Unit 5: Geologic Time

Content Area: **Template**
Course(s):
Time Period:
Length:
Status: **Published**

State Mandated Topics Addressed in this Unit

This unit aligns with the following NJ Student Learning Standards for Science (NJSLS-S) and supports students in analyzing geologic time, fossil evidence, and Earth system evolution:

NJSLS-S Performance Expectations:

- **HS-ESS1-5**: Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.
- **HS-ESS1-6**: Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.
- **HS-ESS2-7**: Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.

Integrated Mathematics Standards (NJSLS-M):

- **S-ID.B.6**: Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

Science & Engineering Practices (SEPs):

- SEP 1: Asking Questions and Defining Problems
- SEP 2: Developing and Using Models
- SEP 4: Analyzing and Interpreting Data
- SEP 6: Constructing Explanations and Designing Solutions
- SEP 7: Engaging in Argument from Evidence
- SEP 8: Obtaining, Evaluating, and Communicating Information

Crosscutting Concepts:

- Patterns
- Scale, Proportion, and Quantity
- Stability and Change
- Systems and System Models

These standards support instructional objectives including:

- Understanding geologic and fossil evidence for Earth's history
- Applying radiometric dating and stratigraphy to reconstruct geologic events
- Using index fossils and rock layers to interpret the geologic time scale
- Exploring mass extinction, adaptation, and evolutionary change over time
- Evaluating the interconnectedness of climate, tectonics, and biological evolution
- Analyzing models that show changes in Earth's systems across geologic eras

Enduring Understanding

Scientists use multiple lines of evidence—including radiometric dating, rock layers, and fossils—to reconstruct Earth's long and dynamic history. Through an understanding of the geologic time scale and evolutionary processes, students can make sense of how life on Earth has changed over billions of years. A common misconception is that evolution lacks evidence or is merely a theory in the casual sense. In fact, evolution is a well-substantiated scientific explanation supported by a vast and growing body of evidence. This unit will clarify those misconceptions and highlight how Earth's geologic and biological history are deeply intertwined.

Standards

SCI.HS-ESS1-6	Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth’s formation and early history.
SCI.HS-ESS2-7	Construct an argument based on evidence about the simultaneous coevolution of Earth’s systems and life on Earth.
9-12.HS-ESS1-5	Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.

Essential Questions

- How do we study past and extinct life forms?
- How does the fossil record provide insight into the evolution and extinction of species?
- How have major changes in Earth’s systems influenced the development of life over time?
- How old is Planet Earth and has it ever changed?
- What events define the boundaries between geologic eras?

- What tools and evidence do scientists use to construct Earth's geologic timeline?

Objectives

- Analyze fossil evidence to infer the behavior, environment, and evolutionary history of organisms.
- Compare and Contrast dating methods
- Construct scientific arguments using fossil and rock evidence to support claims about Earth's past.
- Define fossil formations and how fossils are used to interpret earth's history
- Describe evidence of the age of the Earth
- Describe experimental evidence of how life began on Earth
- Describe how index fossils are used to correlate the ages of rock layers across wide geographic areas.
- Describe the formation of the atmosphere and the oceans
- Distinguish between relative and absolute dating techniques and explain their applications.
- Evaluate the impact of catastrophic events (e.g., asteroid impacts, volcanic activity) on life and geologic change.
- Explain how changes in Earth's systems (e.g., atmosphere, climate, tectonics) influenced the evolution of life.
- Explain how climate change affected life- forms during the Cenozoic
- Explain why scientists need a geologic time scale
- Identify and describe major divisions of geologic time (eons, eras, periods, epochs) and the dominant life forms in each.
- Identify possible causes of extinction of the dinosaurs
- Interpret the geologic time scale and identify key events in Earth's history, including major extinction and diversification events.
- Model how sediment deposition and tectonic activity contribute to the fossil record.
- Summarize the changes in the Paleozoic life- forms

Instructional Tasks/Activities

Student progress will be measured by formative and summative assessments. To maximize student understanding current and cumulative topics will be assessed weekly. This unit is sequenced to begin with an informal assessment of prior knowledge of topics within the unit and determine any misconceptions. Students will then build small concrete blocks of information pertinent to mastery of this unit. Finally, students will be asked to use this information to evaluate higher level problems. This unit will end with a formal assessment common to all college prep students.

- Common assessment chapter test
- Common assessment quiz
- Constructed response
- Do nows and/or exit slips
- Exit Cards (answer to daily objective questions
- Fossil Brochure Project

- Fossil Notes and Questions
- Fossil Research Assignment
- Geologic Time Lesson and Notes Questions
- Geologic Time Test
- Geologic Time Test Review
- Geologic Timeline Project
- Graphic organizers or models
- Guided practice
- Homework
- Homework
- Individual, small, and large group work
- Laboratory investigations within small groups
- Review Activity
- Section Review Questions
- Study Guide Packets
- Vocabulary flash cards or map (word, picture, sentence, example)

Assessment Procedure

Student progress will be measured by formative and summative assessments. To maximize student understanding current and cumulative topics will be assessed weekly. This unit is sequenced to begin with an informal assessment of prior knowledge of topics within the unit and determine any misconceptions. Students will then build small concrete blocks of information pertinent to mastery of this unit. Finally, students will be asked to use this information to evaluate higher level problems. This unit will end with a formal assessment common to all college prep students.

- Flashcards and/or drill and practice
- Inquiry based activities with reflective discussion
- Laboratory groups
- Lecture with note taking or guided notes
- Online models and simulators
- Power point presentations
- Whole and small group discussions

Recommended Technology Activities

- Appropriate Content Specific Online Resource
- Chromebook
- Copy/Paste Content Specific Link Here
- Copy/Paste Content Specific Link Here
- Copy/Paste Content Specific Link Here

- Gimkit
- GoGuardian
- Google Classroom
- Google Docs
- Google Forms
- Google Slides
- Kahoot
- MagicSchool AI
- Other- Specified in Lesson
- Quiziz
- Screencastify

Accommodations & Modifications & Differentiation

Accommodations and Modifications should be used to meet individual needs. Their IEP and 504 plans should be used in addition to the following suggestions.

Gifted and Talented

- Compare & Contrast
- Conferencing
- Debates
- Jigsaw
- Peer Partner Learning
- Problem Solving
- Structured Controversy
- Think, Pair, Share
- Tutorial Groups

Instruction/Materials

- alter format of materials (type/highlight, etc.)
- color code materials
- eliminate answers
- extended time
- extended time
- large print
- modified quiz

- modified test
- Modify Assignments as Needed
- Modify/Repeat/Model directions
- necessary assignments only
- Other (specify in plans)
- other- named in lesson
- provide assistance and cues for transitions
- provide daily assignment list
- read class materials orally
- reduce work load
- shorten assignments
- study guide/outline
- utilize multi-sensory modes to reinforce instruction

Environment

- alter physical room environment
- assign peer tutors/work buddies/note takers
- assign preferential seating
- individualized instruction/small group
- modify student schedule (Describe)
- other- please specify in plans
- provide desktop list/formula

Honors Modifications

Resources

- Resource 1
- Resource 2
- Resource 3
- Resource 4
- Resource 5