

**PHYSICAL GEOLOGY | Curriculum Map and Pacing Guide**

<p><b>COURSE DESCRIPTION:</b> Physical Geology satisfies the Ohio Core science graduation requirements of ORC 3313.603. The law requires a three-unit course with inquiry-based laboratory experience that engages students in asking valid scientific questions and gathering and analyzing information. Physical Geology incorporates Chemistry, Physics and Environmental Science and introduces students to key concepts, principles and theories within geology. Investigations are used to understand and explain the behavior of nature in a variety of inquiry and design scenarios that incorporate scientific reasoning, analysis, communication skills, and real-world applications.</p>	<p><b>Course SCI335</b> <b>1 year, 1 credit</b> <b>Grades 10-12</b> <b>Prerequisite:</b> Physical Science, Biology</p>
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**QUARTER 1**

<p><b>Topic:</b> Matter and Change</p>		
<p><b>Key Terms:</b> matter, element, nucleus, proton, electron, neutron, atomic number, mass number, isotope, ion, compound, chemical bond, covalent bond, molecule, ionic bond, metallic bond, chemical reaction, solution, acid, base, crystalline structure, glass, evaporation, plasma, condensation, sublimation</p>		
<p><b>Measurable Skills:</b> Identify elements in real world, Identify saturated solution</p>		
Ohio Science Standards (2018)	Student Learning Targets	Learning Activities/Investigations
<p>PG.M.1</p>	<p>Atoms of each element emit and absorb characteristic frequencies of light. These characteristics allow identification of the presence of an element, even in microscopic quantities.</p>	<p>Elements in classroom lab</p>
	<p>Describe atoms and their components.</p>	<p>Fortified cereal Lab</p>
	<p>Relate energy levels and chemical properties of elements.</p>	
	<p>Define isotopes.</p>	
<p>PG.M.2</p>	<p>List the different types of chemical bonds.</p>	
	<p>Relate the chemical bond of a compound to the physical structure of the compound.</p>	
	<p>List the different types of mixtures and solutions.</p>	<p>Precipitate salts lab</p>
<p>PG.M.3</p>	<p>List the different states of matter on Earth.</p>	<p>Observing crystal shapes of minerals demo</p>
	<p>Explain why matters exists in those states.</p>	
	<p>Relate thermal energy to the changes in states of matter.</p>	

## BEXLEY CITY SCHOOLS

### QUARTER 1

<b>Topic:</b> Minerals		
<b>Key Terms:</b> mineral, crystal, luster, hardness, cleavage, fracture, streak, specific gravity, silicate, tetrahedron, ore, gem		
<b>Measurable Skills:</b> Make a mineral field guide, Identify minerals based on characteristics, Distinguish between fracture and cleavage		
Ohio Science Standards (2018)	Student Learning Targets	Learning Activities/Investigations
PG.M.4	Define mineral.	Mineral field guide lab
	Describe mineral formation.	
	List the major mineral groups.	Cleavage vs. fracture lab
	Illustrate the silicon-oxygen tetrahedron.	Shapes of minerals lab
	List the uses of minerals.	
PG.M.5	Classify minerals based on physical properties.	Mineral identification lab Hardness test demo Streak test demo Testing minerals for magnetism demo Testing minerals for calcite demo

### QUARTER 1

<b>Topic:</b> Igneous Rocks		
<b>Key Terms:</b> lava, magma, igneous rock, partial melting, Bowen’s reaction series, fractional crystallization, intrusive rock, extrusive rock, basaltic rock, granitic rock, texture, porphyritic texture, vesicular texture, pegmatite, kimberlite, magnetometer, magnetic reversal, paleomagnetism, isochron, seafloor spreading, crust, inner core, outer core, lower mantle, upper mantle, Mohorovicic discontinuity		
<b>Measurable Skills:</b> Identify igneous rock characteristics, Form different crystals, Model plate boundaries, Model density’s effects on fluids		
Ohio Science Standards (2018)	Student Learning Targets	Learning Activities/Investigations
PG.IMS.1: Igneous	Identify the different types and textures of igneous rocks.	Characteristics of Igneous rocks lab
	Describe the effect of cooling rate on grain size of igneous rocks.	Model crystal formation lab Varying the size of crystals demo
	Review the uses of igneous rocks.	
	Describe how igneous rocks form.	
	Analyze the composition of magma.	Mineral composition of rock lab
	List the factors that affect rocks melting and crystalizing.	
	Define mafic and felsic rocks/minerals.	
	List and describe the igneous structures.	
	Identify and describe the Earth’s layers.	

**QUARTER 1**

**Topic:** Igneous Rocks

**Key Terms:** lava, magma, igneous rock, partial melting, Bowen’s reaction series, fractional crystallization, intrusive rock, extrusive rock, basaltic rock, granitic rock, texture, porphyritic texture, vesicular texture, pegmatite, kimberlite, magnetometer, magnetic reversal, paleomagnetism, isochron, seafloor spreading, crust, inner core, outer core, lower mantle, upper mantle, Mohorovicic discontinuity

**Measurable Skills:** Identify igneous rock characteristics, Form different crystals, Model plate boundaries, Model density’s effects on fluids

Ohio Science Standards (2018)	Student Learning Targets	Learning Activities/Investigations
	Describe the significance of magnetic patterns on the sea floor.	Earthquakes and subduction lab
	Describe the process of convection.	Density currents lab Warm air rises demo
	Relate convection and movement of tectonic plates.	Design a plate boundary lab

**QUARTER 2**

**Topic:** Metamorphic and Sedimentary Rocks

**Key Terms:** sediment, lithification, cementation, bedding, graded bedding, cross-bedding, clastic sedimentary rock, clastic, porosity, evaporate, foliated, nonfoliated, regional metamorphism, contact metamorphism, hydrothermal metamorphism, rock cycle, pressure, stress, temperature and compressional forces

**Measurable Skills:** Model sedimentary rock formation, Identify changes that occur during metamorphism, Classify rocks as igneous, sedimentary or metamorphic

Ohio Science Standards (2018)	Student Learning Targets	Learning Activities/Investigations
PG.IMS.2	List the different types of metamorphic rock.	Model sediment layering lab
	Describe the different causes of the different types of metamorphic rock.	
	Describe metamorphic textures.	What happened here lab
	Describe how mineral/compositional changes occur during metamorphism.	
	Describe how rocks are classified using the rock cycle.	Classification of rocks lab
	Describe where metamorphic rocks form.	
PG.IMS.3	Describe how sedimentary rocks form.	
	Define the process of lithification.	
	List the main features of sedimentary rock.	
	Describe the different types of clastic sedimentary rock.	Interpret changes in rocks lab
	Describe how chemical sedimentary rocks form.	Classification of rocks lab

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**Measurable Skills:** Model sedimentary rock formation, Identify changes that occur during metamorphism, Classify rocks as igneous, sedimentary or metamorphic

Ohio Science Standards (2018)	Student Learning Targets	Learning Activities/Investigations
	Define biochemical sedimentary rock.	

### QUARTER 2

**Topic:** Glaciers (will need additional resources) 8, 21

**Key Terms:** ice sheet, ice cap, piedmont, valley, cirque, glacier, valley glacier, continental glacier, moraine, outwash plain, drumlin, esker, kame, kettle, ice cores

**Measurable Skills:** Model outwash plain and glacial deposition, Describe information for core samples

Ohio Science Standards (2018)	Student Learning Targets	Learning Activities/Investigations
PG.GG.1	Describe glacier formation.	
	Compare valley and continental glaciers.	
	Explain how glaciers modify landscapes.	
	List features that occur with glacial erosion.	
	List features that occur with glacial deposition.	Model glacial deposition lab
	List evidence of past glaciers.	Model outwash demo
	Describe causes of glaciation.	
	Explain past and present glacier distribution.	
	Describe structure of glaciers.	
	Describe how glaciers move.	
	Explain how ice cores provide evidence of Earth's history.	Core sample demo

**QUARTER 2**

**Topic:** Oceans and Water

**Key Terms:** floodplain, stream channel, stream bank, base level, meander, delta, rejuvenation, lake, wetland, eutrophication, sea level, salinity, estuary, temperature profile, thermocline, wave, crest, trough, breaker, tide, spring tide, neap tide, surface current, upwelling, density current, beach, wave refraction, longshore bar, longshore current, barrier island, continental margin, continental shelf, continental slope, turbidity current, continental rise, abyssal plain, deep-sea trench, mid-ocean ridge, seamount, guyot

**Measurable Skills:** Find stream velocity, Model alluvial fan formation and lake formation, Model sea water composition and ocean layering, Determine the settling rate of ocean sediment

Ohio Science Standards (2018)	Student Learning Targets	Learning Activities/Investigations
PG.IMS.4	Describe how a stream carries its load.	Velocity of a stream lab
	Describe the formation of a floodplain.	
	List the physical features that are characteristic of stream development.	Alluvial Fan formation demo
	Describe methods used to study the ocean.	
	Describe ocean formation.	
	Describe how water is distributed on Earth.	
	Describe the composition of seawater.	Model sea water lab
	Illustrate ocean layering.	Model water masses lab
	Describe the formation of deep-water masses.	
	List the physical properties of waves.	
	Describe how tides form.	
	Compare different ocean currents.	
	Describe the formation and modification of shoreline features.	Beach sediment Demo
	List the major shoreline features.	
	Categorize shoreline features as erosional or depositional.	
	List the major geological features of continental margins.	
	List the major geological features of ocean basins.	
Classify and describe the different marine sediments.	Sediment settling rates lab	
PG.ER.3	Describe the formation of lakes and wetlands.	Lake formation Lab
	Describe the process of eutrophication.	
	List the effects of human activity on lake development.	

**QUARTER 3**

**Topic:** Plate Tectonics

**Key Terms:** mantle plumes, continental drift, Pangea, magnetometer, magnetic reversal, paleomagnetism, isochron, seafloor spreading, tectonic plate, divergent boundary, rift valley, convergent boundary, subduction, transform boundary, ridge push, slab pull, stress, strain, elastic deformation, plastic deformation, fault, seismic wave, primary wave, secondary wave, focus, epicenter, asthenosphere, lithosphere, mohorovicic boundary, isostasy, orogeny

**Measurable Skills:** Model ocean basin formation and plate boundaries, Identify fault types, wave movement, and deformation types

Ohio Science Standards (2018)	Student Learning Targets	Learning Activities/Investigations
PG.PT.1	Describe the three types of movement of faults.	Fault types demo
	Define the three types of seismic waves.	Deformation demo Wave movement demo
PG.PT.2	Describe the composition of each layer of the Earth.	
	Define isostasy and its relation to mountains.	Isostatic rebound lab
	Describe all methods that mountains are formed.	
PG.PT.3	Describe evidence from ancient climates that support continental drift.	
	Describe evidence that came from the magnetic patterns in the seafloor.	
PG.PT.4	Explain how Earth's geological features came from tectonic plate movement.	
	List three plate boundaries and describe each.	Model plate boundaries lab
	Describe the processes of a subduction zone.	
	Explain convection.	Convection currents Demo
	Relate convection in mantle to tectonic plate movement.	
	Describe ridge push and slab pull.	
	Describe evidence that the Earth's continents move.	
	Explain seafloor spreading.	
Describe evidence that supported seafloor spreading.	Model ocean-basin formation lab	

**QUARTER 3**

**Topic:** Geological Rock Record

**Key Terms:** geological time scale, eon, Precambrian, era, period, epoch, mass extinction, uniformitarianism, relative-age dating, original horizontality, superposition, cross-cutting relationship, principle of inclusions, unconformity, correlation, key bed, absolute-age dating, radioactive decay, radiometric dating, half-life, radiocarbon dating, dendrochronology, varve, evolution, original preservation, trace fossil, index fossil, altered hard part, mineral replacement, mold, cast,

**Measurable Skills:** Form a fossil, Determine relative age

Ohio Science Standards (2018)	Student Learning Targets	Learning Activities/Investigations
PG.EH.1	Describe the purpose of the geologic time scale.	
	Define eons, era, period, and epoch.	
	Define uniformitarianism and how it is important to geology.	
	List the principles used to interpret rock sequences and determine relative age.	Relative age lab
	Compare the different unconformities.	
	Describe how correlation is used to understand the history of a region.	
	Compare absolute age dating and relative age dating.	
	Describe how radioactive elements are used to date rocks and objects.	
	Describe how non-radioactive materials can be used to date geological events.	
	Describe fossil preservation methods.	How are fossils made lab
	Describe index fossil purpose.	
	Describe how fossils are used to interpret Earth's physical and biological history.	

**QUARTER 4**

**Topic:** Earth’s Resources

**Key Terms:** fuel, biomass fuel, hydrocarbon, peat, fossil fuel, photovoltaic cell, hydroelectric power, geothermal energy, nuclear fission, energy efficiency, cogeneration, sustainable energy, reclamation, deforestation, pesticide, bioremediation, primary contaminant, secondary contaminant, greenhouse gas, desertification, mass wasting, erosion

**Measurable Skills:** Identify energy sources, Model oil movement and nutrient loss

Ohio Science Standards (2018)	Student Learning Targets	Learning Activities/Investigations
PG.ER.1	Explain why the sun is the source of most of Earth’s energy.	
	List materials used as fuels.	Identifying sources of energy lab
	Describe coal formation.	
	List alternative energy resources.	Observe light energy demo
	List ways to harness Sun’s energy.	
	Describe how water, wind, nuclear, and thermal energies can be used to generate electricity.	
	Explain why nuclear energy is controversial.	
	List ways energy resources can be conserved.	
	Describe how improving efficiency can preserve fossil fuels.	Model oil migration lab
	List ways to use energy more efficiently.	Design an energy efficient building lab
	Explain impact of mineral extraction on environment.	Model nutrient loss lab
PG.ER.2	Describe relationship between greenhouse gases and global warming.	
	List the effects of air pollution.	
PG.ER.4	Explain how sediment can be a contaminant.	

**District Instructional Resource:**

*Glencoe Earth Science: Geology, the Environment, and the Universe* (2017) / McGraw Hill (6-year online subscription: 2019-2020 to 2024-2025)

**Standards Alignment:**

Ohio Learning Standards (2018) – retrieved Jan. 2, 2019

<http://education.ohio.gov/getattachment/Topics/Learning-in-Ohio/Science/Ohios-Learning-Standards-and-MC/SciFinalStandards121018.pdf.aspx?lang=en-US>

Activities/investigations listed are color coded:

Black = Textbook

Red = Easy Science Demos and Labs