Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Block \_\_\_\_\_\_\_\_\_\_\_ Binder Page # \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Geologic Time Animation Project**

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**Radioactive Dating Game:**

<http://phet.colorado.edu/en/simulation/radioactive-dating-game>

**Run the program and start on the “Half-Life” Tab.**

1. Start with C-14. Add 10 C-14 isotopes. Continue to add until done. What is Carbon – 14’s half-life? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What does C-14 decay into? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Now, chose the U-238. Add 10 U-238 isotopes. Continue to add until done. What is Uranium – 238’s half-life? \_\_\_\_\_\_\_\_\_\_\_\_\_
4. What does U-238 decay into? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Now, chose the mystery isotope. Add mystery isotopes until done. What is the mystery isotope’s half-life \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Choose the Decay Rate Tab.**

1. Choose C-14 and set slider bar with lots of isotopes. How much C-14 after 1 half-life? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What percent of C-14 is left after 2 half-life’s? \_\_\_\_\_\_\_\_\_\_\_ What percent of C-14 is left after 3 half-life’s \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Choose U-238 and set slider bar with lots of isotopes. How much U-238 after 1 half-life? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. What percent of U-238 is left after 2 half-life’s\_\_\_\_\_\_\_\_\_\_\_ What percent of U-238 is left after 3 half-life’s \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Does the amount of C-14 or U-238 every reach 0 %?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Why do you think this is the case? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Choose the Measurement Tab.**

1. Set these parameters: Tree, Objects, and Carbon-14. Now plant the tree. What is the % of C-14 reading as the tree is growing?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What happens to the % of C-14 once the tree dies? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. How much C-14 is left after 1 half-life? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 2 half-life’s?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_3 half-life’s?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Switch to the rock instead of the tree. Erupt the volcano and cool rock. What happens to the % of C-14? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Why? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Set these parameters: Rock, Objects, and Uranium-238. Now erupt the volcano and cool the rock. What is the % of U-238 reading immediately after the lava cools?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. What percent of U-238 is left after 1 half-life? \_\_\_\_\_\_\_\_\_\_\_\_ After2 half-life’s?\_\_\_\_\_\_\_\_\_\_\_ After 3 half-life’s?\_\_\_\_\_\_\_\_\_\_\_\_
7. Switch to the tree instead of the rock. Grow the tree and watch it die. What happens to the % of U-238? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Why? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. Now mess with the Air variable. What % of C-14 does the air always read? \_\_\_\_\_\_\_\_\_\_\_\_ How about U-238?\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Choose the Dating Game Tab.**

1. Choose Carbon and Objects. Drag Geiger Counter to animal skull. Notice that the Probe Type shows 98.2%. To estimate the age of the skull drag the green arrow left and right until it reads 98.2% of element remaining. How many years old does the counter estimate? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Type this in the box and check estimate.
2. Repeat the above process with U-238. What is the Probe type reading now?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Can you make an accurate date reading with this value? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Why is this? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Fill in the following chart. As you experiment with using C-14, U-238, or a custom value to get a date for each sample, remember that a value of 0% will not help. Keep experimenting until you find an isotope that works.

Table 1: Radiometric Age of Objects

|  |  |  |  |
| --- | --- | --- | --- |
| **Layer** | **Name of Object** | **Age of Object (including units)** | **Which method of radioactive dating did you use to discover the age of the object?****(C-14, U-238, Custom: 100ky, 1my, 10my, 100my)** |
| **Surface** |  **Animal Skull** |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
| **1 – Dark Blue** |  |  |  |
|  |  |  |
|  |  |  |
| **2- Light Blue** |  |  |  |
|  |  |  |
| **3- Pink** |  |  |  |
|  |  |  |
|  |  |  |
| **4-Green** |  |  |  |
|  |  |  |
| **5-Gray** |  |  |  |
|  |  |  |
|  |  |  |

**Summary: Write a summary (min.6 sentences) which answers the following Questions:**

Make sure to ***use examples from the animation activities*** and talk about ***both kinds of radiometric dating*** used in these animations.

***1. What is radiometric dating? (define it)*** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***2. How is Radiometric Dating used to learn the age of objects of an unknown date?***

Newly dead (*dead tree*): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Dead for a long time (*Fish Fossil 1*): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Never alive (*Rock*): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_