**How Can Fossils Determine When An Organism Lived?**

**I. Introduction**

 Fossils are the remains, imprints, or traces of organisms that were once alive. By studying fossils, scientists can learn where, when, and how those organisms lived.

 Fossils are usually found in sedimentary rocks. This is because the intense pressure and heat that create igneous and metamorphic rocks often destroy fossils.

 Scientists use special fossils, called index fossils, to date rocks. Index fossils are from species that existed on Earth for relatively short periods of time and were abundant and widespread. Index fossils found in a sedimentary rock layer can be used to help date the layer.

 Another way scientists might determine the age of a rock layer is by using the principle of superposition. This states that in undisturbed layers of rock, the oldest rocks are on the bottom and the youngest rocks are towards the top. However, layers of rock do not always remain undisturbed. A fault could cause rock layers to overturn. In this case, scientists use relative dating to determine the order of events and the relative age of rocks by looking at the position of rocks in a sequence. Relative dating does not indicate the exact age of rock layers. It does indicate, however, that a layer is younger than the layers below it and older than a fault cutting through it.

 Besides using index fossils, superposition, and relative dating, scientists also use a more precise method, called absolute dating, to date rocks. Absolute dating uses the radioactive decay of radioactive isotopes of minerals in rocks to determine the age of the rock. When a radioactive isotope (parent material) decays, it forms a new isotope, a daughter product. The half-life of a radioactive element is the time it takes for half of its atoms to decay into the daughter product. After two half-lives, one-fourth of the original isotope's atoms remain and three-fourths have turned into the daughter product. After three half-lives, only one-eighth of the original isotope's atoms still remain. After many more half-lives, a very small amount of the original parent isotope remains.

 By measuring the amounts of parent and daughter materials in a rock and by knowing the half-life of the parent, a geologist can calculate the absolute age of the rock. This method is called radiometric dating.

 In this Virtual Lab you will confirm or refute the age of a rare fossil and determine when the organism that produced it was alive. To date the fossil you will use radiometric dating of rock layers and information about index fossils.

**II. Procedure**

 1. Start the activity by going to the following website :

<http://www.glencoe.com/sites/common_assets/science/virtual_labs/ES12/ES12.html> .

 2. Begin at one of three dig sites. Click and drag a nail with a label to each of the four rock and

 sediment layers.

 3. Drag the magnifying glass over the rock and sediment layers to look for fossils. Note: A hand

 is displayed on the handle of the magnifying glass. As you move the magnifying glass, the

 layer the hand is on indicates the rock layer where a fossil may be located.

 4. When you find fossils, compare them to those shown in the field guide. To access the field

 guide, click the laptop computer. Under Menu click field guide. Compare the geologic rock

 layers shown with those of the dig site. Click the Next button to research the fossils.

 5. Open the Table and record the names of the fossils and the layers in which you found them.

 Return to the dig site.

 6. Click and drag the hammer to the layers you want samples from. The samples are placed in

 the tray according to the layers from which they are taken.

 7. Click and drag each of the samples to the utility truck's front driver's side window.

 8. Click the utility truck's window again to send the rock samples to the lab for absolute dating.

 9. Click the laptop computer to check your email. Under Menu click e-mail to read the results

 of the absolute dating tests.

 10. Click the Next button and read the graph to determine the age of your rock sample. Find the

 flashing point on the graph. Convert the number of half-lives into millions of years. You

 may use the Calculator, if necessary. If you received data for more than one rock sample,

 click the Next button again and determine the age of this rock sample. Record your findings

 in the Table.

 11. Use your Journal to describe your findings.

 12. To explore a different dig site, click the Reset button.

**III. Data**

 1. Record your data in the Table below.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Rock / Sediment** **Layers** |  **Index Fossil** **Found** | **Rare, Undated** **Fossil Found** |
| Quaternary Period 1.6 m.y.b.p. |  |  |  |
| Tertiary Period 64.4 m.y.b.p. |  |  |  |
| Cretaceous Period 144 m.y.b.p. |  |  |  |
| Jurassic Period 208 m.y.b.p. |  |  |  |
| Triassic Period 245 m.y.b.p. |  |  |  |
| Permian Period 286 m.y.b.p. |  |  |  |
| Pennsylvanian Period 320 m.y.b.p. |  |  |  |
| Mississippian Period 360 m.y.b.p. |  |  |  |
| Devonian Period 408 m.y.b.p. |  |  |  |
| Silurian Period 438 m.y.b.p. |  |  |  |
| Ordovician Period 505 m.y.b.p. |  |  |  |
| Cambrian Period 544 m.y.b.p. |  |  |  |
| Precambrian Era 4,600 m.y.b.p. |  |  |  |

**IV. Analysis & Conclusions**

 **1. What steps did you take to date the fossils you found?**

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 **2. What steps did you take to date the rock layers?**

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 **3. Does the information you collected from the dig site support the principle of**

 **superposition? Explain.**

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 **4. Describe how you determined the age of rare fossils you found. Did your findings**

 **support the field guide information about the age of the rare fossils? Explain.**

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