

Topic 7 – Geologic History

How old are you? Compared to your parents, who is older?

Explain the difference between absolute age vs. relative age?

Uniformitarianism: - James Hutton, the father of modern geology, produced this important principle.

Rules of Relative Dating

Law of Superposition - _____

Principle of Original Horizontality - _____

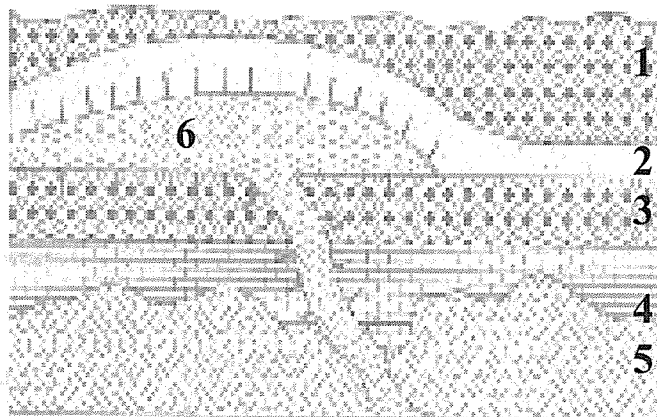
Principle of Cross-Cutting Relationships - _____

Why is layer 4 older than layer 3?

Is rock structure 6 older than layer 3?

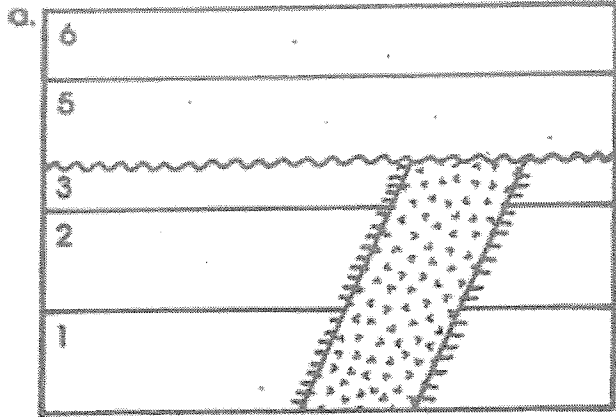
How do you know that rock structure 6 is younger than layer 2?

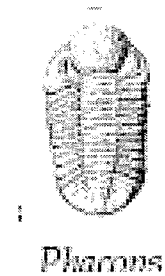
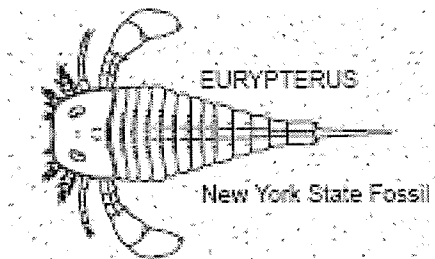
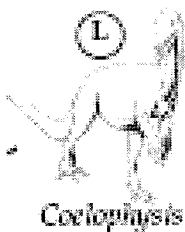
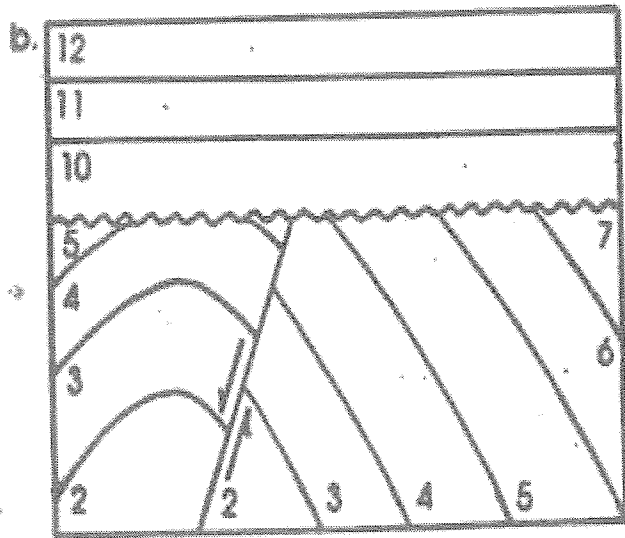
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Unconformity - _____

Recreate the geologic history of these profiles.





NOTES

Rock Layer Correlation

Correlation - _____

Ways to Correlate Rock Layers:

1. **Walking the outcrop** – In order to match two rock layers, a person can walk along the layers to see if they are the same layer and therefore the same age.
2. **Rock Characteristics** – This process uses characteristics of the rock layers in order to match layers to see if they are the same age.

List as many rock characteristics as you can that could be used for correlation.



What scientist correlated rocks from different locations as evidence of his theory?

3. **Index Fossils** - _____

4. **Volcanic Time Markers** - Volcanoes can emit (give off) large amounts of ash that can provide a thin layer over a large geographic area. Like index fossils, volcanic ash can be a good for correlating age of rock formations that may be thousands of miles apart.

The Geologic Time Scale - Geologists have divided Earth's history into units based on fossil evidence. For instance, there are many locations in Ulster County that you can find *graptolite* fossils and geologists know that these organisms existed in what we call the Ordovician period.

⇒ Geologic time is divided into:

ERAS → PERIODS → EPOCHS

⇒ You **must** spend some time reading and becoming familiar with page 8 & 9 of the ESRT.

Absolute Age (or Dating)

Radioactive Dating - This method is used to determine absolute age of rocks, especially igneous and metamorphic rocks.

A. **Radioactive Decay** - Some elements are unstable, which means they break down into different elements and in the process give off energy and ions. Unstable elements are said to be *radioactive* and the process of breaking down is called *decay* of a radioactive element.

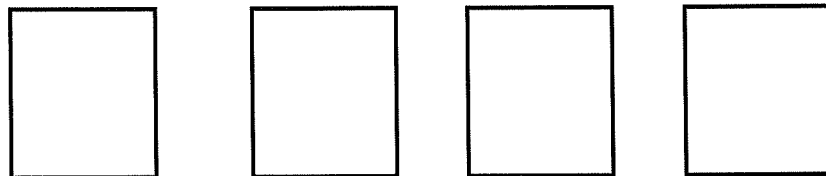
⇒ **Isotopes** - atoms of the same element that have the same number of protons, but a different number of neutrons in their nuclei. Common isotopes used for radioactive decay and their half-lives are listed on the front cover of the ESRT.

B. **Half-life** - is the time it takes for one-half of the atoms of that element to decay into another element. At the end of one half-life, one half the atoms of the radioactive element will remain. After two half-lives, one quarter will remain.

⇒ Different isotopes have different half-lives. So, some are good dating recent remains and some are better at dating older remains.

⇒ Half-lives are constant; they do not change which makes them predictable and useful. They are not affected by temperature or pressure.

Example: Let Carbon-14 be represented by the uncolored portion of the boxes and let Nitrogen-14 be represented by the shaded portions of these boxes.



# of Half-lives	_____	_____	_____	_____
Total Years passed	_____	_____	_____	_____
% of Carbon-14 remaining	_____	_____	_____	_____
% of Nitrogen-14	_____	_____	_____	_____
Decay Product ratio	_____	_____	_____	_____