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EALR 1: Systems (SYS)	
Core Content: Predictability and Feedback	
In prior grades, students learned how to simplify and analyze complex situations by thinking about them as systems. In grades 9-12, students learn to construct more sophisticated system models, including the concept of feedback. Students are expected to determine whether or not systems analysis will be helpful in a given situation and if so, to describe the system, including subsystems, boundaries, flows, and feedbacks. The next step is to use the system as a dynamic model to predict changes. Students are also expected to recognize that even the most sophisticated models may not accurately predict how the real world functions. This deep understanding of systems and ability to use systems analysis is an essential tool both for scientific inquiry and for technological design.	
Content Standards	
Students know that:	
9-12 SYSA - Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system.	**SE/TE:** 174-176. 201-202, 345-348 **TE only:** 201 **Event-Based Science:** Representative Selections: **GOLD MEDAL!** 13-14 **BLACKOUT!** 14-15 **BLIGHT!** 35-36 **OIL SPILL!** 14 **EARTHQUAKE!** 25, 29, 34, 36-37 **GLOBAL WARMING!**: 9, 10-11, 45
	TR: LM: 5-8, 9-12, 13-16, 17-19, 21-24, 27-28, 31-32, 37-39, 41-42
9-12 SYSB - Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible.	**TR:** LM: 47-50, 53-54, 55-56, 57-60, 85-88, 89-94, 95-96, 107-110, 149-152, 161-163 175-178, 257-258 **Event-Based Science:** Representative Selections: **OUTBREAK!** 46 **BLIGHT!** 18 **OIL SPILL!** 22-24 **TOXIC LEAK!** 17 **EARTHQUAKE!** 25, 29, 36

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9-12 SYSC - In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible.	**SE/TE:** 142, 143-146, 522-523, 610-611, 643-644; Fig 23.14 - 533, Fig 23.22 - 542, Fig 23.22 - 542, Fig 25.32 - 611, Fig 27.9 – 44 **Event-Based Science:** Representative Selections: **BLIGHT!** 35-36 **OIL SPILL!** 14, 39 **EARTHQUAKE!** 23, 25, 29, 34, 36-37 **FIRE!**: 54-55 **BLACKOUT!**: 4-6, 13
	TR: LM: 121, 122-124, 255-256, 261-262
9-12 SYSD - Systems can be changing or in equilibrium.	**SE/TE:** 140-141, 530-532, 639-644; Fig 8.19 – 147, Fig 25.1 – 584, Fig 25.3 – 588, Fig 25.16 – 598, Fig 25.17 – 599, Fig 25.27 – 607, Fig 27.20 – 655; Link to Earth Science Floating Mountains – 146 **Event-Based Science:** Representative Selections: **BLACKOUT!** 14-15, 22-23 **FIRST FLIGHT!** 8-9 **THRILL RIDE!** 21-22, 36-37 **BLIGHT!** 35-36 **EARTHQUAKE!** 25, 29, 34, 36-37
Performance Expectations	
Students are expected to:	
Give examples of a positive feedback system and explain its regulatory mechanism (e.g., global warming causes Earth's ice caps to melt, reflecting less energy to space, increasing temperatures). Give examples of a negative feedback system and explain its regulatory mechanism (e.g., when a human body overheats, it produces sweat that cools the body by evaporation).	**SE/TE:** 539-540, 541-545, 646-655; Fig 23.22 – 542, Fig 27.13 – 649 **Event-Based Science:** **Global Warming!**: 9-13, 16 **Event-Based Science:** Representative Selections: **GOLD MEDAL!** 13-14 **BLACKOUT!** 14-15 **BLIGHT!** 35-36 **OIL SPILL!** 14 **EARTHQUAKE!** 25, 29, 34, 36-37 **GLOBAL WARMING!**: 9-13, 16

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Determine if a systems approach will be helpful in answering a question or solving a problem. Represent the system with a diagram specifying components, boundaries, flows, and feedbacks. Describe relevant subsystems and the larger system that contains the system being analyzed. Determine how the system functions with respect to other systems.	**SE/TE:** 639-656; Explore: 638; Fig 27.1 - 639, fig 27.4 – 640 **Event-Based Science:** Representative Selections: **BLACKOUT!** 10-11,14-15 **FIRST FLIGHT!** 8-9, 16 **FLOOD!** 8-9, 13, 17-19 **TOXIC LEAK!** 17, 30 **EARTHQUAKE!** 25, 29, 36
	TR: LM: 215-222, 223-224
Create a simplified model of a complex system. Trace the possible consequences of a change in one part of the system and explain how the simplified model may not be adequate to reliably predict consequences.	**SE/TE:** Explore: 334, 359, 660, 616, **Event-Based Science:** Representative Selections: **FIRST FLIGHT!** 8-9, 16, 21 **THRILL RIDE!** 21-22, 28-29, 33, 38-39 **BLIGHT!** 35-36 **FLOOD!** 48-49 **OIL SPILL!** 14, 38, 43-44
	TR: LM: 121-124,
Analyze whether or not a system (e.g., population) is changing or in equilibrium. Determine whether a state of equilibrium is static or dynamic (i.e., inflows equal outflows).	**SE/TE:** 664-679 **Event-Based Science:** Representative Selections: **BLACKOUT!** 14-15, 22-23 **FIRST FLIGHT!** 8-9 **THRILL RIDE!** 21-22, 36-37 **FLOOD!** 17-19 **EARTHQUAKE!** 25, 29, 36
	TECH: PhysicsPlace.com: Videos Plate Tectonics, Folds and Faults in Earth's Crust; Tutorials Plate Boundaries and Plate Tectonics

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EALR 2: Inquiry (INQ)	
Core Content: Conducting Analyses and Thinking Logically	
In prior grades, students learned to revise questions so they can be answered scientifically. In grades 9-12, students extend and refine their understanding of the nature of inquiry and their ability to formulate questions, propose hypotheses, and design, conduct, and report on investigations. Refinement includes an increased understanding of the kinds of questions that scientists ask and how the results reflect the research methods and the criteria that scientific arguments are judged by. Increased abilities include competence in using mathematics, a closer connection between student-planned investigations and existing knowledge, reflecting increased knowledge and improvements in communication and collaboration, and participation in a community of learners.	
Content Standards	
Students know that:	
9-12 INQA - Question - Scientists generate and evaluate questions to investigate the natural world.	**SE/TE:** 18-20, 23, 30-31, 38-40, 44-45, 47-49, 59-60, 69, 217, 221-223, 227-228, 229-230, 317-319, 642-656 **TE only:** 19, 30, 45, 60, 222, 317 **Event-Based Science:** Representative Selections: **FIRE!** 12-13,16-17, 18-19,, 34-35, 58, 63 **BLIGHT!** 24, 38-39, 46 **GOLD MEDAL!**: 36 **FIRST FLIGHT!**: 17 **OUTBREAK!**: 38
9-12 INQB - Investigate - Scientific progress requires the use of various methods appropriate for answering different kinds of research questions, a thoughtful plan for gathering data needed to answer the question, and care in collecting, analyzing, and displaying the data.	**SE/TE:** 3-7, Explore Activities on first page of each chapter; Think and Do: 53, 71, 87, 134, 108, 160, 189, 212, 232 **Event-Based Science:** Representative Selections: **FLOOD!** 48-49 **SURVIVE**! 21, 30-31, 36-38, 48-49 **ASTEROID!** 10, 23-24, 42-43 **GOLD RUSH!**: 20, 28 **EARTHQUAKE!**: 14-15

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9-12 INQC - Explain - Conclusions must be logical, based on evidence, and consistent with prior established knowledge.	**TR:** LM: Summing Up questions at the end of all labs **Event-Based Science:** Representative Selections: **FIRST FLIGHT!** 16, 21, 32-33 **FLOOD!** 20-21 **OIL SPILL!** 14, 22-24, 29, 38, 39, 43-44 **TOXIC LEAK!** 16, 20, 26-27, 34 **SURVIVE**! 21, 30-31, 36-38, 48-49
9-12 INQD - Communicate Clearly - The methods and procedures that scientists use to obtain evidence must be clearly reported to enhance opportunities for further investigation.	**SE/TE:** 1-6, 8-12, Pseudoscience 7 **Event-Based Science:** Representative Selections: **ASTEROID!** 10, 23-24, 42-43 **GLOBAL WARMING!** 8, 25-26, 41-42, 53 **EARTHQUAKE!** 14-15, 23, 29, 34 **GOLD RUSH!**: 20, 28 **FLOOD!**: 37
	TR: LM: Summing Up: 4, 7-8, 19, 67, 70, 93, 94, 97, 105, 110
9-12 INQE - Model - The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions.	**SE/TE:** 639-641, 645-646, 656, 716-718, 769-771 **Event-Based Science:** Representative Selections: **FIRE!** 15, 40-41 **OUTBREAK!** 5, 38, 44-45 **FLOOD!** 10, 48-49 **OIL SPILL!** 14, 38, 39 **GLOBAL WARMING!** 8, 25-26, 41-42, 53 **EARTHQUAKE!** 14-15, 23, 29, 34
	TR: LM: 13-16, 17-19, 21-24, 35-36, 37-40, 47-50, 65-67, 73-74, 75-76, 77-78, 79-83, 115-118, 122-124, 215-222, 223-233, 245-249, 259-260
9-12 INQF - Communicate - Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light.	**SE/TE:** 30-31. 117-119, 131-132, 143-146; Aristotle: 18, Galileo 20, Newton 23, Hewitt 27 **Event-Based Science:** Representative Selections: **FRAUD!** 24 **ASTEROID!** 10, 23-24, 42-43 **EARTHQUAKE!** 14-15, 23, 29, 34 **TOXIC LEAK!**: 16 **GOLD RUSH!**: 20-21 **FIRE!**: 63

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9-12 INQG - Intellectual Honesty - Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings	**SE/TE:** 1-2; Aristotle 18, Galileo 20, Newton 23, Hewitt 27 **TE only:** 2 **Event-Based Science:** Representative Selections: **FRAUD!** 24 **ASTEROID!** 10, 23-24, 42-43 **EARTHQUAKE!** 14-15, 23, 29, 34 **TOXIC LEAK!**: 16 **GOLD RUSH!**: 20-21 **FIRE!**: 63
9-12 INQH - Intellectual Honesty - Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information.	**Event-Based Science:** Representative Selections: **BLACKOUT!** 48-49, 52-53 **FLOOD!** 20-21 **ASTEROID!** 10, 23-24, 42-43 **GLOBAL WARMING!** 8, 25-26, 41-42, 53, 63-64 **EARTHQUAKE!** 14-15, 23, 29, 34
Performance Expectations	
Students are expected to:	
Generate and evaluate a question that can be answered through a scientific investigation. Critique questions generated by others and explain whether or not the questions are scientific.	**SE/TE:** 3-7; Explore Activities on first page of each chapter **Event-Based Science:** Representative Selections: **BLACKOUT!** 48-49, 52-53 **FLOOD!** 20-21 **ASTEROID!** 10, 23-24, 42-43 **GLOBAL WARMING!** 8, 25-26, 41-42, 53, 63-64 **EARTHQUAKE!** 14-15, 23, 29, 34
Plan and conduct a scientific investigation, choosing a method appropriate to the question being asked. Collect, analyze, and display data using calculators, computers, or other technical devices when available.	**SE/TE:** 3-7; Think and Do: 33, 53, 71, 108, 160, 212, 256, 433, 486, 551, 517 **Event-Based Science:** Representative Selections: **OIL SPILL!** 29, 43-44 **GLOBAL WARMING!** 25-26 **EARTHQUAKE!** 14-15, 23, 29, 34 **SURVIVE!**: 30 **FLOOD!**: 48-49
	TR: LM: All

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Draw conclusions supported by evidence from the investigation and consistent with established scientific knowledge. Analyze alternative explanations and decide which best fits the data.	**TR:** LM: Summing Up: 2, 4, 7-8, 12, 19, 24, 34, 40, 42, 44, 46, 74, 81, 93, 110, 112, 117-118, 124 **Event-Based Science:** Representative Selections: **BLIGHT!** 27-28, 35-36, 44 **OIL SPILL!** 14, 22-24, 29, 38, 39, 43-44 **TOXIC LEAK!** 16 **ASTEROID!** 10, 23-24, 42-43 **OUTBREAK!**: 30 **SURVIVE!**: 21
Write a detailed laboratory report that includes: the question that motivated the study, a justification for the kind of investigation chosen, hypotheses (if any), a description of what was done, a summary of data in tables and graphs, and a conclusion, based on the evidence, that responds to the question.	**TR:** LM: All labs could be written up as detailed laboratory reports **Event-Based Science:** Representative Selections: **BLIGHT!** 10-11, 19, 35-36 **OIL SPILL!** 14, 22-24, 29, 38, 39, 43-44 **ASTEROID!**: 10 **TOXIC LEAK!**: 20, 26-27, 34 **VOLCANO!**: 14-15, 60 **TORNADO!**: 54
Formulate one or more hypotheses based on a model or theory of a causal relationship. Demonstrate creativity and critical thinking to formulate and evaluate the hypotheses.	**TR:** LM: 3-4, 27-28, 51-52; PB: Making Hypothesis **Event-Based Science:** Representative Selections: **GLOBAL WARMING!** 8, 25-26, 41-42, 53 **FLOOD!** 10, 20-21, 48-49 **OIL SPILL!** 38 **TOXIC LEAK!** 16, 20, 26-27, 34 **ASTEROID!** 10, 23-24, 42-43 **EARTHQUAKE!** 14-15, 23, 29, 34
	TECH: LM: Tech Lab 47-50
Evaluate an investigation to determine if it was a valid means of answering the question, and whether or not the results were reliable. Describe the development of a scientific theory that illustrates logical reasoning, creativity, testing, revision, and replacement of prior ideas in light of new evidence.	**SE/TE:** 18-20, 20-25, 30-31, 69, 143-145, 146-147 **TE only:** 19, 22, 31, 144, 147 **Event-Based Science:** Representative Selections: **FIRST FLIGHT!** 8-9, 16, 21 **OUTBREAK!** 44-45 **TOXIC LEAK!** 16, 20, 26-27, 34 **ASTEROID!** 10, 23-24, 42-43 **HURRICANE!**: 20-21

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Participate in a scientific discussion about their own investigations and those performed by others. Respond to questions and criticisms, and if appropriate, revise explanations based on these discussions.	**TR:** LM: Summing up and Going Further at the end of the labs **Event-Based Science:** Representative Selections: **BLIGHT!** 19 **OIL SPILL!** 29 **TOXIC LEAK!** 20, 34 **EARTHQUAKE!** 14-15, 23, 29, 34 **OUTBREAK!**: 5
Provide appropriate citations for all ideas, findings, and information used in any and all written reports. Explain the consequences for failure to provide appropriate citations.	**Event-Based Science:** Representative Selections: **FLOOD!** 20-21 **OIL SPILL!** 22-24 **TOXIC LEAK!** 26-27 **ASTEROID!** 23-24 **EARTHQUAKE!** 14-15, 23, 29, 34
EALR 3: Application (APP)	
Core Content: Science, Technology, and Society	
In prior grades, students learn to work with other members of a team to apply the full process of technological design and relevant science concepts to solve problems. In grades 9-12, students apply what they have learned to address societal issues and cultural differences. Students learn that science and technology are interdependent, that science and technology influence society, and that society influences science and technology. Students continue to increase their abilities to work with other students and to use mathematics and information technologies (when available) to solve problems. They transfer insights from those increased abilities to considering local, regional, and global issues. These insights and capabilities will help prepare students to solve societal and personal problems in future years.	
Content Standards	
Students know that:	
9-12 APPA - Science affects society and cultures by influencing the way many people think about themselves, others, and the environment. Society also affects science by its prevailing views about what is important to study, and by deciding what research will be funded.	**SE/TE:** 1-12, 471-474, 507-515; Fig 21.5 – 465 **Event-Based Science:** Representative Selections: **OIL SPILL!** 2, 31-33, 40 **TOXIC LEAK!** 2-3, 6-7, 10-11, 18-19, 35 **SURVIVE!** 2, 6, 9, 14, 15, 16, 19, 24-25, 26, 28 **GLOBAL WARMING!** 14, 15, 27-28, 29-30, 58 **EARTHQUAKE!** 6-9, 23, 30, 34 **OUTBREAK!**: 46

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9-12 APPB - The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions.	**SE/TE:** 479-480, 507-515 **Event-Based Science:** Representative Selections: **THRILL RIDE!** 11-12, 21-22, 25-33, 28-29 **FLOOD!** 20-21, 39 **TOXIC LEAK!** 33, 34 **ASTERIOD!** 50-51 **EARTHQUAKE!** 25, 29, 34, 36, 41
9-12 APPC - Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a mode or other representation of the final design.	**Event-Based Science:** Representative Selections: **FIRE!** 15, 40-41 **FIRST FLIGHT!** 16 **TOXIC LEAK!** 33, 34 **ASTERIOD!** 50-51 **EARTHQUAKE!** 25, 29, 34, 36, 41
9-12 APPD - The ability to solve problems is greatly enhanced by use of mathematics and information technologies.	**SE/TE:** 3, Plug and Chug: 33, 53, 87, 161, 312 **Event-Based Science:** Representative Selections: **BLIGHT!** 52, 53 **SURVIVE!** 32-33, 58, 59 **VOLCANO!**: 57, 59 **BLACKOUT!**: 60-61 **TORNADO!**: 54
	TR: LM: 277-280, 281
9-12 APPE - Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended others not.	**SE/TE:** 271-274 **TE only:** Nuclear Technology, 335 **Event-Based Science:** Representative Selections: **BLIGHT!** 52, 53 **SURVIVE!** 32-33, 58, 59 **VOLCANO!**: 57, 59 **BLACKOUT!**: 60-61 **TORNADO!**: 54

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9-12 APPF - It is important for all citizens to apply science and technology to critical issues that influence society.	**SE/TE:** 9-10, 154, 156, 560-561, 647, 667-668; Link to Technology: 248, 324, 335 348 **Event-Based Science:** Representative Selections: **TOXIC LEAK!** 2-3, 6-7, 35 **SURVIVE!** 2, 6, 9, 14, 15, 16, 19, 24-25, 26, 28, 32-33 **EARTHQUAKE!** 6-9, 23, 30, 34 **OUTBREAK!**: 3, 34 **FLOOD!:** 50 **BLIGHT!:** 38
	TR: LM: 191-192, 251-252, 263-266
Performance Expectations	
Students are expected to:	
Describe ways that scientific ideas have influenced society or the development of differing cultures. List questions that scientists investigate that are stimulated by the needs of society (e.g., medical research, global climate change).	**SE/TE:** 18-20, 23, 30-31, 38-40, 44-45, 47-49, 59-60, 69, 168, 317-319, 479-480, 641-644, 656, 826-827 **Event-Based Science:** Representative Selections: **OUTBREAK!** 6, 10, 16, 17-18, 24, 31, 32-33, 46, 47 **BLIGHT!** 15, 24, 25, 36, 38-39, 42, 46, 48 **GLOBAL WARMING!** 14, 15, 27-28, 58 **EARTHQUAKE!** 6-9, 23, 30, 34 **TOXIC LEAK!**: 41-44 **EARTHQUAKE!**: 26-28
	TR: LM: 191-192
Work collaboratively with other students to generate ideas for solving a problem. Identify criteria and constraints, research the problem, and generate several possible solutions.	**TR:** LM: Work in groups **Event-Based Science:** Representative Selections: **BLIGHT!** 35-36 **OIL SPILL!** 22-24, 38 **GLOBAL WARMING!** 8, 25-26, 41-42, 53 **EARTHQUAKE!** 6-9, 14-15, 23, 29, 34, 41 **OUTBREAK!**: 5 **SURVIVE!**: 11

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Choose the best solution for a problem, create a model or drawing of the final design, and devise a way to test it. Redesign the solution, if necessary, then present it to peers.	**Event-Based Science:** Representative Selections: **FIRE!** 15, 40-41 **THRILL RIDE!** 11-12, 21-22, 28-29, 33, 38-39 **OIL SPILL!** 38, 39 **ASTERIOD!** 50-51 **EARTHQUAKE!** 6-9, 14-15, 23, 29, 34, 41
Use proportional reasoning, functions, graphing, and estimation to solve problems. Use computers, probes, and software when available to collect, display, and analyze data.	**SE/TE:** Fig 26.4-619, Fig 26.5-620, Fig 26.6-622, Fig 26.9-624 **Event-Based Science:** Representative Selections: **OIL SPILL!** 22-24, 45 **ASTERIOD!** 42-43, 50-51, 51-52 **GLOBAL WARMING!** 27-28, 60, 61-62 **EARTHQUAKE!** 29, 41, 43 **GOLD RUSH!**: 20 **HURRICANE!**: 52
	TR: LM: 5-8, 9-12, 187-188, 277-280
Analyze a societal issue that may be addressed through science and/or technology. Compare alternative solutions by considering trade-offs and unintended consequences (e.g., removing dams to increase salmon spawning).	**Event-Based Science:** Representative Selections: **FIRE!** 12-13, 18-19, 20-22, 34-35 **BLIGHT!** 36, 38-39, 42, 48 **FLOOD!** 1-2, 23 **TOXIC LEAK!** 2-3, 6-7, 33, 35 **SURVIVE!** 14, 32-33 **OUTBREAK!** 5, 6, 10, 16, 17-18, 24, 31, 32-33, 47
Critically analyze scientific information in current events to make personal choices, or to inform public-policy decisions.	**TECH:** PhysicsPlace.com **Event-Based Science:** Representative Selections: **FLOOD!** 1-2, 28, 50 **OIL SPILL!** 31-33, 39, 40 **OUTBREAK!** 6, 10, 16, 17-18, 24, 31, 32-33, 47 **TOXIC LEAK!** 2-3, 6-7, 34, 35 **GLOBAL WARMING!** 14, 15, 58

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EALR 4: Physical Science	
Big Idea: Force and Motion (PS1)	
Core Content: Newton's Laws	
In prior grades, students learned to measure, record, and calculate the average speed of objects, and to tabulate and graph the results. In grades 9-11, students learn to apply Newton's Laws of Motion and Gravity both conceptually and quantitatively. Students are able to calculate average speed, velocity, and acceleration. Students also develop an understanding of forces due to gravitational and electrical attraction. These fundamental concepts enable students to understand the forces that govern the observable world and provide a foundation for a full course in physics.	
Content Standards	
Students know that:	
9-11 PS1A - Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction.	**SE/TE:** 20-22; Plug and Chug: 33 **TE only:** 20, 21, 22 **Event-Based Science:** **FIRE!** 47-48, 59, 67, 68-69 **FIRST FLIGHT!** 5, 13, 21, 23-24, 28, 39, 40, 41, 48 **GOLD MEDAL!** 27, 28, 36, 37-38 **ASTEROID!** 20, 42-43, 51-52 **HURRICANE!** 1-2, 3, 4, 8-9, 15-16, 20-22 **FLOOD!** 52-53 **THRILL RIDE!** 1-2, 4-5, 6, 11-12, 21-22, 28-29, 36-37, 38-40, 43, 49 **TORNADO!** 19-20, 52-53, 59-60
	TR: LM: 5-8, 9-12, 21-24
	TECH: PhysicsPlace.com: Videos Definition of Speed, Average Speed, Velocity, Changing Velocity
9-11 PS1B - Average acceleration is defined as a change in velocity with respect to time. Acceleration indicates a change in speed and/or a change in direction.	**SE/TE:** 38-40, 44-45 **TE only:** 38, 39, 40, 44, 45 **Event-Based Science:** **FIRE!** 47-48, 59, 67, 68-69 **FIRST FLIGHT!** 5, 13, 21, 23-24, 28, 39, 40, 41, 48 **GOLD MEDAL!** 27, 28, 36, 37-38 **ASTEROID!** 20, 42-43, 51-52 **HURRICANE!** 1-2, 3, 4, 8-9, 15-16, 20-22 **FLOOD!** 52-53 **THRILL RIDE!** 1-2, 4-5, 6, 11-12, 21-22, 23, 28-29, 36-37, 38-40, 43, 49 **TORNADO!** 19-20, 52-53, 59-60

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	TR: LM: 21-24, 31-32
9-11 PS1C - An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's 1st Law of Motion, the =Law of Inertia)	**SE/TE:** 17-36 **TE only:** 18, 19, 20, 21, 22, 23, 24, 25, 26, 28, 29, 39, 31 **Event-Based Science:** **THRILL RIDE!** 4-5, 11-12, 14, 17, 23, 24, 30-31, 40, 52
	TR: LM: 13-16. 31-32; PB: Inertia
	TECH: PhysicsPlace.com: Video Newton's Law of Inertia, The Tablecloth Trick, Toilet Paper Roll, Inertia of a Ball, Cylinder, and Anvil
9-11 PS1D - A net force will cause an object to accelerate or change direction. A less massive object will speed up more quickly than a more massive object subjected to the same force. (Newton's 2nd Law of Motion, F=ma)	**SE/TE:** 37-54 **TE only:**37, 38, 39, 40, 41, 42, 43, 44, 46, 48, 51 **Event-Based Science:** **THRILL RIDE!** 4-5, 11-12, 14, 17, 23, 24, 30-31, 36-37, 38-39, 40, 41-42, 49, 52 **GOLD MEDAL!** 29 **ASTEROID!** 10, 11
	TR: LM: 21.24, 25-26, 27-28, 31-32
	TECH: PhysicsPlace.com: Tutorial Parachutes and Newton's Second Law
9-11 PS1E - Whenever one object exerts a force on another object, a force of equal magnitude is exerted on the first object in the opposite direction. (Newton's 3rd Law of Motion)	**SE/TE:** 57-65 **TE only:** 57, 58, 59, 62, 63, 64, 65 **Event-Based Science:** **THRILL RIDE!** 4-5, 11-12, 14, 17, 23, 24, 40, 47, 52 **GOLD MEDAL!** 26, 28-29, 34-35
	TR: LM: 29-3-, 31-32
	TECH: PhysicsPlace.com: Newton's Third Law

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9-11 PS1F - Gravitation is a universal attractive force by which objects with mass attract one another. The gravitational force between two objects is proportional to their masses and inversely proportional to the square of the distance between the objects. (Newton's Law of Universal Gravitation)	**SE/TE:** 23, 114-118, 131 **TE only:** 114, 117, 118, 131, 132 **Event-Based Science:** **THRILL RIDE!** 14, 16, 24, 32, 36-37, 47 **FIRST FLIGHT!** 8-9, 21, 23 **FRAUD!** 9-10 **TORNADO!** 6 **EARTHQUAKE!** 41 **ASTEROID!** 11, 22 **OIL SPILL!** 25
	TECH: PhysicsPlace.com: Inverse-Square Law
9-11 PS1G - Electrical force is a force of nature, independent of gravity that exists between charged objects. Opposite charges attract while like charges repel.	**SE/TE:** 192-194, 196 **TE only:** 193, 194, 196 **Event-Based Science:** **BLACKOUT!** 3, 7, 21, 32, 38, 54 **TORNADO!** 38
	TR: LM: 75-76, 77-78
9-11 PS1H - Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces.	**SE/TE:** 221-230 **TE only:** 221, 222. 223. 225, 226, 228, 230 **Event-Based Science:** **FRAUD!** 28-29 **BLACKOUT!** 7, 9, 26-27, 30, 31, 32, 34-35, 54
	TR: LM: 103-105, 107-110, 111-112
Performance Expectations	
Students are expected to:	
Calculate the average velocity of a moving object, given the object's change in position and time. (v = x2-x1/ t2-t1) Explain how two objects moving at the same speed can have different velocities.	**SE/TE:** 20-21; Concept Check: 22 **Event-Based Science:** **FIRE!** 47-48, 59, 67, 68-69 **FIRST FLIGHT!** 5, 13, 21, 23-24, 28, 39, 40, 41, 48 **GOLD MEDAL!** 27, 28, 36, 37-38 **ASTEROID!** 20, 42-43, 51-52 **HURRICANE!** 1-2, 3, 4, 8-9, 15-16, 20-22 **FLOOD!** 52-53 **THRILL RIDE!** 1-2, 4-5, 6, 11-12, 21-22, 28-29, 36-37, 38-40, 43, 49 **TORNADO!** 19-20, 52-53, 59-60

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Calculate the average acceleration of an object, given the object's change in velocity with respect to time. (a = v2-v1/ t2-t1) Explain how an object moving at constant speed can be accelerating.	**SE/TE:** 38-41, 44-45 **TE only:** 38, 39, 45 **Event-Based Science:** **FIRE!** 47-48, 59, 67, 68-69 **FIRST FLIGHT!** 5, 13, 21, 23-24, 28, 39, 40, 41, 48 **GOLD MEDAL!** 27, 28, 36, 37-38 **ASTEROID!** 20, 42-43, 51-52 **HURRICANE!** 1-2, 3, 4, 8-9, 15-16, 20-22 **FLOOD!** 52-53 **THRILL RIDE!** 1-2, 4-5, 6, 11-12, 21-22, 23, 28-29, 36-37, 38-40, 43, 49 **TORNADO!** 19-20, 52-53, 59-60
	TR: LM: 21-24
Given specific scenarios, compare the motion of an object acted on by balanced forces with the motion of an object acted on by unbalanced forces.	**SE/TE:** 40-41, 57-59 **Event-Based Science:** **THRILL RIDE!** 4-5, 11-12, 14, 17, 23, 24, 30-31, 40, 52
Predict how objects of different masses will accelerate when subject to the same force. Calculate the acceleration of an object, given the object's mass and the net force on the object, using Newton's 2nd law of Motion (F=ma).	**SE/TE:** 38-40, 44-45, 48-51 **TE only:** 48, 49; Plug and Chug: 53 **Event-Based Science:** **THRILL RIDE!** 4-5, 11-12, 14, 17, 23, 24, 30-31, 36-37, 38-39, 40, 41-42, 49, 52 **GOLD MEDAL!** 29 **ASTEROID!** 10, 11
	TR: PB: A Day at the Races (shown in margin of book)
	TECH: PhysicsPlace.com: Definition of Acceleration, Numerical Definition of Acceleration
Illustrate with everyday examples that for every action there is an equal and opposite reaction (e.g., a person exerts the same force on the Earth as the Earth exerts on the person).	**SE/TE:** Explore:57; Fig 4.1, 4.2, 4.3 - 58, Fig 4.4, 4.5 - 59, Fig 4.6 - 61, Fig 4.7, 4.8 - 62, Fig 4.9 , 4.11 - 63, Fig 4.12 - 64; Calculation Corner: 61 **TE only:** 59. 60, 62, 63, 67 **Event-Based Science:** **THRILL RIDE!** 4-5, 11-12, 14, 17, 23, 24, 40, 47, 52 **GOLD MEDAL!** 26, 28-29, 34-35

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	TR: LM: 29-30
Predict how the gravitational force between two bodies would differ for bodies of different masses or different distances apart. Explain how the weight of an object can change while its mass remains constant.	**SE/TE:** 47-51, 113-117, 119-12; Concept Check: 42 **TE only:** 41, 42 **Event-Based Science:** **THRILL RIDE!** 14, 16, 23, 24, 32, 36-37, 38, 40, 47 **FIRST FLIGHT!** 8-9, 21, 23 **FRAUD!** 9-10 **TORNADO!** 6 **EARTHQUAKE!** 41 **ASTEROID!** 11, 22 **OIL SPILL!** 25
	TR: LM: 17-20, 21-24
Predict whether two charged objects will attract or repel each other, and explain why.	**SE/TE:** 192-194, 196 **TE only:** 193, 194, 196 **Event-Based Science:** **BLACKOUT!** 3, 21, 26-27, 30-35, 38, 54 **TORNADO!** 38
	TR: LM: 75-76, 77-78, 79-84,
Demonstrate and explain that an electric current flowing in a wire will create a magnetic field around the wire (i.e., electromagnetic effect). Demonstrate and explain that moving a magnet near a wire will cause an electric current to flow in the wire (i.e., the generator effect).	**SE/TE:** 221-230 **TE only:** 221, 223, 334, 229, 230 **Event-Based Science:** **BLACKOUT!** 3, 21, 26-27, 30-35, 38, 54 **TORNADO!** 38
	TR: LM: 103-105, 107-110, 111-112

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EALR 4: Physical Science	
Big Idea: Matter: Properties and Change (PS2)	
Core Content: Chemical Reactions	
In prior years, students learned the basic concepts behind the atomic nature of matter. In grades 9-11, students learn about chemical reactions, starting with the structure of an atom. They learn that the Periodic Table groups elements with similar physical and chemical properties. With grounding in atomic structure, students learn about the formation of molecules and ions, compounds and solutions, and the details of a few common chemical reactions. They also learn about nuclear reactions and the distinction between fusion and fission. These concepts about the fundamental properties of matter will help students understand chemical reactions that are important in modern society and lay the groundwork for both chemistry and life science.	
Content Standards	
Students know that:	
9-11 PS2A - Atoms are composed of protons, neutrons, and electrons. The nucleus of an atom takes up very little of the atom's volume but makes up almost all of the mass. The nucleus contains protons and neutrons, which are much more massive than the electrons surrounding the nucleus. Protons have a positive charge, electrons are negative in charge, and neutrons have no net charge.	**SE/TE:** 316-319, 322-329 **TE only:** 316, 317, 318, 319, 323, 324, 327 **Event-Based Science:** **FRAUD!** 9, 10 **BLACKOUT!**: 7
	TR: LM: 141-142, 143-144
9-11 PS2B - Atoms of the same element have the same number of protons. The number and arrangement of electrons determines how the atom interacts with other atoms to form molecules and ionic compounds.	**SE/TE:** 322-324, 324-327, 327-329, 376-378, 384 **TE only:** 323, 325, 328 **Event-Based Science:** **FRAUD!** 9, 10, 11-12, 17 **GOLD RUSH!** 1, 2-3, 4-6
9-11 PS2C - When elements are listed in order according to the number of protons, repeating patterns of physical and chemical properties identify families of elements with similar properties. This Periodic Table is a consequence of the repeating pattern of outermost electrons.	**SE/TE:** 320-322, 326-327, 371-376 **Event-Based Science:** **FRAUD!** 9, 10 **GOLDRUSH!** 2-3, 4-6, 7

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9-11 PS2D - Ions are produced when atoms or molecules lose or gain electrons, thereby gaining a positive or negative electrical charge. Ions of opposite charge are attracted to each other, forming ionic bonds. Chemical formulas for ionic compounds represent the proportion of ion of each element in the ionic array.	**SE/TE:** 378-379, 385-394; Think and Explain: 383 **TE only:** 387, 388, 389, 391, 393
9-11 PS2E - Compounds are composed of two or more elements bonded together in a fixed proportion by sharing electrons between atoms, forming covalent bonds. Such compounds consist of well-defined molecules. Formulas of covalent compounds represent the types and number of atoms of each element in each molecule.	**SE/TE:** 376-378, 385-386, 394-404 **TE only:** 394, 395, 396, 397, 398, 399 **Event-Based Science:** **FRAUD!** 9, 12, 17 **VOLCANO!** 24-26, 28, 5 **GOLD RUSH!** 37 **GLOBAL WARMING!** 10-11 **TOXIC LEAK!**: 42
	TR: LM: 165-168
9-11 PS2F - All forms of life are composed of large molecules that contain carbon. Carbon atoms bond to one another and other elements by sharing, forming covalent bonds. Stable molecules of carbon have four covalent bonds per carbon atom.	**SE/TE:** 490-520 **TE only:** 491, 494, 495, 498, 5oo, 502, 503, 506 **Event-Based Science:** **FRAUD!** 14 **FIRE!** 56-57, 62 **GOLD RUSH!** **GLOBAL WARMING!** 10-11, 12-13, 16 **TOXIC LEAK!** 41-42
	TR: LM: 189-190
9-11 PS2G - Chemical reactions change the arrangement of atoms in the molecules of substances. Chemical reactions release or acquire energy from their surroundings and result in the formation of new substances.	**SE/TE:** 437, 438-445, 449-454 **TE only:** 440, 441, 442, 443, 450, 451, 452, 453 **Event-Based Science:** **FRAUD!** 12, 21-22 **FIRE!** 8-9, 10-11, 24-25, 26, 40-41, 44-45, 50-51, 53, 58, 62 **GOLD MEDAL!** 13 **VOLCANO!** 51 **GOLD RUSH!** 2, 4-6
	TR: LM: 155-160, 179-180, 183-186

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9-11 PS2H - Solutions are mixtures in which particles of one substance are evenly distributed through another substance. Liquids are limited in the amount of dissolved solid or gas that they can contain. Aqueous solutions can be described by relative quantities of the dissolved substances and acidity or alkalinity (pH).	**SE/TE:** 412-415, 416-423, 423-427 **TE only:** 412, 413, 419, 423 **Event-Based Science:** **FRAUD!** 10-12, 16, 21-22, 23, 26 **FLOOD!** 21 **GOLD RUSH!** 2-3, 37-38 **GLOBAL WARMING!** 41-42, 61-62 **TOXIC LEAK!** 47 **BLIGHT!** 10-11
	TR: LM: 173-174
9-11 PS2I - The rate of a physical or chemical change may be affected by factors such as temperature, surface area, and pressure.	**SE/TE:** 413-416, 423-427, 437-448 **TE only:** 423, 424, 425, 446, 447 **Event-Based Science:** **FIRE!** 10-11, 26, 50-51, 54-55, 59 **TOXIC LEAK!** 30, 46
	TR: LM: 155-160, 187-188
9-11 PS2J - The number of neutrons in the nucleus of an atom determines the isotope of the element. Radioactive isotopes are unstable and emit particles and/or radiation. Though the timing of a single nuclear decay is unpredictable, a large group of nuclei decay at a predictable rate, making it possible to estimate the age of materials that contain radioactive isotopes.	**SE/TE:** 324-327, 343-345, 326-327 **Event-Based Science:** **FIRE!** 10-11, 26, 50-51, 54-55, 59 **TOXIC LEAK!** 30, 46 **FRAUD!** 17
	TR: LM: 149-152
9-11 PS2K - Nuclear reactions convert matter into energy, releasing large amounts of energy compared with chemical reactions. Fission is the splitting of a large nucleus into smaller pieces. Fusion is the joining of nuclei and is the process that generates energy in the Sun and other stars.	**SE/TE:** 334-356; Link to Technology: 348 **TE only:** 335, 337, 338, 339, 342 **Event-Based Science:** **FIRE!** 58
	TR: LM: 149-152, 153-154

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Performance Expectations	
Students are expected to:	
Describe the relative charges, masses, and locations of the protons, neutrons, and electrons in an atom of an element.	**SE/TE:** 319, 322-324 **TE only:** 319, 323, 324 **Event-Based Science:** **BLACKOUT!** 7
Given the number and arrangement of electrons in the outermost shell of an atom, predict the chemical properties of the element.	**SE/TE:** 327-329, 371-376, 385-386 **TE only:** 327, 374 **Event-Based Science:** **FRAUD!** 9, 10 **GOLD RUSH!** 1, 2-3, 4-6
Given the number of protons, identify the element using a Periodic Table. Explain the arrangement of the elements on the Periodic Table, including the significant relationships among elements in a given column or row.	**SE/TE:** 371-376 **Event-Based Science:** **FRAUD!** 9, 10 **GOLD RUSH!** 2-3, 4-6, 7
Explain how ions and ionic bonds are formed (e.g., sodium atoms lose an electron and chlorine atoms gain an electron, then the charged ions are attracted to each other and form bonds). Explain the meaning of a chemical formula for an ionic array (e.g., NaCl).	**SE/TE:** 376-378, 378-379, 386-392 **TE only:** 389, 390, 391
Give examples to illustrate that molecules are groups of two or more atoms bonded together (e.g., a molecule of water is formed when one oxygen atom shares electrons with two hydrogen atoms). Explain the meaning of a chemical formula for a molecule (e.g., CH4 or H2O).	**SE/TE:** Fig 17.11 - 368, Fig 17.23 - 377 Fig 18.7 - 390, Fig 18.8, 18.9 - 391, Fig 18.10 - 392, Fig 18.14 - 394, Fig 18.20 - 397, Fig 21.6 - 466 **Event-Based Science:** **FRAUD!** 9 **VOLCANO!** 24-26, 28, 51 **GLOBAL WARMING!** 10-11
	TR: LM**:** 165-168
Demonstrate how carbon atoms form four covalent bonds to make large molecules. Identify the functions of these molecules (e.g., plant and animal tissue, polymers, sources of food and nutrition, fossil fuels).	**SE/TE:** 498-507; Fig 22.1 - 492, Fig 22.2 - 493, Fig 22.4, Fig 22.5 - 496; Table 22.1 – 494 **TE only:** 491. 492, 493, 494, 500, 501 **Event-Based Science:** **FRAUD!** 17 **FIRE!** 56-57, 62 **GOLD RUSH!** 5 **GLOBAL WARMING!** 10-11, 12-13, 16 **TOXIC LEAK!** 41-42

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	TR: LM: 165-168,
Describe at least three chemical reactions of particular importance to humans (e.g., burning of fossil fuels, photosynthesis, rusting of metals). Use a chemical equation to illustrate how the atoms in molecules are arranged before and after a reaction. Give examples of chemical reactions that either release or acquire energy and result in the formation of new substances (e.g., burning of fossil fuels releases large amounts of energy in the form of heat).	**SE/TE:** 437, 438-440, 440-443, 445-448, 449-454 **TE only:** 438, 439, 440, 445, 451, 453 **Event-Based Science:** **FRAUD!** 11-12 **FIRE!** 8-9, 10-11, 24-25, 26, 40-41, 44-45, 50-51, 53, 58, 62 **GOLD MEDAL!** 13 **VOLCANO!** 51 **GOLD RUSH!** 2, 4-5 **GLOBAL WARMING!** 10-11
	TR: LM: 187-188
Give examples of common solutions. Explain the differences among the processes of dissolving, melting, and reacting. Predict the result of adding increased amounts of a substance to an aqueous solution, in concentration and pH.	**SE/TE:** 416-418, 419-421, 423-427; Explore: 412 **TE only:** 438, 439, 440, 445, 451, 453 **Event-Based Science:** **FRAUD!** 11-12, 16, 21-22, 23, 26 **GOLD RUSH!** 37 **GLOBAL WARMING!** 41-42, 61-62 **TOXIC LEAK!** 47 **BLIGHT!** 10-11
	TR: LM: 173-174, 175-177, 181, 182, 203-205
Predict the effect of a change in temperature, surface area, pressure, on the rate of a given physical or chemical change.	**SE/TE:** 364-371, 382, 423-427 **TE only:** 369 **Event-Based Science:** **FIRE!** 10-11, 26, 50-51, 54-55, 59 **TOXIC LEAK!** 30, 46
	TR: LM: 51-52, 61-62, 155-160
Given the atomic number and atomic mass number of an isotope, students draw and label a model of the isotope's atomic structure (number of protons, neutrons and electrons). Given data from a sample, use a decay curve for a radioactive isotope to find the age of the sample. Explain how the decay curve is derived.	**SE/TE:** 424-327, 342-345 **TE only:** 324, 325, 326, 327, 342, 343 **Event-Based Science:** **FRAUD!** 17
	TR: LM: 149-152

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Distinguish between nuclear fusion and nuclear fission by describing how each process transforms elements present before the reaction into elements present after the reaction.	**SE/TE:** 334, 345-352 **TE only:** 345, 346, 347, 350, 351, 352 **Event-Based Science:** **FIRE!** 58
	TR: LM: 149-152, 153-154
EALR 4: Physical Science	
Big Idea: Energy: Transfer, Transformation, and Conservation (PS3)	
Core Content: Transformation and Conservation of Energy	
In prior grades, students learned to apply the concept of —energy in various settings. In grades 9-11, students learn fundamental concepts of energy, including the Law of Conservation of Energy—that the total amount of energy in a closed system is constant. Other key concepts include gravitational potential and kinetic energy, how waves transfer energy, the nature of sound and the electromagnetic spectrum. Energy concepts are essential for understanding all of the domains of science, from the ways that organisms get energy from their environment, to the energy that drives weather systems and volcanoes.	
Content Standards	
Students know that:	
9-11 PS3A - Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system is constant and can neither be created nor destroyed. (Conservation of Energy)	**SE/TE:** 98-100 **Event-Based Science:** **THRILL RIDE!** 11-12, 17, 21-22, 24, 35-37 **FIRE!** 10-11, 50-51, 53, 54-55, 58, 62 **BLACKOUT!** 9, 10-11, 12, 14-15, 21, 34-35 **GLOBAL WARMING!** 20
	TR: PB: Conservation of Energy
9-11 PS3B - Kinetic energy is the energy of motion. The kinetic energy of an object is defined by the equation: Ek = ½ mv2	**SE/TE:** 95-96 **TE only:** 95, 96 **Event-Based Science:** **THRILL RIDE!** 11-12, 17, 21-22, 24, 35, 36-37
9-11 PS3C - Gravitational potential energy is due to the separation of mutually attracting masses. Transformations can occur between gravitational potential energy and kinetic energy, but the total amount of energy remains constant.	**SE/TE:** 94-98, 98-100 **TE only:** 94, 95, 98, 100 **Event-Based Science:** **THRILL RIDE!** 11-12, 17, 21-22, 24, 35, 43

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9-11 PS3D - Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, amplitudes, and travel at different speeds.	**SE/TE:** Explore: 235: 236-241, 242-244, 250-251, 261-262, 270-271, 616-621; Wave Motion:630 **TE only:** 236, 242, 250,251, 270, 616, 619, 629 **Event-Based Science:** **EARTHQUAKE!** 21 **OIL SPILL!** 20-21
	TR: LM: 115-118, 127-130, 131-132
9-11 PS3E - Electromagnetic waves differ from physical waves because they do not require a medium and they all travel at the same speed in a vacuum. This is the maximum speed that any object or wave can travel. Forms of electromagnetic waves include X-rays, ultraviolet, visible light, infrared, and radio.	**SE/TE:** 261-262, 262-266 **Event-Based Science:** **BLACKOUT!** 21 **GLOBAL WARMING!** 9 **SURVIVE!** 24, 29
	TR: LM: 145-148
Performance Expectations	
Students are expected to:	
Describe a situation in which energy is transferred from one place to another, and explain how energy is conserved. Describe a situation in which energy is transformed from one form to another and explain how energy is conserved.	**SE/TE:** 96-97, 98-100, 105, 438-440; Fig 6.13 - 98, Fig 6.14, 6.15 – 99 **TE only:** 95, 96, 99 **Event-Based Science:** **THRILL RIDE!** 11-12, 17, 21-22, 24, 35 **FIRE!** 10-11, 50-51, 53, 54-55, 58, 62 **BLACKOUT!** 9, 10-11, 12, 14-15, 21, 34-35 **GLOBAL WARMING!** 20
	TR: PB: Conservation of Energy
Calculate the kinetic energy of an object, given the object's mass and velocity.	**SE/TE:** 95, 96; Concept Check: 96; Think and Compare: 104 **Event-Based Science:** **THRILL RIDE!** 11-12, 21-22, 35
Give an example in which gravitational potential energy and kinetic energy are changed from one to the other (e.g., a child on a swing illustrates the alternating transformation of kinetic and gravitational potential energy).	**SE/TE:** 93-96; Fig 6.1, 6.2, 6.3 - 91, Fig 6.6 - 93, fig 6.7 – 94 **TE only:** 94, 95 **Event-Based Science:** **THRILL RIDE!** 11-12, 17, 21-22, 24, 35

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	TR: LM: 21-24
Demonstrate how energy can be transmitted by sending waves along a spring or rope. Characterize physical waves by frequency, wavelength, amplitude, and speed. Apply these properties to the pitch and volume of sound waves, and to the wavelength and magnitude of water waves.	**SE/TE:** 236-241, 250-251; Fig 12.1-637, Fig 12.6 - 239, Fig 12.25 - 250; Explore: 235 **Event-Based Science:** **EARTHQUAKE!** 21 **OIL SPILL!** 20-21
	TR: LM: 115-118
Illustrate the electromagnetic spectrum with a labeled diagram, showing how regions of the spectrum differ regarding wavelength, frequency, and energy, and how they are used (e.g., infrared in heat lamps, microwaves for heating foods, X-rays for medical imaging).	**SE/TE:** 260-262; Fig 13.3 – 261 **TE only:** 261. 262 **Event-Based Science:** **BLACKOUT!** 21 **GLOBAL WARMING!** 9 **SURVIVE!** 24, 29
	TR: LM: 145-148