

Earth & Space Science - The Earth's Formation, Structure, and Life

Unit 3 Packet

Name _____ Period _____ Score _____/ 67

Canvas Assignments in italics and underlined

- Day 1: Intro to Geology; Our Backyard _____ /20
- Day 2: History of the Earth & *History of Life* _____ /9
- Day 3: Dating Methods 1 & Crayon Lab _____ /11
- Day 4: Dating Methods 2 & PhET Radioactive Dating _____ /14
- Day 5: Dating Methods 3 & *Date Your Backyard* _____ /5
- Day 6: *Layers of the Earth Lab*
- Day 7: Evidence for Layers & Seismograph Lab _____ /8
- Day 8: Review (separate paper. **THE REVIEW WILL BE THE NOTES YOU CAN USE ON THE TEST**)
- Day 9: *Test*

Day 1: Intro to Geology; Our Backyard (___ / 20 pts)

Kickstart Question

NOTES

Link to Slides: <https://science.dbuckley.dev/slides/earth-systems/03/intro-to-geology>

What are some of the things we observed on the hike? (1 pt)

Why learn about Geology and the Earth? List 3 reasons. (3 pts)

1.

2.

3.

INTERACTIVE ACTIVITIES (_ / 16 pts)

Links on Canvas:



1. Wasatch Front Canyons Geologic Tour (_ / 6 pts)

Choose 3 canyons from the available list (City Creek, Emigration, Mill Creek, Big Cottonwood, Little Cottonwood) and answer the questions for each.

Canyon 1:

1. What are some of the minerals in this canyon?

2. What are interesting features or facts about the canyon? List any caves, structures, formations, etc.

Canyon 2:

1. What are some of the minerals in this canyon?

2. What are interesting features or facts about the canyon? List any caves, structures, formations, etc.

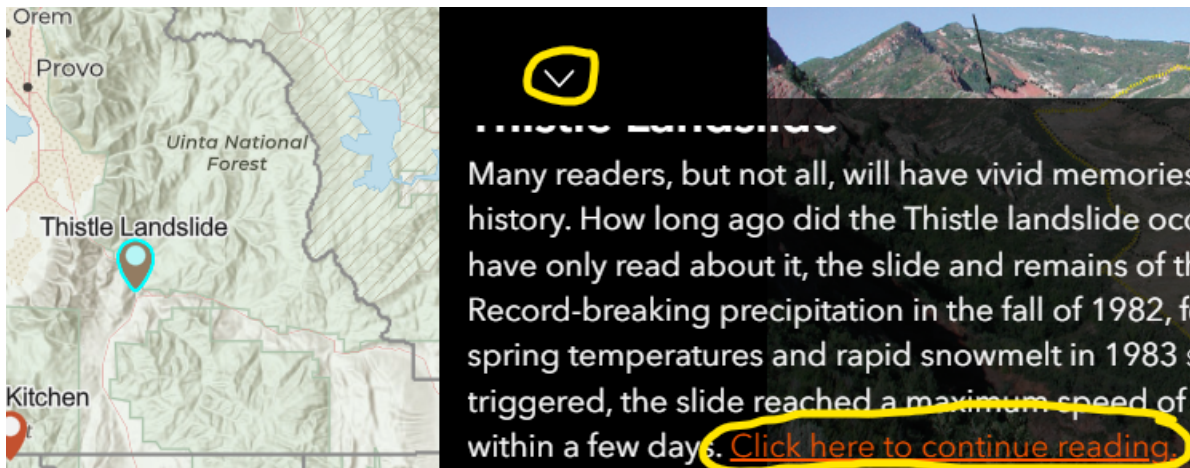
Canyon 3:

1. What are some of the minerals in this canyon?

2. What are interesting features or facts about the canyon? List any caves, structures, formations, etc.

2. GeoSights (___ / 6 pts)

Use the map to select an Utahn geological site and select the “Click here to continue reading.” to discover information about the site. Fill out the table below for 6 sites.



The screenshot shows a map of Utah with a red pin on the Thistle Landslide site. The text on the right describes the landslide event of 1982-1983 and includes a link to continue reading.

Many readers, but not all, will have vivid memories of this event. How long ago did the Thistle landslide occur? Many have only read about it, the slide and remains of the landslide. Record-breaking precipitation in the fall of 1982, followed by spring temperatures and rapid snowmelt in 1983, triggered the slide. The slide reached a maximum speed of 100 mph within a few days. [Click here to continue reading.](#)

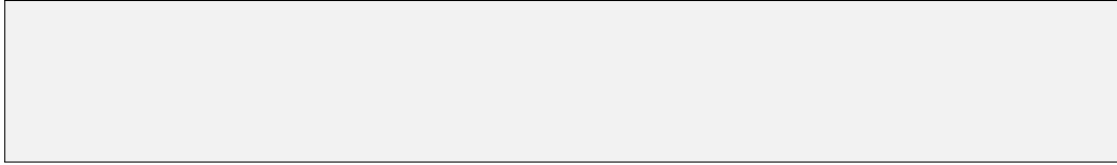
Name of Geologic Site	Geologic Era or Age of Site (if listed, else put N/A)	Features

3. Lake Bonneville: <https://tinyurl.com/bonnevillelake> (___ / 4 pts)

Lake Bonneville is the historic body of water that shaped much of our landscape in Utah Valley. Its remnants include the Great Salt Lake and Utah Lake.

Write down 4 things that you learned about Lake Bonneville from the multimedia website.

1.



2.



3.



4.

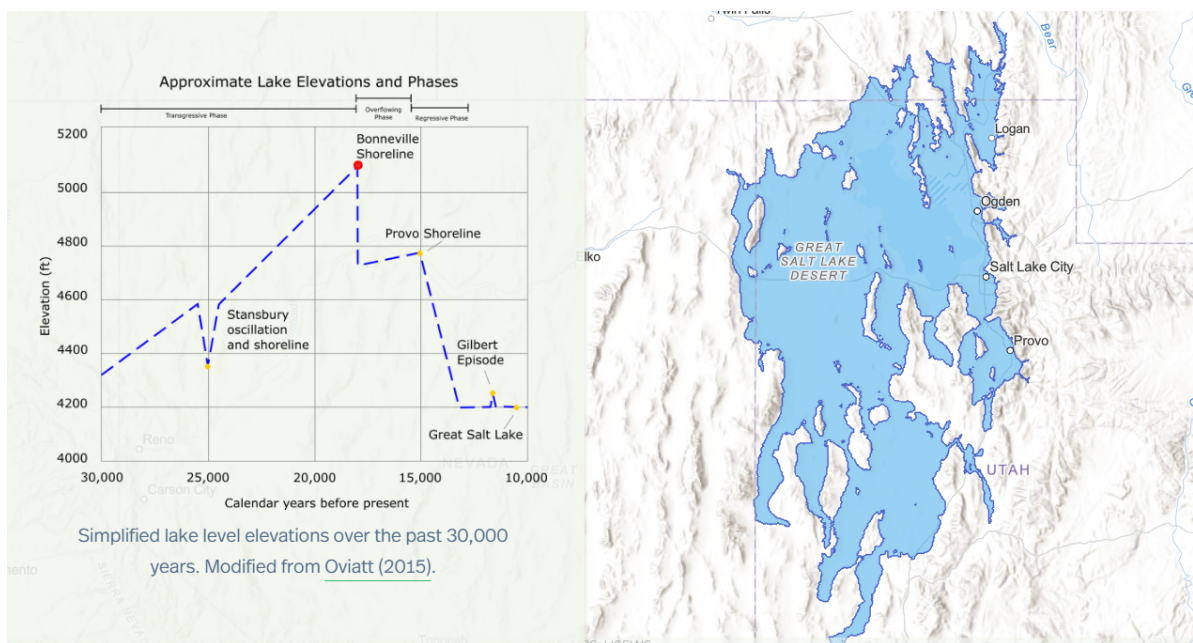


Image from [arcgis.com](https://arcgis.com/storymap) Lake Bonneville StoryMap

Day 2: History of the Earth & History of Life (___ / 9 pts)

Kickstart Question

NOTES

How does the Nebular Hypothesis explain the origins of the Earth? (1 pt)

4.57 BYA is the reckoned age of the Earth, determined from the oldest found. (1 pt)

Fill out the table. (4 pts)

Eon	Time Range	Events
Hadean Eon		
Archean Eon		
Proterozoic Eon		
Phanerozoic Eon		

Within the Phanerozoic Eon, there are 3 main eras. Fill out the table below. **(3 pts)**

Era	Time Range	Events
Paleozoic Era		
Mesozoic Era		
Cenozoic Era		

Within each Eon, there are Eras; within each Era, there are Periods.

ON CANVAS: HISTORY OF LIFE

Day 3: Dating Methods 1 (___ / 11 pts)

Kickstart Question

NOTES

Why are there so many fossils in Utah?

Define the 4 methods of dating archaeological (including geological and biological) materials:

1. Radiometric Dating (Carbon Dating):

2. Electron Spin Resonance (Archaeomagnetic Dating)

3. Stratigraphy (Relative Dating)

4. Seriation:

Today we will understand how to use Stratigraphy to date materials in different layers of sedimentary rock.

- Crayon Lab: How different rocks and layers are made.
- Stratigraphy Lab: How layers group together specimens of the same age, with the lowest layers generally being the oldest.

CRAYON LAB

Instructions <https://tinyurl.com/crayon-rock-cycle>

Make some crayon rocks.

Questions (___ / 5 pts)

The first rock you made was sedimentary. Describe the rock: does it have layers, is it firm or crumbly, etc.

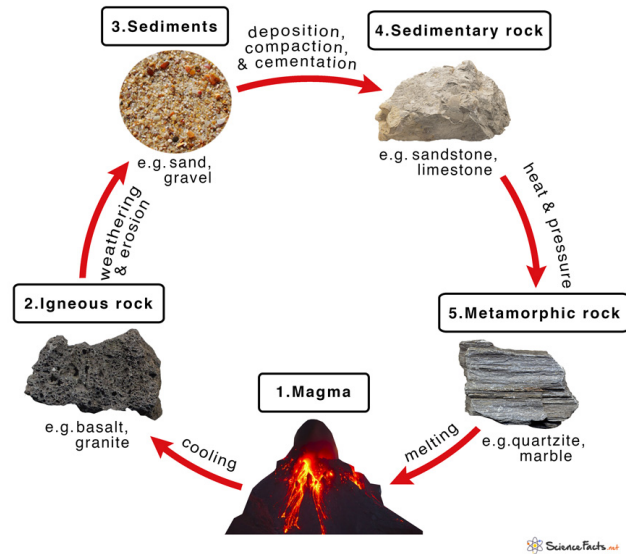
The second rock you made was metamorphic. Describe the rock. How does it differ from sedimentary?

The third rock you made was igneous. Describe the rock.

Which type of rock is the strongest and why?

Which type of rock are fossils commonly found in and why?

Steps of the Rock Cycle



STRATIGRAPHY LAB

Instructions <https://tinyurl.com/merit-stratigraphy>

Questions (___ / 2 pts)

How can the different layers of rock in the Earth tell us the order in which events happened in the past?

Scientists can date fossils using carbon dating. How could they then use that information to date the surrounding rock layers?

Day 4: Dating Methods 2 (___ / 14 pts)

Kickstart Question

NOTES (___ / 4 pts)

Review: What is the fundamental force that causes beta decay?

How can beta decay and half-lives tell us the age of a material?

For what materials and time range can carbon dating be used for?

For what materials and time range can uranium dating be used for?

HALF-LIFE LAB (___ / 6 pts)

Adapted from lab 6.4 from BYU Independent Study Physics, Part 2

This lab deals with the radioactive decay of atoms and how the half-life of a particular atom can be used to estimate the number of half-lives that an atom has undergone.

Required Materials

- 1 package of 100 pennies or other small two-sided objects with a distinct mark on one side
- 1 Cup

Procedure

1. First, you should fill in the table (see next page) for the theoretical values. To do this, we begin with 100 “atoms.” After a time equal to one half-life has passed, only half these atoms should remain. (The original element is called the “parent.” The other half has decayed into a different element, referred to as a “daughter” element.) So after one half-life, 50 should remain. After two half-lives, 25 should remain and so on.
2. Count out 100 pennies. These will represent individual atoms. Place these 100 “atoms” in the cup.
3. Dump them out on the table. Now separate the ones that are heads up or show the mark. These will represent atoms that have radioactively decayed into other elements. (These are the daughter atoms.) Count the atoms that are tails up or don’t show the mark. These are the parent atoms remaining. Record this number in the table.
4. Repeat steps 2 and 3 five times (so you have a total of six trials), putting only the parent atoms back in the cup each time.
5. Create a graph of your data. Put the number of parent atoms on the vertical axis and the trial number (which equals the number of half-lives that have passed) on the horizontal axis. Graph the theoretical values in one color and the experimental values in a different color on the same graph. Compare your results with the theoretical values. (Some variation is normal, but the overall pattern should be the same.)

Table (2 pts)

<u>Trial Number</u>	<u>Theoretical Number of Parent Atoms Remaining</u>	<u>Experimental Number of Parent Atoms Remaining</u>
<u>0</u>	100	100
<u>1</u>	50	
<u>2</u>		
<u>3</u>		
<u>4</u>		
<u>5</u>		
<u>6</u>		

Graph trial number and experimental number of parent atoms remaining (2 pts)

What is the independent variable (x) and the dependent variable (y)?

Applying What You Know (2 pts)

Suppose now that the data represents carbon-14, which has a half-life of 5,700 years. On your graph, write in the elapsed time on your horizontal-axis scale. So, one half-life would be 5,700 years, two half-lives would be 10,400 years ($2 \times 5,700$), and so on. If we started with 100 atoms and we find that there are 20 atoms now, how old would you estimate this artifact to be (using the graph you created)?

Why do you think scientists provide a range for carbon dated objects instead of giving an exact number?

PhET RADIOACTIVE DATING LAB (___ / 5 pts)



Run CheerpJ Browser-Compatible Version

1. Explore [Radioactive Dating Game](#). Try all the tabs to figure out why there is more than one element used to estimate how old things might be.
2. What elements' isotopes are used to estimate how old something is? Why do scientists use more than one type? (Be specific, it is not just to get repeated results)

3. Pretend you are a scientist and have a tool like the one on **Dating Game** tab:
 1. How do you decide which to use: Carbon-14 or Uranium-238?

2. How does the percentage help you estimate the age?

3. If you can't get a reading on one object like the fish fossil, what else can you try? Determine the approximate age of the fish fossil and explain what you did to estimate the fossil age.

4. If you were a forensic scientist and found a dead buried body, could you use one of the isotopes in the simulation to figure out how long ago the person died? Explain.

Day 5: Dating Methods 3 (___ / 5 pts)

Kickstart Question

NOTES (___ / 5 pts)

How does archaeomagnetic dating work? (2 pts)

Circle the correct answer, the Earth's magnetic field has always been the same. (True / False)
(1 pt)

Dating Methods Review

Match the dating methods to the types of materials that can be dated with them. (2 pts)

Method	Types of Materials
1. Radiometric Dating	a. Rocks that are magnetized as they cool.
2. Electron Spin Resonance (Archaeomagnetic Dating)	b. Organic materials or materials with uranium and lead.
3. Stratigraphy	c. Materials found in layers of known age (due to another method)

ON CANVAS: DATE YOUR BACKYARD

Day 7: Evidence for Layers & Seismograph Lab (___ / 8 pts)

Kickstart Question

NOTES (___ / 8 pts)

Review: Electromagnetic Force. How is a magnetic field created? **(1 pt)**

How do we know the materials that make up the inner and outer core? **(1 pt)**

Circle the answer: Earth's magnetic field has drifted and even swapped polarity before (True / False) **(1 pt)**

What are seismic waves? **(1 pt)**

What are surface and body waves? **(1 pt)**

What are P-Waves (Primary) and S-Waves (Secondary)? Draw a picture of each. **(1 pt)**



Wave interaction depends on three things. What are they? **(1 pt)**



How do P and S Waves tell us about the interior of Earth? **(1 pt)**



Next Unit: Plate Tectonics!

SEISMOGRAPH LAB

Instructions <https://tinyurl.com/seismolab>

Make a seismograph to measure vibrations.