

MONTGOMERY COUNTY PUBLIC SCHOOLS

Earth Science Curriculum Pacing Guide

1 st 9 Weeks	SOL Objectives	Vocabulary
<p>90 Minute Class: 1 Week</p> <p>45 Minute Class: 2 Weeks</p>	<p>ES.1 The student will plan and conduct investigations in which</p> <ul style="list-style-type: none"> a) volume, area, mass, elapsed time, direction, temperature, pressure, distance, density, and changes in elevation/depth are calculated utilizing the most appropriate tools; b) technologies, including computers, probeware, and geospatial technologies, are used to collect, analyze, and report data and to demonstrate concepts and simulate experimental conditions; c) scales, diagrams, charts, graphs, tables, imagery, models, and profiles are constructed and interpreted; d) maps and globes are read and interpreted, including location by latitude and longitude; e) variables are manipulated with repeated trials; and current applications are used to reinforce Earth science concepts. 	<p>1a) Density, mass, volume, grams, meters, liters, balance, graduated cylinder</p> <p>1c,d) map, Mercator Projection, Azimuthal Projection, Conic Projection, Robinson Projection, latitude, longitude, Equator, Prime Meridian, map scale, map legend, topographic map, contour line, contour interval, index contour, hachure line, elevation, relief, topography</p> <p>1e) hypothesis, experiment, conclusion, predict, scientific method, independent, dependent, constant, control, solution.</p>
<p>90 Minute Class: 1 Week</p> <p>45 Minute Class: 2 Weeks</p>	<p>ES.2 The student will demonstrate an understanding of the nature of science and scientific reasoning and logic. Key concepts include:</p> <ul style="list-style-type: none"> a) Science explains and predicts the interactions and dynamics of complex Earth systems; b) Evidence is required to evaluate hypotheses and explanations; c) Observation and logic are the essential for reaching a conclusion; and d) Evidence is evaluated for scientific theories. 	<p>Scientific law, scientific theory, inference, observation, evidence, qualitative, quantitative, bias, fact, opinion, biosphere, geosphere, atmosphere, hydrosphere</p>
<p>90 Minute Class: 1 Week</p> <p>45 Minute Class: 2 Weeks</p>	<p>ES.4 The student will investigate and understand how to identify major rock-forming and ore minerals based on physical and chemical properties. Key concept include:</p> <ul style="list-style-type: none"> a) hardness, color and streak, luster, cleavage, fracture, and unique properties; and b) uses of minerals. 	<p>Cleavage, crystal fracture, gem, hardness, luster, magma, mineral, ore, silicate, specific gravity, streak.</p>

<p>90 Minute Class: 1 Week</p> <p>45 Minute Class: 2 Weeks</p>	<p>ES.5 The student will investigate and understand the rock cycle as it relates to the origin and transformation of rock types and how to identify common rock types based on mineral composition and textures. Key concepts include:</p> <ul style="list-style-type: none"> a) igneous rocks; b) sedimentary rocks; and c) metamorphic rocks. 	<p>Rock, rock cycle, texture, composition, Igneous rock, Lava, Magma, Intrusive, Extrusive, Basaltic (mafic), Granitic (felsic), Metamorphic rock, Foliated, Nonfoliated, Sediment, Sedimentary rock, Compaction, Cementation, Weathering, Erosion, Deposition, Strata</p>
<p>90 Minute Class: ½ Week</p> <p>45 Minute Class: 1 Week</p>	<p>ES.6 The student will investigate and understand the difference between renewable and nonrenewable resources. Key concepts include:</p> <ul style="list-style-type: none"> a) fossil fuels, minerals, rocks, water, and vegetation; b) advantages and disadvantages of various energy sources; c) resources found in Virginia; and d) environmental costs and benefits. 	<p>Renewable resource, Nonrenewable resource, fossil fuel, coal, oil, natural gas, reserve, nuclear energy, solar energy, wind farm, hydroelectric energy, geothermal energy, biomass energy, mineral resources, ore, recycling Piedmont, Valley & Ridge, Coastal Plain, Blue Ridge, Appalachian Plateau</p>

2 nd 9 Weeks	SOL Objectives	Vocabulary
<p>90 Minute Class: 2 Weeks</p> <p>45 Minute Class: 4 Weeks</p>	<p>ES.8 The student will investigate and understand how freshwater resources are influenced by geologic processes and the activities of humans. Key concepts include:</p> <ul style="list-style-type: none"> a) processes of soil development; b) development of karst topography; c) relationships between groundwater zones, including saturated and unsaturated zones, and the water table; d) identification of sources of fresh water including rivers, springs, and aquifers, with reference to the hydrologic cycle; e) dependence on freshwater resources and the effects of human usage on water quality; and f) identification of the major water systems in Virginia, including the Chesapeake Bay and its tributaries. 	<p>8a) soil, humus, horizon, soil profile, leaching, no-till farming, contour farming, terracing, crop rotation, soil conservation</p> <p>8b-e) groundwater, permeable, impermeable, aquifer, water table, zone of aeration, zone of saturation, spring, geyser, cave, sinkhole, karst topography, point source pollution, nonpoint source pollution</p> <p>7a) erosion, deposition, slump, mass movement, creep, landslide, glacier, till, moraine, outwash, deflation, abrasion, loess, dune, runoff, channel, drainage basin (watershed), meander, oxbow lake, longshore current, beaches weathering, mechanical weathering, ice wedging, root wedging, abrasion, chemical weathering, acid precipitation, oxidation, climate</p>
<p>90 Minute Class: 2 ½ Weeks</p> <p>45 Minute Class: 5 Weeks</p>	<p>ES.7 The student will investigate and understand geologic processes including plate tectonics. Key concepts include:</p> <ul style="list-style-type: none"> a) geologic processes and their resulting features; and b) tectonic processes. 	<p>7b) asthenosphere, lithosphere, outer core, inner core, Continental Drift, Pangaea, convection current, tectonic plate, plate tectonics, seafloor spreading, mid-ocean ridge, subduction, rift, anticline, syncline, monocline, fault-block mountain, folded mountain, volcanic mountain, earthquake, epicenter, focus, liquefaction, magnitude, fault, normal fault, reverse fault, strike-slip fault, seismic wave, primary wave, secondary wave, surface wave, seismograph, tsunami, volcano, shield volcano, cinder cone volcano, composite or stratovolcano, batholith, sill, dike, laccolith, caldera, crater, hot spot, tephra, vent, volcanic neck, plain, plateau</p>

3rd 9 Weeks	SOL Objectives	Vocabulary
<p>90 Minute Class: 1 ½ Weeks</p> <p>45 Minute Class: 2 Weeks</p>	<p>ES.9 The student will investigate and understand that many aspects of the history and evolution of Earth and life can be inferred by studying rocks and fossils. Key concepts include:</p> <ul style="list-style-type: none"> a) traces and remains of ancient, often extinct, life are preserved by various means in many sedimentary rocks; b) superposition, cross-cutting relationships, index fossils, and radioactive decay are methods of dating bodies of rock; c) absolute and relative dating have different applications but can be used together to determine the age of rocks and structures; and d) rocks and fossils from many different geologic periods and epochs are found in Virginia. 	<p>Geologic times scale, Precambrian Eon, Paleozoic Era, Mesozoic Era, Cenozoic Era, Period, Epoch, Gondwana, Lauasia, Pangaea, mass extinction, evolution, uniformitarianism, relative age, superposition, cross-cutting, unconformity, fossil, index fossil, petrified fossil, trace fossil, mold, cast, impression, carbon film, unaltered remains, absolute age, radioactive decay, radiometric dating, half-life.</p>
<p>90 Minute Class: 1 ½ Weeks</p> <p>45 Minute Class: 3 Weeks</p>	<p>ES.10 The student will investigate and understand that oceans are complex, interactive physical, chemical, and biological systems and are subject to long-term and short-term variations. Key concepts include:</p> <ul style="list-style-type: none"> a) physical and chemical changes related to tides, waves, currents, sea level and ice cap variations, upwelling, and salinity variations; b) importance of environmental and geologic implications; c) systems interactions; d) features of the sea floor as reflections of tectonic processes; and e) economic and public policy issues concerning the oceans and the coastal zone including the Chesapeake Bay. 	<p>Basin, breaker, Coriolis, effect, crest, density current, salinity, surface current, tidal range, tide, trough, upwelling, wave, abyssal plain, benthos, chemosynthesis, continental shelf, continental slope, estuary, mid-ocean ridge, nekton photosynthetic zone, plankton, pollution, reef, trench, intertidal, neritic, abyssal zones, thermocline.</p>
<p>90 Minute Class: 2 Weeks</p> <p>45 Minute Class: 4 Weeks</p>	<p>ES.11 The student will investigate and understand the origin and evolution of the atmosphere and the interrelationship of geologic processes, biologic processes, and human activities on its composition and dynamics. Key concepts include:</p> <ul style="list-style-type: none"> a) Scientific evidence for atmospheric composition changes over geologic time; b) Current theories related to the effects of early life on the chemical makeup of the atmosphere; c) atmospheric regulation mechanisms including the effects of density differences and energy transfer; and d) potential changes to the atmosphere and climate due to human, biologic, and geologic activity. 	<p>Hydrologic cycle, evaporation, condensation, precipitation, convection, conduction, radiation, atmosphere, oxygen, nitrogen, trace gases, carbon dioxide, composition, weather, climate, sun, wind, elevation, Coriolis effect, season, polar temperature, tropical zone, tornado, hurricane, barometer, thermometer, anemometer, psychomotor, cloud type, barometric pressure, station model, chlorofluorocarbon, hydrosphere, ionosphere, ozone layer, troposphere, ultraviolet radiation, jet stream, relative humidity, meteorologist, fronts, isobar, isotherm, global warming, greenhouse effect, El Nino.</p>

4 th 9 Weeks	SOL Objectives	Vocabulary
<p>90 Minute Class: 1 Week</p> <p>45 Minute Class: 2 Weeks</p>	<p>ES.12 The student will investigate and understand that energy transfer between the sun and Earth and its atmosphere drives weather and climate on Earth.</p> <p>Key concepts include:</p> <ul style="list-style-type: none"> a) observation and collection of weather data; b) prediction of weather patterns; c) severe weather occurrences, such as tornadoes, hurricanes, and major storms; and d) weather phenomena and the factors that affect climate including radiation, conductions, and convections. 	<p>Hydrosphere, ionosphere, ozone layer, troposphere, ultraviolet radiation, jet stream, relative humidity, meteorologist, fronts, isobar, isotherm, global warming, greenhouse effect, El Nino.</p>
<p>90 Minute Class: 1 ½ Weeks</p> <p>45 Minute Class: 3 Weeks</p>	<p>ES.3 The students will investigate and understand the characteristics of Earth and the solar system. Key concepts include:</p> <ul style="list-style-type: none"> a) position of Earth in the solar system; b) sun-Earth-moon relationships; (seasons, tides, and eclipses) c) characteristics of the sun, planets and their moons, comets, meteors, and asteroids; d) the history and contributions of space exploration. 	<p>Electromagnetic spectrum, observatory, orbit, Projects - Apollo, Gemini, Mercury; telescopes - radio, reflecting, refracting; rocket, satellite, space - probe, shuttle, station; axis, ellipse, equinox, full & new moon, impact basin, lunar & solar eclipse, maria, moon phase, revolution, rotation, solar eclipse, solstice, sphere, waning & waxing, asteroid, comet, Earth, Great Red Spot, Jupiter, Mars, Mercury, meteor, meteorite, Neptune, Pluto, Saturn, solar system, Uranus, Venus, absolute & apparent magnitude, big bang theory, black hole, chromospheres, constellation, corona, galaxy, giant, light-year, nebula, neutron star, photosphere, sunspot, supergiant, white dwarf.</p>

<p>90 Minute Class: 1 ½ Weeks</p> <p>45 Minute Class: 3 Weeks</p>	<p>ES.13 The student will investigate and understand scientific concepts related to the origin and evolution of the universe. Key concepts include:</p> <ul style="list-style-type: none">a) cosmology including the Big Bang theory; andb) the origin and evolution of stars, star systems, and galaxies.	<p>Electromagnetic spectrum absolute & apparent magnitude, big bang theory, black hole, parallax, chromospheres, constellation, corona, galaxy, giant, light-year, nebula, neutron star, photosphere, sunspot, supergiant, white dwarf, red shift, blue shift, Hertzsprung-Russell Diagram, main sequence, super nova, nuclear fusion</p>
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