Richmond Public Schools

Department of Curriculum and Instruction
Curriculum Pacing And Resource Guide – Unit Plan

Course Title/ Course #: Earth Science 2 Physical Geology

Unit Title/ Marking Period # (MP): Earth Materials ES.4a-b ,ES.5a-c

Start day:

Meetings (Length of Unit):

Desired Results ~ What will students be learning?

Standards of Learning/ Standards

ES.4
The student will investigate and understand how to identify major rock-forming and ore minerals based on physical and chemical properties. Key concepts include
a) hardness, color and streak, luster, cleavage, fracture, and unique properties;
b) uses of minerals.

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
a) igneous rocks;
b) sedimentary rocks; and
c) metamorphic rocks.

Essential Understandings/ Big Ideas

ES. 4

- There is a difference between rocks and minerals. Most rocks are made of one or more minerals.
- A mineral is a naturally occurring, inorganic, solid substance with a definite chemical composition and structure and can be identified based on specific chemical and physical properties.

- The major elements found in Earth's crust are oxygen, silicon, aluminum, and iron. The most abundant group of minerals is the
- silicates, which contain silicon and oxygen. Some common silicates include feldspar and quartz.
- The carbonate group of minerals is composed of the carbonate compound CO_3. Some common carbonates are calcite and dolomite.
- The oxide group of minerals is composed of oxygen and a metal. Some common oxides include hematite and magnetite.
- Minerals are important to human wealth and welfare.

ES. 5

- Rocks can be identified on the basis of mineral content and texture.
- The processes by which rocks are formed define the three major groups of rocks.
- The rock cycle is the process by which all rocks are formed and how basic Earth materials are recycled through time.
- Igneous rock forms from molten rock that cools and hardens either below or on Earth's surface. Extrusive igneous rocks have small or no crystals, resulting in fine-grained or glassy textures and include pumice,obsidian, and basalt. Intrusive igneous rocks have larger crystals and a coarser texture and include granite.
- Sedimentary rocks may be formed either by rock fragments or organic matter being bound together or by chemical precipitation. Clastic sedimentary rocks are made up of fragments of other rocks and include sandstone, conglomerate, and shale. Non-clastic sedimentary rocks include limestone and rock salt.
- Metamorphic rocks form when any rock is changed by the effects of heat, pressure, or chemical action. Foliated metamorphic rocks have bands of different minerals and include slate, schist, and gneiss. Unfoliated metamorphic rocks have little or no banding and are
- relatively homogenous throughout and include marble and quartzite.

Key Essential Skills and Knowledge

ES. 4

In order to meet this standard, it is expected that students will

- analyze why certain common metallic elements (iron, aluminum, silicon) are rarely, if ever, found in the native state.
- analyze the distribution and persistence of minerals at or near Earth's surface in terms of Earth's general structure, plate tectonics, and chemical and physical weathering.
- analyze the relationship between the qualities of cleavage, fracture, and hardness and the molecular structure and chemistry of silicates, carbonates, and oxides.
- identify minerals by their physical properties, such as hardness, color, luster, and streak.
- recognize some major rock-forming minerals such as quartz, feldspar, calcite, and mica.
- recognize ore minerals including pyrite, magnetite, hematite, galena, graphite, and sulfur

ES. 5

In order to meet this standard, it is expected that students will

- comprehend and identify various igneous rock textural features and mineral components with a hand sample or by description, and

- analyze the significance of these features in terms of mode of origin and history.
- analyze and identify various sedimentary rocks in terms of mode of origin and history, using sedimentary features (grain size, texture, and composition).
- analyze the major groups of metamorphic rocks for mineral composition and textural features and determine the potential parent
- rock and in terms of the rock cycle.
- analyze a sequence of rocks in terms of types, textures, composition, fossils, structural, and weathering features in order to infer the history of the sequence over time.
- integrate the rock cycle with Plate Tectonics Theory and determine how this is reflected in the geology of Virginia's five physiographic provinces.
- classify the following rock types as igneous, metamorphic, or sedimentary: pumice, obsidian, basalt, granite, sandstone,
- conglomerate, shale, limestone, slate, schist, gneiss, marble, and quartzite.
- differentiate between clastic and non-clastic sedimentary rocks.
- compare and contrast distinguishing characteristics of the crystal structure and textures of extrusive and intrusive igneous rocks.
- describe the structure of foliated and unfoliated metamorphic rocks
- offer interpretations of the tectonic history of an area based on the range and type of rocks found in that area.
- compare and contrast the tectonic activity of the east coast and the west coast of North America.

Vocabulary

ES. 4

chemical property	cleavage	crystal	elements
fracture	gemstones	halides	hardness
inorganic	luster	magma	metals
mineral	native elements	non-metals	ores
oxides	properties	physical property	silicates
streak	sulfates	sulfide	unique

ES. 5

basaltic	extrusive	intrusive	rock cycle
cementation	fine grained	organic rocks	sedimentary rocks
sediments	chemical rock	foliated	texture
metamorphic rock	igneous rocks	granitic	clastic rock
non-foliated	volcano	coarse grained	compaction
lava	transformation	cementation	magma
non-clastic rock	process	origin	composition
molten	classify		

Assessment Evidence ~ What is evidence of mastery? What did the students master & what are they missing?

Assessment/ Evidence

Evidence of mastery: Students will display mastery by consistently scoring at a "C" or above on all assessements. Success and mastery will also be shown by increasing scores from the beginning of the unit to the end of the unit. Overall mastery of the content and targeted objectives will be assessed during final unit assessment.

Assessment Methods:

- Teacher created IA Test/Quiz
- Group Discussions
- Predict and Explain Assessments- students apply principles and evidence
- Research Reports & Presentations
- Visual Displays- Concept maps, Diagrams, Models

Possible learning Gaps/Misconceptions

ES. 4, ES. 5

- All rocks are the same, and it's hard to tell how they originated.
- Rocks and minerals are the same thing; distinguishing them is not important.
- Humans can fabricate rocks and minerals; artifacts are the same as rocks and minerals.
- All rocks are all the same.
- Minerals are not important to my life.
- All minerals are the same.
- Minerals don't have specific names.
- Humans can make rocks and minerals.
- Any crystals that scratches glass is a diamond.
- Only "Pretty" rocks are crystals
- popular literature and Hollywood movies).

Learning Plan ~ What are the strategies and activities you plan to use

Learning Experiences/ Best Practice

- Have students to analyze why certain common metallic elements (iron, aluminum, silicon) are rarely, if ever, found in the native state.
- Have students to analyze the distribution and persistence of minerals at or near Earth's surface in terms of Earth's general structure, plate tectonics, and chemical and physical weathering.
- Have students to analyze the relationship between the qualities of cleavage, fracture, and hardness and the molecular structure and chemistry of silicates, carbonates, and oxides.
- Have students to identify minerals by their physical properties, such as hardness, color, luster, and streak.
- Have students to recognize some major rock-forming minerals such as quartz, feldspar, calcite, and mica.
- Have students to recognize ore minerals including pyrite, magnetite, hematite, galena, graphite, and sulfur.

- Have students to comprehend and identify various igneous rock textural features and mineral components with a hand sample or by description, and analyze the significance of these features in terms of mode of origin and history.
- Have students to analyze and identify various sedimentary rocks in terms of mode of origin and history, using sedimentary features (grain size, texture, and composition).
- Have students to analyze the major groups of metamorphic rocks for mineral composition and textural features and determine the potential parent rock and in terms of the rock cycle.
- Have students to analyze a sequence of rocks in terms of types, textures, composition, fossils, structural, and weathering features in order to infer the history of the sequence over time.
- Have students to integrate the rock cycle with Plate Tectonics Theory and determine how this is reflected in the geology of Virginia's five physiographic provinces.
- Have students to classify the following rock types as igneous, metamorphic, or sedimentary: pumice, obsidian, basalt, granite, sandstone, conglomerate, shale, limestone, slate, schist, gneiss, marble, and quartzite.
- Have students to differentiate between clastic and non-clastic sedimentary rocks.
- Have students to compare and contrast distinguishing characteristics of the crystal structure and textures of extrusive and intrusive igneous rocks.
- Have students to describe the structure of foliated and unfoliated metamorphic rocks.
- Have students to label on a map the physiographic provinces of Virginia.
- Have student to identify the topographic, rock-type and geologic-structural characteristics of each physiographic province of Virginia.
- Have students analyze the geologic history of Virginia in terms of the structures, rock types, and topography represented in the five physiographic provinces.
- Have students to integrate and interpret the rock cycle, plate tectonics, and Virginia's geology in an interacting diagram.
- Have student to analyze how multiple continental collisions and rifting events over the

Technology Integration

Web Resources

Crystallization activity
Mineral Identification Lab
Rock cycle with sugar cubes:
Interactive rock cycle:
Rock cycle animation:
The Virtual rock lab interactivity- Wiley

Rock Cycle Simulation Lab with crayons

Resources

Sample lesson Plans (VDOE)

Mineral Identification
Igneous Rocks
Three types of Rocks
Metamorphic Rock
Weathering of Limestone
VA Physiological Provinces

Cross Curricular Connection

English - Have students assume the persona of the rock they are describing and tell its story from its point of view.