# Pre-Lab Information

Purpose To understand how relative dating and absolute dating are used to determine the age of rock layers

Time Approximately 60 minutes

Question How are relative and absolute dating methods used to determine the age of rocks and fossils?

Summary In this virtual lab, you will examine examples of rock outcrops and determine the relative age of rock layers, including cross-cutting intrusions and index fossils.

# Lab Procedure

1. **Prepare for the lab.**
2. Read through this guide before you begin so you know the expectations for this lab.
3. If anything is not clear to you, be sure to ask your teacher.

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1. **Open the virtual lab.**
2. **Use the law of superposition to determine the relative ages of layers.**
   1. Read about relative dating and the law of superposition.
   2. Press **2** to proceed. You can go back to the information about relative dating and the law of superposition by pressing **1.**
   3. Examine the two outcrops. Based on the law of superposition, determine the relative ages of the rock layers.
   4. Press the **X** at the top right to start dating the rock layers.
   5. Drag the rock layers from the tools panel to the diagram and arrange them from oldest to youngest.
   6. Press the **Check** button.
   7. If an **x** mark appears, you have incorrectly placed a rock layer. Rearrange the rock layers. Press the **?** button to reexamine the outcrops if you need to. Press the **Check** button again. Repeat this process until you get four **✓** marks.
   8. Write the names of the rock layers in the order of their relative ages in **Table A** of the **Data** section of this guide.
   9. Hover your cursor over each layer and learn about the rocks that make up the layer. Write their descriptions in **Table A**.
   10. Move on to the next activity.
3. **Use index fossils to determine the relative ages of layers.** 
   1. Read about index fossils. Press the **?** buttons to learn more about ammonites, crinoids, and trilobites.
   2. Press **2** to proceed. You can go back to the information about index fossils by pressing **1.**
   3. Examine the two outcrops. Based on the law of superposition and the index fossils present in the layers, determine the relative ages of the rock layers.
   4. Press the **X** at the top right to start dating the rock layers.
   5. Drag the rock layers from the tools panel to the diagram and arrange them from oldest to youngest.
   6. Press the **Check** button.
   7. If an **x** mark appears, you have incorrectly placed a rock layer. Rearrange the rock layers. Press the **?** button to reexamine the outcrops if you need to. Press the **Check** button again. Repeat this process until you get four **✓** marks.
   8. Write the names of the rock layers in the order of their relative ages in **Table B** of the **Data** section of this guide.
   9. Hover your cursor over each layer and learn about the rocks that make up the layer. Write their descriptions in **Table B**.
   10. Move on to the next activity.
4. **Use the law of superposition and the principle of cross-cutting relationships to determine the relative ages of layers.**
   1. Read about the cross-cutting principle.
   2. Press **2** to proceed. You can go back to the information about the principle of cross-cutting relationships by pressing **1**.
   3. Examine the outcrop. Based on the law of superposition and the principle of cross-cutting relationships, determine the relative ages of the rock layers in the outcrop.
   4. Press the **X** at the top right to start dating the rock layers.
   5. Drag the rock layers from the tools panel to the diagram and arrange them from oldest to youngest.
   6. Press the **Check** button.
   7. If an **x** mark appears, you have incorrectly placed a rock layer. Rearrange the rock layers. Press the **?** button to reexamine the outcrop if you need to. Press the **Check** button again. Repeat this process until you get four **✓** marks.
   8. Write the names of the rock layers in the order of their relative ages in **Table C** of the **Data** section of this guide.
   9. Hover your cursor over each layer and learn about the rocks that make up the layer. Write their descriptions in **Table C**.
   10. Move on to the next activity.
5. **Use a mass spectrometer to determine the absolute ages of rocks.**
   1. Read about absolute dating. Press the **?** buttons to learn more about the geological time scale and mass spectrometer.
   2. Press the **X** at the top right to start dating the rocks that make up the layers.
   3. Drag the samples from the rock layers to the mass spectrometer.
   4. Record the absolute age of the rock layers in **Table D** in the **Data** section of this guide.
   5. Move on to the next activity.

**Step 7: Determine identity of the unknown fossil.**

* 1. Use the data in **Table D** toarrange the rock layers in the geologic time scale from oldest to youngest.
  2. Press the **Check** button.
  3. If an **x** mark appears, you have incorrectly placed a rock layer in the geologic time scale. Revisit the data in **Table D**. Rearrange the rock layers. Press the **Check** button again. Repeat this process until you get four **✓** marks.
  4. Write the names of the rock layers in the order of their relative and absolute ages in **Table E** in the **Data** section of this guide.
  5. Write the name of the periods the rock layers were formed in **Table E**.
  6. Press the **?** button.
  7. Use the the information from **Table E** and the Fossils Chart to determine the identity of the unknown fossil. Write the name of the unknown fossil in **Table E**.
  8. Move on to the next activity in the Virtual Classroom.

# Data

**Table A. Arrangement of Layers and Description of Rocks**

|  |  |  |
| --- | --- | --- |
| **Relative Age** | **Rock Layer** | **Description of Rocks** |
| **Youngest** |  |  |
|  |  |  |
|  |  |
| **Oldest** |  |  |

**Table B. Arrangement of Layers and Description of Rocks with Index Fossils**

|  |  |  |
| --- | --- | --- |
| **Relative Age** | **Rock Layer** | **Description of Rocks** |
| **Youngest** |  |  |
|  |  |  |
|  |  |
| **Oldest** |  |  |

**Table C. Arrangement of Layers with Rock Intrusion and Description of Rocks**

|  |  |  |
| --- | --- | --- |
| **Relative Age** | **Rock Layer** | **Description of Rocks** |
| **Youngest** |  |  |
|  |  |  |
|  |  |
| **Oldest** |  |  |

**Table D. Absolute Age of Rock Layers**

|  |  |
| --- | --- |
| **Rock Sample** | **Age of Layer**  **(million years)** |
| Basalt |  |
| Limestone with unknown fossil |  |
| Sandstone with trilobite |  |
| Shale with ammonite |  |

**Table E. Arrangement of Rocks in Geologic Time Scale and Identity of Unknown Fossil**

|  |  |  |
| --- | --- | --- |
| **Relative Age** | **Rock Layer** | **Period** |
| **Youngest** |  |  |
|  |  |  |
|  |  |
| **Oldest** |  |  |
| **Identity of Unknown Fossil** |  | |