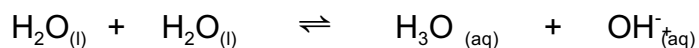


Chem 116: Acid and Bases

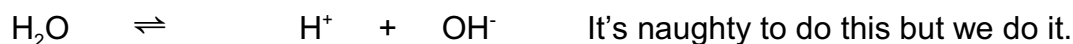
I'll mention only acids, but it's the same with bases only everything is the opposite

Of all the calculations you've done concerning acids and bases, you've probably (unless the answer is pH = 7.0) never calculated a correct answer. Don't sweat it; the same goes for virtually all chemists. The problem is that water ionizes itself



Let's detour

Most chemists leave the subscripts out unless the chemist wants to draw attention to them. You can subtract H₂O from each side leaving



In any aqueous solution containing an acid, H⁺ come from both the acid and from water. What we do (and it's wrong) is to assume that all the H⁺ come from the acid **or** from the water. And if all the H⁺ come from the water, the pH is 7. This occurs if the acid is really, really, weak or really, really dilute. We usually assume that all the H⁺ come from the acid and ignore the H⁺ that come from the water.

But, if you are perfectionist, and want to include the contributions of both the acid and the water, here's the equation you need:

$$\frac{1}{K_a} [\text{H}_3\text{O}^+]^3 + [\text{H}_3\text{O}^+]^2 - \left([\text{HA}] + \frac{K_w}{K_a} \right) [\text{H}_3\text{O}^+] - K_w = 0$$

The eagle-eyed will have noticed that this is a cubic equation. I haven't a clue how to solve it