AS ACADEMIC STUDIO

FREE STUDY GUIDE

General Chemistry 2

Study guide: what to know, the equations to memorize, and the mistakes to avoid

Topic checklist

Check off each topic when you can do a problem on it without your notes.

- [ ] Solutions and colligative properties (freezing point, boiling point, osmotic pressure)
- [ ] Rate laws from initial-rate data
- [ ] Integrated rate laws and half-life (zero, first, second order)
- [ ] Activation energy and the Arrhenius equation
- [ ] Equilibrium constants, Q vs K and ICE tables
- [ ] Le Chatelier's principle
- [ ] pH of strong and weak acids and bases
- [ ] Salts that make solutions acidic or basic
- [ ] Buffers and the Henderson–Hasselbalch equation
- [ ] Titration curves (half-equivalence and equivalence points)
- [ ] Solubility, K_{sp} and the common-ion effect
- [ ] Entropy, Gibbs free energy and spontaneity
- [ ] Galvanic cells, $E°_{cell}$, $\Delta G°$ and the Nernst equation

Equations to memorize

Equation	What it's for
$\Delta T_f = i \cdot K_f \cdot m$ and $\Delta T_b = i \cdot K_b \cdot m$	colligative properties (m = mol solute / kg solvent)
Zero order: $[A] = [A]_0 - kt$	integrated rate law
First order: $\ln[A] = \ln[A]_0 - kt$, $t_{1/2} = 0.693 / k$	integrated rate law and half-life
Second order: $1/[A] = 1/[A]_0 + kt$	integrated rate law
$\ln(k_2/k_1) = (E_a/R)(1/T_1 - 1/T_2)$	activation energy (R = 8.314 J/(mol·K))
$pH = -\log[H^+]$, $pH + pOH = 14.00$	pH at 25 °C
$K_a \times K_b = K_w = 1.0 \times 10^{-14}$	conjugate acid–base pairs

$pH = pK_a + \log([A^-]/[HA])$	buffers
$\Delta G = \Delta H - T\Delta S$	spontaneity
$\Delta G° = -RT \ln K$ and $\Delta G° = -nFE°$	linking $\Delta G°$, K and $E°$
$E°_{cell} = E°_{cathode} - E°_{anode}$	cell potential
$E = E° - (0.0592 / n) \log Q$	Nernst equation at 25 °C

The 5 most common mistakes

- **Taking reaction orders from the coefficients.** Orders come from experimental data only.
- **Getting Q vs K backward.** Q bigger than K means too much product, so the reaction shifts left.
- **Forgetting that $Ba(OH)_2$ gives 2 OH^-** (and H_2SO_4 gives up to 2 H^+).
- **Mixing J and kJ** in $\Delta G = \Delta H - T\Delta S$ or $\Delta G° = -RT \ln K$.
- **Multiplying $E°$ by the coefficients.** Cell potentials never scale with the balanced equation.

How to practice

Work through the free **General Chemistry 2 Practice Exam** one problem per day, or take it all at once under a 2-hour timer. Check every answer with the answer key and add each miss to your mistake log (see the How to Study Chemistry & Biology guide).

Want help with this? AS Academic Studio offers affordable one-on-one chemistry tutoring online, with flexible pricing for anyone who needs it. Book a free 15-minute intro call at asacademicstudio.com.