LAB-AIDS Correlations for
Ohio Learning Standards
Physical Geology

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This document is intended to show how our curriculum products align with the *Ohio Learning Standards for Physical Geology*[1].

ABOUT OUR PROGRAMS

LAB-AIDS Core Science Programs are developed to support current knowledge on the teaching and learning of science. All materials support an inquiry-driven pedagogy, with support for literacy skill development and with assessment programs that clearly show what students know and are able to do from using the programs. All programs have extensive support for technology in the school science classrooms, and feature comprehensive teacher support. For more information please visit www.lab-aids.com/edc.

ABOUT *EDC EARTH SCIENCE*

EDC Earth Science is a full year, activity-driven high school earth science course developed by the Education Development Center (EDC), with support from the National Science Foundation, and is fully aligned to the *Next Generation Science Framework (*NRC, 2010). *EDC Earth Science* is designed around the belief that students are capable of rigorous and in-depth explorations in science when given adequate support, structure, and motivation for learning.

EDC Earth Science features the following design components:

- In-depth treatment of content based on recommendations in national standards and representative state frameworks
- Developmentally appropriate lessons featuring Earth Science concepts that build on previous learning and prepare students for more advanced courses
- Using historical, newsworthy, and fictionalized stories to draw students into the earth science content, to motivate them to acquire the knowledge for solving problems, and to serve as a framework around which students build conceptual understanding
- Differentiated instructional strategies and activities that help students construct meaning from their experiences and that serve as bridges between concrete and abstract thinking
- Support for developing literacy skills and the use of formative assessment techniques
- Each chapter of EDC: Earth Science is a cluster of activities that addresses a specific set of concepts and skills. The amount of class time for each chapter will vary. A chapter may range from one to four weeks of classroom sessions. Not shown here are two project-oriented shorter chapters that open and close the course, which taken together require 2-4 weeks for completion. This provides up to 32 weeks of actual instructional time, plus an additional 4 weeks for assessment and related activities.

[1] http://education.ohio.gov/getattachment/Topics/Learning-in-Ohio/Science/Ohios-Learnin[...]ndards-and-MC/SciFinalStandardsMC060719.pdf.aspx?lang=en-US

EDCE SCOPE AND SEQUENCE

Unit Title	Core Science Content	Suggested Time
1 Hydrosphere: Water in Earth's Systems	Water cycle; surface water, groundwater, assessing and protecting water supplies, Global patterns of ocean circulation; how wind and density differences drive ocean currents; global conveyor belt; El Niño	3-4 weeks
2 Atmosphere and Climate	Climate and weather; influence of latitude, atmospheric circulation, proximity to ocean, elevation, land features, and prevailing winds on regional climate, energy balance, albedo effect, greenhouse effect, carbon cycle, positive and negative feedback loops; Paleoclimatology, climate proxies, climate change in Earth's past, Milankovitch cycles, tectonic processes that influence climate, human impact on climate	5-8 weeks
3 Earth's Place in the Universe	Life and death of stars, solar nebular condensation hypothesis, Kepler's Laws, Earth's interior structure and composition, internal sources of heat energy, seismic waves, introduction to plate tectonic theory, driving forces of plate movement	3-4 weeks
4 Plate Tectonics	Transform-fault boundaries, earthquakes, physical and computer models Subduction zones, volcanoes, formation of igneous rocks, field-measurement technologies for volcano monitoring Seafloor spreading, paleo-magnetism, plate tectonics summary, landforms associated with plate boundaries	5-7 weeks
5 The Rock Cycle	Erosion and deposition, deltaic processes, formation of sedimentary rock, The nature of rocks and minerals, rock cycle	3-6 weeks
6 Earth's Resources	The geologic processes by which mineral ores are formed; mineral extraction and processing, fossil fuel formation, petroleum resources and exploration technologies	3-6 weeks

NATURE OF SCIENCE HIGH SCHOOL*

Nature of Science One goal of science education is to help students become scientifically literate citizens able to use science as a way of knowing about the natural and material world. All students should have sufficient understanding of scientific knowledge and scientific processes to enable them to distinguish what is science from what is not science and to make informed decisions about career choices, health maintenance, quality of life, community and other decisions that impact both themselves and others.		
Categories	**High School**	
Scientific Inquiry, Practice and Applications All students must use these scientific processes with appropriate laboratory safety techniques to construct their knowledge and understanding in all science content areas.	• Identify questions and concepts that guide scientific investigations. • Design and conduct scientific investigations using a variety of methods and tools to collect empirical evidence, observing appropriate safety techniques. • Use technology and mathematics to improve investigations and communications. • Formulate and revise explanations and models using logic and scientific evidence (critical thinking). • Recognize and analyze explanations and models. • Communicate and support scientific arguments.	*EDC Earth Science* is grounded in current understandings about cognitive development, the learning process, and the pedagogical methods that support construction of science knowledge. All aspects of the instructional materials— from the overall organization of the teaching–learning cycle (consider–investigate–process) to the design and sequencing of the activities to the detail of the suggested teaching strategies—have been tailored to support students' learning. The chapters employ varied teaching strategies and learning opportunities, move from the concrete to the more abstract, target common misconceptions, emphasize guided inquiry, and balance a strong, guided-inquiry orientation with readings and opportunities for practice. Sustained attention is applied to processing for meaning as students are often asked to pause and "Think About It." During the process phase of the learning cycle, students review their data, ideas, and
Science is a Way of Knowing Science assumes the universe is a vast single system in which basic laws are consistent. Natural laws operate today as they did in the past and they will continue to do so in the future. Science is both a body of knowledge that represents a current understanding of natural systems and the processes used	• Various science disciplines use diverse methods to obtain evidence and do not always use the same set of procedures to obtain and analyze data (i.e., there is no one scientific method). ◦ Make observations and look for patterns. ◦ Determine relevant independent variables affecting observed patterns. ◦ Manipulate an independent variable to affect a dependent variable. ◦ Conduct an experiment with controlled variables based on a question or hypothesis. ◦ Analyze data graphically and mathematically. • Science disciplines share common rules of evidence used to evaluate explanations about natural	

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Categories	**High School**	
to refine, elaborate, revise and extend this knowledge.	phenomenon by using empirical standards, logical arguments and peer reviews. • Empirical standards include objectivity, reproducibility, and honest and ethical reporting of findings. • Logical arguments should be evaluated with open-mindedness, objectivity and skepticism. • Science arguments are strengthened by multiple lines of evidence supporting a single explanation. • The various scientific disciplines have practices, methods, and modes of thinking that are used in the process of developing new science knowledge and critiquing existing knowledge.	experiences obtained during the experimental phase. In teacher guided discussions, students present their own ideas, listen to the ideas of other students, revise their thinking, and come to new understandings of the concepts being developed. Learning goals, assessment outcomes, and assessments are closely aligned and clearly delineated. Students are afforded multiple ways to express their understandings and level of mastery. This array of features allows students with a range of learning styles to achieve their optimal level of understanding. For each chapter and its activities, the teacher edition gives detailed suggestions for teaching and assessment strategies, discusses the rationales for those strategies, and discusses possible student preconceptions. In the pages that follow, this information is augmented with discussions of key teaching and learning elements of *EDC Earth Science.*
Science is a Human Endeavor Science has been, and continues to be, advanced by individuals of various races, genders, ethnicities, languages, abilities, family backgrounds and incomes.	• Science depends on curiosity, imagination, creativity and persistence. • Individuals from different social, cultural, and ethnic backgrounds work as scientists and engineers. • Science and engineering are influenced by technological advances and society; technological advances and society are influenced by science and engineering.	

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Categories	**High School**	
	• Science and technology might raise ethical, social and cultural issues for which science, by itself, does not provide answers and solutions.	
Scientific Knowledge is Open to Revision in Light of New Evidence Science is not static. Science is constantly changing as we acquire more knowledge.	• Science can advance through critical thinking about existing evidence. • Science includes the process of comparing patterns of evidence with current theory. • Some science knowledge pertains to probabilities or tendencies. • Science should carefully consider and evaluate anomalies (persistent outliers) in data and evidence. • Improvements in technology allow us to gather new scientific evidence.	**Use of Story in *EDC Earth Science*** Stories have long been a means of conveying information, describing events, and passing on cultural history and skills. Story can also be used to engage and motivate learners. A good story will inspire readers to want to learn more about the subject or challenge them to acquire the knowledge required to solve a problem or conundrum presented in the narrative. Science stories in *EDC Earth Science* serve several purposes. Initially, the story engages students' interests by presenting an event or phenomenon that they find interesting or intriguing. The story presents the content in a context that serves as a framework around which students build conceptual understandings. Throughout a chapter, students may return to the story to determine how a concept might apply. The story also presents a

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Categories	**High School**	
		challenge or question that students must address by applying the conceptual understandings that they have acquired during the chapter. Stories in *EDC Earth Science* relate historical events, recent newsworthy events, and in some cases fictionalized scenarios.

*Adapted from Appendix H – Understanding the Scientific Enterprise: The Nature of Science in the Next Generation Science Standards

Physical Geology

COURSE CONTENT

The following information may be taught in any order; there is no ODE-recommended sequence.

CONTENT ELABORATION: MINERALS

OHIO PHYSICAL GEOLOGY LEARNING STANDARDS	LAB-AIDS *EDC Earth Science*: Chapter (Ch.), Title or Activity *(Content may be found in Student Edition or Teacher Edition)*	Selected Assessment Opportunities
PG.M.1: Atoms and elements	**Ch. 14 - A Solid Foundation: Building Earth's Crust** Reading: Elements of Earth's Crust **Ch. 15 - Hidden Treasures in Rocks: Mineral Resources** Task: What Makes a Metal, Rock, or Mineral Valuable? Activity 1: Where Are the Mineral Ores?	**Ch. 14**: p. 412 About the Reading 1, 4; p. 428-430 End of Chapter Assessment 10 **Ch. 15**: p. 438 Analysis Question 1; p. 459-460 End of Chapter Assessment 8
PG.M.2: Chemical bonding (ionic, covalent, metallic)		
PG.M.3: Crystallinity (crystal structure)	**Ch. 14 - A Solid Foundation: Building Earth's Crust** Reading: Minerals - The Building Blocks of Earth's Crust **Ch. 15 - Hidden Treasures in Rocks: Mineral Resources** Task: What Makes a Metal, Rock, or Mineral Valuable?	**Ch. 14**: p. 412 About the Reading 2, 4; p. 428-430 End of Chapter Assessment 1, 8, 11 **Ch. 15**: p. 438 Analysis Question 1; p. 459-460 End of Chapter Assessment 1
PG.M.4: Criteria of a mineral (crystalline solid, occurs in nature, inorganic, defined chemical composition)	**Ch. 14 - A Solid Foundation: Building Earth's Crust** Reading: Minerals - The Building Blocks of Earth's Crust Final Reading: A Solid Foundation Digging Deeper **Ch. 15 - Hidden Treasures in Rocks: Mineral Resources** Task: What Makes a Metal, Rock, or Mineral Valuable? Activity 1: Where Are the Mineral Ores?	**Ch. 14**: p. 412 About the Reading 1, 3; p. 427 Digging Deeper 3; p. 428-430 End of Chapter Assessment 1, 8, 11 **Ch. 15**: p. 438 Analysis Question 1; p. 459-460 End of Chapter Assessment 1, 2, 3
PG.M.5: Properties of minerals (hardness, luster, cleavage, streak, crystal shape, fluorescence, flammability, density/specific gravity, malleability)	**Ch. 14 - A Solid Foundation: Building Earth's Crust** Activity 2: Identifying Minerals by Their Physical Characteristics Digging Deeper **Ch. 15 - Hidden Treasures in Rocks: Mineral Resources**	**Ch. 14**: p. 413-414 Procedure Step 3-7; p. 414 About the Reading 1, 2, 3; p. 427 Digging Deeper 3; p. 428-430 End of Chapter Assessment 1, 5, 8, 10, 11 **Ch. 15**: p. 438 Analysis Question 1; p. 459-460 End of Chapter Assessment 1, 2, 8, 11

OHIO PHYSICAL GEOLOGY LEARNING STANDARDS	LAB-AIDS *EDC Earth Science*: Chapter (Ch.), Title or Activity *(Content may be found in Student Edition or Teacher Edition)*	Selected Assessment Opportunities
	Task: What Makes a Metal, Rock, or Mineral Valuable? Activity 1: Where Are the Mineral Ores?	

CONTENT ELABORATION: IGNEOUS, METAMORPHIC, AND SEDIMENTARY ROCKS

OHIO PHYSICAL GEOLOGY LEARNING STANDARDS	LAB-AIDS *EDC Earth Science*: Chapter (Ch.), Title or Activity *(Content may be found in Student Edition or Teacher Edition)*	Selected Assessment Opportunities
PG.IMS.1: Igneous • Mafic and felsic rocks and minerals • Intrusive (igneous structures: dikes, sills, batholiths, pegmatites) • Earth's interior (inner core, outer core, lower mantle, upper mantle, Mohorovicic discontinuity, crust) • Magnetic reversals and Earth's magnetic field • Thermal energy within the Earth • Extrusive (volcanic activity, volcanoes: cinder cones, composite, shield) • Bowen's Reaction Series (continuous and discontinuous branches)	**Ch. 9 - Journey to the Center of the Earth: Exploring Earth's Interior** Reading: A Dense Interior Activity 1: Modeling Earth's Interior Structure Reading: Energy in Earth's Interior Address the Challenge Digging Deeper **Ch. 11 - Sleeping Dragons? Subduction-Zone Volcanoes** Activity 2: A Lava Flow or an Explosion? Activity 3: What Might an Eruption of Rainier Be Like? Activity 4: How Do Scientists Monitor Volcanoes? **Ch. 12 - Clues on the Ocean Floor: Divergent Boundaries** Reading: The Missing Piece of the Plate Tectonics Puzzle Activity 3: Plotting a Magnetic Map of the Ocean Activity 4: How Are Ocean Basins Formed by Seafloor Spreading? Address the Challenge Reading: Pulling it All Together: Earth's Machinery **Ch. 14 - A Solid Foundation: Building Earth's Crust** Activity 3: Clues in Rock-Forming Process Final Reading: A Solid Foundation Digging Deeper	*Mafic and felsic rocks and minerals; Intrusive* **Ch. 11**: p. 295 About the Reading 3, 5 **Ch. 14**: p. 416-418 Procedure Steps 2, 4-7; p. 419 Analysis Questions 1, 3, 7; p. 427 Digging Deeper 1; p. 428-430 End of Chapter Assessment 3, 7, 12, 14, 15 *Earth's interior* **Ch 9**: p. 228- 229 Procedure Step 2, 5; p. 230 Analysis Questions 1, 2; p. 244 About the Reading 1, 2, 4; p. 245 Address the Challenge 1, 3; pg 246 Digging Deeper 3; p. 247-248 End of Chapter Assessment 1-4, 6, 9, 10 *Magnetic reversals and Earth's magnetic field* **Ch. 12**: p. 345 About the Reading 1; p. 345-346 Procedure Step 1 and Analysis Question 2; p. 354-355 End of Chapter Assessment 7, 10 *Thermal energy within the Earth* **Ch. 9**: p. 244 About the Reading 1, 2, 4; p. 245 Address the Challenge 2, 3; p. 247-248 End of Chapter Assessment 2, 9, 10 *Extrusive* **Ch. 11**: p. 300 Analysis Question 1, 2, 3; p. 310 About the Reading 1, 2, 3; p. 325-327 End of Chapter Assessment 5, 8, 9, 10, 11, 12 **Ch. 12**: p. 345 About the Reading 1; p. Analysis Question 2; p. 348 Address the Challenge; p. 352 About the Reading 2; p. 352 Digging Deeper

OHIO PHYSICAL GEOLOGY LEARNING STANDARDS	LAB-AIDS *EDC Earth Science*: Chapter (Ch.), Title or Activity *(Content may be found in Student Edition or Teacher Edition)*	Selected Assessment Opportunities
		1; p. 354-355 End of Chapter Assessment 5, 10, 11 **Ch. 14**: p. 427 Digging Deeper 1; p. 428-430 End of Chapter Assessment 3, 6, 7, 12, 14
PG.IMS.2: Metamorphic • Pressure, stress, temperature and compressional forces • Foliated (regional), non-foliated (contact) • Parent rock and degrees of metamorphism • Metamorphic zones (where metamorphic rocks are found)	**Ch. 14** - **A Solid Foundation: Building Earth's Crust** Activity 3: Clues in Rock - Forming Process Address the Challenge Digging Deeper	*Pressure, stress, temperature and compressional forces* **Ch. 14**: p. 416-418 Procedure Steps 2, 4-7; p. 419 Analysis Questions 4, 7, 8; p. 422 Address the Challenge 2; p. 428-430 End of Chapter Assessment 7, 12, 14 *Foliated (regional), non-foliated (contact)* **Ch. 14**: p. 416-418 Procedure Steps 2, 4-7; p. 419 Analysis Questions 4, 7, 8; p. 422 Address the Challenge 2; p. 428-430 End of Chapter Assessment 7, 12, 14 *Parent rock and degrees of metamorphism* **Ch. 14**: p. 416-418 Procedure Steps 4-7; p. 419 Analysis Questions 4, 7, 8; p. 427 Digging Deeper 1; p. 428-430 End of Chapter Assessment 12, 14
PG.IMS.3: Sedimentary • Division of sedimentary rocks and minerals (chemical, clastic/physical, organic) • Depositional environments	**Ch. 13 - Mississippi Blues: Sedimentary Processes in a Delta** Reading: How Do Rivers Build Land? Activity 2: Modeling A River Delta Activity 3: What Does a Real Delta Look Like? Reading: Layer by Layer Activity 4: A View Beneath the Surface Activity 5: Settling Sediments Digging Deeper **Ch. 14** - **A Solid Foundation: Building Earth's Crust** Activity 3: Clues in Rock-Forming Process Digging Deeper	*Division of sedimentary rocks and minerals* **Ch. 13**: p. 386 Procedure Step 8, Analysis Questions 2, 3; p. 392 Digging Deeper 3; p. 395-396 End of Chapter Assessment 1, 7, 9 **Ch. 14**: p. 416-418 Procedure Steps 4-7; p. 419 Analysis Questions 4, 5, 6; p. 427 Digging Deeper 1; p. 428-430 End of Chapter Assessment 2, 4, 7, 14 *Depositional environments* **Ch. 13**: p. 367 About the Reading 3; p. 370 Analysis Question 1; p. 376 Analysis Question 1; p. 379-380 About the Reading 1, 3, 4; p. 383 Analysis Questions 2-5; p. 386 Analysis Question 2; p. 392 Digging Deeper 3; p. 395-396 End of Chapter Assessment 1-3, 5-6, 10-11

OHIO PHYSICAL GEOLOGY LEARNING STANDARDS	LAB-AIDS *EDC Earth Science*: Chapter (Ch.), Title or Activity *(Content may be found in Student Edition or Teacher Edition)*	Selected Assessment Opportunities
		Ch. 14: p. 427 Digging Deeper 1, 2; End of Chapter Assessment; p. 428-430 End of Chapter Assessment 14
PG.IMS.4: Ocean • Tides (daily, neap and spring) • Currents (deep and shallow, rip and longshore) • Thermal energy and water density • Waves • Ocean features (ridges, trenches, island systems, abyssal zone, shelves, slopes, reefs, island arcs) • Passive and active continental margins • Transgressing and regressing sea levels • Streams (channels, streambeds, floodplains, cross-bedding, alluvial fans, deltas)	**Ch. 3 - Rivers of the Sea: Ocean Currents** Activity 1: The Effect of Wind on Ocean Currents Activity 2: Natural Patterns Reading: Patterns in Surface Ocean Currents Activity 3: The Effect of Density on Ocean Currents Reading: Striving for Equilibrium: The Forces That Drive Ocean Currents Reading: The Peru Current Activity 4: An Influential Current **Ch. 11 - Sleeping Dragons: Subduction Zone Volcanoes** Reading: Could Mount Rainier Erupt Activity 1: Detecting a Subducting Plate Reading; How Do Convergent Boundaries Shape Earth's Surface Features? Activity 6: Features Along Convergent Boundaries **Ch. 12 - Clues on the Ocean Floor: Divergent Boundaries** Activity 1: Using Sound Waves to Map an Ocean Floor Reading: Into the Depths Activity 2: Studying Maps of Earth's Oceans **Ch. 13 - Mississippi Blues: Sedimentary Processes in a Delta** Activity 3: What Does a Real Delta Look Like? Address the Challenge Final Reading: Dynamic Rivers and Changing Landscapes Digging Deeper	*Currents* **Ch. 3**: p. 63 About the Reading 1- 4; p. 69-70 About the Reading 1, 3-5, 7-8; p. 77-78 End of Chapter Assessment 2-12 *Thermal energy and water density* **Ch. 3**: p. 64-65 Procedure Steps 7,8 and Analysis Questions 1-3; p. 69-70 About the Reading 1, 2, 5, 7, 8; p. 77-78 End of Chapter Assessment 3, 5, 7, 8, 11 *Ocean features* **Ch. 11**: p. 319 Analysis Question 3; p. 319-320 Procedure Steps 2-4 and Analysis Question 2; p. 325-327 End of Chapter Assessment 7, 8, 9 **Ch. 12**: p. 334-335 Procedure Steps 3-5, Analysis Question 1; p. 345 About the Reading 1; p. 338-342 Procedure Steps 1, 2 and Analysis Question 2; p. 354-355 End of Chapter Assessment 1-4, 9-11 *Streams* **Ch. 13**: p. 367 About the Reading 3; p. 370 Analysis Question 1; p. 376 Analysis Question 1; p. 379-380 About the Reading 1, 3, 4; p. 383 Analysis Questions 2-5; p. 386 Analysis Question 2; p. 392 Digging Deeper 1; p. 395-396 End of Chapter Assessment 2-5, 8, 10

CONTENT ELABORATION: EARTH'S HISTORY

OHIO PHYSICAL GEOLOGY LEARNING STANDARDS	LAB-AIDS *EDC Earth Science*: Chapter (Ch.), Title or Activity *(Content may be found in Student Edition or Teacher Edition)*	Selected Assessment Opportunities
PG.EH.1: The geologic rock record • Relative and absolute age • Principles to determine relative age ○ Original horizontality ○ Superposition ○ Cross-cutting relationships • Absolute age ○ Radiometric dating (isotopes, radioactive decay) ○ Correct uses of radiometric dating • Combining relative and absolute age data • The geologic time scale ○ Comprehending geologic time ○ Climate changes evident through the rock record Fossil record	**Ch. 6 - The Longest Experiment: Climate Change in Earth's History** What's the Story? Journey to a Different Time Reading: Evidence of Earth's Past Activity 2: Using Climate Proxies Reading: The Carbon Cycle, Cretaceous Breadfruit Trees, and the Long Slide to the Ice Age **Ch. 8 - Stars, Planets, and Everything In Between: Solar System Origins** Activity 1: The Dating Game **Ch. 14 - A Solid Foundation: Building Earth's Crust** Reading: Piecing Together Earth's History Final Reading: A Solid Foundation Digging Deeper	*Relative and absolute age; Principles to determine relative age* **Ch. 14**: p. 424-425 Analysis Question 1; p. 428-430 End of Chapter Assessment 9, 10 *Absolute age* **Ch. 8**: p. 199 Analysis Question 3; p. 217-219 End of Chapter Assessment 15 **Ch. 14**: p. 424-425 Analysis Question 2; p. 428-430 End of Chapter Assessment 10 *Combining relative and absolute age data* **Ch. 14**: p. 424-425 Analysis Questions 1, 2; *The geologic time scale* **Ch. 6**: p. 145 About the Reading 1-3; p. 151-152 About the Reading 1, 3; p. 154 Procedure Steps 6-7 and Analysis Question 1; p. 183-185 End of Chapter Assessment 1, 3, 10 **Ch. 14**: p. 427 Digging Deeper 1, 2

CONTENT ELABORATION: PLATE TECTONICS

OHIO PHYSICAL GEOLOGY LEARNING STANDARDS	LAB-AIDS *EDC Earth Science*: Chapter (Ch.), Title or Activity *(Content may be found in Student Edition or Teacher Edition)*	Selected Assessment Opportunities
PG.PT.1: Internal Earth • Seismic waves ○ S and P waves Velocities, reflection, refraction of waves	**Ch. 9 - Journey to the Center of the Earth: Exploring Earth's Interior** Activity 2: See What You Can't See Reading: How Do Scientists Explore Earth's Interior? Activity 3: Body Waves Activity 4: Locating an Earthquake Epicenter Address the Challenge Digging Deeper	*Seismic waves* **Ch. 9**: p. 235 About the Reading 1-4; p. 237 Analysis Question 1-5; p. 240 Procedure Steps 3-5; p. 246 4 and Digging Deeper 3; p. 247-248 End of Chapter Assessment 6-8
PG.PT.2: Structure of Earth (Note: specific layers were part of grade 8) • Asthenosphere • Lithosphere	**Ch 9 - Journey to the Center of the Earth: Exploring Earth's Interior** Reading: A Dense Interior Activity 1: Modeling Earth's Interior Structure	*Asthenosphere; Lithosphere* ***Ch. 9**: p. 228- 229 Procedure Steps 2, 5; p. 230 Analysis Questions 1, 2; p. 245 Address the Challenge 1; p. 247-248 End of Chapter Assessment 3-5*

OHIO PHYSICAL GEOLOGY LEARNING STANDARDS	LAB-AIDS *EDC Earth Science*: Chapter (Ch.), Title or Activity *(Content may be found in Student Edition or Teacher Edition)*	Selected Assessment Opportunities
• Mohorovicic boundary (Moho) • Composition of each of the layers of Earth • Gravity, magnetism and isostasy Thermal energy (geothermal gradient and heat flow)	Reading: How Do Scientists Explore Earth's Interior? Reading: Energy in Earth's Interior Address the Challenge Digging Deeper	*Composition of each of the layers of Earth* ***Ch. 9**: p. 228- 229 Procedure Steps 2, 5; p. 230 Analysis Questions 1, 2; p. 245 Address the Challenge 1, 3; p. 246 Digging Deeper 3; p. 247-248 End of Chapter Assessment 2, 4, 6* *Thermal energy* ***Ch. 9**: p. 244 About the Reading 1, 2; 4; p. 245 Address the Challenge 2, 3; p. 247-248 End of Chapter Assessment 2, 4, 9, 10*245 Address the Challenge 1, 3; p. 246 Digging Deeper 3; p. 247-248 End of Chapter Assessment 2, 4, 6 *Thermal energy* **Ch. 9**: p. 244 About the Reading 1, 2; 4; p. 245 Address the Challenge 2, 3; p. 247-248 End of Chapter Assessment 2, 4, 9, 10
PG.PT.3: Historical review (Note: this would include a review of continental drift and sea-floor spreading found in grade 8) • Paleomagnetism and magnetic anomalies Paleoclimatology	**Ch 6 - The Longest Experiment: Climate Change in Earth's History** What's the Story: Journey to a Different Time Reading: Evidence of Earth's Past Activity 2: Using Climate Proxies Reading: The Carbon Cycle, Cretaceous Breadfruit Trees, and the Long Slide to the Ice Age Address the Challenge **Ch 12 - Clues on the Ocean Floor: Divergent Boundaries** What's the Story? An Explorer with Big Ideas Reading: The Missing Piece of the Plate Tectonics Puzzle Activity 3: Plotting a Magnetic Map of the Ocean Digging Deeper	*Review continental drift and sea-floor spreading* **Ch. 12**: p. 332 About the Reading 1, 2; p. 352 Digging Deeper 2; p. 354-355 End of Chapter Assessment 1, 2, 10 *Paleomagnetism and magnetic anomalies* **Ch. 12**: p. 345 About the Reading 1; p. 345-346 Procedure Step 1 and Analysis Question 2; p. 354-355 End of Chapter Assessment 7, 10 *Paleoclimatology* **Ch. 6**: p. 145 About the Reading 1-3; p. 151-152 About the Reading 1, 3; p. 154 Procedure Steps 6-7 and Analysis Question 1; p. 178 Address the Challenge; p. 179 2; p. 180 Digging Deeper 2; p. 183-185 End of Chapter Assessment 1-3, 10
PG.PT.4: Plate motion (Note: introduced in grade 8)	**Ch. 10 - On Shaky Ground: Earthquakes and Transform Boundaries** What's the story? Waves of Destruction	*Causes and evidence of plate motion*

OHIO PHYSICAL GEOLOGY LEARNING STANDARDS	LAB-AIDS *EDC Earth Science*: Chapter (Ch.), Title or Activity *(Content may be found in Student Edition or Teacher Edition)*	Selected Assessment Opportunities
• Causes and evidence of plate motion • Measuring plate motion • Characteristics of oceanic and continental plates • Relationship of plate movement and geologic events • Mantle plumes	Reading: Clues in the Landscape Activity 1: Using GPS Data and Geologic Markers to Track Plate Motion Activity 2: Looking for Patterns in a World Map Reading: What Do Tectonic Plates Have to Do with Earthquakes? Activity 3: What is Happening Along the San Andreas Fault? Reading: Measurements and Computer Models Activity 4: Studying Earthquake Computer Models **Ch. 11 - Sleeping Dragons: Subduction Zone Volcanoes** What's the story? A Hazardous Development Reading: Could Mount Rainier Erupt? Activity 1: Detecting a Subducting Plate Activity 2: A Lava Flow or an Explosion? Activity 3: What Might an Eruption of Rainier Be Like? Activity 4: How Do Scientists Monitor Volcanoes? Reading: Has Rainier Erupted in the Past? Activity 5: Monitoring Mount Rainier Reading: How Do Convergent Boundaries Shape Earth's Surface Features? Activity 6: Features Along Convergent Boundaries Final Reading: Convergent Boundaries **Ch. 12 - Clues on the Ocean Floor: Divergent Boundaries** What's the story? An Explorer with Big Ideas Activity 1: Using Sound Waves to Map an Ocean Floor Reading: Into the Depths Activity 2: Studying Maps of Earth's Oceans Reading: The Missing Piece of the Plate Tectonic Puzzle Activity 3: Plotting a Magnetic Map of the Ocean Activity 4: How Are Ocean Basins Formed by Seafloor Spreading? Reading: Pulling It All Together— Earth's Machinery	**Almost every assessment opportunity in these three chapters is pertinent.** *Measuring plate motion* **Ch. 10**: p. 257-260 Procedure Steps 1-5, 7-9 and Analysis Questions 1 and 2; p. 285-287 End of Chapter Assessment 4, 10-12 *Characteristics of oceanic and continental plates* **Ch. 11**: p. 295 About the Reading 1; p. 319 About the Reading AQ 1; p. 325-327 End of Chapter Assessment 1, 2, 7 **Ch. 12**: p. 342 Analysis Question 2; p. 345 About the Reading 1, 3; p. 352 About the Reading 1; p. 354-355 End of Chapter Assessment 7, 8 *Relationship of plate movement and geologic events* **Almost every assessment opportunity in these three chapters is pertinent.** *Mantle plumes* **Ch. 12**: p. 352 Digging Deeper 1

CONTENT ELABORATION: PLATE TECTONICS

OHIO PHYSICAL GEOLOGY LEARNING STANDARDS	LAB-AIDS *EDC Earth Science*: Chapter (Ch.), Title or Activity *(Content may be found in Student Edition or Teacher Edition)*	Selected Assessment Opportunities
PG.ER.1: Energy resources • Renewable and nonrenewable energy sources and efficiency • Alternate energy sources and efficiency • Resource availability • Mining and resource extraction	**Ch 16 - The Mystery of the Rub' AL-Khali: Energy Resources in Earth's Crust** Task: Energy Connections What's the story? The Mystery of the Rub' al-Khali Activity 1: How Do Oil Reservoirs Form? Reading: A Convergence of Conditions—the Rub'al-Khali Address the Challenge Reading: How Is Oil Found and Produced? Activity 2: Exploration and Production Models Final Reading: The Recipe for Oil Digging Deeper **Ch 15 - Hidden Treasures in Rocks: Mineral Resources** Everything in this chapter is pertinent to non-energy related resource availability, mining, and resource extraction.	*Renewable and nonrenewable energy sources and efficiency* **Ch. 16**: p. 463 Analysis Question 4; p. 466 Analysis Question 2; p. 473 Analysis Question 3; p. 476 About the Reading 1, 2, 3, 5; p. 477 Address the Challenge 1 2; p. 478 2, 3; p. 480 About the Reading 1, 2, 3; p. 484 Analysis Question 1, 2, 3; p. 485 Digging Deeper 1-3; p. 488-490 End of Chapter Assessment 1-5, 7-9 *Alternate energy sources and efficiency* **Ch. 16**: p. 466 Analysis Question 2; p. 485 Digging Deeper 1 *Resource availability* **Ch. 16**: p. 466 Analysis Question 2; p. 473 Analysis Question 3; p. 476 About the Reading 2, 3, 4, 5; p. 477 Address the Challenge 2; p. 478 2, 3; p. 480 About the Reading 1, 2, 3; p. 484 Analysis Questions 1, 2, 3; p. 485 Digging Deeper 1-3; p. 488-490 End of Chapter Assessment 2, 5, 7, 8 *Mining and resource extraction* **Ch. 16:** p. 480 About the Reading 1-3; p. 484 Analysis Questions 1-2; p. 488-490 End of Chapter Assessment 2-5 **Ch 15**: p. 435 About the Reading 1-3, 5; p. 438 Analysis Question 2; p. 440-441 Procedure Steps 3, 4; p. 444-446 Activity 2; p. 450-451 About the Reading 1-5; p. 451-453 Activity 3; p. 453-456 Address the Challenge; p. 456-457 Digging Deeper; p. 459-460 End of Chapter Assessment 4, 5, 11, 12, 13
PG.ER.2: Air • Primary and secondary contaminants • Greenhouse gases	**Ch. 1 - Comparing Earth to Other Worlds** What's the Story? Two Travelers in a Distant World Activity: Survival on Earth and Mars Address the Challenge **Ch. 3 - Rivers of the Sea**	*Air* **Ch. 1**: p. 4 About the Reading 1, 2, 3; p. 8 Procedure Steps 1, 2 and Analysis Question 1; p. 12 About the Reading 5 **Ch. 3**: p. 70 About the Reading 3, 4; p. 71 Address the Challenge 1, 2, 3,

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	Reading: Striving for Equilibrium: The Forces That Drive Ocean Currents **Ch. 4 - Local Connections: Regional Climate** Reading: Sharing the Warmth Reading: Winds and Mountains **Ch. 5 - The Bigger Picture: Global Climate** Reading: Following the Path of Light Energy Activity 1: The Greenhouse Effect Activity 4: Calling All Carbons Reading: The Greenhouse Effect, the Albedo Effect, the Carbon Cycle and Feedback Address the Challenge Digging Deeper	6; p. 77-78 End of Chapter Assessment 3, 4, 10-12 **Ch. 4**: p. 98 About the Reading 1, 2, 3, 4; p. 106 About the Reading 1, 3, 4; p. 109-110 End of Chapter Assessment 4, 5, 8, 10 *Primary and secondary contaminants; Greenhouse gases* **Ch. 5**: p. 120 Analysis Question 1; p. 126 Analysis Questions 1, 3; p. 128 Procedure Step 4; p. 132 Analysis Questions 1-10; p. 135 About the Reading 2, 3; p. 137 Address the Challenge 5, 6 and Digging Deeper 1; p. 139-140 End of Chapter Assessment 1, 6-9
PG.ER.3: Water • Potable water and water quality • Hypoxia, eutrophication	**Ch. 1 - Comparing Earth to Other Worlds** What's the Story? Two Travelers in a Distant World Activity: Survival on Earth and Mars Address the Challenge **Ch. 2 - Life's Blood: Seeking Water from Earth** What's the story? Water Running Dry Task 1: How Much Water Do You Use? Task 2: Thinking Beyond the Bathwater Activity 1: Reservoir Roulette: A Journey Through the Water Cycle Reading: The Unique Qualities of Water Activity 2: Where's the Drinking Water? Reading: Capturing the Good Water Activity 3: Water Supply Case Studies Activity 4: Follow the Flow: Researching Your Water Supply Address the Challenge Final Reading: The Most Precious Resource	*Water* **Ch. 3**: Almost every assessment opportunity in this chapter is pertinent to "Water." *Potable water and water quality* **Ch. 1**: p. 4-5 About the Reading 1, 4; p. 8 Procedure Steps 1, 2 and Analysis Question 1; p. 12 About the Reading 5 **Ch. 2**: Almost every assessment opportunity in this chapter is pertinent.

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	Ch. 3 - Rivers of the Sea Everything in this chapter is pertinent to the bigger subject of water.	
PG.ER.4: Soil and sediment • Desertification • Mass wasting and erosion • Sediment and contamination	**Ch. 2 - Life's Blood: Seeking Water from Earth** What's the Story: Water Running Dry **Ch. 5 - The Bigger Picture: Global Climate** Address the Challenge **Ch 13 – Mississippi Blues: Sedimentary Processes in a Delta** What's the Story? Flooding the Big Easy Activity 1: Modeling River Deposits Reading: How Do Rivers Build Land? Activity 2: Modeling a River Delta Activity 3: What Does a Real Delta Look Like? Reading: Layer by Layer Activity 4: A View Beneath the Surface Reading: Why Is the Mississippi Delta Region Sinking? Activity 5: Settling Sediments Reading: Have People Played a Role in the Subsidence of New Orleans? Final Reading: Dynamic Rivers and Changing Landscapes	*Desertification* **Ch. 2**: p. 17 About the Reading 1, 2 **Ch. 5**: p. 137 Address the Challenge 6 *Mass wasting and erosion; Sediment and contamination* **Ch. 13**: Almost every assessment opportunity in this chapter is pertinent.

CONTENT ELABORATION: GLACIAL GEOLOGY

OHIO PHYSICAL GEOLOGY LEARNING STANDARDS	LAB-AIDS *EDC Earth Science*: Chapter (Ch.), Title or Activity *(Content may be found in Student Edition or Teacher Edition)*	Selected Assessment Opportunities
PG.GG.1: Glaciers and glaciation • Evidence of past glaciers (including features formed through erosion or deposition) • Glacial deposition and erosion (including features formed through erosion or deposition) • Data from ice cores ○ Historical changes (glacial ages, amounts, locations, particulate matter, correlation to fossil evidence) ○ Evidence of climate changes throughout Earth's history • Glacial distribution and causes of glaciation • Types of glaciers – continental (ice sheets, ice caps), alpine/valley (piedmont, valley, cirque, ice caps) Glacial structure, formation and movement	**Ch 6 - The Longest Experiment: Climate Change in Earth's History** What's the Story? Journey to a Different Time Reading: Evidence of Earth's Past Activity 2: Using Climate Proxies Activity 3: Investigating How Orbital Changes Have Affected Past Climate Reading: The Carbon Cycle, Cretaceous Breadfruit Trees, and the Long Slide to the Ice Age Digging Deeper	*Historical changes; Evidence of climate changes throughout Earth's history* **Ch. 6**: p. 145 About the Reading 1, 2, 3; p. 151 About the Reading 1, 3; p. 154 Analysis Questions 1, 2; p. 159 Analysis Question 5; p. 162 About the Reading 1, 2, 3; p. 180 Digging Deeper 2; p. 183-185 End of Chapter Assessment 1-3, 7-10 *Glacial distribution and causes of glaciation* **Ch. 6**: p. 159 Analysis Question 5; p. 162 About the Reading 1, 2, 3; p. 180 Digging Deeper 2; p. 183-185 End of Chapter Assessment 8