

Measuring Acids

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- pH is a value that represents the concentration of dissolved hydronium ions (H_3O^+) within a solution

- the $[\text{H}_3\text{O}^+]$ influences
 1. How quickly the solution will begin to react
 2. How much change the acid may cause
 3. The amount of base required to neutralize the acid
 4. The amount of base or metal it will react with

Calculating pH

- pH of 7 = neutral
- low pH (to 0) = strong acid
- high pH (to 14) = strong base

$$\text{pH} = -\log [\text{H}_3\text{O}^+]$$

- this is a very important formula
- can calculate pH or the concentration of H_3O^+

Example 1

- Determine the pH of a sample of rainwater that has a hydronium ion concentration $[\text{H}_3\text{O}^+]$ of $1.0 \times 10^{-4} \text{ mol/L}$

Example 2

- A sample of lake water has a hydronium ion concentration of 2.27×10^{-7} mol/L.

Determine the pH of the lake water.

Sig Figs in Acid Base

- Sig figs in acid and base are determined by using the appropriate number of digits after the decimal point

$$[\text{H}_3\text{O}^+] = 10^{-\text{pH}}$$

- calculating the concentration of $[\text{H}_3\text{O}^+]$ ions is the inverse of calculating the pH

Think about it!

- What happens to the concentration of acids as the pH goes up???



Example

- Calculate the hydronium ion concentration $[\text{H}_3\text{O}^+]$ in a shampoo with a pH of 2.0

Example 2

- Determine the hydronium ion concentration of a solution with a pH of 13.283. Is this solution acidic or basic?

Indicators



- changing color as a response to differing pH is a property of indicators

Using Indicators

- the colors shown by indicators at various pH values can be used to interpret and estimate the pH

Example

- Separate samples of a solution of unknown pH cause the following acid base indicator colors
- Orange IV = yellow
- Bromothymol blue = blue
- Phenolphthalein = colorless
- What is the solution pH?

Buffers

- indicators are buffers
- a buffer is an aqueous solution made of an acid and its conjugate base
- buffers change very little when a strong acid is added

- when a buffer reaches its buffering capacity (limit of acid or base being added), it drastically spikes (because of the added acid)
- at this point an acid changes color (endpoint)