






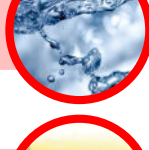









# ACIDS, ALKALIS, AND THE pH SCALE

The pH scale is a way of gauging the acidity or alkalinity of a solution. It is calculated using:  $\text{pH} = -\log_{10}[\text{H}^+]$ . Adding an acid to water increases the  $\text{H}^+$  ( $\text{H}_3\text{O}^+$ ) concentration, and decreases the  $\text{OH}^-$  concentration. An alkali does the opposite.

|                                       | pH | $\text{H}^+$ CONCENTRATION<br>(in moles per litre) | $\text{OH}^-$ CONCENTRATION<br>(in moles per litre) | EVERYDAY EXAMPLE  |
|---------------------------------------|----|--|---|---|
| ALKALINE<br>Turquoise → Blue → Purple | 14 | $1 \times 10^{-14}$                                | 1   | Drain Cleaner      |
|                                       | 13 | $1 \times 10^{-13}$                                | 0.1   | Bleach             |
|                                       | 12 | $1 \times 10^{-12}$                                | 0.01  | Ammonia            |
|                                       | 11 | $1 \times 10^{-11}$                                | 0.001   | Soap              |
|                                       | 10 | $1 \times 10^{-10}$                                | $1 \times 10^{-4}$                                  | Antacid Tablets  |
|                                       | 9  | $1 \times 10^{-9}$                                 | $1 \times 10^{-5}$                                  | Baking Soda      |
|                                       | 8  | $1 \times 10^{-8}$                                 | $1 \times 10^{-6}$                                  | Seawater         |
| NEUTRAL<br>Green                      | 7  | $1 \times 10^{-7}$                                 | $1 \times 10^{-7}$                                  | Pure Water       |
| ACIDIC<br>Red → Orange → Yellow       | 6  | $1 \times 10^{-6}$                                 | $1 \times 10^{-8}$                                  | Urine (average)  |
|                                       | 5  | $1 \times 10^{-5}$                                 | $1 \times 10^{-9}$                                  | Black Coffee     |
|                                       | 4  | $1 \times 10^{-4}$                                 | $1 \times 10^{-10}$                                 | Tomato Juice     |
|                                       | 3  | 0.001  | $1 \times 10^{-11}$                                 | Soda             |
|                                       | 2  | 0.01   | $1 \times 10^{-12}$                                 | Lemon Juice      |
|                                       | 1  | 0.1  | $1 \times 10^{-13}$                                 | Stomach Acid     |
|                                       | 0  | 1  | $1 \times 10^{-14}$                                 | Battery Acid     |

