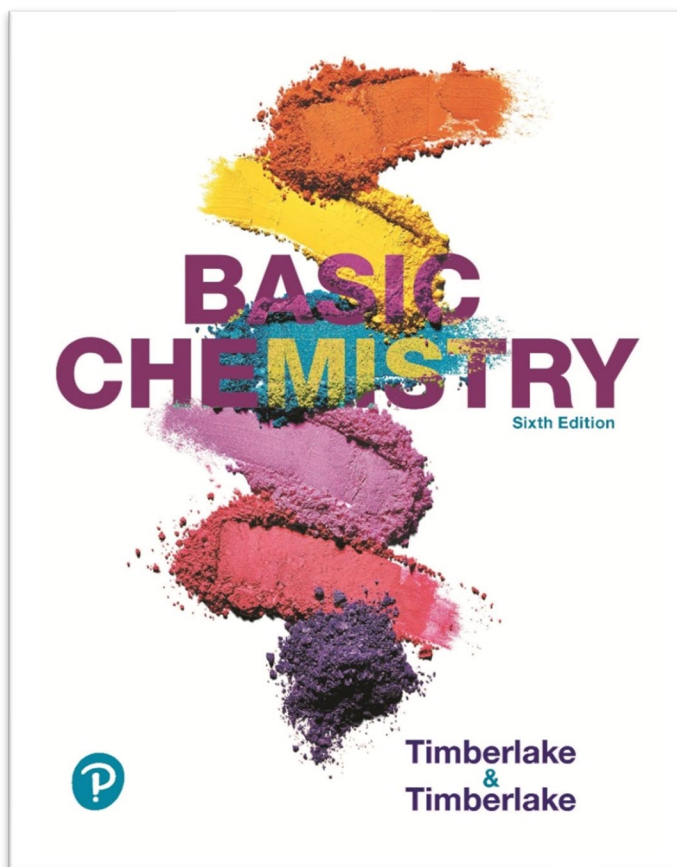


A Correlation of
Basic Chemistry
6th Edition, ©2020



To the
Next Generation Science Standards
Physical Science Performance Expectations
Grades 9-12

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NGSS High School Physical Sciences:	
(HS-PS1) Matter and Its Interactions	
(HS-PS1-1) Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms	SE/TE: 4.2 The Periodic Table, 103–107 5.5 Electron Configurations and the Periodic Table, 139–143 Practice Problems, 5.5 Electron Configurations and the Periodic Table, 143 5.6 Trends in Periodic Properties, 143–149 Practice Problems, 5.6 Trends in Periodic Properties, 147–148
(HS-PS1-2) Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.	SE/TE: 5.5 Electron Configurations and the Periodic Table, 139–143 5.6 Trends in Periodic Properties, 143–149 8.1 Equations for Chemical Reactions, 214–217 Practice Problems, 8.1 Equations for Chemical Reactions, 216–217 8.3 Types of Chemical Reactions, 226 10.1 Lewis Structures for Molecules and Polyatomic Ions, 270–276
(HS-PS1-3) Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.	SE/TE: 10.6 Intermolecular Forces Between Atoms or Molecules, 288–291 Practice Problems, 10.6 Intermolecular Forces Between Atoms or Molecules, 291 Core Chemistry Skills, Identifying Intermolecular Forces (10.6), 302 For supporting content, please see 11.4 Temperature and Pressure (Gay-Lussac's Law), 322–324
(HS-PS1-4) Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.	SE/TE: 9.6 Energy in Chemical Reactions, 254–259 Practice Problems, 9.6 Energy in Chemical Reactions, 259–260
(HS-PS1-5) Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.	SE/TE: 13.1 Rates of Reactions, 399–402 Practice Problems, 13.1 Rates of Reactions, 403 Figure 13.2 and 13.3, p. 400 Sample Problem 13.1, 402

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(HS-PS1-6) Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.	SE/TE: 13.5 Changing Equilibrium Conditions: Le Chatelier's Principle, 414–419 Practice Problems, 13.5 Changing Equilibrium Conditions: Le Chatelier's Principle, 420 Chapter 13, Challenge Problems, 429
(HS-PS1-7) Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.	SE/TE: 9.1 Conservation of Mass, 240–241 Practice Problems, 9.1 Conservation of Mass, 241 9.2 Mole Relationships in Chemical Equations, 241–244 Practice Problems, 9.2 Mole Relationships in Chemical Equations, 244 9.3 Mass Calculations for Chemical Reactions, 245–247 Practice Problems, 9.3 Mass Calculations for Chemical Reactions, 247
(HS-PS1-8) Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.	SE/TE: 16.2 Nuclear Reactions, 512 16.6 Nuclear Fission and Fusion, 529–531 Practice Problems, 16.6 Nuclear Fission and Fusion, 532
(HS-PS2) Motion and Stability: Forces and Interactions	
(HS-PS2-6) Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.	SE/TE: 4.2 The Periodic Table: Metals, Nonmetals, and Metalloids, 104–105 5.6 Trends in Periodic Properties: Metallic Character, 147–148 Update: Developing New Materials for Computer Chips, 148 10.3 Shapes of Molecules and Polyatomic Ions (VSEPR) Theory, 279–283 Practice Problems, 10.3 Shapes of Molecules and Polyatomic Ions (VSEPR) Theory, 283 15.3 Electrical Energy from Oxidation-Reduction Reactions: Batteries 492–494 Chemistry Link to the Environment, 494–495 17.2 Alkenes, Alkynes, and Polymers: Polymerization, 554–557 18.5 Protein Structure: Primary Structure, 617

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(HS-PS3) Energy	
(HS-PS3-1) Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.	SE/TE: 3.4 Energy, 79–81 Practice Problems, 3.4 Energy, 81–82 3.5 Specific Heat, 82–86 Practice Problems, 3.5 Specific Heat, 86–87 Supporting Content: 3.6 Energy and Nutrition, 87–89 Practice Problems, 3.6 Energy and Nutrition, 90 Update: A Diet and Exercise Program, 90 9.6 Energy in Chemical Reactions, 254–260 Chapter 9, Additional Practice Problems, 265–266 Chapter 9, Challenge Problems, 266–267 13.5 Changing Equilibrium Conditions: Le Chatelier’s Principle, 414–419
(HS-PS3-2) Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motion of particles (objects) and energy associated with the relative position of particles (objects).	Supporting Content: SE/TE: 3.4 Energy, 79–81 Practice Problems, 3.4 Energy, 81–82 3.5 Specific Heat, 82–86 Practice Problems, 3.5 Specific Heat, 86–87 5.1 Electromagnetic Radiation, 126–128 5.2 Atomic Spectra and Energy Levels, 129–131 13.1 Rates of Reactions, 399–402 13.2 Chemical Equilibrium, 403–406 13.3 Equilibrium Constants, 406–410 13.4 Using Equilibrium Constants, 410–414 13.5 Changing Equilibrium Conditions: Le Chatelier’s Principle, 414–420
(HS-PS3-3) Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.	Supporting Content: SE/TE: 15.3 Electrical Energy from Oxidation-Reduction Reactions, 488–496 Chemistry Link to the Environment, 494–495
(HS-PS3-4) Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).	SE/TE: 3.5 Specific Heat, Heat Exchange: Heat Gain Equals Heat Loss, 85–86 Practice Problems, 3.5 Specific Heat, Questions 3.39–3.40, 87 Supporting Content: 3.4 Energy, Heat and Energy, 80 3.6 Energy and Nutrition, 87–90 Chapter 3, Challenge Problems, 95–96

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(HS-PS3-5) Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.	Supporting Content: SE/TE: 4.3 The Atom, 108–110 10.4 Electronegativity and Bond Polarity, 283–286 Practice Problems, 10.4 Electronegativity and Bond Polarity, 286 10.5 Polarity of Molecules, 287–288 Practice Problems, 10.5 Polarity of Molecules, 288 16.5 Medical Applications Using Radioactivity, 526–529
(HS-PS4) Waves and Their Applications in Technologies for Information Transfer	
(HS-PS4-1) Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.	Supporting Content: SE/TE: 5.1 Electromagnetic Radiation, 126–128 Chapter 5, Understanding the Concepts, 151–152
(HS-PS4-3) Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.	Supporting Content: SE/TE: 5.1 Electromagnetic Radiation, 126–128 Practice Problems, 128 5.2 Atomic Spectra and Energy Levels, 129–131
(HS-PS4-4) Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.	SE/TE: 5.1 Electromagnetic Radiation, 126–128 Practice Problems, 5.1 Electromagnetic Radiation, 128 Supporting Content: 5.2 Atomic Spectra and Energy Levels, Photons, 129 16.3 Radiation Measurement, 519–522
(HS-PS4-5) Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.	Supporting Content: SE/TE: 5.1 Electromagnetic Radiation, 126–128 Practice Problems, 128 5.2 Atomic Spectra and Energy Levels: Photons, 129 16.5 Medical Applications Using Radioactivity, 526–529