

8 Acids, bases, and pH – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary

*Write each word three times.***English****Write it 3 times** (English)

acid

base

conjugate base

strong acid

strong base

Recall

You already know a lot about acids and bases:

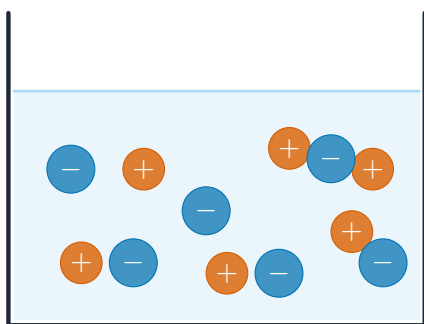
- Acids turn litmus red; bases (alkalis) turn it blue.
- The **pH scale** runs from 0 (very acidic) to 14 (very alkaline), with 7 neutral.
- Some acids are strong and some are weak.

This sheet makes pH exact. Each idea has a worked example.

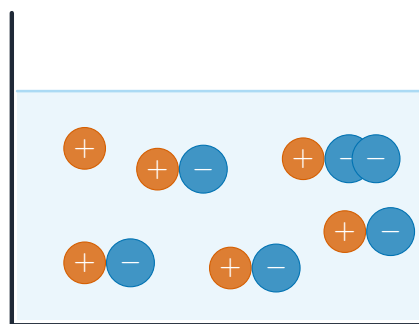
New ideas

■ 1 Acids and bases

By the **Brønsted–Lowry** idea, an **acid** gives away a proton (H^+) and a **base** accepts one. When an acid loses its proton it becomes its **conjugate base**.



strong acid
fully dissociated: many ions



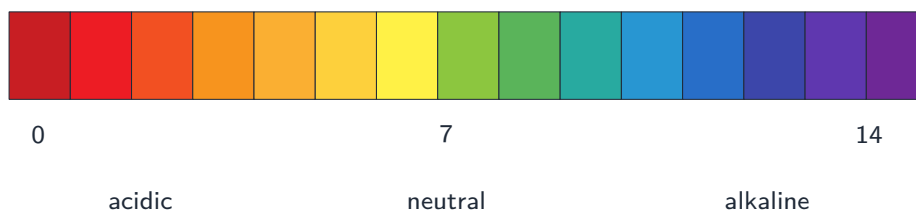
weak acid
mostly molecules: few ions

■ 2 The pH scale

The **pH** measures acidity:

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

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A lower pH means a higher $[\text{H}^+]$ and a more acidic solution.

■ 3 Strong acids and bases

A **strong acid** or **strong base** dissociates **completely** in water, so all of it splits into ions. Then $[\text{H}^+]$ equals the acid's concentration, and you can find the pH directly.

Worked example. For 0.010 M HCl (a strong acid, fully dissociated), $[\text{H}^+] = 0.010$ M, so $\text{pH} = -\log(0.010) = 2.0$.

Watch out: pH is a **logarithmic** scale, so each step of 1 pH unit means a **ten-fold** change in $[\text{H}^+]$. A solution of pH 2 is ten times more acidic than pH 3, not just a little more.

Practice

Try these in order. The methods are all above.

2.1 State the Brønsted–Lowry definitions of an acid and a base. [2]

2.2 State what happens to a strong acid when it dissolves in water. [1]

2.3 Find the pH of 0.10 M HCl (a strong acid). [2]

2.4 Find the pH of a solution with $[\text{H}^+] = 1 \times 10^{-5} \text{ M}$. [2]

2.5 A solution of pH 3 is compared with one of pH 5. State how many times more acidic the pH-3 solution is. [2]
