List of Strong Acids and Bases

AP Chemistry · 26 cards

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QUESTION	ANSWER
Which six acids does AP Chemistry list as strong?	HCl, HBr, HI, $HClO_4$, H_2SO_4 and HNO_3. Each ionizes completely in water, so $[H_3O^+]$ equals the starting concentration of the acid.
What makes an acid “strong”?	It ionizes completely in water: essentially no intact acid molecules remain. Strength is about ionization, not concentration: a dilute strong acid is still strong.
What is the name of HCl(aq)?	Hydrochloric acid. A binary acid, like HBr and HI.
What is the name of HBr(aq)?	Hydrobromic acid. Fully ionized in water, like HCl and HI.
What is the name of HI(aq)?	Hydroiodic acid. In water it is fully ionized, like HCl and HBr; it is the strongest of the three only in a less basic solvent such as ethanol.
What is the name of HNO_3?	Nitric acid. Its conjugate base is nitrate, NO_3^-.
What is the name of H_2SO_4?	Sulfuric acid. Only its first ionization is complete; see the card on HSO_4^-.
What is the formula of perchloric acid?	$HClO_4$. The only chlorine oxyacid on the AP list of strong acids.
Which hydrogen halide is a weak acid?	HF, with $K_a = 6.8 \times 10^{-4}$. Acidity increases HF < HCl < HBr < HI, so fluorine is the odd one out.

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Is HSO_4^- a strong or a weak acid?	Weak, with Ka = 1.2×10^{-2}. That is why H_2SO_4 ionizes completely only in its first step.
Which hydroxides of Group 1 are strong bases?	LiOH, NaOH, KOH, RbOH and CsOH. They dissociate completely into M^+ and OH^-, so $[OH^-]$ equals the starting concentration.
Which hydroxides of Group 2 are usually listed as strong bases?	$Ca(OH)_2$, $Sr(OH)_2$ and $Ba(OH)_2$. Each releases two OH^- per formula unit, so $[OH^-]$ is twice the starting concentration.
What is the pH of 0.010 M HCl?	2.00. HCl is strong, so $[H_3O^+] = 0.010$ M and pH = −log(0.010).
What is the pH of 0.0050 M HNO_3?	2.30. $[H_3O^+] = 0.0050$ M because nitric acid is strong; $-\log(5.0 \times 10^{-3}) \approx 2.30$.
What is the pH of 1.0×10^{-3} M HBr?	3.00. HBr is strong; with a coefficient of 1.0, the exponent gives the pH directly.
What is the pH of 0.0010 M KOH?	11.00. $[OH^-] = 0.0010$ M, so pOH = 3.00 and pH = 14.00 − 3.00.
What is $[OH^-]$ in 0.010 M NaOH?	0.010 M. One OH^- per NaOH, so pOH = 2.00 and pH = 12.00.
What is $[OH^-]$ in 0.010 M $Ba(OH)_2$?	0.020 M. $Ba(OH)_2$ gives two OH^- per formula unit, so pOH ≈ 1.70 and pH ≈ 12.30.
What is the relation between pH and pOH at 25 °C?	pH + pOH = 14.00. It comes from $K_w = [H_3O^+][OH^-] = 1.0 \times 10^{-14}$.
Is acetic acid, CH_3COOH, a strong or a weak acid?	Weak, with Ka = 1.8×10^{-5}. Only a small fraction of molecules ionize, so you need an equilibrium (ICE) calculation, not $[H_3O^+] = c$.

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How do nitrous acid and nitric acid differ in strength?	HNO_2 is weak (Ka = 4.6×10^{-4}); HNO_3 is strong. One extra oxygen changes the name ending, from -ous to -ic, and the strength.
Is ammonia, NH_3, a strong or a weak base?	Weak, with Kb = 1.8×10^{-5}. It has no OH^- in its formula: it makes OH^- by taking H^+ from water, and only slightly.
How strong a base is Cl^-, the conjugate base of HCl?	Negligibly weak: it does not change the pH. The stronger the acid, the weaker its conjugate base.
What relates Ka and Kb of a conjugate acid-base pair?	Ka × Kb = Kw. In logs: pKa + pKb = pKw = 14.00 at 25 °C.
Does a 5.0 M solution of acetic acid count as a strong acid?	No, it is still a weak acid. A high concentration does not make it ionize completely; strong and weak describe ionization, not concentration.
How do you find $[H_3O^+]$ for a strong acid versus a weak acid?	Strong: $[H_3O^+]$ = initial concentration. Weak: solve with Ka. This split decides which pH method to use on an exam problem.