

OpenStax Chemistry 2nd Edition

Transition Guide

Global Changes

Chemistry 2e was updated to enhance overall coherence and consistency, improving the narrative readability, and correcting errors. We tried to address adopter comments regarding the textbook's voice and problem-solving approach.

Additional book-wide changes include:

- Art was updated throughout the text, for either accuracy, clarity, visual appeal, or accessibility.
- The entire book's accessibility was analyzed and improved. Many figures were corrected to improve color contrast, alternative text was expanded, and navigation aspects were addressed.

Thematic Changes

- Throughout the book, readers should notice positive changes in the style and quality of the writing, as well as better conceptual clarity. The most extensive rewrites occurred on the chapters covering Solutions (Ch. 11), Thermodynamics (Ch. 16), and electrochemistry (Ch. 17); these revisions focused intensely on the narrative and the precision of the language.
- In addition, there is more consistency in problem-solving strategies. Unifying the problem-solving approaches across various chapters will help students develop a cumulative understanding and better prepare them for more advanced material.
- Although end-of-chapter problems were addressed in many chapters, the most significant assessment improvements occurred in the equilibrium coverage — Chapters 13, 14, and 15.

Chapter Revisions

Chapter(s)	General Description	Specific Change Examples
Chapter 1	Readability updates	<ul style="list-style-type: none"> Over 350 readability edits Updates to key terms to include the definition of temperature
Chapter 2	Readability and minor factual/currency updates	<ul style="list-style-type: none"> Over 200 readability edits Update to accuracy of IUPAC definition of transition metals not including Group 12 elements Addition of ionic hydrates section Substitution of some chromium compounds for magnesium compounds; aluminum fluoride trihydrate for aluminum nitride; and cobalt(II) chloride hydrate for cobalt(II) oxide Update to key terms to include definition of hydrate and to update definition of main-group element and transition metal
Chapter 3	Readability updates	<ul style="list-style-type: none"> Over 200 readability edits Removal of unnecessary figure
Chapter 4	Readability and minor factual updates	<ul style="list-style-type: none"> Over 150 readability edits Revision of solubility rules table Addition of Chemistry in Everyday Life scenarios, including stomach antacids and the culinary aspects of chemistry Updated problem with KHP with correct symbols
Chapter 5	Readability and moderate content updates	<ul style="list-style-type: none"> Over 200 readability edits Expanded description of well-insulated calorimeters More clear description of enthalpy added, including a revision to the examples writing thermochemical equations Updated summary for 5.1 Updates to ΔH° notation throughout
Chapter 6	Readability and moderate content updates	<ul style="list-style-type: none"> Over 300 readability edits Modified caption for the electromagnetic spectrum in Figure 6.3 Edited description of standing waves to remove radial nodes and angular nodes An edited description of the Bohr model for clarity and simplification to remove discussions of theta and phi. Removal of Bohr's formula for the quantization of the angular momentum and the diagram showing angular momentum for a circular motion.

		<ul style="list-style-type: none"> • Edited the caption for the wave-particle duality diagram for clarity (Figure 6.18) and the energy order for atomic orbitals (Figure 6.26) • Condensed discussion of Heisenberg’s uncertainty principle • Updated electron configuration for several atoms • Updated key terms to have a revised definition for atomic orbital, d orbital, electromagnetic spectrum, electron affinity, electron configuration, f orbital, ionization energy, magnetic quantum number, p orbital, quantization, quantum number, secondary (angular momentum) quantum number, shell, subshell, valence electrons, valence shell, wave, wave-particle duality
Chapters 7-8	Minor readability edits	<ul style="list-style-type: none"> • Minor readability edits
Chapter 9	Minor readability edits and minor content edits	<ul style="list-style-type: none"> • Over 150 readability edits • Added torr conversion for atmospheres • Added reference to IUPAC definition of standard pressure • Revised section about gas density and molar mass • Revised presentation of the ideal gas law • Updated data values about greenhouse gases and climate change to be current • Revised description to highlight difference between effusion and diffusion
Chapter 10	Minor readability edits and minor content edits	<ul style="list-style-type: none"> • Dozens of minor readability edits • Correction to typo in the description of the Clausius-Clapeyron equation • An updated description of a phase change diagram for clarity • Updated values in “Determining the State of Carbon Dioxide” example and in problem set • Updated table of critical temperatures and critical pressures of common substances to be in Kelvin and kPa units

Chapter 11	Minor readability edits and moderate content edits	<ul style="list-style-type: none"> • Over 400 readability changes • Significant reworking of 11.1 (The Dissolution Process) section for clarity • Significant reworking of 11.3 (Solubility) section for clarity <ul style="list-style-type: none"> • Example was changed from salt to sugar • Expanded to include intermolecular interactions as they relate to solubility • Expansion of mole fraction to include sum of mole fractions • Addition of a molality and molarity conversion example • Revision of Raoult's Law notation • Added references to ideal solution assumption throughout • Updated phase diagram description • Updated description of osmosis across an osmotic membrane (Figure 11.24) • Significant expansion of "Colligative Properties of Electrolytes" section <ul style="list-style-type: none"> ○ Added classification column to Predicted and Measured van't Hoff Factors for Several 0.050 m Aqueous Solutions table ○ Revision to "The Freezing Point of a Solution of an Electrolyte" Example (Example 11.13) for clarity and correctness ○ Revision to "Electrical Properties of Colloidal Particles" section for clarity and to add details about Frederick Cottrell • Updated the definition of Raoult's Law and added suspension in the Key Terms
Chapter 12	Moderate readability edits and minor content edits	<ul style="list-style-type: none"> • Over 1000 readability changes • Minor content edits for numerical accuracy • Improved Figure for concentration vs. time (Figure 12.3) • Moderate revision to the relative rates of reaction section to show for a generic reaction • Moderate revision to "The Physical States of the Reactants" section for clarity • Moderate revision to "The Presence of a Catalyst" section • Addition of differential rate laws to the rate laws section (12.3) while simplifying the rate law equation provided • Minor revision to treatment of method of initial rates • Revised "Rate Constant Units for Common Reaction Orders" table for clarity • Updated some calculations and formulas for correctness • An expanded section on differential rate laws for better understanding • Addition of example (12.10) showing Graphical Determination of Zero-Order Rate Constant • Addition of "Half-Life for Zero-Order and Second-Order Reactions" (12.12)

		<ul style="list-style-type: none"> • Significant revision to the “Activation Energy and the Arrhenius Equation” section for clarity • Moderate revisions to the Reaction Mechanisms section (12.6) for clarity • Significant revision to the “Deriving a Rate Law from a Reaction Mechanism” (12.14) example to enhance clarity • Significant textual revision to 12.7 “Catalysis” section to enhance clarity • Significant revision to Example 12.15, Reaction Diagrams for Catalyzed Reactions and homogenous catalysts section • Updated definitions to key terms, such as Arrhenius equation, elementary reaction, method of initial rates, as well as updates to key equations • Addition of reaction diagram to the Key Terms • Update to 12.4 and 12.6 summaries • Updated problems for correctness as necessary • Revision of references to rate equation as rate law
Chapter 13	Significant readability edits and minor content edits	<ul style="list-style-type: none"> • Over 1300 readability changes • Significant textual changes to 13.1 Chemical Equilibria for clarity and to further highlight forward and reverse reaction rates • Revised usage of amount to be rate throughout • Expansion of reaction quotient discussion as a simplification of more rigorous expressions • Significant textual changes to 13.2 Equilibrium Constants for clarity • Added concentration-based reaction quotient as needed for clarity throughout • Revision of “shift to” language to “proceed to”, “right” to “forward” and “left” to “reverse” • Revision of numbers in examples as necessary • Significant textual edits for clarity in homogeneous equilibria section • Addition of a Coupled Equilibria section, including an example problem (13.5) • Significant textual edits for 13.3 Shifting Equilibria: Le Chatelier’s Principle for clarity and a focus on forward and reverse rates and the calculation of reaction quotients • Expanded equilibrium and soft drinks discussion to include specific reactions • Moderate revisions to the Calculation of Equilibrium Concentrations from Initial Concentrations section for clarity • Updated Key Terms to revise definitions of equilibrium, equilibrium constant, heterogenous equilibria, homogeneous equilibria, Le Chatelier’s principle, and reaction quotient

		<ul style="list-style-type: none"> • Updated key equations to include K and Q. • Updated all summaries for clarity
Chapter 14	Significant readability edits and moderate content edits	<ul style="list-style-type: none"> • Over 1500 readability changes • Significant updates for conceptual clarity in the Bronsted-Lowry Acids and Bases section (14.1) • Integrated the “amphiprotic species” section from 1e into discussion of amphoteric species. • Updated examples to included implied equalities (Example 14.1 now shows how the variable x fits into the autoionization of water calculations) • Removed unnecessary references to specific compounds in discussions of generic $[\text{OH}^-]$ and $[\text{H}_3\text{O}^+]$ concentrations for clarity • Addition of Acid and Base Ionization Constants and Relative Strengths of Conjugate Acid-Base Pairs subsections in the description of the Relative Strengths of Acids and Bases (14.3) • More clarity in steps involved in calculations • Addition of references back to Equilibrium chapter to highlight content connections, including an additional section called Acid-Base Equilibrium Calculations and special attention to language about equilibrium • A clearer description of conjugate acid-base pairs in Figure 14.8 • Ionization constants tables were moved to the appendix • Significant reworking of examples to provide additional clarity • Added sections about binary acids and bases and ternary acids and bases • Significant textual edits of Hydrolysis of Salts (14.4) for clarity • Significant textual edits of Buffers (14.6) for clarity • Significant textual edits of Acid-Base Titrations (14.7) and examples for clarity • Changes to key terms for correctness and clarity, including acid ionization constant, acid-base indicator, amphiprotic, base ionization constant, buffer, color-change interval, diprotic acid, diprotic base, Henderson-Hasselbalch equation, leveling effect, oxyacid, percent ionization, stepwise ionization, titration curve and triprotic acid • Updated summaries to incorporate changes made • Minor content correctness updates to formulas or values

		<ul style="list-style-type: none"> Significant edits to exercises
Chapter 15	Moderate readability edits and minor content edits	<ul style="list-style-type: none"> Over 800 updates to text for readability Updated K_{sp} examples for conceptual clarity (15.2, 15.3, 15.4, and 15.5) Significant textual updates for conceptual clarity for the Predicting Precipitation section Revised Precipitation of Silver Halides Example to use KBr instead of KI (15.11) Significant textual updates to the Common Ion Effect section for conceptual clarity and its Example (15.12) Revised discussion of ligands for conceptual clarity Significant textual edits to the Coupled Equilibria section (15.3, formerly Multiple Equilibria) to highlight the connections to solubility and acid-base behavior. The corresponding example was reworked for conceptual clarity (15.15 and 15.16) Updated Key Terms to include coupled equilibria Lewis acid-base chemistry and updated definitions of complex ion, ligand, and solubility product constant. Revised summary of 15.2 Lewis Acids and Bases and 15.3 Coupled Equilibria to reflect changes Revised values and phrasing for clarity and correctness in several exercises
Chapter 16	Minor readability updates and moderate content updates	<ul style="list-style-type: none"> Over 350 updates to text for readability Updates to captions and credits on images Update to Example 16.1 for correctness and clarity Moderate textual updates to the Entropy and Microstates section for conceptual clarity Updated typos in Examples 16.3 and 16.7 Moderate revision to The Second Law of Thermodynamics section for conceptual clarity. Updated standard notation throughout Addition of “What’s Free about ΔG?” and “Free Energy Changes for Coupled Reactions” sections Addition of “Calculating Free Energy Change for a Coupled Reaction” example (16.9) Updated definitions of Key Terms including: entropy, second law of thermodynamics, standard entropy, and standard entropy change Updated Key Equations to include Expanded exercise 28 to specify reactions.

Chapter 17	Significant readability and content edits	<ul style="list-style-type: none"> • Over 1500 updates to text for readability • Significant edits to the Review of Redox Chemistry (17.1) section for conceptual clarity and to provide steps for writing half-reactions • Significant edits to the Galvanic Cells (17.2) and Electrode and Cell Potentials (17.3) sections and corresponding examples for conceptual clarity • Addition of Predicting Redox Spontaneity example (Example 17.5) • Reframing of the Nernst equation conceptually as it relates to free energy and equilibrium (17.4) and provide clarity about potentials at nonstandard conditions • Addition of table predicting outcomes given K, ΔG°, and E°_{cell} • Significant changes to the Batteries and Fuel Cells section (17.5) to spiral to other content • Call-outs to secondary batteries as rechargeable batteries • Updates to Statue of Liberty: Changing Colors for correctness and clarity • Significant revision to Electrolysis section (17.7) for conceptual clarity, especially around the quantitative aspects of electrolysis • Updated definitions of Key Terms, including: active electrode, alkaline battery, battery, cathodic protection, cell notation (schematic), cell potential, concentration cell, corrosion, dry cell, electrode potential, electrolytic cell, fuel cell, galvanic (voltaic) cell, galvanization, half cell, inert electrode, inert electrode, lead acid battery, lithium ion battery, Nernst equation, nickel-cadmium battery, primary cell, sacrificial anode, salt bridge, secondary cell, standard electrode potential, and standard hydrogen electrode. • Revised all summaries to reflect textual changes. • Moderate revisions to exercises
Chapters 18 - 21	Minor readability edits and content updates	<ul style="list-style-type: none"> • Dozens of updates to text for readability in each chapter for clarity and correctness