Introduction to Geology EarthSci 1300

Fall 2024, V2

This syllabus is subject to change over the course of the semester

Lectures:	M, W, F	8:00 to 8:50	(Latham 125)
Lab:	Tues. **Sec. 02**:	8:00 to 9:50	(Latham Hall 111)

Professor:	Dr. Chad Heinzel (116 Latham Hall)
Office hours:	M, W, F: 9 to 10AM and upon request (open to in person or Zoom) Tuesday 10 to 11AM
Office phone:	273-6168
Email:	chad.heinzel@uni.edu
Class website:	www.exploreiowageology.org > Education > Fall 2024 > Intro. to Geology
Social Media	Instagram, Tiktok @Ubreccia
Text:	Lecture: Earth – Portrait of a Planet 6th or 7th ed., by Marshak (Recommended) Lab: Covered – will be provided for you via handouts value @ approx. $15.00
Credits:	Four - This course meets the Course Credit Hour Expectation outlined in the Course Catalog. You should expect to work approximately 2 hours per week outside of class for every course credit hour, (so about 8 more hours per week).
Final Exam:	**Monday, December 16, 8am to 9:50am**

UNI Intro. to Geology Learning Outcomes -

Your liberal arts education - Courses in natural science promote an understanding of science as a human process that investigates matter and energy acting within complex organic and inorganic systems. Fundamental principles of both physical and life sciences are included.

Specifically you will -

1. Obtain experience utilizing scientific methodology (observation, hypotheses, experimentation, interpretation, and theory)
2. Gain a fundamental understanding of the Earth (properties and processes)
3. Begin to develop a basic science/geology 'tool kit' so you can actively explore your environment and/or properly interpret geologic articles/videos.
    a. Characterize then name minerals and rocks to gain an understanding of the rock cycle
    b. Learn and apply knowledge of plate tectonics, geophysics, and structural geology to interpret earth history
    c. Use topographic and geologic maps to interpret landscapes
    d. Distinguish soil from dirt; climate from weather; erosion from deposition and gain an understanding of how the Earth's, internal and external, energy sources lead to specific processes and products.
    e. Understand basic processes and products of past and current climate change and the importance of water (rivers, groundwater, oceans, glaciers)
4. By the end of Intro. to Geology you should be able to discuss its 'Big Ideas', page five and six, with your peers.
5. Be prepared for taking upper level earth science courses, allowing you to further explore what you find most fascinating and if you are up for it a meaningful career.

Course Description –

EARTHSCI 1300 (870:031). Introduction to Geology — 4 hrs., Introduction to the physical environment, emphasizing materials of the Earth and processes that lead to changes within and on the Earth. Lab emphasis includes rocks and minerals, geologic processes, and landscape development. Discussion, 3 periods; lab, 2 periods. Prerequisite(s): student must have satisfied university entrance requirements in English and Mathematics. (Fall and Spring)

	Class Schedule	Text/Reading
Prelude* (Aug. 26/30)	Geology and the Earth's Environments Lab: None, week starts on Th.	Prelude
Week Two (Sept. 2/6)	Earth History (*No class Mon. Sept 2*) Lab: Observations and Descriptions	Ch. 12 and 13
Week Three (Sept. 9/13)	Minerals Lab: Physical Properties of Minerals, Minerals in everyday life	Ch. 5
Week Four (Sept. 16/20)	Igneous to Metamorphic Rocks and the Rock Cycle Lab: Mineral Identification	Ch. 6 and 8 Interludes - A and C
Week Five (Sept. 23/27)	Sedimentary Rock, Weathering & Soil Lab: Igneous and Metamorphic rock Identification **Quiz 1 – Minerals, Rocks and the Rock Cycle (in Lab)**	Ch. 7 Interlude B
Week Six (Sept.30/Oct.4)	Fossils, Minerals and Rocks: Important Resources Lab: Sedimentary Rocks	Ch. 14 and 15 Interlude E
Week Seven (Oct. 7/11)	Plate Tectonics Lab: **EXAM 1 (Minerals and Rocks as Resources and History)**	Ch. 2, 3, 4
Week Eight (Oct. 14/18)	Earth's Past Climates Lab: Topographic Maps	Ch. 23
Week Nine (Oct. 21/25)	Glaciers Lab: Maps and Glaciers	Ch. 22
Week Ten (Oct 28/Nov.1)	Rivers Lab: Maps and Rivers	Ch. 17
Week Eleven (Nov. 4/8)	Groundwater Lab: Groundwater modeling, Hydrogeology II	Ch. 19
Week Twelve (Nov. 11/15)	Oceans and Coasts Lab: **EXAM 2 (Plate Tectonics, Climates: Ice & Water)**	Ch. 18
Week Thirteen (Nov. 18/22)	Geologic Hazards: E.g. Earthquakes & Volcanoes Lab: Seismic Studies	Ch. 9 and 10
Week Fourteen (Nov 25/29)	Fall Break No Class	
Week Fifteen (Dec 2/6)	Geology and Sustainability Lab:	
Week Sixteen (Dec 9/13)	Geology and Climate Change Lab: Open for review	

Finals Week
(Dec. 16-20) **Monday, Dec. 16, 8am to 9:50am, Latham 125**

Grading procedure and policies

A >93%, A->90%;
B+>87%, B >83%, B->80%
C+>77%, C >73%, C->70%
D+>67%, D >63%, D->60%
F < 60%

If you earn 93% of the total points you are guaranteed a grade of A. The lower limit for each grade range will not move up. **A curve will not be used in this class.** I will try to use e-learning to help you keep track of your grade throughout the course. *Note I keep a separate excel sheet for your grades. If you see something wrong on e-learning, it is likely a typo, I have not had time to update it, if this happens just let me know and I will fix the error. I also recommend that you keep track of your learning and scores by reviewing everything that is graded and handed back to you.

There will be no make-up exams after the scheduled exams are given. Should you have a scheduled conflict, please visit with me at least two weeks before the exam date. An unexcused absence during an exam will lead to an automatic zero. If there is an emergency, we will work together on a solution.

Approximate point distribution *This may change slightly through the semester*

		Points
Pop Quiz	2 @ 10	= 20
Tests	#1 @ 100	= 100
	#2 @ 100	= 100
Final Exam	Final @ 140	= 140
Lab assignments (+ =10; √= 8; - = 6)	10 @ 10	= 100
Participation/Attendance	20	= 20
	Total =	**480 points**

Class Attendance and Participation

Course questions will reflect and cover class 1) discussions, 2) field and lab activities, 3) text/journal readings, and 4) small group activities. Anything I say/discuss is fair game for a quiz or exam. Attendance is essential. If you listen, ask questions, take very good notes, and study for tests chances for earning a good grade are high! And the general guidelines of UNI's attendance policy will be employed, https://policies.uni.edu/306).

UNI - Statements for Non-discrimination and Accessibility

UNI Information and regulations regarding Free Speech, Equity, Accessibility, The Learning Center and potential Covid guidelines should be accessed here… https://provost.uni.edu/syllabus-statements

Additional recommendations from UNI's Center for Excellence in Teaching & Learning

A. Course materials, accessibility and opportunities for enhanced success

a. Textbook – Portrait of a Planet 5th or 6th ed., by Marshak (Recommended), Labbook UNI Intro to Geology under Heinzel (required) will be available from UNI Bookstore.
b. Computers, Are available throughout campus. Having access to a computer and the internet is important, especially if we are forced to move online.
c. Course webpage – You will have access to some course materials and additional learning resources through the following webpage - https://www.exploreiowageology.org
d. UNI-E-Learning – https://elearning.uni.edu/, This software will be used to help you keep track of your course progress - primarily scores from lab work, tests and participation.

B. Introduction to Geology classroom civility –

a. Be respectful to everyone at all times.
b. Be on time, pay attention (do not hold side conversations during class), and participate.
c. Represent UNI well when on and off campus.
d. Reduce use and silence phones in class and during field trips.
e. Social distancing and masks are required, please be respectful and safe ☺

C. Class Attendance and Participation

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UNI – Statements for Student Success

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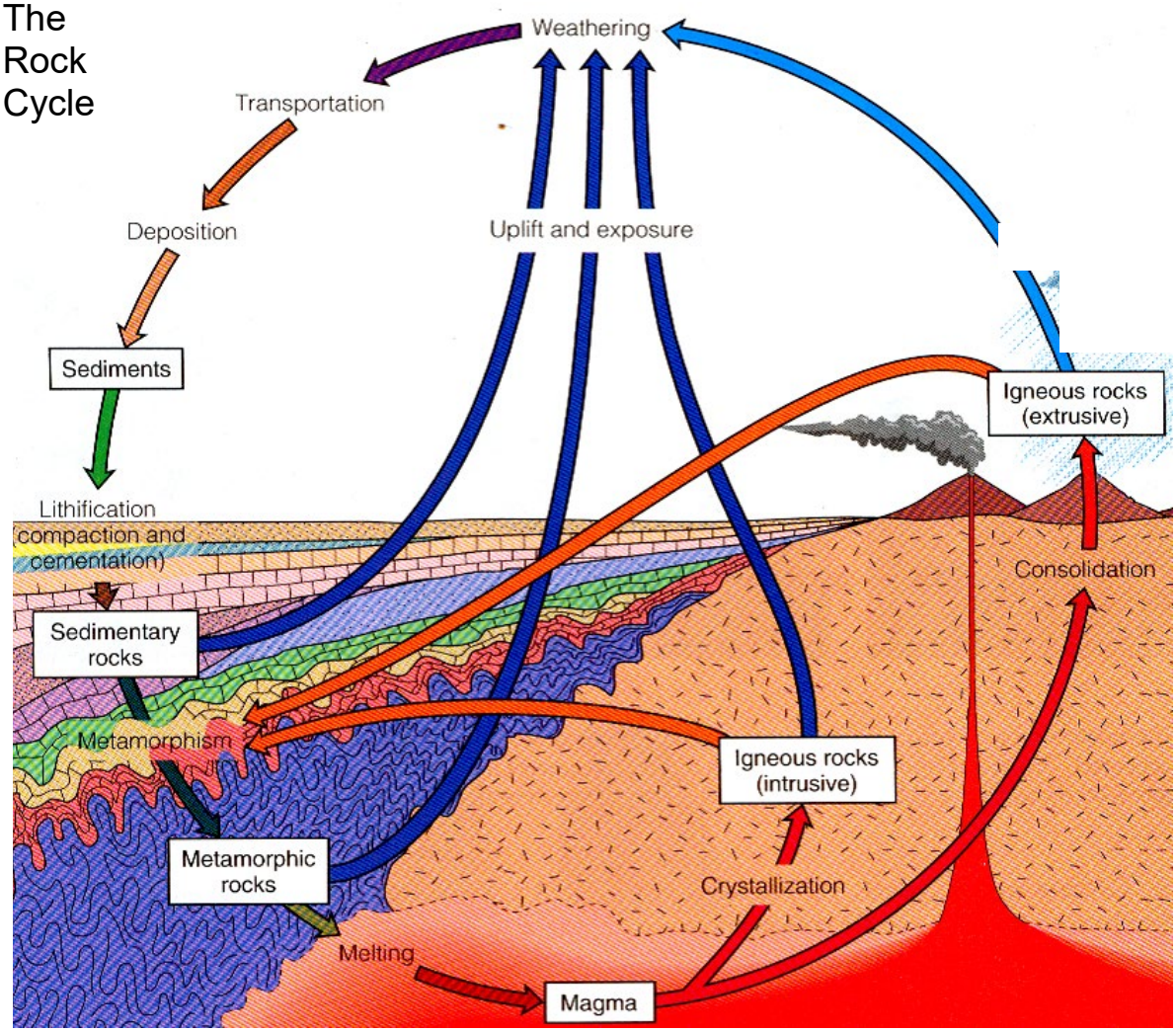
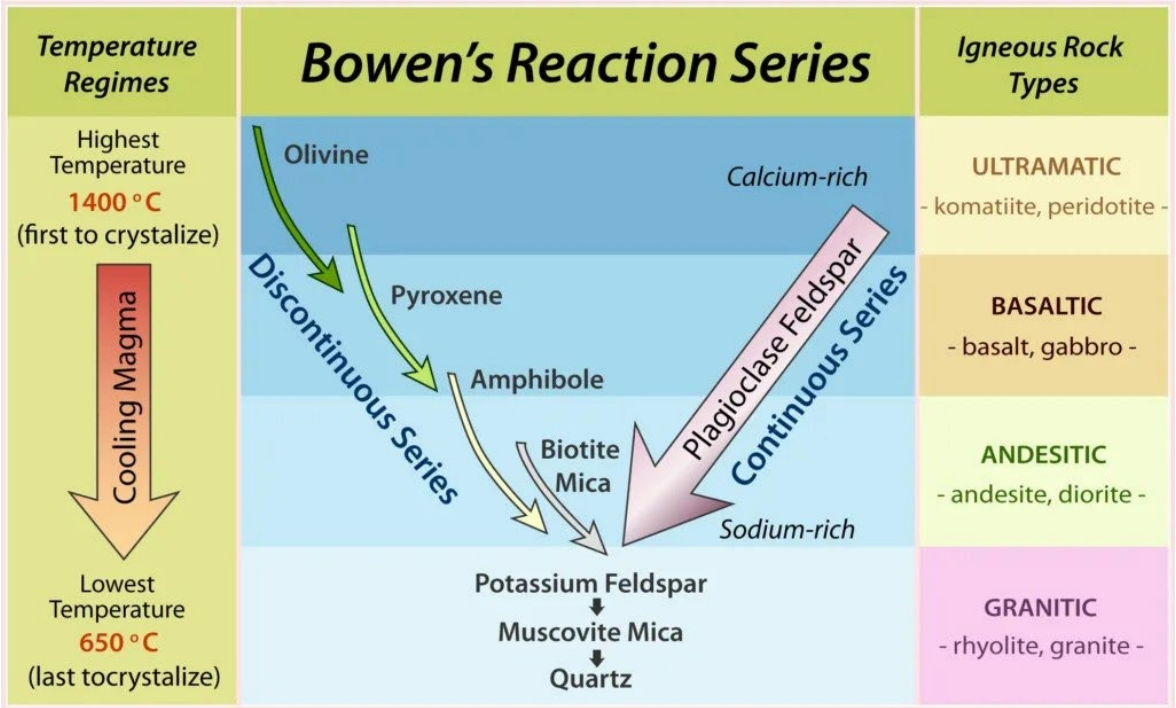
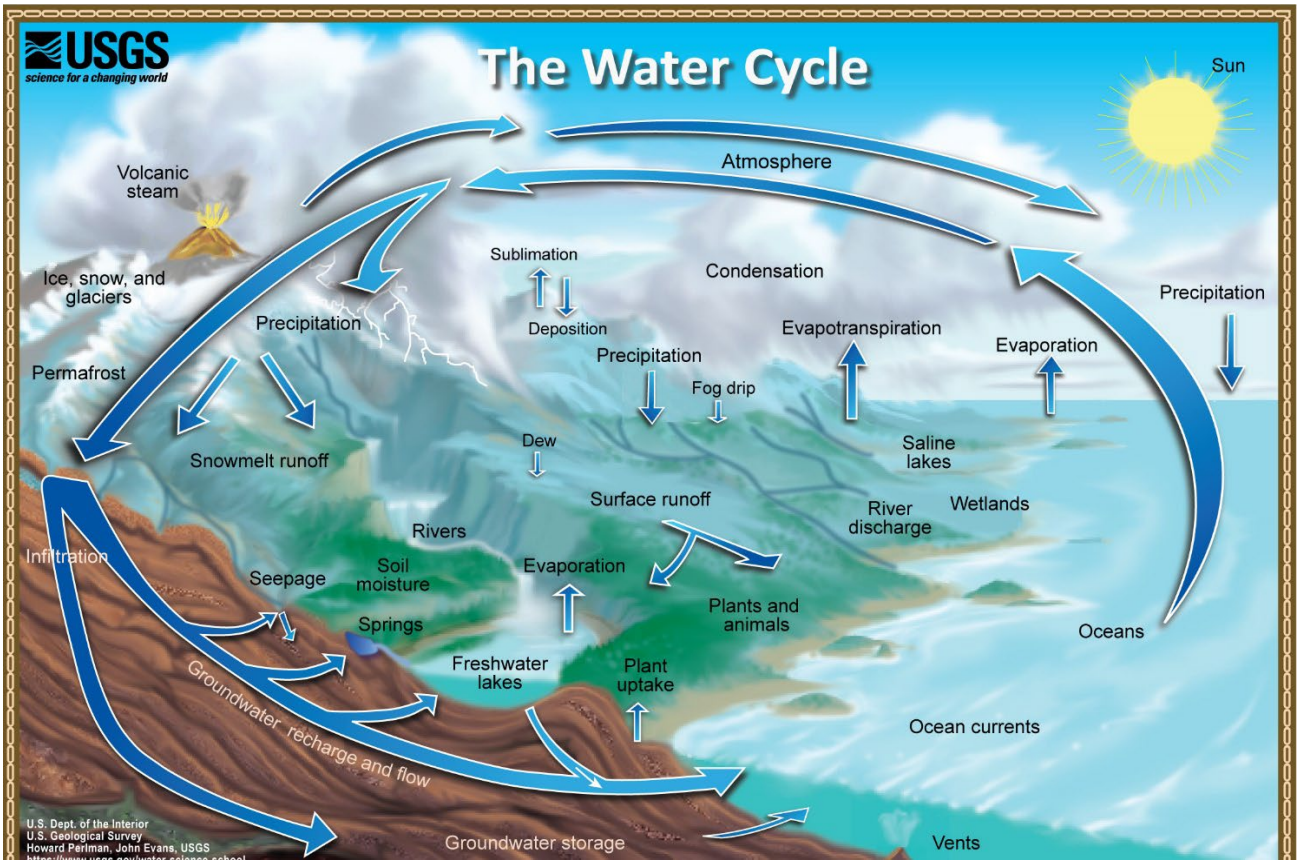
D. Pro-Tips for doing well in this class

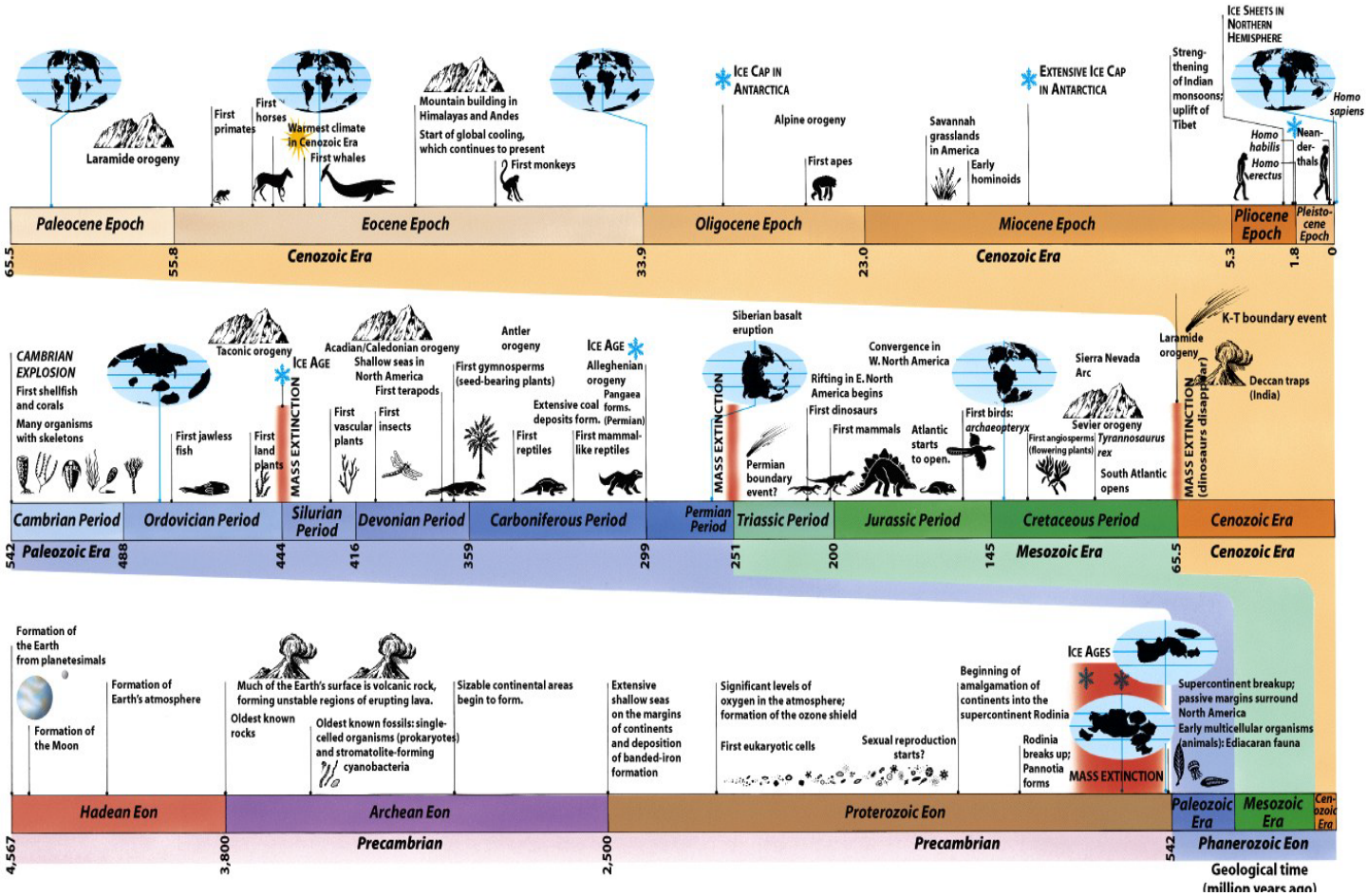
- Do the reading assignments before you come to class! I may ask 2 to 4 test questions directly from the textbook readings - that were not discussed in class.
- Be a good detective, the concepts that you will be learning are connected, so if you don't understand a concept (early on) make sure you ask questions, because you will be using that knowledge again.
- If we have one lecture on the origin of the Earth and three on plate tectonics then take a test, the majority of questions will be about plate tectonics.
- Take great notes, there will be a lot of information coming your way.
- Figure out what is most interesting to you and go with it, I will do everything that I can to help you reach your goals;
- Ask a lot of questions in lecture and lab;
- Have fun, Geology is about exploring and learning from our natural surroundings don't be afraid to get dirty!

The Rock Cycle






USGS
science for a changing world
The Water Cycle
Sun
Atmosphere
Volcanic steam
Ice, snow, and glaciers
Sublimation
Condensation
Deposition
Precipitation
Evapotranspiration
Evaporation
Precipitation
Permafrost
Precipitation
Fog drip
Snowmelt runoff
Dew
Saline lakes
Surface runoff
River discharge
Wetlands
Rivers
Infiltration
Seepage
Soil moisture
Evaporation
Plants and animals
Springs
Oceans
Freshwater lakes
Plant uptake
Groundwater recharge and flow
Ocean currents
U.S. Dept. of the Interior
U.S. Geological Survey
Howard Perlman, John Evans, USGS
Groundwater storage
Vents


Laramide orogeny
First primates
First horses
Warmest climate in Cenozoic Era
First whales
Mountain building in Himalayas and Andes
Start of global cooling, which continues to present
First monkeys
Ice Cap in Antarctica
Alpine orogeny
First apes
Savannah grasslands in America
Early hominoids
Extensive Ice Cap in Antarctica
Strengthening of Indian monsoons; uplift of Tibet
Ice Sheets in Northern Hemisphere
Homo sapiens
Homo habilis
Homo erectus
Neanderthals
Paleocene Epoch
Eocene Epoch
Oligocene Epoch
Miocene Epoch
Pliocene Epoch
Pleistocene Epoch
65.5
55.8
33.9
23.0
5.3
1.8
0
Cenozoic Era
Cenozoic Era
CAMBRIAN EXPLOSION
First shellfish and corals
Many organisms with skeletons
Taconic orogeny
Ice Age
First jawless fish
First land plants
Mass extinction
Acadian/Caledonian orogeny
Shallow seas in North America
First terapods
First vascular plants
First insects
Antler orogeny
First gymnosperms (seed-bearing plants)
Ice Age
Alleghenian orogeny
Pangaea forms. (Permian)
Extensive coal deposits form.
First reptiles
First mammal-like reptiles
Siberian basalt eruption
Mass extinction
Permian boundary event?
Convergence in W. North America
Rifting in E. North America begins
First dinosaurs
First mammals
Atlantic starts to open.
First birds: archaeopteryx
Sierra Nevada Arc
Sevier orogeny
First angiosperms (flowering plants)
Tyrannosaurus rex
South Atlantic opens
Laramide orogeny
K-T boundary event
Deccan traps (India)
Mass extinction (dinosaurs disappear)
Cambrian Period
Ordovician Period
Silurian Period
Devonian Period
Carboniferous Period
Permian Period
Triassic Period
Jurassic Period
Cretaceous Period
Cenozoic Era
542
488
444
416
359
299
251
200
145
65.5
Paleozoic Era
Mesozoic Era
Cenozoic Era
Formation of the Earth from planetesimals
Formation of the Moon
Formation of Earth's atmosphere
Much of the Earth's surface is volcanic rock, forming unstable regions of erupting lava.
Oldest known rocks
Oldest known fossils: single-celled organisms (prokaryotes) and stromatolite-forming cyanobacteria
Sizable continental areas begin to form.
Extensive shallow seas on the margins of continents and deposition of banded-iron formation
Significant levels of oxygen in the atmosphere; formation of the ozone shield
First eukaryotic cells
Sexual reproduction starts?
Beginning of amalgamation of continents into the supercontinent Rodinia
Rodinia breaks up; Pannotia forms
Ice Ages
Mass extinction
Supercontinent breakup; passive margins surround North America
Early multicellular organisms (animals): Ediacaran fauna
Hadean Eon
Archean Eon
Proterozoic Eon
Paleozoic Era
Mesozoic Era
Cenozoic Era
4,567
3,800
2,500
542
Precambrian
Precambrian
Phanerozoic Eon
Geological time (million years ago)

Geology's 'Big ideas' - You shouldn't leave this class without!

BIG IDEA 1. Geologists use repeatable observations & testable ideas to understand & explain our planet.

1.1 **Earth scientists find solutions to society's needs.** Earth scientists work on challenging problems that face humanity on topics such as climate change and human impacts on Earth. Earth scientists successfully predict hazards to humans and locate and recover natural resources, making possible the flourishing of humans on Earth.

BIG IDEA 2. Earth is 4.6 billion years old.

2.1 Earth's rocks and other materials provide a record of its history. Earth scientists use the structure, sequence, and properties of rocks, sediments, and fossils to reconstruct events in Earth's history. Decay rates of radioactive elements are the primary means of obtaining numerical ages of rocks and organic remains. Understanding geologic processes active in the modern world is crucial to interpreting Earth's past.

BIG IDEA 3. Earth is a complex system of interacting rock, water, air, and life.

3.1 The four major systems of Earth are the geosphere, hydrosphere, atmosphere, and biosphere. The geosphere includes a metallic core, solid and molten rock, soil, and sediments. The atmosphere is the envelope of gas surrounding Earth. The hydrosphere includes the ice, water vapor, and liquid water in the atmosphere, the ocean, lakes, streams, soils, and groundwater. The biosphere includes Earth's life, which can be found in many parts of the geosphere, hydrosphere, and atmosphere. Humans are part of the biosphere, and human activities have important impacts on all four spheres.

BIG IDEA 4. Earth is continuously changing.

4.1 Earth's geosphere changes through geological, hydrological, physical, chemical, and biological processes that are explained by universal laws. These changes can be small or large, continuous or sporadic, and gradual or catastrophic.

BIG IDEA 5. Earth is the water planet.

5.1 Water is found everywhere on Earth, from the heights of the atmosphere to the depths of the mantle. Early in Earth's history, surface water accumulated through both out-gassing from its interior and the capture of some extraterrestrial ice. Water vapor in the atmosphere condensed and rained out as the planet cooled.

BIG IDEA 6. Life evolves on a dynamic Earth and continuously modifies Earth.

6.1 Fossils are the preserved evidence of ancient life. Fossils document the presence of life early in Earth's history and the subsequent evolution of life over billions of years.

BIG IDEA 7. Humans depend on Earth for resources.

7.1 Earth is our home; its resources mold civilizations, drive human exploration, and inspire human endeavors that include art, literature, and science. We depend upon Earth for sustenance, comfort, places to live and play, and spiritual inspiration.

BIG IDEA 8. Natural hazards pose risks to humans.

8.1 Natural hazards result from natural Earth processes.
These hazards include earthquakes, tsunamis, hurricanes, floods, droughts, landslides, volcanic eruptions, extreme weather, lightning-induced fires, sinkholes, coastal erosion, and comet and asteroid impacts.

BIG IDEA 9. Humans significantly alter the Earth.

9.1 Human activities significantly change the rates of many of Earth's surface processes. Humankind has become a geological agent that must be taken into account equally with natural processes in any attempt to understand the workings of Earth's systems. As human populations and per capita consumption of natural resources increase, so do our impacts on Earth's systems.

BIG IDEA 10. Becoming an earth scientist is an extremely meaningful and rewarding career!

Climate Principles - You shouldn't leave this class without!!!

Principle #1 Humans can take actions to reduce climate change and its impacts.
Actions taken by individuals, communities, states, and countries all influence climate. Practices and policies followed in homes, schools, businesses, and governments can affect climate. Climate-related decisions made by one generation can provide opportunities as well as limit the range of possibilities open to the next generation. Steps toward reducing the impact of climate change may influence the present generation by providing other benefits such as improved public health infrastructure and sustainable built environments.

Principle #2 The Sun is the primary source of energy for Earth's climate system.
Sunlight reaching the Earth can heat the land, ocean, and atmosphere. Some of that sunlight is reflected back to space by the surface, clouds, or ice. Much of the sunlight that reaches Earth is absorbed and warms the planet.

Principle #3 Climate is regulated by complex interactions among components of the Earth system.
Earth's climate is influenced by interactions involving the Sun, ocean, atmosphere, clouds, ice, land, and life. Climate varies by region as a result of local differences in these interactions.

Principle #4 Life on Earth depends on, is shaped by, and affects climate.
Individual organisms survive within specific ranges of temperature, precipitation, humidity, and sunlight. Organisms exposed to climate conditions outside their normal range must adapt or migrate, or they will perish.

Principle #5 Climate varies over space and time through both natural and man-made processes.
Climate is determined by the long-term pattern of temperature and precipitation averages and extremes at a location. Climate descriptions can refer to areas that are local, regional, or global in extent. Climate can be described for different time intervals, such as decades, years, seasons, months, or specific dates of the year.

Principle #6 Our understanding of the climate system is improved through observations, theoretical studies, and modeling.
The components and processes of Earth's climate system are subject to the same physical laws as the rest of the Universe. Therefore, the behavior of the climate system can be understood and predicted through careful, systematic study.

Principle #7 Human activities are impacting the climate system.
The overwhelming consensus of scientific studies on climate indicates that most of the observed increase in global average temperatures since the latter part of the 20th century is very likely due to human activities, primarily from increases in greenhouse gas concentrations resulting from the burning of fossil fuels.

Principle #8 Climate change will have consequences for the Earth system and human lives.
Incidents of extreme weather are projected to increase as a result of climate change. Many locations will see a substantial increase in the number of heat waves they experience per year and a likely decrease in episodes of severe cold. Precipitation events are expected to become less frequent but more intense in many areas, and droughts will be more frequent and severe in areas where average precipitation is projected to decrease.

Source materials =
Geology – www.earthscienceliteracy.org
Climate – www.cleanet.org