PLANNED INSTRUCTION

A PLANNED COURSE FOR:

Geology

Curriculum writing committee:

Robert E. Curtis, Jr. P.E.

Grade Level:

10, 11, & 12

Date of Board Approval: _____2021_____

Course Weighting: Geology

Major Assessments (Tests, Common Assessments)	45 % (6-7 per marking period)
Skills Application (Labs)	30 % (6-7 per marking period)
Skills Practice (Activities, Homework)	20 % (18-20 per marking period)
Participation	5 %
Total	100 %

Curriculum Map

Overview:
Geology is a one semester, ½ credit, introductory geology course for grades 10, 11, 12. The course studies Earth's mineral composition, structure, and processes of formation; and the effect of these processes on materials and structures of the earth's crust. Focuses on plate tectonics, rocks and minerals, soils, earthquakes, mountain building, glaciation, flowing and ground water, geologic time, climate change, and topographic and geologic maps. College credit available through Keystone College.

Goals:
Geology is the branch of science dedicated to the study of the Earth as a system and the interaction between the Earth's systems, or spheres. The course covers a time scale dating back billions of years. The main goal of this course is to provide students with an introductory overview of geology to spark a continuing interest in geology and encourage further study of geology on a college level or individual basis. Other goals of the course include having students develop an understanding and appreciation for how geologists gather and interpret data from the Earth through the use of field studies and seismic waves, acquire an understanding of current thought on explaining geological phenomena, appreciate that geology is a vibrant field with new discoveries happening every day, and be able to perform basic geological observations themselves. The course is also very useful for students planning to study civil engineering or environmental science in college. Specifically, the course will address the Earth as a system, plate tectonics, matter and minerals, igneous rocks and intrusive activity, volcanoes and volcanic hazards, weathering and soils, sedimentary rocks, metamorphism and metamorphic rocks, earthquakes and Earth's interior, crustal deformation and mountain building, running water, groundwater, glaciers and glaciation, geologic time and Earth's evolution through geologic time, and global climate change.
Specifically, the concepts to be covered by marking period are as follows:

MP1/3: An Introduction to Geology, Plate Tectonics: A Scientific Revolution Unfolds, Matter and Minerals, Igneous Rocks and Intrusive Activity & Volcanoes and Volcanic Hazards, Weathering and Soils, Sedimentary Rocks

MP2/4: Metamorphism and Metamorphic Rocks, Earthquakes and Earth's Interior, Crustal Deformation and Mountain Building, Running Water and Groundwater, Glaciers and Glaciation, Geologic Time and Earth's Evolution Through Geologic Time, Global Climate Change

Big Ideas:

BIG IDEA 1: Matter can be understood in terms of the types of atoms present and the interactions both between and within atoms.

BIG IDEA 2: Interactions between any two objects can cause changes in one or both of them.

BIG IDEA 3: Interactions of objects or systems of objects can be predicted and explained using the concept of energy transfer and conservation.

BIG IDEA 4: Waves are a repeating pattern of motion that transfers energy from place to place without overall displacement of matter.

Textbook and Supplemental Resources:

Lutgens, Tarbuck, Tasa (2015). Essentials of Geology. 12th Edition. New York, NY: Pearson.

Earth Science Laboratory Manual, Teacher Edition. Pearson.

Earth Science Investigations. American Geological Institute.

"Geologic Time Scale". University of Colorado Boulder Museum of Natural History https://www.colorado.edu/cumuseum/programs/schools-and-groups/fossils-classroom/materials-and-resources/geologic-time-scale

Google Earth Pro. Earth Versions – Google Earth

"Great Glaciers". Flinn Scientific. https://www.flinnsci.com/api/library/Download/cc5a77d90a9b4411a70958675263dbfe

"My NASA Data - Lesson Plans Create Your Own Soil Profile Activity". https://mynasadata.larc.nasa.gov/print/pdf/node/100

Pearson. "Personalize the Teaching and Learning Experience." *Pearson*, www.pearsonmylabandmastering.com/masteringgeology/.

PhET Interactive Physics Simulations, University of Colorado Boulder. https://phet.colorado.edu/en/simulations/category/physics

"River Processes Using the Streamtable" https://serc.carleton.edu/NAGTWorkshops/intro/activities/23422.html

"Understanding Geologic Time". https://www.jsg.utexas.edu/glow/files/Understanding-Geologic-Time-6-8.pdf

Curriculum Plan

Unit 1: An Introduction to Geology Time/Days (11 days)

Standards (by number): 3.3.10.A1, 3.3.12.A1, 3.3.10.A3, 3.3.12.A3, 3.3.10.A4, 3.3.12.A4, 3.3.10.A7, 3.3.12.A7, 3.3.10.A8, 3.3.12.A8, 3.3.10.B1, CC.3.5.9-10.A., CC 3.5.11-12.A, CC.3.5.9-10.B, CC.3.5.11-12.B, CC.3.5.9-10.C, CC.3.5.11-12.C, CC.3.5.9-10.D, CC3.5.11-12.D, CC.3.5.9-10.E, CC.3.5.11-12.E.

Anchors: A1.1.1.1, A1.1.1.3, A1.2.1.1

Eligible Content: Chapter 1 of textbook: An Introduction to Geology: Geology (The Science of the Earth), The Development of Geology, The Nature of Scientific Inquiry, Earth's Spheres, Earth as a System, Early Evolution of Earth, Earth's Internal Structure, Rocks and the Rock Cycle, The Face of the Earth. Supplemental instruction in Topographic Maps interpretation.

Objectives: Students shall:

- Distinguish between physical and historical geology and describe the connections between people and geology. (DOK Level 2)
- Summarize early and modern views on how change occurs on Earth and relate them to the prevailing ideas about the age of Earth. (DOK Level 3)
- Discuss the nature of scientific inquiry, including the construction of hypotheses and the development of theories. (DOK Level 1)
- List and describe Earth's four major spheres. (DOK Level 1)
- Define system and explain why Earth is considered a system. (DOK Level 2)
- Outline the stages in the formation of our solar system. (DOK Level 1)
- Describe Earth's internal structure. (DOK Level 1)
- Sketch, label, and explain the rock cycle. (DOK Level 2)
- List and describe the major features of the continents and ocean basins. (DOK Level 2)
- Interpret topographical maps (DOK Level 3)

Core Activities and Corresponding Instructional Methods:

- "Understanding Geologic Time" Activity from Texas Memorial Museum or equivalent
- Reading of Chapter 1 in Textbook
- Direct Instruction (lecture with fill-in note pages for student completion)
- Online Chapter 1 Independent Practice and Review through the Pearson Mastering Geology website
- "Topographic Map and Profiling" Lab from Ward's Science or equivalent

Assessments:

- Diagnostic: Teacher observations and questioning
- Formative: student responses to independent practice
- Summative: Unit 1 Test; Lab

Unit 2: Plate Tectonics: A Scientific Revolution Unfolds Time/Days (7 days)

Standards (by number): 3.3.10.A1, 3.3.12.A1, 3.3.10.A3, 3.3.10.A4, 3.3.12.A4, 3.3.10.A7, 3.3.12.A7, 3.3.10.A8, 3.3.12.A8, CC.3.5.9-10.A., CC 3.5.11-12.A, CC.3.5.9-10.B, CC.3.5.11-12.B, CC.3.5.9-10.C, CC.3.5.11-12.C, CC.3.5.9-10.D, CC3.5.11-12.D, CC.3.5.9-10.E, CC.3.5.11-12.E.

Anchors: A1.1.1.1, A1.1.1.3, A1.2.1.1

Eligible Content: Chapter 2 of textbook: From Continental Drift to Plate Tectonics, Continental Drift: An Idea Before Its Time, The Great Debate, The Theory of Plate Tectonics, Divergent Plate Boundaries and Seafloor Spreading, Convergent Plate Boundaries and Subduction, Transform Plate Boundaries, How Do Plates and Plate Boundaries Change? Testing the Plate Tectonics Model, How Is Plate Motion Measured? What Drives Plate Motions?

Objectives: Students shall:

- Discuss the view that most geologists held prior to the 1960s regarding the geographic positions of the ocean basins and continents. (DOK Level 2)
- List and explain the evidence Wegener presented to support his continental drift hypothesis. (DOK Level 2)
- Discuss the two main objections to the continental drift hypothesis. (DOK Level 2)
- List the major differences between the Earth's lithosphere and asthenosphere and explain the importance of each in plate tectonics theory. (DOK Level 2)
- Sketch and describe the movement along a divergent plate boundary that results in the formation of new oceanic lithosphere. (DOK Level 2)
- Compare and contrast the three types of convergent boundaries and name a location where each type can be found. (DOK Level 2)
- Describe the relative motion along a transform plate boundary and locate several examples on a plate boundary map. (DOK Level 3)
- Explain why plates such as the African and Antarctic plates are getting larger and the Pacific plate is getting smaller. (DOK Level 4)
- List and explain the evidence used to support plate tectonics theory. (DOK Level 3)
- Describe two methods researchers use to measure relative plate motion. (DOK Level 2)
- Summarize what is meant by plate-mantle convection and explain two of the primary driving forces of plate motion. (DOK Level 3)

Core Activities and Corresponding Instructional Methods:

- Reading of Chapter 2 in Textbook
- Direct Instruction (lecture with fill-in note pages for student completion)
    - Online Chapter 2 Independent Practice and Review through the Pearson Mastering Geology website
    - "Encounter Geosystems: Exploration – Sea Floor Spreading", "Encounter Earth: Plate Tectonics - Transform Boundaries - The San Andreas Fault", "Encounter Earth Science: Internal Processes – Plate Tectonics I", "Encounter Geosystems: Exploration - Plate Tectonics", "Encounter Geosystems: Plate Tectonics", "Encounter Geosystems: Sea-Floor Spreading" Google Earth Pro Labs on the Pearson Mastering Geology website

Assessments:

- Diagnostic: Teacher observations and questioning
- Formative: student responses to independent practice
- Summative: Unit 2 Test; Lab

Unit 3: Matter and Minerals Time/Days (7 days)

Standards (by number): 3.2.10.A1, 3.2.C.A1, 3.2.10.A2, 3.2.C.A2, 3.3.10.A8, CC.3.5.9-10.A., CC 3.5.11-12.A, CC.3.5.9-10.B, CC.3.5.11-12.B, CC.3.5.9-10.C, CC.3.5.11-12.C, CC.3.5.9-10.D, CC3.5.11-12.D, CC.3.5.9-10.E, CC.3.5.11-12.E.

Anchors: A1.1.1.1, A1.1.1.3, A1.2.1.1

Eligible Content: Chapter 3 of textbook: Minerals: Building Blocks of Rock, Atoms: Building Blocks of Minerals, Why Atoms Bond, Properties of a Mineral, Mineral Groups, The Silicates, Common Silicate Minerals, Important Non-silicate Minerals, Minerals: A Nonrenewable Resource

Objectives: Students shall:

- List the main characteristics that an Earth material must possess to be considered a mineral and describe each. (DOK Level 2)
- Compare and contrast the three primary particles contained in atoms. (DOK Level 2)
- Distinguish among ionic bonds, covalent bonds, and metallic bonds. (DOK Level 2)
- List and describe the properties that are used in mineral identification. (DOK Level 1)
- Explain how minerals are classified and name the most abundant mineral group in Earth's crust. (DOK Level 3)
- Sketch the silicon-oxygen tetrahedron and explain how these fundamental building blocks join to form other silicate structures. (DOK Level 3)
- Compare and contrast the light (non-ferromagnesian} silicates with the dark (ferromagnesian) silicates and list four common minerals from each group. (DOK Level 2)
- List the common non-silicate minerals and explain why each is important. (DOK Level 2)
- Discuss Earth's mineral resources in terms of renewability. Differentiate between mineral resources and ore deposits. (DOK Level 2)

Core Activities and Corresponding Instructional Methods:

- Reading of Chapter 3 in Textbook
- Direct Instruction (lecture with fill-in note pages for student completion)
- Online Chapter 3 Independent Practice and Review through the Pearson Mastering Geology website
- "Ward's® Introductory Mineral Collection Mineral Identification Lab" or equivalent

Assessments:

- Diagnostic: Teacher observations and questioning
- Formative: student responses to independent practice
- Summative: Unit 3 Test; Lab

Unit 4: Igneous Rocks and Intrusive Activity & Volcanoes and Volcanic Activity Time/Days (7 days)

Standards (by number): 3.3.10.A1, 3.3.12.A1, 3.3.10.A2, 3.3.10.A3, 3.3.10.A7, 3.3.12.A7, 3.3.12.A8, CC.3.5.9-10.A., CC 3.5.11-12.A, CC.3.5.9-10.B, CC.3.5.11-12.B, CC.3.5.9-10.C, CC.3.5.11-12.C, CC.3.5.9-10.D, CC3.5.11-12.D, CC.3.5.9-10.E, CC.3.5.11-12.E.

Anchors: A1.1.1.1, A1.1.1.3, A1.2.1.1

Eligible Content: Chapter 4 of textbook: Magma: Parent Material of Igneous Rock, Igneous Compositions, Igneous Textures: What Can They Tell Us, Naming Igneous Rocks, Origin of Magma, How Magmas Evolve, Partial Melting and Magma Composition, Intrusive Igneous Activity, Mineral Resources and Igneous Processes & Chapter 5 of textbook: Mount St. Helens Versus Kilauea, The Nature of Volcanic Eruptions, Materials Extruded During and Eruption, Anatomy of a Volcano, Shield Volcanoes, Cinder Cones, Composite Volcanoes, Volcanic Hazards, Other Volcanic Landforms, Plate Tectonics and Volcanic Activity.

Objectives: Students shall:

- List and describe the three major components of magma. (DOK Level 2)
- Compare and contrast the four basic igneous compositions: basaltic (mafic), granitic (felsic), andesitic (intermediate), and ultramafic. (DOK Level 2)
- Identify and describe the six major igneous textures. (DOK Level 2)
- Distinguish among common igneous rocks based on texture and mineral composition. (DOK Level 2)
- Summarize the major processes that generate magma from solid rock. (DOK Level 2)
- Write a statement describing how magmatic differentiation can result in the formation of one or more secondary magmas from a single parent magma. (DOK Level 4)
- Describe how partial melting of the mantle rock peridotite generates basaltic (mafic) magma. (DOK Level 3)
- Compare and contrast these intrusive igneous structures: dikes, sills, batholiths, stocks, and laccoliths. (DOK Level 2)
- Explain how economic deposits of gold, silver, and many other metals form. (DOK Level 3)
- Compare and contrast the 1980 eruption of Mount St. Helens with the eruption of Kilauea, which began in 1983 and continues today. (DOK Level 2)
- Explain why some volcanic eruptions are explosive and others are quiescent. (DOK Level 2)
- List and describe the three categories of materials extruded during volcanic eruptions. (DOK Level 2)
- Label a diagram that illustrates the basic features of a typical volcanic cone. (DOK Level 1)
- Summarize the characteristics of shield volcanoes and provide one example. (DOK Level 2)
- Describe the formation, size, and composition of cinder cones. (DOK Level 2)
- Explain the formation, distribution, and characteristics of composite volcanoes. (DOK Level 4)
- Discuss the major geologic hazards associated with volcanoes. (DOK Level 3)
- List and describe volcanic landforms other than volcanic cones. (DOK Level 2)
- Relate the distribution of volcanic activity to plate tectonics. (DOK Level 4)

Core Activities and Corresponding Instructional Methods:

- Reading of Chapters 4 and 5 in Textbook
- Direct Instruction (lecture with fill-in note pages for student completion)
- Online Chapter 4 and 5 Independent Practice and Review through the Pearson Mastering Geology website
- “Ward's® Igneous Rock Collection Igneous Rock Identification Lab” or equivalent.

Assessments:

- Diagnostic: Teacher observations and questioning
- Formative: student responses to independent practice
- Summative: Unit 4 Test; Lab

Unit 5: Weathering and Soils Time/Days (7 days)

Standards (by number): 3.3.10.A1, 3.3.12.A1, 3.3.12.A2, 3.3.10.A3, 3.3.10.A8, CC.3.5.9-10.A., CC 3.5.11-12.A, CC.3.5.9-10.B, CC.3.5.11-12.B, CC.3.5.9-10.C, CC.3.5.11-12.C, CC.3.5.9-10.D, CC3.5.11-12.D, CC.3.5.9-10.E, CC.3.5.11-12.E.

Anchors: A1.1.1.1, A1.1.1.3, A1.2.1.1

Eligible Content: Chapter 6 of textbook: Weathering, Mechanical Weathering, Chemical Weathering, Rates of Weathering, Soil, Controls of Soil Formation, The Soil Profile, Classifying Soils, The Impact of Human Activities on Soil, Weathering and Ore Deposits.

Objectives: Students shall:

- Define weathering and distinguish between the two main categories of weathering. (DOK Level 2)
- List and describe four examples of mechanical weathering. (DOK Level 2)
- Discuss the importance of water and carbonic acid in chemical weathering processes. (DOK Level 3)
- Summarize the factors that influence the type and rate of rock weathering. (DOK Level 4)
- Define soil and explain why soil is referred to as an interface. (DOK Level 3)
- List and briefly discuss five controls of soil formation. (DOK Level 2)
- Sketch, label, and describe an idealized soil profile. (DOK Level 2)
- Explain the need for classifying soils. (DOK Level 3)
- Discuss the detrimental impact of human activities on soil. (DOK Level 4)
- Relate weathering to the formation of certain ore deposits. (DOK Level 4)

Core Activities and Corresponding Instructional Methods:

- Reading of Chapter 6 in Textbook
- Direct Instruction (lecture with fill-in note pages for student completion)
- Online Chapter 6 Independent Practice and Review through the Pearson Mastering Geology website
- “My NASA Data - Lesson Plans - Create Your Own Soil Profile Activity” or equivalent

Assessments:

- Diagnostic: Teacher observations and questioning
- Formative: student responses to independent practice
- Summative: Unit 5 Test; Lab

Unit 6: Sedimentary Rocks Time/Days (7 days)

Standards (by number): 3.3.10.A1, 3.3.12.A1, 3.3.10.A2, 3.3.10.A3, 3.3.10.A7, 3.3.12.A7, 3.3.12.A8, CC.3.5.9-10.A., CC 3.5.11-12.A, CC.3.5.9-10.B, CC.3.5.11-12.B, CC.3.5.9-10.C, CC.3.5.11-12.C, CC.3.5.9-10.D, CC3.5.11-12.D, CC.3.5.9-10.E, CC.3.5.11-12.E.

Anchors: A1.1.1.1, A1.1.1.3, A1.2.1.1

Eligible Content: Chapter 7 of textbook: The Importance of Sedimentary Rocks, Origins of Sedimentary Rock, Detrital Sedimentary Rocks, Chemical Sedimentary Rocks, Coal: An Organic Sedimentary Rock, Turning Sediment into Sedimentary Rock: Diagenesis and Lithification, Classification of Sedimentary Rocks, Sedimentary Rocks Represent Past Environments, Resources from Sedimentary Rocks, The Carbon Cycle and Sedimentary Rocks.

Objectives: Students shall:

- Discuss the importance of sedimentary rocks to the study of geology and to the general public. (DOK Level 3)
- Summarize the part of the rock cycle that pertains to sediments and sedimentary rocks and distinguish among the three categories of sedimentary rocks. (DOK Level 3)
- Discuss the primary basis for distinguishing among detrital rocks and describe how the origin and history of such rocks might be determined. (DOK Level 3)
- Explain the process involved in the formation of chemical sedimentary rocks and describe several examples. (DOK Level 3)
- Outline the successive stages in the formation of coal. (DOK Level 2)
- Describe the processes that convert sediment into sedimentary rock and other changes associated with burial. (DOK Level 3)
- Summarize the criteria used to classify sedimentary rocks. (DOK Level 2)
- Distinguish among three broad categories of sedimentary environments and provide an example of each. List several sedimentary structures and explain why these features are useful to geologists. (DOK Level 2)
- Distinguish between the two broad groups of nonmetallic mineral resources. Discuss three important fossil fuels associated with sedimentary rocks. (DOK Level 2)
- Relate weathering processes and sedimentary rocks to the carbon cycle. (DOK Level 4)

Core Activities and Corresponding Instructional Methods:

- Reading of Chapter 7 in Textbook
- Direct Instruction (lecture with fill-in note pages for student completion)
- Online Chapter 7 Independent Practice and Review through the Pearson Mastering Geology website
- “Ward's® Sedimentary Rock Collection Sedimentary Rock Identification Lab” or equivalent.

Assessments:

- Diagnostic: Teacher observations and questioning
- Formative: student responses to independent practice
- Summative: Unit 6 Test; Lab

Unit 7: Metamorphism and Metamorphic Rocks Time/Days (6 days)

Standards (by number): 3.3.10.A1, 3.3.12.A1, 3.3.10.A2, 3.3.10.A3, 3.3.10.A7, 3.3.12.A7, 3.3.12.A8, CC.3.5.9-10.A., CC 3.5.11-12.A, CC.3.5.9-10.B, CC.3.5.11-12.B, CC.3.5.9-10.C, CC.3.5.11-12.C, CC.3.5.9-10.D, CC3.5.11-12.D, CC.3.5.9-10.E, CC.3.5.11-12.E.

Anchors: A1.1.1.1, A1.1.1.3, A1.2.1.1

Eligible Content: Chapter 8 of textbook: What is Metamorphism? What drives Metamorphism? Metamorphic Textures, Common Metamorphic Rocks, Metamorphic Environments, Metamorphic Zones.

Objectives: Students shall:

- Compare and contrast the environments that produce metamorphic, sedimentary, and igneous rocks. (DOK Level 2)
- List and distinguish among the four agents that drive metamorphism. (DOK Level 2)
- Explain how foliated and non-foliated textures develop. (DOK Level 3)
- List and describe the most common metamorphic rocks. (DOK Level 2)
- Write a statement that describes each of these metamorphic environments: contact metamorphism, hydrothermal metamorphism, subduction zone metamorphism, and regional metamorphism. (DOK Level 2)
- Explain how index minerals are used to establish the metamorphic grade of a rock body. (DOK Level 3)

Core Activities and Corresponding Instructional Methods:

- Reading of Chapter 8 in Textbook
- Direct Instruction (lecture with fill-in note pages for student completion)
- Online Chapter 8 Independent Practice and Review through the Pearson Mastering Geology website
- “Ward's® Metamorphic Rock Collection Metamorphic Rock Identification Lab” or equivalent.

Assessments:

- Diagnostic: Teacher observations and questioning
- Formative: student responses to independent practice
- Summative: Unit 7 Test; Lab

Unit 8: Earthquakes and Earth's Interior Time/Days (6 days)

Standards (by number): 3.3.10.A1, 3.3.12.A4, 3.3.12.A7, 3.3.10.A8, CC.3.5.9-10.A., CC 3.5.11-12.A, CC.3.5.9-10.B, CC.3.5.11-12.B, CC.3.5.9-10.C, CC.3.5.11-12.C, CC.3.5.9-10.D, CC3.5.11-12.D, CC.3.5.9-10.E, CC.3.5.11-12.E.

Anchors: A1.1.1.1, A1.1.1.3, A1.2.1.1

Eligible Content: Chapter 9 of textbook: What is an Earthquake? Seismology: The Study of Earthquake Waves, Locating the Source if an Earthquake, Determining the Size of Earthquakes, Earthquake Destruction, Where Do Most Earthquakes Occur? Can Earthquakes Be Predicted? Earth's Interior, Earth's Layers

Objectives: Students shall:

- Sketch and describe the mechanism that generates most earthquakes. (DOK Level 2)
- Compare and contrast the types of seismic waves and describe the principle of the seismograph. (DOK Level 2)
- Explain how seismographs are used to locate the epicenter of an earthquake. (DOK Level 2)
- Distinguish between intensity scales and magnitude scales. (DOK Level 2)
- List and describe the major destructive forces that earthquake vibrations can trigger. (DOK Level 2)
- Locate Earth's major earthquake belts on a world map and label the regions associated with the largest earthquakes. (DOK Level 2)
- Compare and contrast the goals of short-range earthquake predictions and long-range forecasts. (DOK Level 2)
- Explain how Earth acquired its layered structure and briefly describe how seismic waves are used to probe Earth's interior. (DOK Level 2)
- List and describe each of Earth's major layers. (DOK Level 2)

Core Activities and Corresponding Instructional Methods:

- Reading of Chapter 9 in Textbook
- Direct Instruction (lecture with fill-in note pages for student completion)
- Online Chapter 9 Independent Practice and Review through the Pearson Mastering Geology website
- "Locating an Earthquake" and "Earthquake Seismograph" Activities from Pearson *Earth Science* Lab Manual or equivalent

Assessments:

- Diagnostic: Teacher observations and questioning
- Formative: student responses to independent practice
- Summative: Unit 8 Test; Lab

Unit 9: Crustal Deformation and Mountain Building Time/Days (6 days)

Standards (by number): 3.3.10.A1, 3.3.12.A4, 3.3.12.A7, 3.3.10.A8, CC.3.5.9-10.A., CC 3.5.11-12.A, CC.3.5.9-10.B, CC.3.5.11-12.B, CC.3.5.9-10.C, CC.3.5.11-12.C, CC.3.5.9-10.D, CC3.5.11-12.D, CC.3.5.9-10.E, CC.3.5.11-12.E.

Anchors: A1.1.1.1, A1.1.1.3, A1.2.1.1

Eligible Content: Chapter 11 of textbook: Crustal Deformation, Fold: Rock Structures Formed by Ductile Deformation, Faults and Joints: Rock Structures Formed by Brittle Deformation, Mountain Building, Subduction and Mountain Building, Subduction and Mountain Building, Collisional Mountain Belts, What Causes Earth's Varied Topography?

Objectives: Students shall:

- Describe the three types of differential stress. Differentiate stress from strain. Compare and contrast brittle and ductile deformation. (DOK Level 2)
- List and describe five types of folds. (DOK Level 1)
- Sketch and briefly describe the relative motion of rock bodies located on opposite sides of normal, reverse, and thrust faults as well as both types of strike-slip faults. (DOK Level 2)
- Locate and name Earth's major mountain belts on a world map. (DOK Level 1)
- Sketch a cross-section of an Andean-type mountain belt and describe how its major features are generated. (DOK Level 3)
- Summarize the stages in the development of an Alpine-type mountain belt such as the Appalachians. (DOK Level 2)
- Explain the principle of isostasy and how it contributes to the elevated topography of young mountain bels like the Himalayas. (DOK Level 3)

Core Activities and Corresponding Instructional Methods:

- Reading of Chapter 11 in Textbook
- Direct Instruction (lecture with fill-in note pages for student completion)
- Online Chapter 11 Independent Practice and Review through the Pearson Mastering Geology website
- "Block Diagram Problems" Activity from *Earth Science Investigations* from the American Geological Institute or equivalent

Assessments:

- Diagnostic: Teacher observations and questioning
- Formative: student responses to independent practice
- Summative: Unit 9 Test; Lab

Unit 10: Running Water and Groundwater Time/Days (7 days)

Standards (by number): 3.3.10.A1, 3.3.12.A1, 3.3.10.A3, 3.3.10.A4, 3.3.10.A5, 3.3.10.A7, 3.3.10.A8, CC.3.5.9-10.A., CC 3.5.11-12.A, CC.3.5.9-10.B, CC.3.5.11-12.B, CC.3.5.9-10.C, CC.3.5.11-12.C, CC.3.5.9-10.D, CC3.5.11-12.D, CC.3.5.9-10.E, CC.3.5.11-12.E.

Anchors: A1.1.1.1, A1.1.1.3, A1.2.1.1

Eligible Content: Chapter 13 of textbook: Earth as a System: The Hydrologic Cycle, Running Water, Streamflow, The Work of Running Water, Stream Channels, Shaping Stream Valleys, Depositional Landforms, Flood and Flood Control & Chapter 14 of textbook: The Importance of Groundwater; Groundwater and the Water Table; Factors Influencing the Storage and Movement of Groundwater; How Groundwater Moves; Wells; Artesian Systems; Springs, Hot Springs, and Geysers; Environmental Problems

Objectives: Students shall:

- List the hydrosphere's major reservoirs and describe the different paths that water takes through the hydrologic cycle. (DOK Level 2)
- Describe the nature of drainage basins and river systems. Sketch and briefly explain four basic drainage patterns. (DOK Level 2)
- Discuss streamflow and the factors that cause it to change. (DOK Level 4)
- Outline the ways in which streams erode, transport, and deposit sediment. (DOK Level 2)
- Contrast bedrock and alluvial stream channels. Distinguish between two types of alluvial channels. (DOK Level 2)
- Contrast narrow V-shaped valleys, broad valleys with floodplains, and valleys that display incised meanders or stream terraces. (DOK Level 2)
- List the major depositional landforms associated with streams and describe the formation of these features. (DOK Level 2)
- Summarize the various categories of floods and the common measures of flood control. (DOK Level 2)

Core Activities and Corresponding Instructional Methods:

- Reading of Chapters 13 and 14 in Textbook
- Direct Instruction (lecture with fill-in note pages for student completion)
- Online Chapters 13 and 14 Independent Practice and Review through the Pearson Mastering Geology website
- "River Processes Using the Streamtable" lab from serc.carleton.edu or equivalent

Assessments:

- Diagnostic: Teacher observations and questioning
- Formative: student responses to independent practice
- Summative: Unit 10 Test; Lab

Unit 11: Glaciers and Glaciation Time/Days (6 days)

Standards (by number): 3.3.10.A1, 3.3.12.A1, 3.3.10.A3, 3.3.10.A4, 3.3.10.A5, 3.3.10.A7, 3.3.10.A8, CC.3.5.9-10.A., CC 3.5.11-12.A, CC.3.5.9-10.B, CC.3.5.11-12.B, CC.3.5.9-10.C, CC.3.5.11-12.C, CC.3.5.9-10.D, CC3.5.11-12.D, CC.3.5.9-10.E, CC.3.5.11-12.E.

Anchors: A1.1.1.1, A1.1.1.3, A1.2.1.1

Eligible Content: Chapter 15 of textbook: Glaciers: A Part of Two Basic Cycles, Formation and Movement of Glacial Ice, Glacial Erosion, Glacial Deposits, Other Effects of Ice Age Glaciers, The Ice Age

Objectives: Students shall:

- Explain the role of glaciers in the hydrologic and rocks cycles and describe the different types of glaciers, their characteristics, and their present-day distribution. (DOK Level 4)
- Describe how glaciers move, the rates at which they move, and the significance of the glacial budget. (DOK Level 3)
- Discuss the processes of glacial erosion. Identify and describe the major features created by glacial erosion. (DOK Level 2)
- Distinguish between the two basic types of glacial drift. List and describe the major depositional features associated with glacial landscapes. (DOK Level 2)
- Describe and explain several important effects of Ice Age glaciers other than erosional and depositional landforms. (DOK Level 2)
- Briefly discuss the development of glacial theory and summarize current ideas on the causes of ice ages. (DOK Level 3)

Core Activities and Corresponding Instructional Methods:

- Reading of Chapter 15 in Textbook
- Direct Instruction (lecture with fill-in note pages for student completion)
- Online Chapter 15 Independent Practice and Review through the Pearson Mastering Geology website
- “Great Glaciers” lab from Flinn Scientific or equivalent

Assessments:

- Diagnostic: Teacher observations and questioning
- Formative: student responses to independent practice
- Summative: Unit 11 Test; Lab

Unit 12: Geologic Time and Earth's Evolution Through Geologic Time Time/Days (7 days)

Standards (by number): 3.1.10.A1, 3.1.B.A1, 3.3.10.A3, 3.3.12.A3, 3.3.10.A5, 3.3.10.A6, 3.3.10.A7, 3.3.12.A7, 3.3.10.A8, CC.3.5.9-10.A., CC 3.5.11-12.A, CC.3.5.9-10.B, CC.3.5.11-12.B, CC.3.5.9-10.C, CC.3.5.11-12.C, CC.3.5.9-10.D, CC3.5.11-12.D, CC.3.5.9-10.E, CC.3.5.11-12.E.

Anchors: A1.1.1.1, A1.1.1.3, A1.2.1.1

Eligible Content: Chapter 18 of textbook: Creating a Time Scale: Relative Dating Principles, Fossils: Evidence of Past Life, Correlation of Rock Layers, Dating with Radioactivity, The Geologic Time Scale, Determining Numerical Dates for Sedimentary Strata and Chapter 19 of textbook: Is Earth Unique? , Birth of a Planet, Origin and Evolution of the Atmosphere and Oceans, Precambrian History: The Formation of Earth's Continents, Geologic History of the Phanerozoic: The Formation of Earth's Modern Continents, Earth's First Life, Paleozoic Era: Life Explodes

Objectives: Students shall:

- Distinguish between numerical and relative dating and apply relative dating principles to determine a time sequence of geologic events. (DOK Level 2)
- Define fossil and discuss the conditions that favor the preservation of organisms as fossils. List and describe the different types of fossils. (DOK Level 3)
- Explain how rocks of similar age that are in different places can be matched up. (DOK Level 3)
- Discuss three types of radioactive decay and explain how radioactive isotopes are used to determine numerical dates. (DOK Level 3)
- Distinguish among the four basic time units that make up the geologic time scale and explain why the time scale is considered to be a dynamic tool. (DOK Level 3)
- Explain how reliable numerical dates are determined for layers of sedimentary rock. (DOK Level 3)
- List the principal characteristics that make Earth unique among the planets. (DOK Level 1)
- Outline the major stages in the evolution of Earth, from the Big Bang to the formation of our planet's layered internal structure. (DOK Level 2)
- Describe how Earth's atmosphere and oceans have formed and evolved through time. (DOK Level 3)
- Explain the formation of continental crust, how continental crust becomes assembled into continents, and the role that the supercontinent cycle has played in this process. (DOK Level 3)
- List and discuss the major geologic events in the Paleozoic, Mesozoic, and Cenozoic eras. (DOK Level 2)
- Describe some of the hypotheses on the origin of life and the characteristics of early prokaryotes, eukaryotes, and multi-celled organisms. (DOK Level 3)
- Discuss the major developments in the history of life during the Paleozoic, Mesozoic, and Cenozoic eras. (DOK Level 2)

Core Activities and Corresponding Instructional Methods:

- Reading of Chapters 18 and 19 in Textbook
- Direct Instruction (lecture with fill-in note pages for student completion)
- Online Chapter 18 and 19 Independent Practice and Review through the Pearson Mastering Geology website

- “Geologic Time Scale” lab from University of Colorado Boulder Museum of Natural History or equivalent

Assessments:

- Diagnostic: Teacher observations and questioning
- Formative: student responses to independent practice
- Summative: Unit 12 Test; Lab

Unit 13: Global Climate Change Time/Days (6 days)

Standards (by number): 3.3.10.A1, 3.3.12.A1, 3.3.10.A6, 3.3.12.A6, 3.3.10.A7, 3.3.10.A8, CC.3.5.9-10.A., CC 3.5.11-12.A, CC.3.5.9-10.B, CC.3.5.11-12.B, CC.3.5.9-10.C, CC.3.5.11-12.C, CC.3.5.9-10.D, CC3.5.11-12.D, CC.3.5.9-10.E, CC.3.5.11-12.E.

Anchors: A1.1.1.1, A1.1.1.3, A1.2.1.1

Eligible Content: Chapter 20 of textbook: Climate and Geology, Detecting Climate Change, Some Atmospheric Basics, Heating the Atmosphere, Natural Causes of Climate Change, Human Impact on Global Climate, Climate-Feedback Mechanisms, How Aerosols Influence Climate, Some Possible Consequences of Global Warming

Objectives: Students shall:

- List the major parts of the climate system and some connections between climate and geology. (DOK Level 2)
- Explain why unraveling past climate changes is important and discuss several ways in which such changes are detected. (DOK Level 4)
- Discuss the composition of the atmosphere and describe the atmosphere's vertical changes in pressure and temperature. (DOK Level 2)
- Outline the basic processes involved in heating the atmosphere. (DOK Level 3)
- Discuss hypotheses that relate to natural causes of climate change. (DOK Level 2)
- Summarize the nature and cause of the atmosphere's changing composition since about 1750. Describe the climate's response. (DOK Level 2)
- Contrast positive- and negative-feedback mechanisms and provide examples of each. (DOK Level 2)
- Discuss the possible impacts of aerosols on climate change. (DOK Level 3)
- Summarize some of the possible consequences of global warming. (DOK Level 4)

Core Activities and Corresponding Instructional Methods:

- Reading of Chapter 20 in Textbook
- Direct Instruction (lecture with fill-in note pages for student completion)
- Online Chapter 20 Independent Practice and Review through the Pearson Mastering Geology website
- "The Greenhouse Effect" lab from University of Colorado PhET or equivalent

Assessments:

- Diagnostic: Teacher observations and questioning
- Formative: student responses to independent practice
- Summative: Unit 13 Test; Lab

Checklist to Complete and Submit:

(Scan and email)

_____ Copy of the curriculum using the template entitled "Planned Instruction," available on the district website.

_____ The primary textbook form(s).

_____ The appropriate payment form, in compliance with the maximum curriculum writing hours noted on the first page of this document.

Each principal and/or department chair has a schedule of First and Second Readers/Reviewers. Each Reader/Reviewer must sign & date below.

First Reader/Reviewer Printed Name_____

First Reader/Reviewer Signature_____ Date_____

Second Reader/Reviewer Printed Name_____

Second Reader/Reviewer Signature _____ Date_____