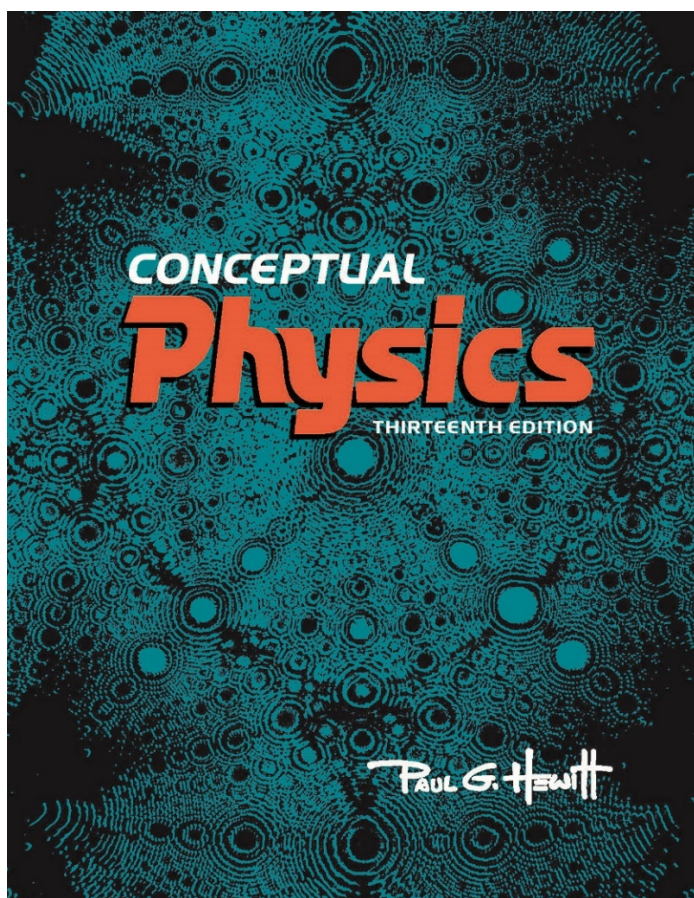


A Correlation of
Conceptual Physics
13th Edition ©2022



To the
**Next Generation Science Standards
Performance Expectations
High School Physical Science**

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(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: Chapter 11: The Atomic Nature of Matter, pp. 238-259 Lesson 11.2: Characteristics of Atoms, pp. 240-242 Lesson 11.4: Atomic Structure, pp. 244-245 Lesson 11.5: The Periodic Table of the Elements, pp. 246-250 Lesson 11.6 Isotopes, pp. 250-252 Chapter 32: The Atom and Quantum, pp. 688-703 Lesson 32.3 Atomic Spectra: Clues to Atomic Structure, pp. 693-694 Lesson 32.4: Bohr Model of the Atom, p. 694
(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: Chapter 11: The Atomic Nature of Matter, pp. 238-259 Lesson 11.5: The Periodic Table of the Elements, pp. 246-250 Lesson 11.7: Molecules, pp. 251-252 Lesson 11.8: Compounds and Mixtures, p. 252
(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: Chapter 22: Electrostatics, pp. 462-487 Lesson 22.1: Electric Forces, pg. 464 Lesson 22.2: Electric Charges, pp. 464-465 Lesson 22.3: Conservation of Charge, pp. 465-467 Lesson 22.4: Coulomb's Law, p. 467 Lesson 22.6: Charging, pp. 470-471 Lesson 22.8: Electric Field, pp. 474-477 Lesson 22.9: Electric Potential, pp. 478-481 Chapter 23: Electric Current, pp. 488-511 Lesson 23.1 Flow of Charge and Electric Current, p. 489 Lesson 23.4 Ohm's Law pp. 492-494 Lesson 23.6 Speed and Source of Electrons in a Circuit, pp. 496-498 Lesson 23.7 Electric Power, p. 499 Lesson 23.8 Electric Circuits, p. 500-504 Chapter 24: Magnetism, pp. 512-529 Lesson 24.5: Electric Current and Magnetic Fields, pp. 418-519 Lesson 24.6: Electromagnets, pp. 519-523 Chapter 25: Electromagnetic Induction, pp. 530-548 Lesson 25.2: Faraday's Law, p.533 Lesson 25.8: Power Transmission, p. 540

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(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.	For supporting content, please see: SE/TE: Chapter 11: The Atomic Nature of Matter, pp. 238-259 Lesson 11.7: Molecules, pp. 251-252 Lesson 11.8: Compounds and Mixtures, p. 252 Chapter 34: Nuclear Fission and Fusion, pp. 728-750 Lesson 34.1: Nuclear Fission, pp. 730-731 Lesson 35.5: Mass-Energy Equivalence pp. 738-741 Lesson 34.6: Nuclear Fusion, pp. 472-743
(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.	For supporting content, please see: SE/TE: Chapter 15: Heat, Temperature, and Expansion, pp. 325-345 Lesson 15.1: Temperature, pp. 327-329
(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.	This chemistry expectation is beyond the scope of <i>Conceptual Physics</i>.
(HS-PS1-7) Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.	This chemistry expectation is beyond the scope of <i>Conceptual Physics</i>.
(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: Chapter 33: The Atomic Nucleus and Radioactivity, pp. 704-727 Lesson 33.5: The Atomic Nucleus and the Strong Force, pp. 712-715 Lesson 33.6: Radioactive Half-Life, pp. 715-716 Lesson 33.8: Transmutation of Elements, pp. 718-720 Chapter 34: Nuclear Fission and Fusion, pp. 728-750 Lesson 34.1: Nuclear Fission, pp. 730-732 Lesson 34.6: Nuclear Fusion, pp. 742-744

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(HS-PS2) Motion and Stability: Forces and Interactions	
(HS-PS2-1) Analyze data to support the claim that Newton’s second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.	SE/TE: Chapter 4: Newton’s Second Law of Motion, pp. 64-83 Lesson 4.1: Forces, p. 65 Lesson 4.2: Friction, pp. 66-67 Lesson 4.3: Mass and Weight, pp. 68-71 Lesson 4.4: Newton’s Second Law of Motion, pp. 72-73 Lesson 4.5: When Acceleration Is g —Free Fall, pp. 73-74 Lesson 4.6: When Acceleration Is Less Than g —Nonfree Fall, pp. 74-76 Think and Do Questions: 32-34, pp. 78-79
(HS-PS2-2) Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.	SE/TE: Chapter 4: Newton’s Second Law of Motion, pp. 64-83 Lesson 4.5: When Acceleration Is g —Free Fall, pp. 73-74 Lesson 4.6: When Acceleration Is Less Than g —Nonfree Fall, pp. 74-76 Chapter 5: Newton’s Third Law of Motion, pp. 84-103 Lesson 5.1: Forces and Interactions, pp. 85-87 Lesson 5.2: Newton’s Third Law of Motion, pp. 87-89 Lesson 5.3: Action and Reaction on Different Masses, pp. 90-93 Chapter 6: Momentum, pp. 104-125 Lesson 6.5: Conservation of Momentum, pp. 112-114 Lesson 6.6: Collisions, pp. 115-117 Lesson 6.7: More Complicated Collisions, pg. 118
(HS-PS2-3) Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.	For supporting content, please see: SE/TE: Chapter 5: Newton’s Third Law of Motion, pp. 84-103 Lesson 5.1: Forces and Interactions, pp. 85-87 Lesson 5.2: Newton’s Third Law of Motion, pp. 87-89 Lesson 5.3: Action and Reaction on Different Masses, pp. 90-93 Chapter 6: Momentum, pp. 104-125 Lesson 6.5: Conservation of Momentum, pp. 112-114 Lesson 6.6: Collisions, pp. 115-117

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<p style="text-align: center;">Next Generation Science Standards Performance Expectations High School Physical Science</p>	<p style="text-align: center;">Conceptual Physics 13th Edition ©2022</p>
<p>(HS-PS2-4) Use mathematical representations of Newton’s Law of Gravitation and Coulomb’s Law to describe and predict the gravitational and electrostatic forces between objects.</p>	<p>SE/TE: Chapter 9: Gravity, pp. 184-209 Lesson 9.1: The Universal Law of Gravity, pp. 185-187 Lesson 9.2: The Universal Gravitational Constant, G, pp. 187-188 Lesson 9.3: Gravity and Distance: The Inverse-Square Law, pp. 189-190 Chapter 22: Electrostatics, pp. 462-487 Lesson 22.1: Electric Forces, pg. 464 Lesson 22.2: Electric Charges, pp. 464-465 Lesson 22.3: Conservation of Charge, pp. 465-467 Lesson 22.4: Coulomb’s Law, p. 467 Lesson 22.8: Electric Field, pp. 474-477 Lesson 22.9: Electric Potential, pp. 478-481</p>
<p>(HS-PS2-5) Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.</p>	<p>SE/TE: Chapter 23: Electric Current, pp. 488-511 Lesson 23.1 Flow of Charge and Electric Current, p. 489 Lesson 23.2 Voltage Sources, p. 490 Lesson 23.5 Direct Current and Alternating Current, p. 495 Chapter 24: Magnetism, pp. 512-529 Lesson 24.3: Magnetic Fields, pp. 515-516 Lesson 24.5: Electric Currents and Magnetic Fields, pp. 518-519 Lesson 24.6: Electromagnets, pp. 519-523 Lesson 24.7: Magnetic Forces, pp. 520-523 Chapter 25: Electromagnetic Induction, pp. 530-548 Lesson 25.1: Electromagnetic Induction, pp. 531-532 Lesson 25.2: Faraday’s Law, p. 533 Lesson 25.3: Generators and Alternating Current, p. 534 Lesson 25.4: Power Production, pp. 535-538 Lesson 25.6: Self-Induction, p. 539 Lesson 25.7: Magnetic Braking, p. 540 Lesson 25.8: Power Transmission, p. 540 Lesson 25.9 : Field Induction, pp. 541-542</p>

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(HS-PS2-6) Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.	For supporting content, please see: SE/TE: Chapter 34: Nuclear Fission and Fusion Lesson 34.1: Nuclear Fission, pp. 730-732. Lesson 34.2: Nuclear Fission Reactors, pp 732-735 Lesson 34.3: The Breeder Reactor, pp. 735 Lesson 34.4: Fission Power, pp. 736 Lesson 34.5: Nuclear Fusion, pp. 732-744 Lesson 34.7: Controlling Fusion, pp. 744-745
(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: Chapter 6: Momentum, pp. 104-125 Lesson 6.6: Collisions, pp. 115-117 Chapter 7: Energy, pp. 126-151 Lesson 7.1: Work, pp. 128 Lesson 7.3: Potential Energy, pp. 131-133 Lesson 7.4: Kinetic Energy, p. 133 Lesson 7.6: Conservation of Energy, pp. 136-138 Lesson 7.6: Machines, pp. 138-139 Chapter 6: Gravity, pp. 184-209 Lesson 9.3: Gravity and Distance: The Inverse Square Law, pp.
(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 motions of particles (objects) and energy associated with the relative position of particles (objects).	SE/TE: Chapter 6: Momentum, pp. 104-125 Lesson 6.6: Collisions, pp. 115-117 Chapter 7: Energy, pp. 126-151 Lesson 7.3: Potential Energy, pp. 131-133 Chapter 10: Projectile and Satellite Motion, pp. 210-236 Lesson 10.6: Energy Conservation and Satellite Motion, p. 226 Chapter 15: Temperature, Heat, and Expansion, pp. 326-345 Lesson 15.2: Heat, pp. 329-331 Lesson 15.4: The Specific Heat Capacity of Water, pp. 332-334 Lesson 15.5: Thermal Expansion, pp. 334-339 Chapter 17: Change of Phase, pp. 366-383 Lesson 17.2: Condensation, pp. 369-371 Lesson 17.3: Boiling, pp. 371-373 Lesson 17.4: Melting and Freezing pp. 373-375 Chapter 22: Electrostatics, pp. 462-487 Lesson 22.8: Electric Field, pp. 474-477 Lesson 22.9: Electric Potential, pp. 478-481

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<p>(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.</p>	<p>SE/TE: Chapter 16: Heat Transfer, pp. 346-366 Lesson 16.7: Solar Power, pp. 359-360 Chapter 23: Electric Current, pp. 488-511 Lesson 23.8 Electric Circuits, pp. 500-505 Chapter 25: Electromagnetic Induction, pp. 530-548 Lesson 25.3: Generators and Alternating Current, pp. 534-535 Lesson 25.4: Power Production, pp. 535-536 Lesson 25.7: Magnetic Braking, pp. 540 Chapter 34: Nuclear Fission and Fusion Lesson 34.2: Nuclear Fission Reactors, pp 732-735 Lesson 34.3: The Breeder Reactor, pp. 735</p>
<p>(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).</p>	<p>SE/TE: Chapter 18: Thermodynamics, pp. 384-403 Lesson 18.5: Second Law of Thermodynamics, pp.392-396 Lesson 18.6: Entropy, pp. 398</p>
<p>(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.</p>	<p>SE/TE: Chapter 22: Electrostatics, pp. 462-487 Lesson 22.1: Electric Forces, pg. 464 Lesson 22.2: Electric Charges, pp. 464-465 Lesson 22.6: Charging, pp. 470-471 Lesson 22.8: Electric Field, pp. 474-477 Lesson 22.9: Electric Potential, pp. 478-481 Chapter 24: Magnetism, pp. 512-529 Lesson 24.3: Magnetic Fields, pp. 515-516 Lesson 24.5: Electric Currents and Magnetic Fields, pp. 518-519 Lesson 24.6: Electromagnets, pp. 519-523 Lesson 24.7: Magnetic Forces, pp. 520-523 Chapter 25: Electromagnetic Induction, pp. 530-548 Lesson 25.8: Power Transmission, p. 540</p>

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(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.	SE/TE: Chapter 19: Vibrations and Waves, pp. 406-425 Lesson 19.2: Wave Description, pp. 409-410 Lesson 19.4: Wave Speed, pg. 413 Lesson 19.5: Wave Interference, pp. 414-416 Chapter 20: Sound, pp. 426-446 Lesson 20.2: Sound in Air, pp. 428-430 Lesson 20.6: Resonance, pp. 436-437 Lesson 20.8: Beats, pp. 439-441 Chapter 26: Light, pp. 550-571 Lesson 26.2: Electromagnetic Wave Velocity, p. 552 Lesson 26.4: Transparent Materials, pp. 555-557 Lesson 26.5: Speed of Light in a Transparent Medium, pp. 557-559 Lesson 26.6: Opaque Materials, pp. 559-560
(HS-PS4-2) Evaluate questions about the advantages of using a digital transmission and storage of information.	SE/TE: Chapter 21: Musical Sounds, pp. 446-459 Lesson 21.7: From Analog to Digital, pp. 454-455
(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.	SE/TE: Chapter 26: Light, pp. 550-571 Lesson 26.1: Electromagnetic Waves, p. 552 Chapter 31: Light Quanta, pp. 666-685 Lesson 31.3: Photoelectric Effect, p. 670-672 Lesson 31.4: Wave-Particle Duality, pp. 673-674 Lesson 31.5: Double-Slit Experiment, pp. 674-675 Lesson 31.6: Particles as Waves: Electron Diffraction, pp. 675-676
(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: Chapter 16: Heat Transfer, pp. 346-365 Lesson 16.3: Radiation, pp. 351-356 Chapter 29: Light Waves, pp. 622-643 Lesson 29.2: Diffraction: X-Ray Diffraction, pp. 628-629
(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.	For supporting content, please see: SE/TE: Chapter 20: Sound, pp. 426-445 Lesson 20.8: Beats: Radio Broadcasts, pp. 440 Chapter 21: Musical Sounds, pp. 446-460 Lesson 21.5: Musical Instruments, p. 451-453 Lesson 21.7: From Analog to Digital, pp. 454-455