Do

The Dating Game

Activity

Scientists generally use two methods for dating fossils. One method is to look at rock layers, or stratigraphy, knowing that geologic processes we see today are similar to those in Earth's past. Fossils are most commonly found in sedimentary layers. Those found in deeper layers are usually older than fossils found in layers above them. This method dates fossil ages relative to each other. However, to estimate a fossil's absolute age, scientists need more information. To determine how many years ago a fossil was created, scientists use methods that rely on radiometric dating.

Examine the provided data to create a timeline chart of when different species existed.

Procedure:

1. Use the final timeline chart on the next page to record your information.
2. You will receive a Region Analysis Card. This card shows the stratigraphy of a particular region with the fossils found in them. It also includes a table that lists radiometric dating results for some of those strata. Using that information, work with your partner to sketch an estimated timeline on a separate sheet of paper. You may wish to start with the known absolute times for certain layers, and then use that to fill in the relative presence of the different species.
3. When you have completed your sketch, another team with information from another region will join you. Combine your findings to better correlate when the different species existed. Adjust your timeline sketches based on your conclusions.
4. Transfer your sketch to the final timeline chart. Use the colored pencils to draw in the ranges of species existence, similar to the model shown on the left side on page 1 of the Student Reference Sheet. Include a color-coded legend to show which color bars represent which species.
5. Lastly, use your timeline chart, along with the Student Reference Sheet and Region Analysis Cards, to write a scientific explanation to answer the following question:
   During what time period did the Ammonite species live?

Claim:

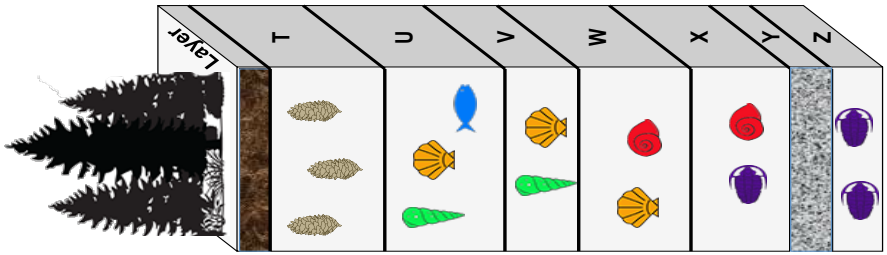
Evidence:

Reasoning:

REGION 2

Symbol	Species Reference Name
	Clam
	Fish
	Pine
	Ammonite
	Turritellid
	Trilobite

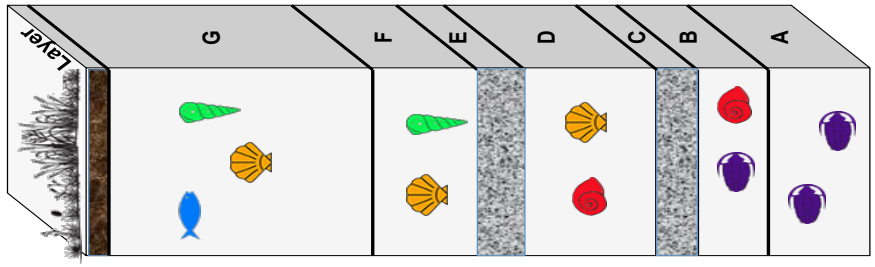
Layer	Material	Test Results (Estimated Age in Years)
T	Sedimentary	5,500
U	Sedimentary	—
V	Sedimentary	—
W	Sedimentary with mica	120 Million
X	Sedimentary	—
Y	Sedimentary with zircon crystals	450 Million
Z	Sedimentary	—



REGION 1

Symbol	Species Reference Name
	Clam
	Fish
	Pine
	Ammonite
	Turritellid
	Trilobite

Layer	Material	Test Results (Estimated Age in Years)
G	Sedimentary	11,000
F	Sedimentary	—
E	Volcanic ash with zircon crystals	28 Million
D	Sedimentary	—
C	Volcanic rock	250 Million
B	Sedimentary	—
A	Sedimentary	—



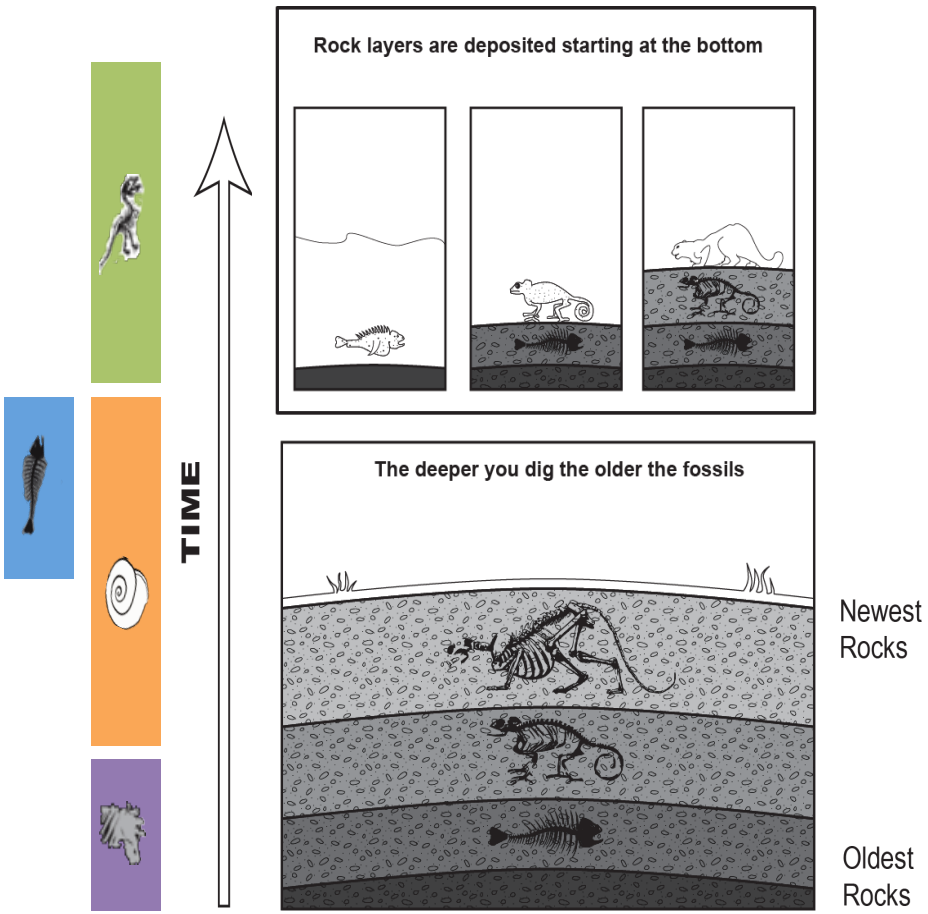
The Dating Game

Student Reference Sheet: Determining Fossil Ages

When scientists can determine the relative or absolute ages of the material in which fossils are found, then they can estimate a timeline of when different groups of animals and species existed in relation to each other and across a period of time.

Student Reference Sheet: Relative Age Dating

The geologic processes we see today are generally similar to those in Earth's past. For example, today we see how layers of sediment, dust, and ash are deposited in layers, referred to as "strata." So, it can generally be concluded that those layers that are deepest were deposited earlier than the layers on top of it. Found in deeper layers, then, are usually older than fossils found in layers above them. Using this method, called stratigraphy, a relative time scale can be sketched

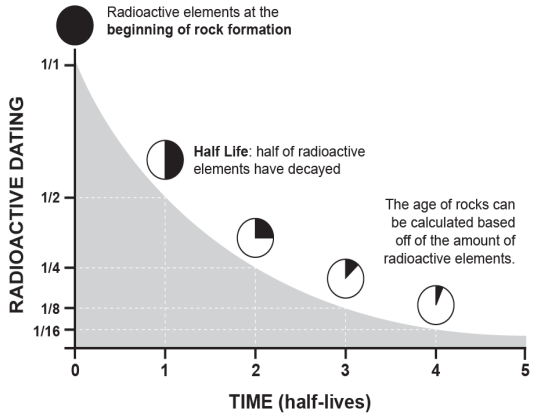


Do

The Dating Game

Student Reference Sheet: Absolute Age Dating

Certain radioactive atoms are, by nature, unstable. Over time, they decay from one type of atom to another. Their rate of decay, called an element's "half-life," is predictable.



Scientists can examine those elements found either in a fossil itself or in the layer material in or around which the fossil was buried to deduce an absolute time scale — that is, how many years ago a fossil was created.

Using Carbon-14 (C-14) is one of the most commonly used methods, specifically called radiocarbon dating. C-14, referred to as the "parent" isotope (a form of a carbon atom), decays to Nitrogen-14 (N-14), its "daughter" isotope (a form of a nitrogen atom).

Using these methods is referred to as radiometric dating.

Dating Method	Parent/ Daughter Isotopes	Half-Lives (Years)	Materials Dated	Age Dating Range (Years)
Carbon (C) / Nitrogen (N)	C-14 / N-14	5,730	Shells, limestone, organic materials	100-50,000
Potassium (K) / Argon (Ar)	K-40 / Ar-40	1.3 Billion	Whole volcanic rock; Biotite	100,000 – 4.5 Billion
Rubidium (Rb) / Strontium (Sr)	Rb-87 / Sr-87	47 Billion	Micas	10 Million – 4.5 Billion +
Uranium (U) / Lead (Pb	U-238 / Pb-206	4.5 Billion	Zircon	10 Million – 4.5 Billion +
Uranium (U) / Lead (Pb	U-235 / Pb-207	710 Million	Zircon	10 Million – 4.5 Billion +

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