
# TEXAS Standards Correlations

**Component Codes**

CK: Checkpoint
CS: Case Study
CT: Chapter Test
DA: Data Analysis
EAW: Explorer feature
INV: Investigations
LA: Lesson Assessment
ML: Minilab
PT: Performance Task
PTT: Posttest
TIAT: Tying It All Together
U: Unit
UO: Unit Opener

*Bold blue numbers indicate chapters or lessons.*



## Texas Essential Knowledge and Skills

| EARTH SYSTEMS | | |
|---|---|---|
| **STANDARD** | **STUDENT/TEACHER EDITION** | **ONLINE RESOURCES** |
| **(a) Introduction.** | | |
| **(1) Earth Systems Science.** The Earth Systems Science course is designed to build on students' prior scientific and academic knowledge and skills to develop their understanding of Earth's systems. These systems (the atmosphere, hydrosphere, geosphere, and biosphere) interact through time to produce the Earth's landscapes, climate, and resources. Students explore the geologic history of individual dynamic systems through the flow of energy and matter, their current states, and how these systems affect and are affected by human use. | | |
| **(2) Nature of science.** Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not currently scientifically testable. | | |
| **(3) Scientific hypotheses and theories.** Students are expected to know that: | | |
| **(A)** hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power that have been tested over a wide variety of conditions are incorporated into theories; and | **1.1** p. 15; **1.1 ML** p. 16 #1, #2, #5; **1.1 LA** p. 20 #2; **1 CT** p. 32 #26; **4 TIAT** p. 122 #2–4; **12 PT** p. 401; **18 CT** p. 613 #30; **22 CT** p. 747 #32 | **INV** 8; **INV** 10 **13 PTT** #5 **INV** 18 |
| **(B)** scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well established and highly reliable explanations, but they may be subject to change as new areas of science and new technologies are developed. | **1.1** pp. 14–16; **1.1 ML** p. 16 #1, #2, #5; **1.1 LA** p. 20 #2–#3; **1 CT** p. 32 #1, #28; **7.1** pp. 205–207; **7.1** pp. 211–212 | |

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| **(4) Scientific inquiry.** Scientific inquiry is the planned and deliberate investigation of the natural world using scientific and engineering practices. Scientific methods of investigation are descriptive, comparative, or experimental. The method chosen should be appropriate to the question being asked. Student learning for different types of investigations include descriptive investigations, which involve collecting data and recording observations without making comparisons; comparative investigations, which involve collecting data with variables that are manipulated to compare results; and experimental investigations, which involve processes similar to comparative investigations but in which a control is identified. | | |
| **(A)** Scientific practices. Students should be able to ask questions, plan and conduct investigations to answer questions, and explain phenomena using appropriate tools and models. | **7 CS** p. 204; **8.1 ML** p. 246; **9.1 ML** p. 279; **19.1 ML** p. 628 #2–4; **19.3 ML** p. 631 #1–2; **18 PT** p. 615 #1A–1B; **20 CS** p. 650 | **INV** 1; **INV** 2; **INV** 6; **INV** 7; **INV** 8; **INV** 9; **INV** 10; **INV** 12; **INV** 13; **INV** 14; **INV** 16; **INV** 19 |
| **(B)** Engineering practices. Students should be able to identify problems and design solutions using appropriate tools and models. | **1.1** pp. 12–13; **8.3** pp. 246–247 | **INV** 6; **INV** 12; **INV** 20; **INV** 21 |
| **(5) Science and social ethics.** Scientific decision making is a way of answering questions about the natural world Involving its own set of ethical standards about how the process of science should be carried out. Students should be able to distinguish between scientific decision-making methods (scientific methods) and ethical and social decisions that Involve science (the application of scientific information). | | |
| | **16 TIAT** p. 542; **16 PT** p. 545 | |
| **(6) Science consists of recurring themes and making connections between overarching concepts.** Recurring themes include systems, models, and patterns. All systems have basic properties that can be described in space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested, while models allow for boundary specification and provide a tool for understanding the ideas presented. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment. | | |
| | **2 CT** pp. 11, 14 #4–5, #8–9, #15–19, #21–23, #25–26; **2.1** pp. 37–42; **2 CS** p. 38; **2.2** pp. 43–44; **2.1 LA** p. 44 #1, #4; **2.3** pp. 48–50; **2.3** pp. 51, 54; **2.3** pp. 54–58; **2.3 LA** p. 61 #1–4; **16 PT** p. 545 | **INV** 2; **2 PTT** #1–4, #7–8, #10–14 |
| **(b) Knowledge and skills.** | | |
| **(1) Scientific and engineering practices.** The student, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to explain phenomena or design solutions using appropriate tools and models. The student is expected to: | | |
| **(A)** ask questions and define problems based on observations or information from text, phenomena, models, or investigations; | | |
| (i) ask questions based on observations or information from text, phenomena, models, or investigations | **1.1** p. 17; **1 PT** p. 20; **2.3 LA** p. 61 #5; **5.3 LA** p. 148 #6; **5 TIAT** p. 158; **7 CS** p. 204; **17.4 LA** p. 576 #5; **20 CS** p. 650; **22.4** p. 739 | **1 PTT** #6; **INV** 2; **INV** 7 |
| (ii) define problems based on observations or information from text, phenomena, models, or investigations | **16 TIAT** p. 542; **16 PT** p. 545; **17 TIAT** p. 577 #3; **16 CT** p. 545 #28 **17 CT** p. 580 #26 | **INV** 2; **INV** 6; **INV** 8; **NV** 12; **INV** 13; **INV** 14; **INV** 17 |
| **(B)** apply scientific practices to plan and conduct descriptive, comparative, and experimental Investigations and use engineering practices to design solutions to problems; | | |
| (i) apply scientific practices to plan descriptive investigations | **1.1** p. 12; **1 CT** p. 32 #31; **3.3 LA** p. 81 #4 | |
| (ii) apply scientific practices to plan comparative investigations | **1.1** p. 12; **1 CT** p. 32 #31; **3.5 LA** p. 91 #4 | |

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| (iii) apply scientific practices to plan experimental investigations | **1.1** p. 15 | **INV** 14; **INV** 19 |
| (iv) apply scientific practices to conduct descriptive investigations | **1.1** p. 12; **1 CT** p. 32 #31; **11.3 ML** p. 347 | |
| (v) apply scientific practices to conduct comparative investigations | **1.1** p. 12; **1.1** p. 15; **1 CT** p. 32 #31; **18.2 ML** p. 594 | |
| (vi) apply scientific practices to conduct experimental investigations | **1.1** pp. 18–19 | **INV** 19; **INV** 21 |
| (vii) use engineering practices to design solutions to problems | **1.1** pp. 18–19 | **INV** 6 |
| **(C)** use appropriate safety equipment and practices during laboratory, classroom, and field Investigations as outlined in Texas Education Agency-approved safety standards; | | |
| (i) use appropriate safety equipment during laboratory investigations as outlined in Texas Education Agency-approved safety standards | | **INV** 1; **INV** 2; **INV** 3; **INV** 4; **INV** 6 |
| (ii) use appropriate safety equipment during classroom investigations as outlined in Texas Education Agency-approved safety standards | | **INV** 1; **INV** 2; **INV** 3; **INV** 4; **INV** 6 |
| (iii) use appropriate safety equipment during field investigations as outlined in Texas Education Agency-approved safety standards | | **INV** 1; **INV** 2; **INV** 3; **INV** 4; **INV** 6 |
| (iv) use appropriate safety practices during laboratory investigations as outlined in Texas Education Agency-approved safety standards | | **INV** 1; **INV** 2; **INV** 3; **INV** 4; **INV** 6 |
| (v) use appropriate safety practices during classroom investigations as outlined in Texas Education Agency-approved safety standards | | **INV** 1; **INV** 2; **INV** 3; **INV** 4; **INV** 6 |
| (vi) use appropriate safety practices during field investigations as outlined in Texas Education Agency-approved safety standards | | **INV** 1; **INV** 2; **INV** 3; **INV** 4; **INV** 6 |
| **(D)** use appropriate tools such as a drawing compass, magnetic compass, bar magnets, topographical and geological maps, satellite imagery and other remote sensing data, Geographic Information Systems (GIS), Global Positioning System (GPS), hand lenses, and fossil and rock sample kits; | | |
| (i) use appropriate tools such as a drawing compass, magnetic compass, bar magnets, topographical and geological maps, satellite imagery and other remote sensing data, Geographic Information Systems (GIS), Global Positioning System (GPS), hand lenses, and fossil and rock sample kits | **1.2** pp. 23–25; **1.2 DA** p. 28; **1 PT** p. 33; **11.3 ML** p. 347 | **INV** 1; **INV** 2; **INV** 3; **INV** 4; **INV** 6 |

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| **(E)** collect quantitative data using the International System of Units (SI) and qualitative data as evidence; | | |
| (i) collect quantitative data using the International System of Units (SI) | **22 ML** p. 736 | **INV** 11 |
| (ii) collect qualitative data as evidence | **2.1 ML** p. 44; **3.1 ML** p. 74 #5; **12.2 ML** p. 376; **13.8 ML** p. 439 #1–3 | **INV** 2; Handout **2.1**; **INV** 3; Handout **3.1**; **INV** 4; Handout **4.4**; Handout **4.6**; **INV** 5; Handout **5.1** |
| **(F)** organize quantitative and qualitative data using scatter plots, line graphs, bar graphs, charts, data tables, digital tools, diagrams, scientific drawings, and student-prepared models; | | |
| (i) organize quantitative data using scatter plots | **1.1** p. 13; **1.1 DA** p. 14 #1; **1 CT** p. 32 #21; **25.2 ML** p. 818 #2 | |
| (ii) organize quantitative data using line graphs | **1.1** p. 13; **13.5 DA** p. 423 #2; **17.3 LA** p. 569 #5 | **INV** 19; Handouts **19.2**, **19.3** |
| (iii) organize quantitative data using bar graphs | **1.1** p. 13 | **INV** 11; Handout **11.2** |
| (iv) organize quantitative data using charts | **8.4 LA** p. 261; **9.3 DA** p. 294 #4, #5; **LA 17.4** p. 576 #2; **24.2 LA** p. 791 #5 | |
| (v) organize quantitative data using data tables | **5.4 ML** p. 150; **15.2 ML** p. 490; **25.2 ML** p. 818 | |
| (vi) organize quantitative data using digital tools | **13.5 DA** p. 423 #1; **14 PT** p. 477 #1; **24.3 DA** p. 794 #1 | |
| (vii) organize quantitative data using diagrams | **2 PT** p. 65; **4.4 DA** p. 121 #5; **24 PT** p. 805 | |
| (viii) organize quantitative data using scientific drawings | **5 PT** p. 161; **7 PT** p. 233; **10.3 DA** p. 322 #2 | |
| (ix) organize quantitative data using student-prepared models | | **INV** 1; **INV** 11 |
| (x) organize qualitative data using charts | **2 TIAT** p. 62 #2; **4 CT** p. 124 #9; **8.2 LA** p. 253 #5; **9 PT** p. 299 #1D; **20.2 DA** p. 656; **23.5 LA** p. 775 #5; **20 TIAT** p. 677 #1; **24 TIAT** p. 801 #2 | |
| (xi) organize qualitative data using data tables | **9 PT** p. 289; **13.1 LA** p. 409 #4; **18.4 DA** p. 603 #1 | **INV** 2; Handout **2.1**; **INV** 3; Handout **3.1**; **INV** 4; Handout **4.4**; Handout **4.6**; **INV** 5; Handout **5.1** |
| (xiii) organize qualitative data using digital tools | **8.2 DA** p. 252; **9 PT** p. 299 | |
| (xiv) organize qualitative data using diagrams | **19 EAW** p. 618; **23.5 LA** p. 775 #5 | **INV** 7 |
| (xv) organize qualitative data using scientific drawings | **9 PT** p. 299; **10 TIAT** p. 324 #2; **14.1 DA** p. 456 #5; **15 TIAT** p. 500 #4; **20.3 LA** p. 668 #6 | |
| (xvi) organize qualitative data using student-prepared models | **4 PT** p. 125 #2; **5 PT** p. 161; **20 TIAT** p. 677 #1 | |
| **(G)** develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and | | |
| (i) develop models to represent phenomena, systems, processes, or solutions to engineering problems | **1.1** pp. 12–13; **2 PT** p. 65; **4.4 DA** p. 121 #6; **5.2 LA** p. 140 #4; **7 CT** p. 232 #12; **7 PT** p. 233; **10 PT** p. 327 #1; **14 PT** p. 477 #2–3; **17.4 ML** p. 573 #1–4 | **INV** 2; **INV** 6; **INV** 7; **INV** 10 |

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| (ii) use models to represent phenomena, systems, processes, or solutions to engineering problems | **1.1** p. 15; **2 PT** p. 65 #2–4; **4 CT** p. 124 #12; **5.4 ML** p. 150 #2; **10 PT** p. 327 #2–5; **12.1 ML** p. 372 #2; **13.8 ML** p. 438 #2; **14 PT** p. 477 #2–3; **15 CT** p. 502 #15; **16.3 ML** p. 525 #4; **19.2 ML** p. 628 #3; **19.3 ML** p. 631 #2 | |
| **(H)** distinguish among scientific hypotheses, theories, and laws. | | |
| (i) distinguish among scientific hypotheses, theories, and laws | **1.1** pp. 15–16; **1.1 LA** p. 20 #2–3; **1 CT** p. 32 #1, #3–4, #18 | **1 PTT** #2–3 |
| **(2) Scientific and engineering practices.** The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to: | | |
| **(A)** identify advantages and limitations of models such as their size, scale, properties, and materials; | | |
| (i) identify advantages of models such as their size, scale, properties, and materials | **1.1** pp. 12–13; **4.1 ML** p. 103 #3–4; **20.3 ML** p. 664 #5 | **INV** 6 |
| (ii) identify limitations of models such as their size, scale, properties, and materials | **1.1** p. 15; **1.2 LA** p. 29 #5; **7.3 ML** p. 221 #4; **8.1 ML** p. 246 #4; **13 PT** p. 445 #3 | **INV** 6 |
| **(B)** analyze data by identifying significant statistical features, patterns, sources of error, and limitations; | | |
| (i) analyze data by identifying significant statistical features | **6.1 LA** p. 173 #5; **13.5 DA** p. 423 #3–4; | |
| (ii) analyze data by identifying patterns | **1.1 DA** p. 11 #2; **8.1 DA** p. 247 #6, #8 | |
| (iii) analyze data by identifying sources of error | **1.1** p. 13 | **INV** 4; **INV** 11; **INV** 15; **INV** 17; **INV** 18; **INV** 19 |
| (iv) analyze data by identifying limitations | **22 ML** p. 736 #2; **25.2 ML** p. 818 #6 | |
| **(C)** use mathematical calculations to assess quantitative relationships in data; and | | |
| (i) use mathematical calculations to assess quantitative relationships in data | **3.3 LA** p. 77 #4; **5.4 LA** p. 151 #4; **13.5 DA** p. 423 #1; **LA 15.1** p. 486 #4; **24.3 DA** p. 794 #1, #5; **22 PT** p. 747 #1–4; **23.1 LA** p. 755 #4; **23.3 LA** p. 776 #6 | |
| **(D)** evaluate experimental and engineering designs. | | |
| (i) evaluate experimental designs | **17.4 LA** p. 576 #5 | **INV** 1; **INV** 19 |
| (ii) evaluate engineering designs | | |
| **(3) Scientific and engineering practices.** The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to: | | |
| **(A)** develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories; | | |
| (i) develop explanations supported by data and consistent with scientific ideas | **6.4 DA** p. 192 #2, #4; **7.1 LA** p. 212 #1–2; **15 CT** p. 503 #28; **19 CT** p. 644 #28; **25.2 DA** p. 817 #5 | **INV** 2 |
| (ii) develop explanations supported by data and consistent with scientific principles | **6.4 DA** p. 192 #2, #4; **7.1 LA** p. 212 #1–2; **15 CT** p. 503 #28; **19 CT** p. 644 #28; **25.2 DA** p. 817 #5 | **INV** 2 |
| (iii) develop explanations supported by data and consistent with scientific theories | **6.4 DA** p. 192 #2, #4; **7.1 LA** p. 212 #1–2; **15 CT** p. 503 #28; **19 CT** p. 644 #28; **25.2 DA** p. 817 #5 | **INV** 2 |
| (iv) develop explanations supported by models and consistent with scientific ideas | **7 PT** p. 233 | **INV** 2; **INV** 6 |

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| (v) develop explanations supported by models and consistent with scientific principles | **7 PT** p. 233 | **INV** 2; **INV** 6 |
| (vi) develop explanations supported by models and consistent with scientific theories | **7 PT** p. 233 | **INV** 2; **INV** 6 |
| (vii) propose solutions supported by data and consistent with scientific ideas | **14.3 LA** p. 472 #5; **14 PT** p. 477 #3–4; **15 PT** p. 503 #3–5 | |
| (viii) propose solutions supported by data and consistent with scientific principles | **14.3 LA** p. 472 #5; **14 PT** p. 477 #3–4; **15 PT** p. 503 #3–5 | |
| (ix) propose solutions supported by data and consistent with scientific theories | **14.3 LA** p. 472 #5; **14 PT** p. 477 #3–4; **15 PT** p. 503 #3–5 | |
| (x) propose solutions supported by models and consistent with scientific ideas | **2 PT** p. 65; **6 PT** p. 197; **10 PT** p. 327; **11 PT** p. 359; **13 PT** p. 445; **16 PT** p. 545 | **INV** 2 |
| (xi) propose solutions supported by models and consistent with scientific principles | **16 PT** p. 545; **17.4 ML** #5 | **INV** 2 |
| (xii) propose solutions supported by models and consistent with scientific theories | **7 PT** p. 233; **11 PT** p. 359; **16 PT** p. 545; **22 PT** p. 747 | **INV** 2 |
| **(B)** communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and | | |
| (i) communicate explanations individually in a variety of settings | **1.1** p. 13; **2 TIAT** p. 62 #4; **7 TIAT** p. 230 | **INV** 8; **INV** 9; **INV** 25 |
| (ii) communicate explanations individually in a variety of formats | **1.1** p. 13; **2 TIAT** p. 62 #4; **7 TIAT** p. 230 | **INV** 8; **INV** 9; **INV** 25 |
| (iii) communicate explanations collaboratively in a variety of settings | **1.1** p. 13; **9 PT** p. 299 #1D; **11 PT** p. 359 #1B; **12 TIAT** p. 397; **14 PT** p. 477 #3; **15 PT** p. 503; **16 TIAT** p. 542; **20 TIAT** p. 677 | |
| (iv) communicate explanations collaboratively in a variety of formats | **1.1** p. 13; **1 PT** p. 33; **2 TIAT** p. 62 #4; **11 PT** p. 359; **13 PT** p. 445; **14 PT** p. 477 #4; **15 PT** p. 503; **17 PT** p. 581; **20 PT** p. 681 | |
| (v) communicate solutions individually in a variety of settings | **1.1** p. 13; **1 PT** p. 33; **2 TIAT** p. 62 #4 | |
| (vi) communicate solutions individually in a variety of formats | **1.1** p. 13; **1 PT** p. 33; **2 TIAT** p. 62 #4; **2 PT** p. 65; **7 PT** p. 233 | |
| (vii) communicate solutions collaboratively in a variety of settings | **1.1** p. 13; **11 PT** p. 359; **13 PT** p. 445; **14 PT** p. 477 #4; **15 PT** p. 503; **17 PT** p. 581; **20 PT** p. 681 | |
| (viii) communicate solutions collaboratively in a variety of formats | **1.1** p. 13; **11 PT** p. 359; **13 PT** p. 445; **14 PT** p. 477 #4; **15 PT** p. 503 #1B, #3; **17 PT** p. 581; **20 PT** p. 681 | |
| **(C)** engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence. | | |
| (i) engage respectfully in scientific argumentation using applied scientific explanations | **1.1** p. 15; **6.4 LA** p. 193 #4; **17 TIAT** p. 577 #5; **18.4 DA** p. 603 #2 | |

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| (ii) engage respectfully in scientific argumentation using empirical evidence | **1.1** p. 15; **6.4 LA** p. 193 #4; **17 TIAT** p. 577 #5; **18.4 DA** p. 603 #2 | |
| **(4) Scientific and engineering practices.** The student knows the contributions of scientists and recognizes the importance of scientific research and innovation on society. The student is expected to: | | |
| **(A)** analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing, so as to encourage critical thinking by the student; | | |
| (i) analyze scientific explanations and solutions by using empirical evidence so as to encourage critical thinking by the student | **1.1** p. 15; **12.3 LA** p. 39, #6; **3.4 DA** p. 84 #2–5; **9.3 LA** p. 295 #5; **10.3 LA** p. 323 #5; **11.1 LA** p. 335 #5; **12.1 ML** p. 372 #4; **12 TIAT** p. 397 #3; **16 TIAT** p. 542; **18 PT** p. 615; **19.1 LA** p. 626 #5 | |
| (ii) analyze scientific explanations and solutions by using logical reasoning so as to encourage critical thinking by the student | **1.1** p. 9; **14.1 LA** p. 457 #2; **15 PT** p. 503 #2 | |
| (iii) analyze scientific explanations and solutions by using experimental testing, so as to encourage critical thinking by the student | **1 CT** p. 32 #26; **18.1 LA** p. 590 #4 | |
| (iv) analyze scientific explanations and solutions by using observational testing, so as to encourage critical thinking by the student | **3 CT** p. 95 #30; **5 EAW** p. 128; **10.2 LA** p. 318 #5; **11.2 LA** p. 337 #4; **12.2 ML** p. 376 #2; **16.3 ML** p. 525 #5 | |
| (v) evaluate scientific explanations and solutions by using empirical evidence so as to encourage critical thinking by the student | **1.1** p. 19; **1.1 DA** p. 14 #3; **11.3 ML** p. 347 #3–4; **12.1 ML** p. 372 #4; **15 PT** p. 503 #4; **16.5 LA** p. 537 #5; **19.2 ML** p. 628 #3; **21 PT** p. 716; **22.1 LA** p. 726 #4; **25.2 DA** p. 817 #5 | |
| (vi) evaluate scientific explanations and solutions by using logical reasoning so as to encourage critical thinking by the student | **4.1 LA** p. 106 #3; **6.4** p. 193; **12.3 LA** p. 390 #7; **12.4 LA** p. 397, #7; **14.3 DA** p. 473 #3–5 | |
| (vii) evaluate scientific explanations and solutions by using experimental testing, so as to encourage critical thinking by the student | **1.1** p. 13 | **INV** 6; **INV** 16; **INV** 18 |
| (viii) evaluate scientific explanations and solutions by using observational testing, so as to encourage critical thinking by the student | **1.1** p. 13; **8 TIAT** p. 266 #1; **22.1 LA** p. 726 #4; | **INV** 12 |
| (ix) critique scientific explanations and solutions by using empirical evidence so as to encourage critical thinking by the student | **1.1** p. 13 | **INV** 6; **INV** 12 |
| (x) critique scientific explanations and solutions by using logical reasoning so as to encourage critical thinking by the student | **1.1** p. 13; **17 CT** p. 580 #25; **19.2 LA** p. 629 #5 | **INV** 6 |
| (xi) critique scientific explanations and solutions by using experimental testing, so as to encourage critical thinking by the student | **1.1** p. 13 | **INV** 6; **INV** 12 |

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| (xii) critique scientific explanations and solutions by using observational testing, so as to encourage critical thinking by the student | **1.1** p. 13 | **INV** 16; **INV** 18 |
| **(B)** relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists as related to the content; and | | |
| (i) relate the impact of past research on scientific thought, including research methodology | **7 CT** p. 233 #22; **21.3 LA** p. 702 #2 | |
| (ii) relate the impact of past research on scientific thought, including cost-benefit analysis | **1.1** p. 19; **6 PT** p. 197 #4; **17.4** p. 572; **17.4** p. 573 | |
| (iii) relate the impact of past research on scientific thought, including contributions of diverse scientists as related to the content | **16.3** p. 519; **18.2** p. 591; **22.2** pp. 717–718; **22.2** p. 727; **22.2** p. 728; **22.2** p. 730; **22.2 LA** p. 731 #4 | |
| (iv) relate the impact of past research on scientific thought, including research methodology | **7 CT** p. 233 #21; **21.3 LA** p. 702 #2 | |
| (v) relate the impact of past research on society, including cost-benefit analysis | **1.1** p. 19; **6 PT** p. 197 #4; **17.4** p. 572; **17.4** p. 573 | |
| (vi) relate the impact of past research on society, including contributions of diverse scientists as related to the content | **16.3** p. 519; **18.2** p. 591; **22.2** pp. 717–718; **22.2** p. 727; **22.2** p. 728; **22.2** p. 730; **22.2 LA** p. 731 #4 | |
| (vii) relate the impact of current research on scientific thought, including research methodology | **21.3 LA** p. 702 #2 | |
| (viii) relate the impact of current research on scientific thought, including cost-benefit analysis | **1.1** p. 19; **6 PT** p. 197 #4; **17.4** p. 572; **17.4** p. 573 | |
| (ix) relate the impact of current research on scientific thought, including contributions of diverse scientists as related to the content | **1.1** p. 19; **6 PT** p. 197 #4; **17.4** p. 572; **17.4** p. 573; **22.2 LA** p. 731 #4 | |
| (x) relate the impact of current research on society, including research methodology | **17.2** p. 557; **17.2** p. 560; **21.3 LA** p. 702 #2 | |
| (xi) relate the impact of current research on society, including cost-benefit analysis | **1.1** p. 19; **6 PT** p. 197 #4; **17.4** p. 572; **17.4** p. 573 | |
| (xii) relate the impact of current research on society, including contributions of diverse scientists as related to the content | **16.3** p. 519; **18.2** p. 591; **22.2** pp. 717–718; **22.2** p. 727; **22.2** p. 728; **22.2 LA** p. 731 #4 | |
| **(C)** research and explore resources such as museums, planetariums, observatories, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics (STEM) field in order to Investigate STEM careers. | | |
| (i) research STEM careers | **1 EAW** p. 6; **5 EAW** p. 128; **10 EAW** p. 302; **15 EAW** p. 482; **20 EAW** p. 638; **25 EAW** p. 808 | |
| (ii) explore resources in order to investigate STEM careers | **1 EAW** p. 6; **5 EAW** p. 128; **10 EAW** p. 302; **15 EAW** p. 482; **20 EAW** p. 638; **25 EAW** p. 808 | |

| STANDARD | STUDENT/TEACHER EDITION | ONLINE RESOURCES |
|---|---|---|
| **(5) Science concepts.** The student understands the formation of the Earth and how objects in the solar system affect Earth's systems. | | |
| **(A)** analyze how gravitational condensation of solar nebular gas and dust can lead to the accretion of planetesimals and protoplanets; | | |
| (i) analyze how gravitational condensation of solar nebular gas lead to the accretion of planetesimals | **2.1** pp. 38–39; **7.1** p. 205; **11.1** p. 333; **23.1** p. 753; **23.1 LA** p. 755 #1; **23 PT** p. 779 #1 | |
| (ii) analyze how gravitational condensation of solar nebular dust lead to the accretion of planetesimals | **2.1** pp. 38–39; **7.1** p. 205; **11.1** p. 333; **23.1** p. 753; **23.1 LA** p. 755 #1; **23 PT** p. 779 #1 | |
| (iii) analyze how gravitational condensation of solar nebular gas lead to the accretion of protoplanets | **2.1** pp. 38–39; **7.1** p. 205; **11.1** p. 333; **23.1** p. 753; **23.1 LA** p. 755 #1; **23 PT** p. 779 #1 | |
| (iv) analyze how gravitational condensation of solar nebular dust lead to the accretion of protoplanets | **2.1** pp. 38–39; **7.1** p. 205; **11.1** p. 333; **23.1** p. 753; **23.1 LA** p. 755 #1; **23 PT** p. 779 #1 | |
| **(B)** identify comets, asteroids, meteoroids, and planets in the solar system and describe how they affect the Earth and Earth's systems; and | | |
| (i) identify comets in the solar system | **11.1** p. 333; **23.5** pp. 762–763; **23.5 LA** p. 775 #4–5; **23 TIAT** p. 776; **23 CT** p. 778 #12, #25 | |
| (ii) identify asteroids in the solar system | **23.5** p. 773; **23.5 LA** p. 775 #2; **23 TIAT** p. 776; **23 CT** p. 778 #8, #25; **23 PT** p. 779 #1 | |
| (iii) identify meteoroids in the solar system | **23.5** p. 773; **23.5 LA** p. 775 #2; **23 TIAT** p. 776; **23 CT** p. 778 #8, #25; **23 PT** p. 779 #1 | |
| (iv) identify planets in the solar system | **23.2** pp. 756–757; **23.2** pp. 759–760; **23.3** pp. 764–768; **23.1 DA** p. 755 #1–3; **23.2 LA** p. 763 #1; **23.3 LA** p. 768, #1–5; **23 TIAT** p. 776; **23 CT** pp. 766–767 #16–17, #21, #30; **23 PT** p. 779 #1 | **INV** 23 |
| (v) describe how comets affect the Earth | **11.1** p. 333; **18.1** p. 590 | |
| (vi) describe how asteroids affect the Earth | **1.1** p. 16; **1.1 LA** p. 20 #3; **23.5** p. 773 | |
| (vii) describe how meteoroids affect the Earth | **23.5** pp. 773–774; **23.5 LA** p. 775 #4; **23 CT** p. 779 #29 | **23 PTT** #15 |
| (viii) describe how planets affect the Earth | **23.1** p. 767 | |
| (ix) describe how comets affect Earth's systems | **11.1** p. 333; **18.1** p. 590 | |
| (x) describe how asteroids affect Earth's systems | **1.1** p. 16; **23.5** p. 773; **1.1 LA** p. 20 #3 | |
| (xi) describe how meteoroids affect Earth's systems | **1.1 LA** p. 20 #3; **23.5** p. 774 | **23 PTT** #15 |
| (xii) describe how planets affect Earth's systems | **23.1** p. 767; **23.5 LA** p. 775 #4; **23 CT** p. 779 #29 | |
| **(C)** explore the historical and current hypotheses for the origin of the Moon, including the collision of Earth with a Mars-sized planetesimal. | | |
| (i) explore the historical hypotheses for the origin of the Moon, including the collision of Earth with a Mars-sized planetesimal | **23.2** p. 762; **23 CT** p. 778 #20 | |

| STANDARD | STUDENT/TEACHER EDITION | ONLINE RESOURCES |
|---|---|---|
| (ii) explore the current hypotheses for the origin of the Moon, including the collision of Earth with a Mars-sized planetesimal | **23.2** p. 762; **23 CT** p. 778 #20 | |
| **(6) Science concepts.** The student knows the evidence for the formation and composition of Earth's atmosphere, hydrosphere, biosphere, and geosphere. The student is expected to: | | |
| **(A)** describe how impact accretion, gravitational compression, radioactive decay, and cooling differentiated proto-Earth into layers; | | |
| (i) describe how impact accretion differentiated proto-Earth into layers | **23.2** p. 760; **22 CT** p. 779 #28 | **23 PTT** #16 |
| (ii) describe how gravitational compression differentiated proto-Earth into layers | **23.2** p. 760; **22 CT** p. 779 #28 | **23 PTT** #16 |
| (iii) describe how radioactive decay differentiated proto-Earth into layers | **23.2** p. 760; **22 CT** p. 779 #28 | **23 PTT** #16 |
| (iv) describe how cooling differentiated proto-Earth into layers | **23.2** p. 760; **22 CT** p. 779 #28 | **23 PTT** #16 |
| **(B)** evaluate the roles of volcanic outgassing and water-bearing comets in developing Earth's atmosphere and hydrosphere; | | |
| (i) evaluate the roles of volcanic outgassing in developing Earth's atmosphere | **18.1** p. 590; **18.1 LA** p. 590 #3 | **18 PTT** #2 |
| (ii) evaluate the roles of volcanic outgassing in developing Earth's hydrosphere | **18 CT** p. 613 #28 | |
| (iii) evaluate the roles of water bearing comets in developing Earth's atmosphere | **11.1** p. 333; **18.1** p. 334; **11.1 LA** p. 335 #1; **11 CT** p. 358 #16 | |
| (iv) evaluate the roles of water-bearing comets in developing Earth's hydrosphere | **11.1** p. 333; **18.1** p. 334; **11.1 LA** p. 335 #1; **11 CT** p. 358 #16 | |
| **(C)** evaluate the evidence for changes to the chemical composition of Earth's atmosphere prior to the introduction of oxygen; | | |
| (i) evaluate the evidence for changes to the chemical composition of Earth's atmosphere prior to the introduction of oxygen | **18.1** pp. 589–590; **18.1 LA** p. 590 #2–3; **18 CT** p. 613 #16–17 | |
| **(D)** evaluate scientific hypotheses for the origin of life through abiotic chemical processes; and | | |
| (i) evaluate scientific hypotheses for the origin of life through abiotic chemical processes | **2.2** p. 46; **18.1 LA** p. 590 #4; **18.2** p. 591; **18 CT** p. 613 #30 | |
| **(E)** describe how the production of oxygen by photosynthesis affected the development of the atmosphere, hydrosphere, geosphere, and biosphere. | | |
| (i) describe how the production of oxygen by photosynthesis affected the development of the atmosphere | **18.1 LA** p. 590 #1–2; **18.2** pp. 591–593; **18.2 ML** p. 594 #6; **LA 18.2** p. 595 #1; **18 CT** p. 613 #18–20; **18 PT** p. 615 | |
| (ii) describe how the production of oxygen by photosynthesis affected the development of the hydrosphere | **18.2** pp. 592–594; **18.2 ML** p. 594 #6; **18.2 LA** p. 595 #3; **18 PT** p. 615 | |

| STANDARD | STUDENT/TEACHER EDITION | ONLINE RESOURCES |
|---|---|---|
| (iii) describe how the production of oxygen by photosynthesis affected the development of the geosphere | **18.2** pp. 592–594; **18.2 LA** p. 595 #3; **18 PT** p. 615; **18 CT** p. 613 #29 | |
| (iv) describe how the production of oxygen by photosynthesis affected the development of the biosphere | **18.2** pp. 592–594; **18.2 LA** p. 595 #1–2; **18 CT** p. 613 #18–20, #29; **18 PT** p. 615 | |
| **(7) Science concepts.** The student knows that rocks and fossils provide evidence for geologic chronology, biological evolution, and environmental changes. The student is expected to: | | |
| **(A)** describe the development of multiple radiometric dating methods and analyze their precision, reliability, and limitations in calculating the ages of igneous rocks from Earth, the Moon, and meteorites; | | |
| (i) describe the development of multiple radiometric dating methods | **5.4 ML** p. 15 #2–5; **5.4** p. 149; **5.4 LA** p. 151 #1; **5 CT** p. 160 #24 | |
| (ii) analyze multiple radiometric dating methods' precision in calculating the ages of igneous rocks from Earth | **5.4** pp. 149–150; **ML 5.4** p. 150 #3; **5.4 DA** p. 151 #2; **5.4 LA** p. 151 #2 | **5 PTT** #11 |
| (iii) analyze multiple radiometric dating methods' precision in calculating the ages of igneous rocks from the Moon | **5.4** pp. 149–150; **ML 5.4** p. 150 #3; **5.4 DA** p. 151 #2; **5.4 LA** p. 151 #2 | **5 PTT** #11 |
| (iv) analyze multiple radiometric dating methods' precision in calculating the ages of igneous rocks from meteorites | **5.4** pp. 149–150; **ML 5.4** p. 150 #3; **5.4 DA** p. 151 #2; **5.4 LA** p. 151 #2 | **5 PTT** #11 |
| (v) analyze multiple radiometric dating methods' reliability in calculating the ages of igneous rocks from Earth | **5.4** pp. 149–150; **ML 5.4** p. 150 #3; **5.4 DA** p. 151 #2; **5.4 LA** p. 151 #2 | **5 PTT** #11 |
| (vi) analyze multiple dating methods' reliability in calculating the ages of igneous rocks from the Moon | **5.4** pp. 149–150; **ML 5.4** p. 150 #3; **5.4 DA** p. 151 #2; **5.4 LA** p. 151 #2 | **5 PTT** #11 |
| (vii) analyze multiple radiometric dating methods' reliability in calculating the ages of igneous rocks from meteorites | **5.4** pp. 149–150; **5.4 DA** p. 151 #2; **5.4 LA** p. 151 #2 | |
| (viii) analyze multiple radiometric dating methods' limitations in calculating the ages of igneous rocks from Earth, | **5.4** pp. 149–150; **5.4 DA** p. 151 #2; **5.4 LA** p. 151 #2 | |
| (ix) analyze multiple radiometric dating methods' limitations in calculating the ages of igneous rocks from the Moon | **5.4** pp. 149–150; **5.4 DA** p. 151 #2; **5.4 LA** p. 151 #2 | |
| (x) analyze multiple radiometric dating methods' limitations in calculating the ages of igneous rocks from meteorites | **5.4** pp. 149–150; **5.4 DA** p. 151 #2; **5.4 LA** p. 151 #2 | |
| **(B)** apply relative dating methods, principles of stratigraphy, and index fossils to determine the chronological order of rock layers; | | |
| (i) apply relative dating methods to determine the chronological order of rock layers | **5.2** pp. 136–138; **5.2 LA** p. 140 #1–3; **5.3** p. 143; **5 TIAT** p. 158 #2; **5 CT** p. 160 #18–20 | |

| STANDARD | STUDENT/TEACHER EDITION | ONLINE RESOURCES |
|---|---|---|
| (ii) apply principles of stratigraphy to determine the chronological order of rock layers | **5.2** pp. 136–138; **5.2 LA** p. 140 #1–3; **5.3** p. 143; **5.3 LA** p. 148 #1–6; **5 TIAT** p. 158 #2; **5 CT** p. 160 #18–23 | |
| (iii) apply index fossils to determine the chronological order of rock layers | **5.2** p. 140; **5.2 LA** p. 140 #4; **5.3** p. 146; **5.3 LA** p. 148 #4; **5 TIAT** p. 158 #2; **5 PT** p. 161; **5 CT** p. 161 #23 | |
| **(C)** construct a model of the geological time scale using relative and absolute dating methods to represent Earth's approximate 4.6-billion-year history; | | |
| (i) construct a model of the geological time scale using relative and absolute dating methods to represent Earth's approximate 4.6-billion-year history | **5.5** pp. 154–157; **5.5 LA** p. 157 #1–3; **5 PT** p. 161; **5 CT** p. 161 #26–27 | **INV** 5 |
| **(D)** explain how sedimentation, fossilization, and speciation affect the degree of completeness of the fossil record; | | |
| (i) explain how sedimentation affects the degree of completeness of the fossil record | **5.2** pp. 139–140; **5.2 LA** p. 140 #3; **5 CT** p. 161 #21 | |
| (ii) explain how fossilization affects the degree of completeness of the fossil record | **5.2** pp. 139–140; **5.2 LA** p. 140 #3; **5 CT** p. 161 #21 | |
| (iii) explain how speciation affects the degree of completeness of the fossil record | **5.2** pp. 139–140; **5.2 LA** p. 140 #3; **5 CT** p. 161 #21 | |
| **(E)** describe how evidence of biozones and faunal succession in rock layers reveal information about the environment at the time those rocks were deposited and the dynamic nature of the Earth; and | | |
| (i) describe how evidence of biozones reveals information about the environment at the time those rocks were deposited | **5.2** p. 140; **5 CT** p. 161 #21 | **5 PTT** #7 |
| (ii) describe how evidence of biozones reveals information about the environment at the dynamic nature of the Earth | **5.2** p. 140; **5 CT** p. 161 #21 | **5 PTT** #7 |
| (iii) describe how evidence of faunal succession in rock layers reveals information about the environment at the time those rocks were deposited | **5.2** p. 138; **5.2** p. 140; **5.2 LA** p. 140 #3; **5 CT** p. 161 #20 | |
| (iv) describe how evidence of faunal succession in rock layers reveals information about the dynamic nature of the Earth | **5.2** p. 138; **5.2** p. 140; **5.2 LA** p. 140 #3; **5 CT** p. 161 #20 | |
| **(F)** analyze data from rock and fossil succession to evaluate the evidence for and significance of mass extinctions, major climatic changes, and tectonic events. | | |
| (i) analyze data from rock succession to evaluate the evidence for mass extinctions | **1.1** pp. 16–18; **5 CS** p. 130; **5.1** pp. 131–133; **5.1 LA** p. 135 #2, #4; **5 CT** p. 160 #17 | |
| (ii) analyze data from rock succession to evaluate the evidence for major climatic changes | **5.1** p. 132; **5.1** p. 133; **5.1 LA** p. 135 #2, #4; **5 CT** p. 160 #17 | **5 PTT** #3 |
| (iii) analyze data from rock succession to evaluate the evidence for tectonic events | **5.1** p. 133; **5.2** p. 134; **5.2** p. 140; **5.2 LA** p. 140 #4; **7.1** pp. 206–207; **7.1** p. 211; **7.1 LA** p. 212 #1–2; **7 CT** p. 232 #14–15, #18 | |

| STANDARD | STUDENT/TEACHER EDITION | ONLINE RESOURCES |
|---|---|---|
| (iv) analyze data from fossil succession to evaluate the evidence for mass extinctions | **1.1** pp. 16–18; **5 CS** p. 130; **5.1** pp. 131–134; **LA 5.1** p. 135 #2, #4; **5 CT** p. 160 #17 | |
| (v) analyze data from fossil succession to evaluate the evidence for major climatic changes | **5.1** pp. 132–133; **5.1 LA** p. 135 #2; **5 CT** p. 161 #28 | **5 PTT** #3 |
| (vi) analyze data from fossil succession to evaluate the evidence for tectonic events | **5.1** pp. 133–134; **5.2** p. 140; **LA 5.2** p. 140 #4; **7.1** p. 197; **7.1** p. 207; **7.1** pp. 211–212; **7.1 LA** p. 212 #1–2; **7 CT** p. 232 #14–15, #18 | |
| (vii) analyze data from rock succession to evaluate the significance of mass extinctions | **1.1** pp. 16–18; **5 CS** p. 130; **5.1** pp. 131–134; **5.1 LA** p. 135 #2, #4; **5 CT** p. 160 #17 | |
| (viii) analyze data from rock succession to evaluate the significance of major climatic changes | **5.1** p. 132; **5.1** p. 133; **5.1 LA** p. 135, #2; **5 CT** p. 161 #28 | **5 PTT** #3 |
| (ix) analyze data from rock succession to evaluate the significance of tectonic events | **5.1** p. 133; **5.2** p. 134; **5.2** p. 140; **LA 5.2** p. 140 #4; **7.1** p. 206; **7.1** p. 207; **7.1** p. 211; **LA 7.1** p. 212 #1–2; **7 CT** p. 232 #14–15, #18 | |
| (x) analyze data from fossil succession to evaluate the significance of mass extinctions | **1.1** pp. 16–18; **5 CS** p. 130; **5.1** pp. 131–133; **5.1 LA** p. 135 #2, #4; **5 CT** p. 160 #17 | |
| (xi) analyze data from fossil succession to evaluate the significance of major climatic changes | **5.1** pp. 132–133; **LA 5.1** p. 135 #2; **5 CT** p. 161 #28 | **5 PTT** #3 |
| (xii) analyze data from fossil succession to evaluate the significance of tectonic events | **5.1** pp. 133–134; **5.2** p. 140; **7.1** pp. 206–207; **7.1** p. 211 | |
| **(8) Science concepts.** The student knows how the Earth's interior dynamics and energy flow drive geological processes on Earth's surface. The student is expected to: | | |
| **(A)** evaluate heat transfer through Earth's systems by convection and conduction and include its role in plate tectonics and volcanism; | | |
| (i) evaluate heat transfer through Earth's systems by convection | **7.3** pp. 219–220; **7.3 ML** p. 221 #6; **19.3** p. 630; **19.3 ML** p. 631 #2, #4; **19.3** p. 632; **19.3 LA** p. 633 #2 | **19 PTT** #6 |
| (ii) evaluate heat transfer through Earth's systems by conduction | **9.1** p. 277; **9 CT** p. 298 #17; **19.3** p. 630; **19 CT** p. 643 #20 | **19 PTT** #6 |
| (iii) include heat transfer's role in plate tectonics | **7.3** pp. 219 –220; **7.3 ML** p. 221 #4; **7 CT** p. 232 #12; **7 PT** p. 233 #1A | |
| (iv) include heat transfer's role in volcanism | **7.3** p. 220; **9.1** p. 276; **9.1** p. 277; **9 CT** p. 298 #17 | **9 PTT** #12 |
| **(B)** develop a model of the physical, mechanical, and chemical composition of Earth's layers using evidence from Earth's magnetic field, the composition of meteorites, and seismic waves; | | |
| (i) develop a model of the physical composition of Earth's layers using evidence from Earth's magnetic field | **8.4** p. 264; **8.4 LA** p. 265 #2, #4 | |
| (ii) develop a model of the physical composition of Earth's layers using evidence from composition of meteorites | **8.4** p. 264; **8.4 LA** p. 265 #3; **8 CT** p. 268 #26 | |
| (iii) develop a model of the physical composition of Earth's layers using evidence from seismic waves | **8.4** pp. 261–263; **8.4** p. 264; **8.4 LA** p. 265 #1, #3 | |

| STANDARD | STUDENT/TEACHER EDITION | ONLINE RESOURCES |
|---|---|---|
| (iv) develop a model of the mechanical composition of Earth's layers using evidence from Earth's magnetic field | **8.4** p. 264; **8.4 LA** p. 265 #4–6; **8 CT** p. 268 #25 | |
| (v) develop a model of the mechanical composition of Earth's layers using evidence from composition of meteorites | **8.4** p. 264; **8.4 LA** p. 265 #3; **8 CT** p. 268 #26 | |
| (vi) develop a model of the mechanical composition of Earth's layers using evidence from seismic waves | **8.4** pp. 261–263; **8.4 LA** p. 265 #1–6 | |
| (vii) develop a model of the chemical composition of Earth's layers using evidence from Earth's magnetic field | **8.4** p. 264; **8.4 LA** p. 265 #4–6 | |
| (viii) develop a model of the chemical composition of Earth's layers using evidence from composition of meteorites | **8.4** p. 264; **8.4 LA** p. 265 #3; **8 CT** p. 268 #26 | |
| (ix) develop a model of the chemical composition of Earth's layers using evidence from seismic waves | **8.4** pp. 262–264; **8.4 LA** p. 265 #2–6 | |
| **(C)** investigate how new conceptual interpretations of data and innovative geophysical technologies led to the current theory of plate tectonics; | | |
| (i) investigate how new conceptual interpretations of data led to the current theory of plate tectonics | **7.1** pp. 206–207; **7.1 LA** p. 212 #1–2; **7 PT** p. 233 | |
| (ii) investigate how innovative geophysical technologies led to the current theory of plate tectonics | **7.1** p. 207; **7.1** p. 211; **7.1** p. 212; **7.1 LA** p. 212 #3–4; **7 PT** p. 233 | |
| **(D)** describe how heat and rock composition affect density within Earth's interior and how density influences the development and motion of Earth's tectonic plates; | | |
| (i) describe how heat affects density within Earth's interior | **7.1** pp. 207–209; **7.1 LA** p. 212 #3, #5; **7 PT** p. 233 | **INV** 7 |
| (ii) describe how rock composition affects density within Earth's interior | **7.1** pp. 207–209; **7.1 LA** p. 212 #3, #5; **7 PT** p. 233 | **INV** 7 |
| (iii) describe how density influences the development of Earth's tectonic plates | **7.2** pp. 214-217; **7.3 ML** p. 224 #2, #4–5; **7 PT** p. 233 | **INV** 7 |
| (iv) describe how density influences the motion of Earth's tectonic plates | **7.2** pp. 216–217; **7.2 LA** p. 217 #4; **7.3** p. 220; **7.3 ML** p. 224 #2, #4–5; **7 PT** p. 233 | **INV** 7 |
| **(E)** explain how plate tectonics accounts for geologic processes, including sea floor spreading and subduction, and features, including ocean ridges, rift valleys, earthquakes, volcanoes, mountain ranges, hot spots, and hydrothermal vents; | | |
| (i) explain how plate tectonics accounts for geologic processes, including sea floor spreading | **7.2 LA** p. 21 #2; **7.1** pp. 212–215; **9.1** p. 276; **9.1 LA** p. 282 #2; **9 CT** p. 298 #17; **11.3** pp. 343–347; **11.3 LA** p. 349 #1; **11 CT** p. 358 #20 | **INV** 7 |
| (ii) explain how plate tectonics accounts for geologic processes, including subduction | **7.2** p. 213; **7.2** p. 216; **9.1** p. 276; **9 CT** p. 298 #17; **11.3** p. 344; **11.3** pp. 354–355 | **INV** 7 |
| (iii) explain how plate tectonics accounts for features, including ocean ridges | **7.2 LA** p. 217 #2; **9.1** p. 276; **11.3** pp. 340–341; **11.3 LA** p. 349 #1; **11 CT** p. 358 #20 | **INV** 7 |

| STANDARD | STUDENT/TEACHER EDITION | ONLINE RESOURCES |
|---|---|---|
| (iv) explain how plate tectonics accounts for features, including rift valleys | **CS 7** p. 204; **7.2** p. 215; **LA 7.2** p. 217 #6; **TIAT 7** p. 230; **7 CT** p. 232 #16; **9.1** p. 276; **11.3** p. 340; **11.3** p. 341 | **INV** 7 |
| (v) explain how plate tectonics accounts for features, including earthquakes | **7.2** p. 217; **7.2 LA** p. 217 #3; **7.4** p. 228; **7 CT** p. 233 #19; **8.2** p. 24; **8.2** pp. 250–251; **8.2 LA** p. 253 #1–5; **8 TIAT** p. 266 #1; **8 CT** p. 26 #17–18 | **INV** 7 |
| (vi) explain how plate tectonics accounts for features, including volcanoes | **7.2** p. 217; **7.2 LA** p. 217 #3; **7.4** p. 225; **LA** 7.4 p. 229 #1; **7 CT** p. 233 #19 | **INV** 7 |
| (vii) explain how plate tectonics accounts for features, including mountain ranges | **7.2** p. 217; **LA 7.2** p. 217 #5; **7.4** p. 228; **7 CT** p. 233 #19, #22; **10.1** p. 305; **10.2** pp. 312–316; **ML 10.2** p. 317 #5; **10.2** p. 318; **LA 10.2** p. 318 #5; **10.2** pp. 320–321; **LA 10.3** p. 323 #5; **10 PT** p. 327; **10 CT** p. 326 #25, #27, #29–31 | **INV** 7 |
| (viii) explain how plate tectonics accounts for features, including hot spots | **7.3** p. 220; **7.3 LA** p. 224 #4; **7 CT** p. 253 #23 | **7 PTT** #16 |
| (ix) explain how plate tectonics accounts for features, including hydrothermal vents | **11.3** p. 341; **11 CT** p. 358 #26 | **11 PTT** #7 |
| **(F)** calculate the motion history of tectonic plates using equations relating rate, time, and distance to predict future motions, locations, and resulting geologic features; | | |
| (i) calculate the motion history of tectonic plates using equations relating rate, time, and distance to predict future motions | **7.3** p. 200; **10.3** p. 222; **11.3** p. 322; **11.3** pp. 345–346; **11.3 ML** p. 347; **11 CT** p. 358 #25 | **11 PTT** #8 |
| (ii) calculate the motion history of tectonic plates using equations relating rate, time, and distance to predict future locations | **7.3** p. 200; **10.3** p. 222; **11.3** p. 322; **11.3** pp. 345–346; **11.3 ML** p. 347; **11 CT** p. 358 #25 | **11 PTT** #8 |
| (iii) calculate the motion history of tectonic plates using equations relating rate, time, and distance to predict future resulting geologic features | **11.3** p. 322; **11.3** pp. 345–346; **10.3 DA** p. 322; **10 TIAT** p. 324 #1, #3; **11.3 ML** p. 347 | |
| **(G)** distinguish the location, type, and relative motion of convergent, divergent, and transform plate boundaries using evidence from the distribution of earthquakes and volcanoes; and | | |
| (i) distinguish the location of convergent plate boundaries using evidence from the distribution of earthquakes | **8.2** p. 249; **8.2** p. 251; **8.2 DA** p. 252; **8.2 LA** p. 253 #1, #4; **8 CT** p. 268 #18 | **INV** 7 |
| (ii) distinguish the location of divergent plate boundaries using evidence from the distribution of earthquakes | **8.2** pp. 249–251; **8.2 DA** p. 252; **8.2 LA** p. 253 #1 | **INV** 7 |
| (iii) distinguish the location of transform plate boundaries using evidence from the distribution of earthquakes | **8.2** pp. 241–242; **8.2 DA** p. 252; **8.2 LA** p. 253 #1–2; **8 CT** p. 268 #27 | **INV** 7 |
| (iv) distinguish the location of convergent plate boundaries using evidence from the distribution of volcanoes | **9.1** p. 277; **10.2** p. 314 | **INV** 7; **INV** 9 |
| (v) distinguish the location of divergent plate boundaries using evidence from the distribution of volcanoes | **9.1** p. 27 | **INV** 7; **INV** 9 |

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| (vi) distinguish the location of transform plate boundaries using evidence from the distribution of volcanoes | **8.2** p. 250; **8 CT** p. 268 #18 | **INV** 7; **8 PTT** #5; **INV** 9 |
| (vii) distinguish the type of convergent plate boundaries using evidence from the distribution of earthquakes | **8.2** pp. 249–251; **8.2 DA** p. 252; **8.2 LA** p. 253 #1, #4; **8 CT** p. 268 #18 | **INV** 7 |
| (viii) distinguish the type of divergent plate boundaries using evidence from the distribution of earthquakes | **8.2** pp. 249–251; **8.2 DA** p. 252; **8.2 LA** p. 253 #1 | **INV** 7 |
| (ix) distinguish the type of transform plate boundaries using evidence from the distribution of earthquakes | **8.2 LA** p. 25 #1–2; **8.2** pp. 241–242; **8.2 DA** p. 252; **8 CT** p. 268 #27 | **INV** 7 |
| (x) distinguish the type of convergent plate boundaries using evidence from the distribution of volcanoes | **9.1** p.269; **10.2** p. 314 | **INV** 7 |
| (xi) distinguish the type of divergent plate boundaries using evidence from the distribution of volcanoes | **9.1** p. 276 | **INV** 7; **INV** 9 |
| (xii) distinguish the type of transform plate boundaries using evidence from the distribution of volcanoes | **8.2** p. 250; **8 CT** p. 268 #18 | **INV** 7; **8 PTT** #5; **INV** 9 |
| (xiii) distinguish the relative motion of convergent plate boundaries using evidence from the distribution of earthquakes | **8.2** pp. 249–251; **8.2 DA** p. 252; **8.2 LA** p. 253 #1, #4; **8 CT** p. 268 #18 | **INV** 7 |
| (xiv) distinguish the relative motion of divergent plate boundaries using evidence from the distribution of earthquakes | **8.2** pp. 249–251; **8.2 DA** p. 252; **8.2 LA** p. 253 #1 | **INV** 7 |
| (xv) distinguish the relative motion of transform plate boundaries using evidence from the distribution of earthquakes | **8.2** pp. 241–242; **8.2 DA** p. 252; **8.2 LA** p. 253 #1–2; **8 CT** p. 268 #27 | **INV** 7 |
| (xvi) distinguish the relative motion of convergent plate boundaries using evidence from the distribution of volcanoes | **9.1** p. 277; **10.2** p. 314 | **INV** 7; **INV** 9 |
| (xvii) distinguish the relative motion of divergent plate boundaries using evidence from the distribution of volcanoes | **9.1** p. 276 | **INV** 7; **INV** 9 |
| (xviii) distinguish the relative motion of transform plate boundaries using evidence from the distribution of volcanoes | **8.2** p. 250; **8 CT** p. 268 #18 | **INV** 7; **8 PTT** #5; **INV** 9 |
| **(H)** evaluate the role of plate tectonics with respect to long-term global changes in Earth's subsystems such as continental buildup, glaciation, sea level fluctuations, mass extinctions, and climate change. | | |
| (i) evaluate the role of plate tectonics with respect to long-term global changes in Earth's subsystems | **5.1** pp. 133–135; **5.1 LA** p. 135 #3; **5 CT** p. 160 #16; **7.2** p. 217; **7.2 LA** p. 217 #5; **7.4** pp. 221–228; **7.4 LA** p. 229; **7 TIAT** p. 230; **7 CT** p. 233 #21; **10.1 LA** p. 311 #1; **10.3 LA** p. 323 #1–2; **11.1 DA** p. 335; **11 CT** p. 358 #21 | |

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| **(9) Science concepts.** The student knows that the lithosphere continuously changes as a result of dynamic and complex interactions among Earth's systems. The student is expected to: | | |
| **(A)** interpret Earth surface features using a variety of methods such as satellite imagery, aerial photography, and topographic and geologic maps using appropriate technologies; | | |
| (i) interpret Earth surface features using a variety of methods | **1.2** p. 24; **1 DA** p. 28; **1.2 LA** p. 29 #4; **1 PT** p. 33; **11.2** pp. 336–337; **11.4** pp. 351–352; **12 CS** p. 366; **12 TIAT** p. 397; **13.7** pp. 434–427; **14.2 LA** p. 463 #5; **15 CS** p. 484; **16.6** p. 541; **16.6** p. 546; **17.2** pp. 553–562; **19 CS** p. 620; **20.4** p. 673; **21 CS** p. 686 | **INV** 1 |
| **(B)** investigate and model how surface water and ground water change the lithosphere through chemical and physical weathering and how they serve as valuable natural resources; | | |
| (i) investigate how surface water changes the lithosphere through chemical weathering | **12.1** p. 368; **12.2** pp. 373–376; **12.2 ML** p. 376; **12.2 LA** p. 376 #1–5 | |
| (ii) investigate how surface water changes the lithosphere through physical weathering | **12.1** pp. 367–368; **12.1 LA** p. 372 #1 | **INV** 12 |
| (iii) investigate how ground water changes the lithosphere through chemical weathering | **12.1** p. 368; **12.2** pp. 373–376; **12.2 ML** p. 376; **12.2 LA** p. 376 #1–5 | |
| (iv) investigate how ground water changes the lithosphere through physical weathering | **12 PT** p. 76 #14; **12.2** pp. 373–376; **12 CT** p. 400 #27; **15.3** p. 497; **15.3** p. 499 | **12 PTT** #14 |
| (v) model how surface water changes the lithosphere through chemical weathering | **12.1** p. 368; **12.2** pp. 373–376; **12.2 ML** p. 376; **12.2 LA** p. 376 #1–5 | |
| (vi) model how surface water changes the lithosphere through physical weathering | **12.1** pp. 367–368; **12.1 LA** p. 372 #1 | **INV** 12 |
| (vii) model how ground water changes the lithosphere through chemical weathering | **12.1** p. 368; **12.2** pp. 373–376 | |
| (viii) model how ground water changes the lithosphere through physical weathering | **15.1** p. 485; **15.3** p. 488; **15.3** pp. 495–496; **15.3 LA** p. 499 #4; **15 CT** p. 502 #26–27 | |
| (ix) investigate how surface water serves as a valuable natural resource | **15 CT** p. 502 #28; **17 CS** p. 540; **17.1** p. 551; **17.1 DA** p. 552; **17.1** pp. 553–556; **17.2 LA** p. 561 #4; **17.3 LA** p. 569 #4; **17 TIAT** p. 577 | |
| (x) investigate how groundwater serves as a valuable natural resource | **15.3 LA** p. 499 #1; **15 CT** p. 502 #31; **17 CS** p. 540; **17.1 DA** p. 552; **17.3** p. 554; **17.3** p. 565; **17 TIAT** p. 577; **17 CT** p. 579 #19 | |
| **(C)** model the processes of mass wasting, erosion, and deposition by water, wind, ice, glaciation, gravity, and volcanism in constantly reshaping Earth's surface; and | | |
| (i) model the processes of erosion by water in constantly reshaping Earth's surface | **12 CT** p. 41 #21; **12.3** pp. 380–384; **12 TIAT** p. 397; **13.7 LA** p. 433 #1, #5; **13 CT** p. 444 #30; **13 PT** p. 445; **14.3** p. 466; **14.3 ML** p. 468; **16.4** pp. 516–517 | **INV** 12 |
| (ii) model the processes of deposition by water in constantly reshaping Earth's surface | **12.3** pp. 383–384; **12.3** pp. 377–379; **12.3** p. 390; **12.3 LA** p. 390 #3, #5–6; **12 TIAT** p. 397; **12 CT** p. 399 #20–22; **13.4** pp. 412–413; **13.7 LA** p. 43, #5; **13 PT** p. 445 | **INV** 12 |
| (iii) model the processes of erosion by wind in constantly reshaping Earth's surface | **12.1** p. 369; **12.1 LA** p. 372 #4; **13.8** pp. 436–437; **13.8 ML** p. 439; **13.8 LA** p. 439 #1; **13 TIAT** p. 440; **13 CT** p. 444 #32; **13 PT** p. 445; **14.3** p. 466 | |

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| (iv) model the processes of deposition by wind in constantly reshaping Earth's surface | **13.8** pp. 437–439; **13.8 LA** p. 439 #2–3; **13 PT** p. 445 | |
| (v) model the processes of erosion by ice in constantly reshaping Earth's surface | **12.1** p. 368; **12 CT** p. 399 #29; **13.3** p. 413; **13 TIAT** p. 440; **13 PT** p. 445 | |
| (vi) model the processes of deposition by ice in constantly reshaping Earth's surface | **13.4** pp. 417–419; **13.4 LA** p. 421 #1–4; **13 CT** p. 443, #21–22; **13 PT** p. 445 | |
| (vii) model the processes of erosion by glaciation in constantly reshaping Earth's surface | **13.3** pp. 362–363; **13.3** pp. 406–408; **13.3** p. 413; **13.3 LA** p. 416 #1–3; **13 CT** p. 444 #19–22, #30, #32 | **INV** 13 |
| (viii) model the processes of deposition by glaciation in constantly reshaping Earth's surface | **13.4** pp. 412–413; **13.4** pp. 417–419; **13.4 LA** p. 421 #1–4; **13 PT** p. 445; **13 CT** p. 443 #21–22 | **INV** 13 |
| (ix) model the processes of mass wasting by gravity in constantly reshaping Earth's surface | **12.4** pp. 384–388; **12.4** p. 391; **12.4 LA** p. 396 #1–6; **12 CT** p. 400 #25, #32 | |
| (x) model the processes of erosion by volcanism in constantly reshaping Earth's surface | **9.3** p. 290; **9.3 LA** p. 295 #5; **9 CT** p. 298 #5 | **9 PTT** #13 |
| (xi) model the processes of deposition by volcanism in constantly reshaping Earth's surface | **9.2** pp. 284–285, 287–288; **9.2 LA** p. 288 #2–3; **9.3 LA** p. 295 #5 | |
| **(D)** evaluate how weather and human activity affect the location, quality, and supply of available freshwater resources. | | |
| (i) evaluate how weather affects the location of available freshwater resources | **15.1** p. 485; **15.3** pp. 486–488; **15 TIAT** p. 500 #4; **15 CT** p. 502 #15, #25; **17 CT** p. 579 #15 | |
| (ii) evaluate how weather affects the quality of available freshwater resources | **15.2 ML** p. 490 #4–5; **15 TIAT** p. 500 #4; **18.4** p. 595; **18.4** p. 604; **18 CT** p. 612 #25 | |
| (iii) evaluate how weather affects the supply of available freshwater resources | **15.1** p. 485; **15.3** pp. 486–488; **15 TIAT** p. 500 #4; **15 CT** p. 502 #15, #25 **17.3** p. 569; **17 CT** p. 579 #15 | |
| (iv) evaluate how human activity affects the location of available freshwater resources | **15.2** p. 491; **15.2** pp.493–494; **15.2 DA** p. 493; **15.2 LA** p. 494 #5; **15 CT** p. 503 #29, #31; **17.2** pp. 493–494; **17.2 LA** p. 561 #1, #5; **17 PT** p. 581; **17 CT** p. 579 #18, #25, #27 | |
| (v) evaluate how human activity affects the quality of available freshwater resources | **15.2 LA** p. 49, #5; **15.2** p. 491; **15.2 ML** p. 494; **17.2** pp. 493–494; **17.2 LA** p. 561 #2–3, #5; **17.3 LA** p. 569 #3–4; **17.4 ML** p. 573; **17.4 LA** p. 576 #1–5; **17 CT** p. 579 #17, #21–24, #28; **17 PT** p. 581 | |
| (vi) evaluate how human activity affects the supply of available freshwater resources | **15 CT** p. 503 #28, #31; **17.1 DA** p. 552; **17.2 LA** p. 556 #1–5; **17 TIAT** p. 577; **17 PT** p. 581; **17 CT** p. 579 #14, #16–17, #19 | |
| **(10) Science concepts.** The student knows how the physical and chemical properties of the ocean affect its structure and flow of energy. The student is expected to: | | |
| **(A)** describe how the composition and structure of the oceans leads to thermohaline circulation and its periodicity; | | |
| (i) describe how the composition of the oceans leads to thermohaline circulation | **16.3** p. 521; **16.3** p. 524; **16.3 ML** p. 525 #1–5; **16.3 LA** p. 526 #4; **16 CT** p. 545 #27 | |
| (ii) describe how the structure of the oceans leads to thermohaline circulation | **16.3** p. 521; **16.3** p. 524; **16.3 ML** p. 525 #1–5; **16.3 LA** p. 526 #4; **16 CT** p. 545 #27 | |

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| (iii) describe how the composition of the oceans leads to thermohaline periodicity | **16.3** p. 521; **16.3** p. 524; **16 CT** p. 545 #27 | **16 PTT** #13 |
| (iv) describe how the structure of the oceans leads to thermohaline periodicity | **16.3** p. 521; **16.3** p. 524; **16.3** p. 526; **16 CT** p. 545 #27 | **16 PTT** #13 |
| **(B)** model and explain how changes to the composition, structure, and circulation of deep oceans affect thermohaline circulation using data on energy flow, ocean basin structure, and changes in polar ice caps and glaciers; and | | |
| (i) model how changes to the composition of deep oceans affect thermohaline circulation using data on energy flow | **16.3** pp. 521–524; **16.3 ML** p. 525 #1–5; **16.3 LA** p. 526 #4; **16 CT** p. 545 #27 | **INV** 16 |
| (ii) model how changes to the composition of deep oceans affect thermohaline circulation using data on ocean basin structure | **16.3** pp. 521–524; **16.3 ML** p. 525 #1–5; **16.3 LA** p. 526 #4; **16 CT** p. 545 #27 | **INV** 16 |
| (iii) model how changes to the composition of deep oceans affect thermohaline circulation using data on changes in polar ice caps and glaciers | **16.3** pp. 521–524; **16.3 ML** pp. 525 #1–5; **16.3 LA** p. 526 #4; **16 CT** p. 545 #27 | |
| (iv) model how changes to the structure of deep oceans affect thermohaline circulation using data on energy flow | **16.3** pp. 521–524; **16.3 ML** p. 525 #1–5; **16.3 LA** p. 526 #4; **16 CT** p. 545 #27 | **INV** 16 |
| (v) model how changes to the structure of deep oceans affect thermohaline circulation using data on ocean basin structure | **16.3** pp. 521–524; **16.3 ML** p. 525 #1–5; **16.3 LA** p. 526 #4; **16 CT** p. 545 #27 | **INV** 16 |
| (vi) model how changes to the structure of deep oceans affect thermohaline circulation using data on changes in polar ice caps and glaciers | **16.3** pp. 521–524; **16.3 ML** pp. 525 #1–5; **16.3 LA** p. 526 #4; **16 CT** p. 545 #27 | |
| (vii) model how changes to the circulation of deep oceans affect thermohaline circulation using data on energy flow | **16.3** pp. 521–524; **16.3 ML** p. 525 #1–5; **16.3 LA** p. 526 #4; **16 CT** p. 545 #27 | **INV** 16 |
| (viii) model how changes to the circulation of deep oceans affect thermohaline circulation using data on ocean basin structure | **16.3** pp. 521–524; **16.3 ML** p. 525 #1–5; **16.3 LA** p. 526 #4; **16 CT** p. 545 #27 | **INV** 16 |
| (ix) model how changes to the circulation of deep oceans affect thermohaline circulation using data on changes in polar ice caps and glaciers | **16.3** pp. 521–524; **16.3 ML** pp. 525 #1–5; **16.3 LA** p. 526 #4; **16 CT** p. 545 #27 | |
| (x) explain how changes to the composition of deep oceans affect thermohaline circulation using data on energy flow | **16.3** pp. 521–524; **16.3 ML** p. 525 #1–5; **16.3 LA** p. 526 #4; **16 CT** p. 545 #27 | **INV** 16 |
| (xi) explain how changes to the composition of deep oceans affect thermohaline circulation using data on ocean basin structure | **16.3** pp. 521–524; **16.3 ML** p. 525 #1–5; **16.3 LA** p. 526 #4; **16 CT** p. 545 #27 | **INV** 16 |

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| (xii) explain how changes to the composition of deep oceans affect thermohaline circulation using data on changes in polar ice caps and glaciers | **16.3** pp. 521–524; **16.3 ML** pp. 525 #1–5; **16.3 LA** p. 526 #4; **16 CT** p. 545 #27 | |
| (xiii) explain how changes to the structure of deep oceans affect thermohaline circulation using data on energy flow | **16.3** pp. 521–524; **16.3 ML** p. 525 #1–5; **16.3 LA** p. 526 #4; **16 CT** p. 545 #27 | **INV** 16 |
| (xiv) explain how changes to the structure of deep oceans affect thermohaline circulation using data on ocean basin structure | **16.3** pp. 521–524; **16.3 ML** p. 525 #1–5; **16 CT** p. 545 #27, #29 | **INV** 16 |
| (xv) explain how changes to the structure of deep oceans affect thermohaline circulation using data on changes in polar ice caps and glaciers | **16.3** pp. 521–524; **16.3 ML** pp. 525 #1–5; **16.3 CK** p. 524; **16.3 LA** p. 526 #4; **16 CT** p. 545 #27 | |
| (xvi) explain how changes to the circulation of deep oceans affect thermohaline circulation using data on energy flow | **16.3** pp. 521–524; **16.3 ML** p. 525 #1–5; **16.3 CK** p. 524; **16.3 LA** p. 526 #4; **16 CT** p. 545 #27 | **INV** 16 |
| (xvii) explain how changes to the circulation of deep oceans affect thermohaline circulation using data on ocean basin structure | **16.3** pp. 521–524; **16.3 ML** p. 525 #1–5; **16 CT** p. 545 #27, #29 | **INV** 16 |
| (xviii) explain how changes to the circulation of deep oceans affect thermohaline circulation using data on changes in polar ice caps and glaciers | **16.3** pp. 521–524; **16.3 ML** p. 525 #1–5; **16.3 CK** p. 524; **16.3 LA** p. 526 #4; **16 CT** p. 545 #27 | |
| **(C)** analyze how global surface ocean circulation is the result of wind, tides, the Coriolis effect, water density differences, and the shape of the ocean basins. | | |
| (i) analyze how global surface ocean circulation is the result of wind | **16.3** pp. 518–520; **16.3** p. 524; **16.3** p. 526; **16.3 LA** p. 526 #1; **16 CT** p. 544 #21 | |
| (ii) analyze how global surface ocean circulation is the result of tides | **16.2** pp. 513–515; **16.3** p. 518; **16.2 LA** p. 516 #1–4; **16 CT** p. 544 #18 | |
| (iii) analyze how global surface ocean circulation is the result of the Coriolis effect | **16.3** pp. 519–520; **16.3 CK** p. 520; **16.3** p. 524; **20.3 ML** p. 664 #3, #5 | |
| (iv) analyze how global surface ocean circulation is the result of water density differences | **16.3** pp. 520–521; **16.3** p. 524; **16 CT** p. 545 #38 | **16 PTT** #14 |
| (v) analyze how global surface ocean circulation is the result of the shape of ocean basins | **16.3** pp. 518–519; **16.3** p. 524; **16.3** p. 526; **16.3 LA** p. 526 #2–3; **16 CT** p. 544 #21 | |
| **(11) Science concepts.** The student knows that dynamic and complex interactions among Earth's systems produce climate and weather. The student is expected to: | | |
| **(A)** analyze how energy transfer through Milankovitch cycles, albedo, and differences in atmospheric and surface absorption are mechanisms of climate; | | |
| (i) analyze how energy transfer through Milankovitch cycles is a mechanism of climate | **21.3** p. 701; **21 CT** p. 715 #27 | |

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| (ii) analyze how albedo is a mechanism of climate | **19.1** pp. 625–626; **19.1 LA** p. 626 #5; **19.4** p. 640; **19 CT** p. 643 #17; **21.3** p. 699; **21.5** p. 699; **21 PT** pp. 716–717 | |
| (iii) analyze how differences in atmospheric absorption is a mechanism of climate | **19.3** p. 630; **19.3 LA** p. 633 #2–3; **19.4** p. 634; **19.4 LA** p. 640 #1; **19 CT** p. 643 #21–22; **21.1** pp. 687–689; **21.1 LA** p. 689 #1–4; **21 PT** pp. 716–717; **21 CT** p. 715 #17 | **INV** 19 |
| (iv) analyze how differences in surface absorption is a mechanism of climate | **19.3** p. 630; **19.3 LA** p. 633 #2–3; **19.4** p. 634; **19.4 LA** p. 640 #1; **19 CT** p. 643 #21–22; **21.1** pp. 687–689; **21.1 LA** p. 689 #1–4; **21 PT** p. 716; **21 PT** p. 717; **21 CT** p. 715 #17 | **INV** 19 |
| **(B)** describe how Earth's atmosphere is chemically and thermally stratified and how solar radiation interacts with the layers to cause the ozone layer, the jet stream, Hadley and Ferrel cells, and other atmospheric phenomena; | | |
| (i) describe how Earth's atmosphere is chemically stratified | **18.2** p. 594; **18.3 LA** p. 595 #4–5; **18.2 ML** p. 595 #4; **18.3** pp. 600–601; **18 CT** p. 612 #21 | |
| (ii) describe how Earth's atmosphere is thermally stratified | **18.3** pp. 600–601; **18.3 LA** p. 601 #4; **18 CT** p. 612 #23 | |
| (iii) describe how solar radiation interacts with the layers to cause the ozone layer | **18.3** p. 593; **18.3** p. 600; **18.3 LA** p. 601 #5; **18.4** p. 608; **18.4 LA** p. 609 #4; **18 CT** p. 612 #27 | |
| (iv) describe how solar radiation interacts with the layers to cause the jet stream | **20.3** p. 660; **21.1** p. 689; **21.1 LA** p. 689 #3 | |
| (v) describe how solar radiation interacts with the layers to cause Hadley and Ferrel cells | **21.1** pp. 687–689; **21.1 LA** p. 689 #4 | |
| (vi) describe how solar radiation interacts with the layers to cause other atmospheric phenomena | **19.1** pp. 614–615; **19.1** p. 626; **19.1 LA** p. 626 #3–4; **19 CT** p. 643 #20 | |
| **(C)** model how greenhouse gases trap thermal energy near Earth's surface; | | |
| (i) model how greenhouse gases trap thermal energy near Earth's surface | **19.2** pp. 627–629; **19.2 ML** p. 628; **19.2 LA** p. 629 #3–5; **19 PT** pp. 634–635; **19 CT** p. 643 #19–20, #28; **21 PT** pp. 704–705; **21 CT** p. 715 #24 | |
| **(D)** evaluate how the combination of multiple feedback loops alter global climate; | | |
| (i) evaluate how the combination of multiple feedback loops alter global climate | **19 PT** pp. 634–635; **19 CT** p. 645 #29; **20.3 LA** p. 668 #4; **21.5** p. 711; **21.5** p. 712; **21.5 LA** p. 712 #4; **21 CT** p. 715 #20 | |
| **(E)** investigate and analyze evidence for climate changes over Earth's history using paleoclimate data, historical records, and measured greenhouse gas levels; | | |
| (i) investigate climate changes over Earth's history using paleoclimate data | **21.3** pp. 696–697; **21.3** pp. 688–689; **21.3 LA** p. 702 #1–2, #4; **21 CT** p. 715 #17, #23, #27 | **INV** 2 |
| (ii) investigate climate changes over Earth's history using historical records | **21.3** p. 697; **21.3 LA** p. 702 #1–2; **21 CT** p. 715 #17, #27 | |
| (iii) investigate climate changes over Earth's history using measured greenhouse gas levels | **21.4** pp. 702–703; **21.4 LA** p. 704 #3; **21 PT** pp. 704–705 | |
| (iv) analyze evidence for climate changes over Earth's history using paleoclimate data | **21.3** pp. 688–689; **21.3** pp. 696–697; **21.3 LA** p. 702 #1–2, #4; **21 CT** p. 715 #17, #23, #27 | **INV** 2 |
| (v) analyze evidence for climate changes over Earth's history using historical records | **21.3** p. 697; **21.3 LA** p. 702 #1–2; **21 CT** p. 715 #17, #27 | |

| STANDARD | STUDENT/TEACHER EDITION | ONLINE RESOURCES |
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| (vi) analyze evidence for climate changes over Earth's history using measured greenhouse gas levels | **21.4** pp. 702–703; **21.4 LA** p. 704 #3; **21 PT** pp. 704–705 | |
| **(F)** explain how the transfer of thermal energy among the hydrosphere, lithosphere, and atmosphere influences weather; and | | |
| (i) explain how the transfer of thermal energy among the hydrosphere, lithosphere, and atmosphere influences weather | **9.3** pp. 622–623; **19.3 LA** p. 633 #3–4; **19 PT** pp. 634–635; **19.4** p. 638; **19.4 LA** p. 640 #4; **20.1** pp. 641–642; **20.1** pp. 642–643; **20.1** pp. 643–644; **20.1 LA** p. 654 #2–4, #6; **20 TIAT** p. 677; **20 CT** p. 679 #14, #22–23, #26, #30 | **INV** 20 |
| **(G)** describe how changing surface-ocean conditions, including El Niño-Southern Oscillation, affect global weather and climate patterns. | | |
| (i) describe how changing surface-ocean conditions, including El Niño-Southern Oscillation, affect global weather patterns | **20.4** pp. 674–676; **20 CT** p. 680 #30 | **20 PTT** #10 |
| (ii) describe how changing surface-ocean conditions, including El Niño-Southern Oscillation, affect global climate patterns | **20.4** pp. 674–676; **20 CT** p. 680 #30 | **20 PTT** #12 |
| **(12) Science concepts.** The student understands how Earth's systems affect and are affected by human activities, including resource use and management. The student is expected to: | | |
| **(A)** evaluate the impact on humans of natural changes in Earth's systems such as earthquakes, tsunamis, and volcanic eruptions; | | |
| (i) evaluate the impact on humans of natural changes in Earth's systems | **8.1 LA** p. 248 #6; **8.3** p. 247; **8.3** pp. 254–257; **8.3 LA** p. 261 #1–5; **8 TIAT** p. 266; **8 PT** p. 269; **8 CT** p. 269 #19, #28, #30; **9.3** p. 291; **9.3** p. 293; **9.3 DA** p. 294 #1–5; **9.3** p. 295; **9 TIAT** p. 296 #5–6; **11 CS** p. 332 | |
| **(B)** analyze the impact on humans of naturally occurring extreme weather events such as flooding, hurricanes, tornadoes, and thunderstorms; | | |
| (i) analyze the impact on humans of naturally occurring extreme weather events | **12 CS** p. 366; **12.3** pp. 387–390; **LA 12.3** p. 390 #4, #7; **12 TIAT** p. 397; **12 CT** p. 399 #23, #30–31; **20 CS** p. 650; **20.4** p. 654; **20.4** p. 670; **20.4** pp. 672–673; **20.4 DA** p. 676; **20 CT** p. 680 #29; **20 PT** p. 681 | **20 PTT** #10 |
| **(C)** analyze the natural and anthropogenic factors that affect the severity and frequency of extreme weather events and the hazards associated with these events; | | |
| (i) analyze the natural factors that affect the severity of extreme weather events | **20.4** p. 670; **20.4** pp. 672–673; **20.4** p. 654; **20.4** pp. 675–676; **20 TIAT** p. 677; **20 PT** p. 681 | |
| (ii) analyze the natural factors that affect the frequency of extreme weather events | **20.4** p. 670; **20.4** pp. 672–673; **20.4** p. 654; **20.4** pp. 675–676; **20.4 LA** p. 676 #1; **20 TIAT** p. 677; **20 PT** p. 681 | |
| (iii) analyze the anthropogenic factors that affect the severity of extreme weather events | **21.5** p. 705 para 3; **21.5** p. 706 para 4; **21 CT** p. 716 #29 | **21 PTT** #13 |
| (iv) analyze the anthropogenic factors that affect the frequency of extreme weather events | **21.5** pp. 705–706; **21 CT** p. 716 #29 | **21 PTT** #13 |
| (v) analyze the hazards associated with extreme weather events | **20.4** p. 670; **20.4** pp. 673–674; **20.4 DA** p. 676 #4–5; **20.4 LA** 676 #3–4; **20 TIAT** p. 677; **20 PT** p. 681 | |

| STANDARD | STUDENT/TEACHER EDITION | ONLINE RESOURCES |
|---|---|---|
| **(D)** analyze recent global ocean temperature data to predict the consequences of changing ocean temperature on evaporation, sea level, algal growth, coral bleaching, and biodiversity; | | |
| (i) analyze recent global ocean temperature data to predict the consequences of changing ocean temperature on evaporation | **21.5** p. 705; **21.5 LA** p. 712 #3; **21 CT** p. 716 #30 | |
| (ii) analyze recent global ocean temperature data to predict the consequences of changing ocean temperature on sea level | **INV** 2 pp. 84–85; **16 CT** p. 544 #23, #26; **21.5** p. 707; **21.5** p. 708; **21 TIAT** p. 713 | |
| (iii) analyze recent global ocean temperature data to predict the consequences of changing ocean temperature on algal growth | **16.1** pp. 510–511; **16 TIAT** p. 542 | |
| (iv) analyze recent global ocean temperature data to predict the consequences of changing ocean temperature on coral bleaching | **16.1** pp. 510–512; **16.6** p. 540; **16 TIAT** p. 542; **21.5** p. 708 | |
| (v) analyze recent global ocean temperature data to predict the consequences of changing ocean temperature on biodiversity | **16 TIAT** p. 542; **21.5** p. 708; **21 TIAT** p. 713 | |
| **(E)** predict how human use of Texas's naturally occurring resources such as fossil fuels, minerals, soil, solar energy, and wind energy directly and indirectly changes the cycling of matter and energy through Earth's systems; and | | |
| (i) predict how human use of Texas's naturally occurring resources directly changes the cycling of matter through Earth's systems | **6 CS** p. 166; **6.1** pp. 167–168; **6.1** p. 173; **6.1 LA** p. 173 #2–3, #5; **6 TIAT** p. 194; **CS** p. 450; **14.1 DA** p. 456; **14.3** pp. 459–464; **14.3 ML** p. 468; **14.3 LA** p. 472 #1–5; **14 TIAT** p. 474; **14 CT** p. 476 #22–25, #29, #31 | **6 PTT** #8 |
| (ii) predict how human use of Texas's naturally occurring resources indirectly changes the cycling of matter through Earth's systems | **6 CS** p. 166; **6.1** pp. 167–168; **6.1** p. 173; **6.1 LA** p. 173 #2–3, #5; **6 TIAT** p. 194; **CS** p. 450; **14.1 DA** p. 456; **14.3** pp. 459–464; **14.3 ML** p. 468; **14.3 LA** p. 472 #1–5; **14 TIAT** p. 474; **14 CT** p. 476 #22–25, #29, #31 | **6 PTT** #8 |
| (iii) predict how human use of Texas's naturally occurring resources directly changes the cycling of energy through Earth's systems | **6 CT** p. 196 #22; **6.2** pp. 176–177; **6.2** p. 179; **6.3** p. 183; **6.3** p. 187; **6.4 DA** p. 192; **14.1 CS** p. 450; **14.1 DA** p. 456 #1; **14.3 ML** p. 468 | **6 PTT** #8 |
| (iv) predict how human use of Texas's naturally occurring resources indirectly changes the cycling of energy through Earth's systems | **6 CT** p. 196 #22; **6.2** pp. 176–177; **6.2** p. 179; **6.3** p. 183; **6.3** p. 187; **6.4 DA** p. 192; **14.1 CS** p. 450; **14.1 DA** p. 456 #1; **14.3 ML** p. 468 | **6 PTT** #8 |
| **(F)** explain the cycling of carbon through different forms among Earth's systems and how biological processes have caused major changes to the carbon cycle in those systems over Earth's history. | | |
| (i) explain the cycling of carbon through different forms among Earth's systems | **2.3** p. 58; **2.3** p. 60; **2.3 LA** p. 61 #2; **2 PT** p. 65 | |
| (ii) explain how biological processes have caused major changes to the carbon cycle in those systems over Earth's history | **2.3** p. 58; **2.3** p. 60; **2.3 LA** p. 61 #2; **2 PT** p. 65 | |

| STANDARD | STUDENT/TEACHER EDITION | ONLINE RESOURCES |
|---|---|---|
| **(13) Science concepts.** The student explores global policies and careers related to the life cycles of Earth's resources. The student is expected to: | | |
| **(A)** analyze the policies related to resources from discovery to disposal, including economics, health, technological advances, resource type, concentration and location, waste disposal and recycling, mitigation efforts, and environmental impacts; and | | |
| (i) analyze the policies related to resources from discovery to disposal, including economics | **3.4** pp. 84–85; **6 CS** p.166; **6.1** p. 168; **6.1 LA** p. 173 #5; **6.4**, p.193 | |
| (ii) analyze the policies related to resources from discovery to disposal, including health | **3.5** pp. 86–87; **3 CT** p. 94 #32; **6 TIAT** p. 90 | |
| (iii) analyze the policies related to resources from discovery to disposal, including technological advances | **3 CT** p. 94 #32; **6.1** p. 167; **6.2** p. 178; **6.4** p. 183; **6.4** p. 186 | **6 PTT** #8 |
| (iv) analyze the policies related to resources from discovery to disposal, including resource type | **6.1** pp. 167–168; **6.1 LA** p. 173 #1; **6.2 LA** p. 177 #1; **6.4** pp. 183–184; **6.4 LA** p. 193 #3–4 | |
| (v) analyze the policies related to resources from discovery to disposal, including concentration and location | **1 TIAT** pp. 27–28; **6.4** p. 190; **6.4 LA** p. 193 #2; **6 CT** p. 196 #25, #27 | |
| (vi) analyze the policies related to resources from discovery to disposal, including waste disposal and recycling | **6.4** p. 190; **6.4 LA** p. 193 #4; **6 CT** p. 196 #26 | |
| (vii) analyze the policies related to resources from discovery to disposal, including mitigation efforts | **6.4** p. 185; **6.4** p. 187; **6.4 DA** p. 187; **6.4** pp. 192–193; **6.4 LA** p. 193 #1, #2, #4; **6 CT** p. 196 #25 | |
| (viii) analyze the policies related to resources from discovery to disposal, including environmental impacts | **3.5** pp. 88–90; **3.5 LA** p. 91 #3; **3 CT** p. 93 #25–26, #32; **6.1** p. 173; **6.2** p. 176; **6.2** p. 179; **6.3** p.184; **6.3 ML** p. 184 #5 | |
| **(B)** explore global and Texas-based careers that involve the exploration, extraction, production, use, disposal, regulation, and protection of Earth's resources. | | |
| (i) explore global and Texas-based careers that involve the exploration of Earth's resources | **1 CS** p. 8; **6.4** pp. 189–190 | |
| (ii) explore global and Texas-based careers that involve the extraction of Earth's resources | **6 CS** p. 200; **6.4** pp. 189–190 | **6 PTT** #8 |
| (iii) explore global and Texas-based careers that involve the production of Earth's resources | **6 CS** p. 200; **6.4** pp. 189–190 | **6 PTT** #8 |
| (iv) explore global and Texas-based careers that involve the use of Earth's resources | **6.4** pp. 189–190 | |
| (v) explore global and Texas-based careers that involve the disposal of Earth's resources | **1 CS** p. 8; **6.4** pp. 189–190; **6 CS** p. 200; **14 TIAT** p. 474 | |
| (vi) explore global and Texas-based careers that involve the regulation of Earth's resources | **3 EAW**; **6 EAW**; **6.4** pp. 189–190; **17 CT** p. 580 #23 | |
| (vii) explore global and Texas-based careers that involve the protection of Earth's resources | **16 EAW**; **17 EAW**; **6.4** pp. 189–190; **14 TIAT** p. 474; **17 CT** p. 580 #23 | |

# English Language Proficiency Standards

The **English Language Proficiency Standards for Science** offer support for second-language acquisition throughout the text using a variety of approaches for reading, writing, speaking, and listening. All Roman numeral breakouts listed in this table are required for Science courses 6–12. Breakouts for student-facing ELPS have supporting **Acquire English Worksheets** available digitally that offer opportunities for students to work individually or in small groups. Breakouts that are teacher-facing only are indicated with an asterisk.

| SCIENCE | |
|---|---|
| **STANDARD** | **STUDENT/TEACHER EDITION** |
| **(c) Cross-curricular second language acquisition essential knowledge and skills** | |
| **(1) Cross-curricular second language acquisition/learning strategies.** The ELL uses language learning strategies to develop an awareness of his or her own learning processes in all content areas. In order for the ELL to meet grade-level learning expectations across the foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. The student is expected to: | |
| **(A)** use prior knowledge and experiences to understand meanings in English; | |
| (i) use prior knowledge to understand meanings in English | **20.4** p.674; **18.2** p. 593 |
| (ii) use prior experiences to understand meanings in English | **20.1** p. 651 |
| **(B)** monitor oral and written language production and employ self-corrective techniques or other resources; | **9.2** p. 288; **13.7** p. 433 |
| (i) monitor oral language production and employ self-corrective techniques or other resources* | **7.3** p. 219 |
| **(C)** use strategic learning techniques such as concept mapping, drawing, memorizing, comparing, contrasting, and reviewing to acquire basic and grade-level vocabulary; | **3.1** p. 73; **11.3** p. 345; **15.1** p. 485; **18.2** p. 593; **25.1** p. 811 |
| **(D)** speak using learning strategies such as requesting assistance, employing non-verbal cues, and using synonyms and circumlocution (conveying ideas by defining or describing when exact English words are not known); | |
| (i) speak using learning strategies | **6.4** p. 187; **7.2** p. 215; **25.3** p. 822 |
| **(E)** internalize new basic and academic language by using and reusing it in meaningful ways in speaking and writing activities that build concept and language attainment; | |
| (i) internalize new basic language by using and reusing it in meaningful ways in speaking activities that build concept and language attainment | **4.3** p. 113 |
| (ii) internalize new basic language by using and reusing it in meaningful ways in writing activities that build concept and language attainment | **19 CT** p. 643 |
| (iii) internalize new academic language by using and reusing it in meaningful ways in speaking activities that build concept and language attainment | **11.4** p. 369; **19.3** p. 630; **22.4** p. 741; **25.2** p. 819 |
| (iv) internalize new academic language by using and reusing it in meaningful ways in writing activities that build concept and language attainment | **17 CT** p. 579 |
| **(F)** use accessible language and learn new and essential language in the process; | **22.3** p. 731 |
| (i) use accessible language and learn new and essential language in the process* | |
| **(G)** demonstrate an increasing ability to distinguish between formal and informal English and an increasing knowledge of when to use each one commensurate with grade-level learning expectations. | **8.2** p. 251; **11.3** p. 331 |
| **(H)** develop and expand repertoire of learning strategies such as reasoning inductively or deductively, looking for patterns in language, and analyzing sayings and expressions commensurate with grade-level learning expectations. | **2.2** p. 50; **10.1** p. 305; **13 EAW** p. 405; **19.1** p. 622; **20.1** p. 651; **23.5** p. 773 |

| STANDARD | STUDENT/TEACHER EDITION |
| --- | --- |
| **(2) Cross-curricular second language acquisition/listening.** The ELL listens to a variety of speakers including teachers, peers, and electronic media to gain an increasing level of comprehension of newly acquired language in all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in listening. In order for the ELL to meet grade-level learning expectations across the foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. The student is expected to: | |
| **(A)** distinguish sounds and intonation patterns of English with increasing ease; | **2 EAW** p. 37; **3.2** p. 75; **18.3** p. 598 |
| **(B)** recognize elements of the English sound system in newly acquired vocabulary such as long and short vowels, silent letters, and consonant clusters; | **3.3** p. 77; **4.1** p. 101; **11.3** p. 345; **17.3** p. 568; **24.1** p. 785 |
| **(C)** learn new language structures, expressions, and basic and academic vocabulary heard during classroom instruction and interactions; | **4.1** p. 101 |
| (i) learn new language structures heard during classroom instruction and interactions* | **10 EAW** p. 303; **19.4** p. 634 |
| (ii) learn new expressions heard during classroom instruction and interactions* | **16.5** p. 537; **20.1** p. 651 |
| (iii) learn basic vocabulary heard during classroom instruction and interactions | **15.1** p. 485 |
| (iv) learn academic vocabulary heard during classroom instruction and interactions | **17 CT** p. 589 |
| **(D)** monitor understanding of spoken language during classroom instruction and interactions and seek clarification as needed; | |
| (i) monitor understanding of spoken language during classroom instruction and interactions* | **7.2** p. 214 |
| (ii) seek clarification [of spoken language] as needed | **7.2** p. 214 |
| **(E)** use visual, contextual, and linguistic support to enhance and confirm understanding of increasingly complex and elaborated spoken language; | **8 EAW** p. 236; **15 EAW** p. 483 |
| (iii) use linguistic support to enhance and confirm understanding of increasingly complex and elaborated spoken language | **5 EAW** p. 129 |
| **(F)** listen to and derive meaning from a variety of media such as audio tape, video, DVD, and CD ROM to build and reinforce concept and language attainment; | **1 EAW** p. 7; **2 EAW** p. 37; **9.1** p. 277; **10 EAW** p. 303; **14 EAW** p. 449 |
| **(G)** understand the general meaning, main points, and important details of spoken language ranging from situations in which topics, language, and contexts are familiar to unfamiliar; | **1 EAW** p. 7; **4 EAW** p. 99; **6 EAW** p. 165; **9 EAW** p. 273; **15 EAW** 483; **11.3** p. 649; **22 CS** p. 724; **25 CS** p. 810 |
| **(H)** understand implicit ideas and information in increasingly complex spoken language commensurate with grade-level learning expectations; and | **10 EAW** p. 303; **19.1** p. 622 |
| **(I)** demonstrate listening comprehension of increasingly complex spoken English by following directions, retelling or summarizing spoken messages, responding to questions and requests, collaborating with peers, and taking notes commensurate with content and grade-level needs. | **9 EAW** p. 273 |
| (i) demonstrate listening comprehension of increasingly complex spoken English by following directions commensurate with content and grade-level needs | **10.1** p. 306 |
| (iii) demonstrate listening comprehension of increasingly complex spoken English by responding to questions and requests commensurate with content and grade-level needs | **25 CS** p. 810 |
| (iv) demonstrate listening comprehension of increasingly complex spoken English by collaborating with peers commensurate with content and grade-level needs* | **14 EAW** p. 449 |
| (v) demonstrate listening comprehension of increasingly complex spoken English by taking notes commensurate with content and grade-level needs | **1 EAW** p. 7 |

| STANDARD | STUDENT/TEACHER EDITION |
|---|---|
| **(3) Cross-curricular second language acquisition/speaking.** The ELL speaks in a variety of modes for a variety of purposes with an awareness of different language registers (formal/informal) using vocabulary with increasing fluency and accuracy in language arts and all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in speaking. In order for the ELL to meet grade-level learning expectations across the foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. The student is expected to: | |
| **(A)** practice producing sounds of newly acquired vocabulary such as long and short vowels, silent letters, and consonant clusters to pronounce English words in a manner that is increasingly comprehensible; | **3.3** p. 77; **4.1** p. 101; **11.3** p. 345; **18.3** p. 598; **24.1** p. 785 |
| **(B)** expand and internalize initial English vocabulary by learning and using high-frequency English words necessary for identifying and describing people, places, and objects, by retelling simple stories and basic information represented or supported by pictures, and by learning and using routine language needed for classroom communication; | **4.3** p. 113 |
| (ii) expand and internalize initial English vocabulary by retelling simple stories and basic information represented or supported by pictures | **21.4** p. 704 |
| (iii) expand and internalize initial English vocabulary by learning and using routine language needed for classroom communication | **5.5** p. 155; **25.3** p. 822 |
| **(C)** speak using a variety of grammatical structures, sentence lengths, sentence types, and connecting words with increasing accuracy and ease as more English is acquired; | **9.2** p. 287; **15.2** p.489; **16.6** p. 540; **19.1** p. 622 |
| **(D)** speak using grade-level content area vocabulary in context to internalize new English words and build academic language proficiency; | |
| (i) speak using grade-level content area vocabulary in context to internalize new English words | **12.1** p. 369 |
| (ii) speak using grade-level content area vocabulary in context to build academic language proficiency | **25.2** p. 819 |
| **(E)** share information in cooperative learning interactions; | **1.2** p. 25 |
| (i) share information in cooperative learning interactions | |
| **(F)** ask and give information ranging from using a very limited bank of high-frequency, high-need, concrete vocabulary, including key words and expressions needed for basic communication in academic and social contexts, to using abstract and content-based vocabulary during extended speaking assignments; | |
| (i) ask [for] information ranging from using a very limited bank of high-frequency, high-need, concrete vocabulary, including key words and expressions needed for basic communication in academic and social contexts, to using abstract and content-based vocabulary during extended speaking assignments | **13.1** p. 408 |
| (ii) give information ranging from using a very limited bank of high-frequency, high-need, concrete vocabulary, including key words and expressions needed for basic communication in academic and social contexts, to using abstract and content-based vocabulary during extended speaking assignments | **13.1** p. 408 |
| **(G)** express opinions, ideas, and feelings ranging from communicating single words and short phrases to participating in extended discussions on a variety of social and grade-appropriate academic topics; | **21 EAW** p. 685 |
| (i) express opinions ranging from communicating single words and short phrases to participating in extended discussions on a variety of social and grade-appropriate academic topics* | **17.4** p. 574 |
| (ii) express ideas ranging from communicating single words and short phrases to participating in extended discussions on a variety of social and grade-appropriate academic topics | **17.4** p. 574 |

| STANDARD | STUDENT/TEACHER EDITION |
|---|---|
| **(H)** narrate, describe, and explain with increasing specificity and detail as more English is acquired; | **9.2** p. 286 |
| (ii) describe with increasing specificity and detail as more English is acquired | **11.3** p. 341 |
| (iii) explain with increasing specificity and detail as more English is acquired | **22.4** p. 741 |
| **(I)** adapt spoken language appropriately for formal and informal purposes; and | **8.2** p. 251; **11 EAW** p. 331 |
| **(J)** respond orally to information presented in a wide variety of print, electronic, audio, and visual media to build and reinforce concept and language attainment. | **7.2** p. 214; **9.2** p. 286; **11.3** p. 341; **21 EAW** p. 685 |
| **(4) Cross-curricular second language acquisition/reading.** The ELL reads a variety of texts for a variety of purposes with an increasing level of comprehension in all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in reading. In order for the ELL to meet grade-level learning expectations across the foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. For Kindergarten and Grade 1, certain of these student expectations apply to text read aloud for students not yet at the stage of decoding written text. The student is expected to: | |
| **(A)** learn relationships between sounds and letters of the English language and decode (sound out) words using a combination of skills such as recognizing sound-letter relationships and identifying cognates, affixes, roots, and base words; | **2.1** p. 39; **3.3** p. 77; **4.1** p. 101; **5.3** p. 143; **17.1** p. 553; **23.5** p. 773; **24.1** p. 785 |
| **(B)** recognize directionality of English reading such as left to right and top to bottom; | **3.4** p. 83 |
| **(C)** develop basic sight vocabulary, derive meaning of environmental print, and comprehend English vocabulary and language structures used routinely in written classroom materials; | |
| (i) develop basic sight vocabulary used routinely in written classroom materials | **3.5** p. 89 |
| (ii) derive meaning of environmental print | **9.1** p. 277 |
| (iii) comprehend English vocabulary used routinely in written classroom materials | **9.4** p. 634; **22.2** p. 729 |
| (iv) comprehend English language structures used routinely in written classroom materials | **17 EAW** p. 549; **22.2** p. 729 |
| **(D)** use prereading supports such as graphic organizers, illustrations, and pretaught topic-related vocabulary and other prereading activities to enhance comprehension of written text; | |
| (i) use prereading supports to enhance comprehension of written text | **1.1** p. 9; **5 EAW** p. 129; **16.2** p. 513 |
| **(E)** read linguistically accommodated content area material with a decreasing need for linguistic accommodations as more English is learned; | **18.4** p. 607; **21.3** p. 698 |
| (i) read linguistically accommodated content area material with a decreasing need for linguistic accommodations as more English is learned* | |
| **(F)** use visual and contextual support and support from peers and teachers to read grade-appropriate content area text, enhance and confirm understanding, and develop vocabulary, grasp of language structures, and background knowledge needed to comprehend increasingly challenging language; | **10.3** p. 320 |
| (i) use visual and contextual support to read grade-appropriate content area text | **19.3** p. 630; **20.3** p. 660 |
| (ii) use visual and contextual support to enhance and confirm understanding | **3.4** p. 83; **18.4** p. 604 |
| (iii) use visual and contextual support to develop vocabulary needed to comprehend increasingly challenging language | **2.1** p. 39; **20.3** p. 660 |
| (v) use visual and contextual support to develop background knowledge needed to comprehend increasingly challenging language | **13.6** p. 428 |

| STANDARD | STUDENT/TEACHER EDITION |
|---|---|
| (vi) use support from peers and teachers to read grade-appropriate content area text | **18.4** p. 607; **21.3** p. 698; **24.4** p. 799 |
| (vii) use support from peers and teachers to enhance and confirm understanding | **1.2** p. 25 |
| (viii) use support from peers and teachers to develop vocabulary needed to comprehend increasingly challenging language | **5.3** p. 143; p. **17.1**; p. 553 |
| (ix) use support from peers and teachers to develop grasp of language structures needed to comprehend increasingly challenging language | **10.1** p. 305; **18.4** p. 607 |
| (x) use support from peers and teachers to develop background knowledge needed to comprehend increasingly challenging language | **16 CS** p. 508 |
| **(G)** demonstrate comprehension of increasingly complex English by participating in shared reading, retelling or summarizing material, responding to questions, and taking notes commensurate with content area and grade level needs; | **24.4** p. 799 |
| (ii) demonstrate comprehension of increasingly complex English by retelling or summarizing material commensurate with content area and grade level needs | **5.1** p. 131 |
| (iii) demonstrate comprehension of increasingly complex English by responding to questions commensurate with content area and grade level needs | **23.2** p. 761 |
| (iv) demonstrate comprehension of increasingly complex English by taking notes commensurate with content area and grade level needs | **21.2** p. 691 |
| **(H)** read silently with increasing ease and comprehension for longer periods; | **17.2** p. 558 |
| **(I)** demonstrate English comprehension and expand reading skills by employing basic reading skills such as demonstrating understanding of supporting ideas and details in text and graphic sources, summarizing text, and distinguishing main ideas from details commensurate with content area needs; | **8.1** p. 239; **10.3** p. 320; **13.2** p. 411; **18.4** p. 604; **23.1** p. 753, **23.2** p. 761 |
| **(J)** demonstrate English comprehension and expand reading skills by employing inferential skills such as predicting, making connections between ideas, drawing inferences and conclusions from text and graphic sources, and finding supporting text evidence commensurate with content area needs; and | **6.2** p. 177; **13 EAW** p. 405; **13.2** p. 411; **13.6** p. 428; **14.3** p. 470; **16.2** p. 513; **16.5** p. 537; **17.4** p. 574; **20.4** p. 674; **21.4** p. 704 |
| **(K)** demonstrate English comprehension and expand reading skills by employing analytical skills such as evaluating written information and performing critical analyses commensurate with content area and grade-level needs. | **16.5** p. 537; **21.1** p. 687 |
| **(5) Cross-curricular second language acquisition/writing.** The ELL writes in a variety of forms with increasing accuracy to effectively address a specific purpose and audience in all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in writing. In order for the ELL to meet grade-level learning expectations across foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. For Kindergarten and Grade 1, certain of these student expectations do not apply until the student has reached the stage of generating original written text using a standard writing system. The student is expected to: | |
| **(A)** learn relationships between sounds and letters of the English language to represent sounds when writing in English; | **16.4** p. 531; **18.3** p. 598 |
| **(B)** write using newly acquired basic vocabulary and content-based grade-level vocabulary; | |
| (i) write using newly acquired basic vocabulary | **19 CT** p. 643 |
| (ii) write using content-based grade-level vocabulary | **14.2** p. 463; **17 CT** p. 579 |
| **(C)** spell familiar English words with increasing accuracy, and employ English spelling patterns and rules with increasing accuracy as more English is acquired; | **11.3** p. 345; **14.2** p. 463; **16.4** p. 531; **18.3** p. 598 |

| STANDARD | STUDENT/TEACHER EDITION |
|---|---|
| **(D)** edit writing for standard grammar and usage, including subject-verb agreement, pronoun agreement, and appropriate verb tenses commensurate with grade-level expectations as more English is acquired; | **7.2** p. 217; **9.2** p. 288; **13.7** p. 433 |
| **(E)** employ increasingly complex grammatical structures in content area writing commensurate with grade level expectations such as (i) using correct verbs, tenses, and pronouns/antecedents; (ii) using possessive case (apostrophe -s) correctly; and, (iii) using negatives and contractions correctly; | **7.2** p. 217; **11 EAW** p. 331; **11.4** p. 355; **12 CT** p. 399; **13.7** p. 433; **17 EAW** p. 549; **20 CT** p. 679 |
| **(F)** write using a variety of grade-appropriate sentence lengths, patterns, and connecting words to combine phrases, clauses, and sentences in increasingly accurate ways as more English is acquired; and | **4.3** p. 116; **6.3** p. 181; **12.4** p. 390 |
| **(G)** narrate, describe, and explain with increasing specificity and detail to fulfill content area writing needs as more English is acquired. | **5 CS** p. 130; **12.4** p. 391; **12.4** p. 394 |