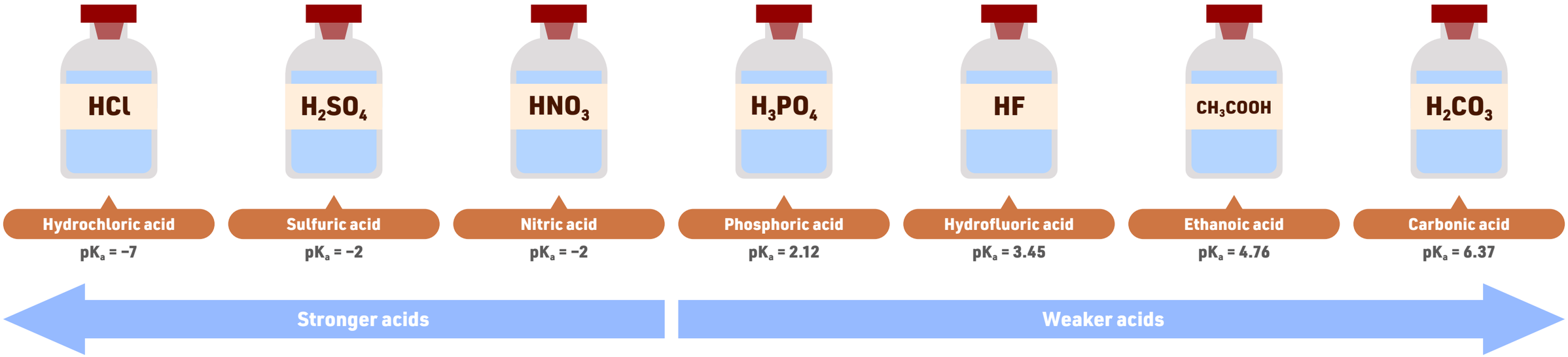
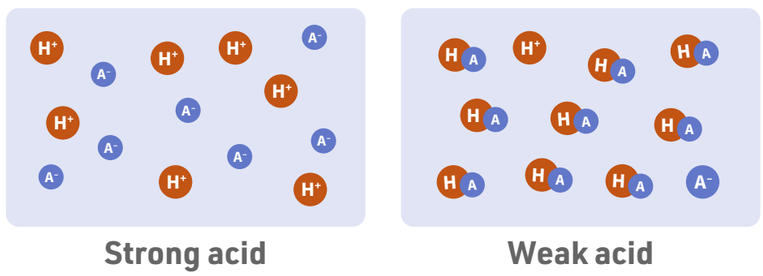
Acids, acid strength and concentration



Strong acids vs. weak acids

$$HA \rightleftharpoons H^+ + A^-$$

The H^+ ion is transferred to a water molecule, forming H_3O^+



Acids react with water when they are added to it, forming ions. The degree to which they do this is what determines whether they are strong or weak acids. Strong acids are essentially 100% ionised in solution. Weak acids ionise very little in solution.

Acids, K_a and pK_a

$$K_a = \frac{[H^+]\,[A^-]}{[HA]} \qquad pK_a = -\log_{10}[K_a]$$

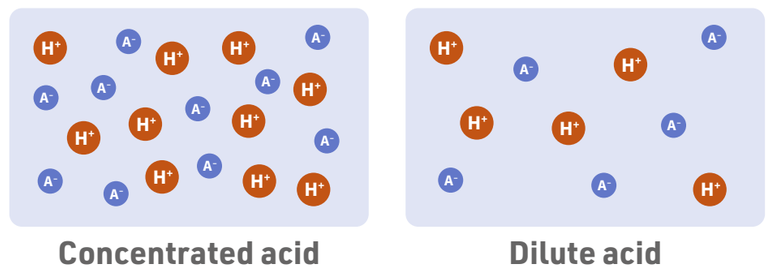
	K_a	pK_a
Very strong acid	>0.1	<1
Fairly strong acid	10^{-3}–0.1	1–3
Weak acid	10^{-5}–10^{-3}	3–5
Very weak acid	10^{-15}–10^{-5}	5–15
Extremely weak acid	<10^{-15}	>15

The acid dissociation constant, K_a, is a measure of the strength of an acid. The higher its value, the stronger the acid (the more readily it ionises in water). pK_a converts the K_a value to a logarithmic scale that makes it easier to compare strengths of different acids.

Concentration and pH

$$pH = -\log_{10}[H^+]$$

A decrease of one on the pH scale represents a tenfold increase in H^+ concentration.



Concentration refers to the amount of acid in a given solution (often in moles per decimetre cubed) and is distinct from strength. A concentrated acid contains a large amount of acid in a given volume; a dilute solution contains a small amount. The pH scale shows the amount of hydrogen ions in solution.

© Andy Brunning/Compound Interest 2023 | Creative Commons Attribution-NonCommercial-NoDerivatives licence.