



LG #8: Geologic Time, Fossils & Dating

BIG IDEA: Earth's geological and biological history is interpreted and inferred from information stored in rock strata and fossil evidence.

Fundamental Knowledge (I know):

- Major events in Earth's history: for example, formation of oldest rocks, earliest recorded life, domination of invertebrates, first land plants, domination of reptiles, appearance of flowering plants, Rocky Mountain orogeny, mass extinctions
- Fossil record: for example, Foraminifera, Mollusca, Brachiopoda, Echinodermata, Arthropoda (trilobites), Coelenterata (corals), Vertebrata, Graptolithina, Conodonts, algae, plants, reptiles
- Evidence of evolution: changes found in the fossil record over time as evidence for natural selection, adaptive radiation, and punctuated equilibrium
- Relative and absolute dating:
 - absolute dating using radioactive isotopes
 - principles of relative dating (e.g., superposition, unconformities, cross-cutting, index fossils, law of faunal succession)

Curricular Competencies (I can)

	Proficiency Scale Teacher and Student self assessment (Circle one)	Example	Evidence (How do you know?)
Use knowledge of scientific concepts to draw conclusions that are consistent with evidence. Analyze cause-and-effect relationships.	Emerging (C-/C) Initial Understanding	Completed Activity #1 – Journal with fundamental knowledge and vocabulary (in your words). Activity #2 is complete.	
	Developing (C+/B) Partial/Near Complete Understanding	Completed Activity #1 – Journal with fundamental knowledge and vocabulary (in your words with details). Completed the suggested learning activities below (Activities #2 & #3)	
	Proficient (B+/A) Complete Understanding	Completed Activity #1 – Journal with fundamental knowledge and vocabulary (in your words, with examples and diagrams, connecting to the main ideas). Suggested activities (Activities #2 & #3) are thoroughly completed, provide details, use vocab that is related accurately and good resources.	
	Extending (A+) Sophisticated Understanding		

Student Signature:

Teacher Signature:

Date:

Resources can be found at www.THSSscience.com

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Suggested Learning Activities:

RESOURCES

1. Text: **Physical Geology & the Environment**

2. Online Resources:

Geologic Time - <https://www.youtube.com/watch?v=rWp5ZpJAIAE>

Fossil Record - https://www.youtube.com/watch?v=bRuSmxJo_iA

<https://www.youtube.com/watch?v=ID7qhn1ipmw>

Relative & Absolute Dating - <https://www.youtube.com/watch?v=rWp5ZpJAIAE>

Evidence of evolution - <https://www.youtube.com/watch?v=CGFEJRjUh2g>

Activity #1: Journal

1. Refer to your text Physical Geology & the Environment Ch. 19 Time and Geology. Read pages 510-535.

Alternatively, you can check out the online resources listed above and/or find your own to help research the definitions below.

2. In your journal:

- Define what “uniformitarianism” is.
- Explain what the difference is between relative age and absolute age.
- Using diagrams, explain the following relative dating techniques: original horizontality, superposition, cross-cutting relationships, included fragments (inclusion).
- Define: *unconformity, correlation, and faunal succession*.
- Describe how the Geologic Time Scale is structured.
- Describe how isotopic dating can determine the approximate age of a rock.
- Explain the concept of “half-life”.
- Describe the advantages and disadvantages of Potassium-Argon, Rubidium-Strontium, Uranium-Lead and Carbon 14 dating methods.
- Identify the era when the following developed: one-celled organisms, fish, amphibians, dinosaurs, birds, reptiles, and mammals.

Activity #2: The Law of Superposition Worksheet

1. Complete the worksheet found on page 5.

Activity #3: Fossil Record Inquiry

Directions – Using a variety of sources, answer the following questions shown below.

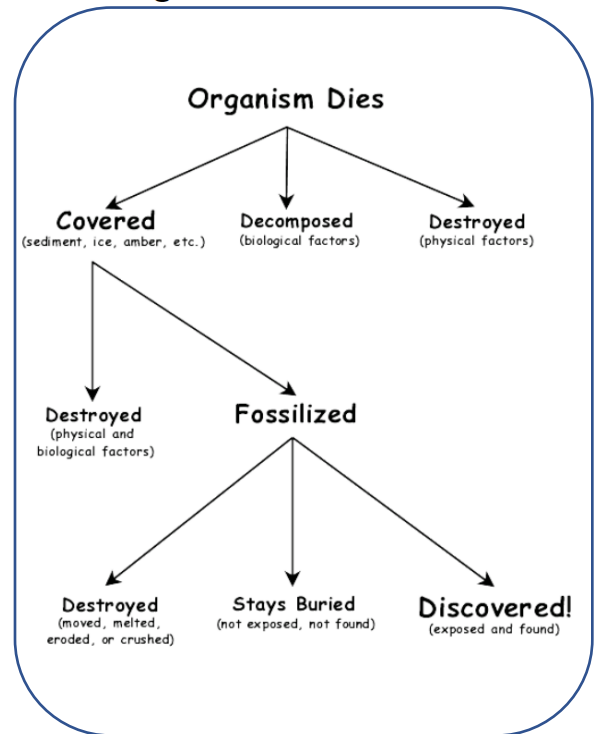
1. What kinds of questions can the fossil record help us to answer?

2. Describe the difference between a body fossil and a trace fossil.

3. Why are organisms that are buried rapidly more likely to fossilize than those that are buried slowly or not at all?

4. Describe two ways an organism can become a fossil without being buried in sediment.

Getting Into the Fossil Record



Activity #3: Fossil Record Inquiry (cont.)

5. How does the environment affect the formation of fossils?

6. Describe three factors that could prevent an organism from long ago from ever turning up in a fossil collection today.

7. In your own words, explain why the fossil record is not complete.

BONUS: You have been hired by National Geographic Magazine to journey to Inner Mongolia in search of fossils. You have the good fortune to find a site filled with many fossilized leaves, teeth, bones, eggs and even footprints from a variety of creatures. Amidst this treasure trove of ancient life, you find no trace of insects. Your research partner concludes that no insects lived here at that time. What other hypothesis might you suggest to your partner?

The Law of Superposition

According to the Law of Superposition, within the layers of sedimentary rock, the oldest layer of rock is at the bottom. As you move towards the top, the layers get younger.

If the rock layers are preserved in their original sequence, relative dating can be used to determine the relative age of rock or fossils found within the rock.

Color the picture below using a different color for each layer. Use the picture to help you answer the questions.

1. Which layer of rock is the oldest?
2. Which layer of rock is the youngest?
3. A brachiopod fossil is roughly 550 million years old and is found in Layer G. A eurypterid fossil is roughly 460 million years old and is found in Layer E. A trilobite fossil is found in Layer F. What would be a reasonable estimate for the relative age of this fossil?
4. An ammonite fossil is found in Layer B, a layer of shale that is 200 million years old. An ichthyosaur fossil that is roughly 195 million years old is found in a layer of sandstone. Which layer in the picture below represents sandstone?

