples of Users** |
| **NaOH** |  | * Drain and oven cleaner
* Used to manufacture paper, glass and soap
 |
| **Mg(OH)2** |  | * Active ingredient in some antacids
 |
| **Ca(OH)2** |  | * Soil and water treatment
 |
| **NH4OH** |  | * Kitchen cleaner
* Used to make fertilizer
 |

THE pH SCALE

The **pH scale** is a numeric scale for measuring how\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ a solution is.

**Acids –** produce a solution with a pH of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ when they dissolve in water. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the pH, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the acid.

**Bases** – produce a solution with a pH of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ when they dissolve in water. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the pH, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the base.

**Neutral** – a solution that has a pH of \_\_\_\_\_\_\_\_\_\_. It’s neither \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Pure water** is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with a pH of 7. **Human saliva** is close to neutral, ranging from a pH of 6.5 to a pH of 7.4. **Human blood** is slightly basic with a pH of 7.3 to 7.5.

**pH Indicators**

Many of the solutions that acids and bases form are clear liquids and look like water. However, they could be quite dangerous depending on their pH level. A safe way to determine whether a solution is acidic or basic, is to use a \_\_\_\_\_.

**pH indicators** are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that change from one \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to another colour depending on the pH level of the solution that they are placed in. Each indicator changes at a specific pH.

**Universal indicator** changes a variety of colours depending on the pH.

**Properties of Acids and Bases**

***Use your textbook page 229 to complete this table.***

|  |  |  |
| --- | --- | --- |
| **Property** | **Acid** | **Base** |
| **Taste**CAUTION: Never taste chemicals in the classroom. | * Acids taste \_\_\_\_\_\_\_\_\_\_\_
* Examples:
 | * Bases taste \_\_\_\_\_\_\_\_\_\_\_\_
* Example:
 |
| **Touch**CAUTION: Never touch chemicals with your bare skin in the classroom | * Many acids will \_\_\_\_\_\_\_\_\_ your skin.
* Example:
 | * Bases feel \_\_\_\_\_\_\_\_\_\_\_\_\_
* Many bases will \_\_\_\_\_\_\_\_\_ your skin
* Example:
 |
| **Indicator Tests** | * Acids turn blue litmus paper \_\_\_\_\_\_\_\_\_\_
* Phenolphthalein is \_\_\_\_\_\_\_\_\_\_\_\_\_\_ in an acidic solution.
 | * Bases turn red litmus paper \_\_\_\_\_\_\_\_\_\_\_
* Phenolphthalein is \_\_\_\_\_\_\_\_\_\_\_\_\_\_ in slightly basic solutions and \_\_\_\_\_\_\_\_\_ in moderate to strong bases.
 |
| **Reaction with some metals, such as magnesium or zinc** | * Acids \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ metal
 | * \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 |
| **Electrical Conductivity** | * \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 | * \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 |
| **pH** | * \_\_\_\_\_\_\_\_ than 7
 | * \_\_\_\_\_\_\_\_ than 7
 |
| **Production of ions** | * Acids form \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ions when dissolved in water
 | * Bases form \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ions when dissolved in solution.
 |

**Use your data booklet to complete the following.**

Identify whether the substance is an acid or a base and indicate the colour the pH indicator will turn.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Substance** | **pH value** | **Acid or Base** | **Methyl Orange** | **Bromothymol Blue** | **Litmus** |
| **Lemon** |  |  |  |  |  |
| **Ammonia** |  |  |  |  |  |
| **Milk** |  |  |  |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Substance** | **pH value** | **Acid or Base** | **Methyl Red** | **Phenolphthalein** | **Indigo Carmine** |
| **Tomato** |  |  |  |  |  |
| **Oven Cleaner** |  |  |  |  |  |
| **Egg** |  |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Substance** | **pH value** | **Acid or Base** | **pH indicator** | **Colour of pH indicator** |
| **Black coffee** | **5** |  | **Litmus** |  |
| **Battery acid** | **0** |  | **Bromothymol blue** |  |
| **Sea water** | **8** |  | **Indigo Carmine** |  |
| **Orange Juice** | **3** |  | **Methyl Orange** |  |

**Classify each of the following as an acid or a base.**

1. H3PO4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 2. Mg(OH)2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. NH4OH \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 4. Has a pH of 4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5. has a pH of 9 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 6. Sulphurous acid \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

7. hydrogen bromide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 8. Potassium hydroxide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

9. causes methyl orange to turn red \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

10. causes phenolphthalein to turn pink \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

11. causes bromothymol blue to turn yellow \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Investigation into some Common Household Products**

**Your task:**

1. Choose 6 common household products and write their names in the first column below
2. Place a paper towel under your spot plate and label next to 6 “spots” the names of your products above
3. Place 3 or 4 drops of each household product in the labeled spot on your spot plate.
4. In the second column, predict whether each of the household items is an acid or a base and briefly explain why you think this.
5. Add 1-2 drops of universal indicator to each “spot” and write down the colour it turns
6. Check the pH scale at the front of the room to see your results and write down the pH in the next column and indicate if it actually is an acid or a base.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Household Product** | **Prediction****(Acid or Base? Why?)** | **Universal Indicator Colour** | **pH** | **Acid or Base****(final answer)** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

