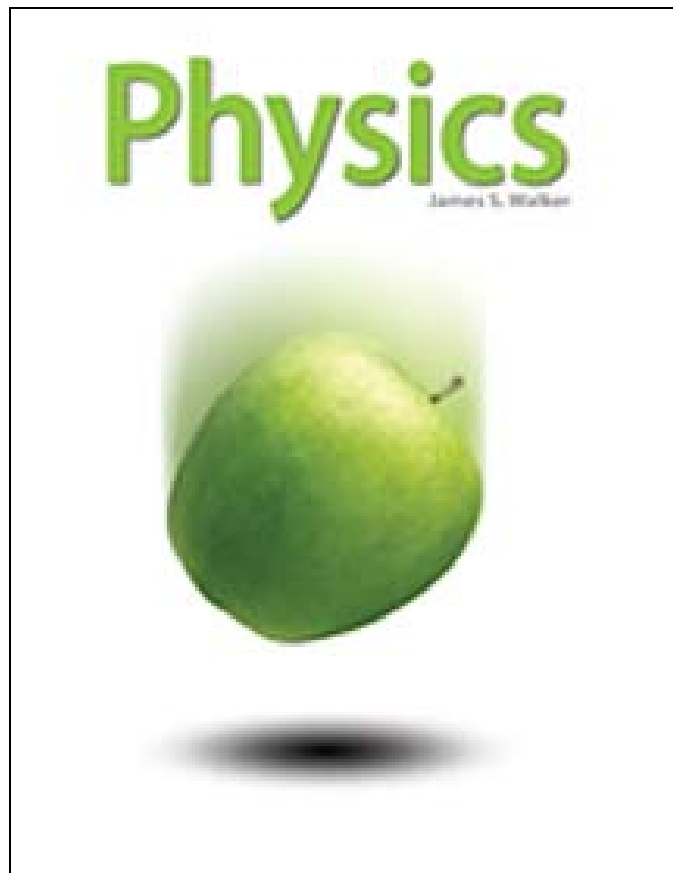


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PHYSICS	
Motion and Stability: Forces and Interactions	
1. Investigate and analyze, based on evidence obtained through observation or experimental design, the motion of an object using both graphical and mathematical models (e.g., creating or interpreting graphs of displacement, velocity, and acceleration versus time graphs for one- and two-dimensional motion; solving problems using kinematic equations for the case of constant acceleration) that may include descriptors such as distance, displacement, velocity, and acceleration.	SE/TE: 43-47, 48-53, 54-57, 58-62, 64, 73-81, 82-91, 92-96, 97-101, 103, 105-111, 131-140, 146-149
2. Identify forces in a system and apply Newton’s laws graphically by using models such as free-body diagrams to explain how the motion of an object is affected, ranging from simple to complex, and including circular motion.	SE/TE: 161-169, 170-176, 178, 181-182, 290-296, 298, 320-326, 327-328, 334
a. Use mathematical computations to derive simple equations of motion for various systems using Newton’s second law.	SE/TE: 153-158, 161-165, 169, 180-181, 320-326
b. Use mathematical computations to explain the nature of action-reaction force pairs (e.g., tension, friction, normal) related to Newton’s second and third laws, respectively.	SE/TE: 153-157, 158-160, 161-169, 170-176, 178, 179, 180-186, 187, 242-247, 684
3. Evaluate qualitatively and quantitatively the relationship between the average force acting on an object, the time of interaction, and the change in momentum using the impulse-momentum theorem.	SE/TE: 229-233, 234-241, 242-247, 248-256, 257, 258, 260-264, 265

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SE = Student Edition TE = Teacher’s Edition

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<p>4. Identify and analyze forces responsible for changes in rotational motion and develop an understanding of the effect of rotational inertia on the motion of a rotating object (e.g., merry-go-round, spinning toy, spinning figure skater, stellar collapse [supernova], rapidly spinning pulsar).</p>	<p>SE/TE: 267-275, 276-280, 281-289, 300-303, 305</p>
Energy	
<p>5. Construct models that illustrate how energy is related to work performed on or by an object and explain how different forms of energy are transformed from one form to another (e.g., distinguishing between kinetic, potential, and other forms of energy such as heat and sound; applying both the work-energy theorem and the law of conservation of energy to systems such as roller coasters, falling objects, and spring-mass systems; discussing the effect of frictional losses on energy conservation and how it affects the motion of an object).</p>	<p>SE/TE: 170-176, 189-196, 197-205, 206-210, 218, 220-226, 431, 723-724</p>
<p>6. Investigate collisions, both elastic and inelastic, to evaluate the effects on momentum and energy conservation.</p>	<p>SE/TE: 206-210, 248-256, 257, 258, 262-264, 265</p>
<p>7. Plan and carry out investigations to provide evidence that the first and second laws of thermodynamics relate work and heat transfers to the change in internal energy of a system with limits on the ability to do useful work (e.g., heat engine transforming heat at high temperature into mechanical energy and low-temperature waste heat, refrigerator absorbing heat from the cold reservoir and giving off heat to the hot reservoir with work being done).</p>	<p>SE/TE: 350-357, 358-360, 385-392, 393-398, 400-406, 408</p>

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a. Develop models to illustrate methods of heat transfer by conduction (e.g., an ice cube in water), convection (e.g., currents that transfer heat from the interior up to the surface), and radiation (e.g., an object in sunlight).	SE/TE: 354-357, 378
b. Engage in argument from evidence regarding how the second law of thermodynamics applies to the entropy of open and closed systems.	SE/TE: 403-406, 407, 408
Waves and Their Applications in Technologies for Information Transfer	
8. Investigate the nature of wave behavior to illustrate the concept of the superposition principle responsible for wave patterns, constructive and destructive interference, and standing waves (e.g., organ pipes, tuned exhaust systems).	SE/TE: 470-475, 476-482, 484, 487-489, 501-506
a. Predict and explore how wave behavior is applied to scientific phenomena such as the Doppler effect and Sound Navigation and Ranging (SONAR) .	SE/TE: 493-500, 507-512, 513-519, 520, 521, 524-526
9. Obtain and evaluate information regarding technical devices to describe wave propagation of electromagnetic radiation and compare it to sound propagation. (e.g., wireless telephones, magnetic resonance imaging [MRI], microwave systems, (Radio Detection and Ranging [RADAR] , SONAR, ultrasound).	SE/TE: 493-500, 512-519, 520, 536-544, 549-552, 554, 795, 934-935
10. Plan and carry out investigations that evaluate the mathematical explanations of light as related to optical systems (e.g., reflection, refraction, diffraction, intensity, polarization, Snell's law, the inverse square law).	SE/TE: 545-553, 555, 565-569, 570-574, 575-580, 581-586, 587, 588, 590-594, 597-605, 612-618, 619-624, 625, 627, 637-646, 647-653, 654-661, 662-664, 666

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<p>11. Develop and use models to illustrate electric and magnetic fields, including how each is created (e.g., charging by either conduction or induction and polarizing; sketching field lines for situations such as point charges, a charged straight wire, or a current carrying wires such as solenoids; calculating the forces due to Coulomb's laws), and predict the motion of charged particles in each field and the energy required to move a charge between two points in each field.</p>	<p>SE/TE: 678-680, 683-689, 690-694, 696, 698-702, 705-717, 718-727, 736, 738-742, 789-795, 797-805, 808, 817-827, 841, 842, 849</p>
<p>12. Use the principles of Ohm's and Kirchhoff's laws to design and construct combination circuits using typical components (e.g., resistors, capacitors, inductors, diodes, sources of power).</p>	<p>SE/TE: 757-764, 765-768, 773, 775-777</p>