Name _____ Radioactive Decay Data

Date _____ Earth Science

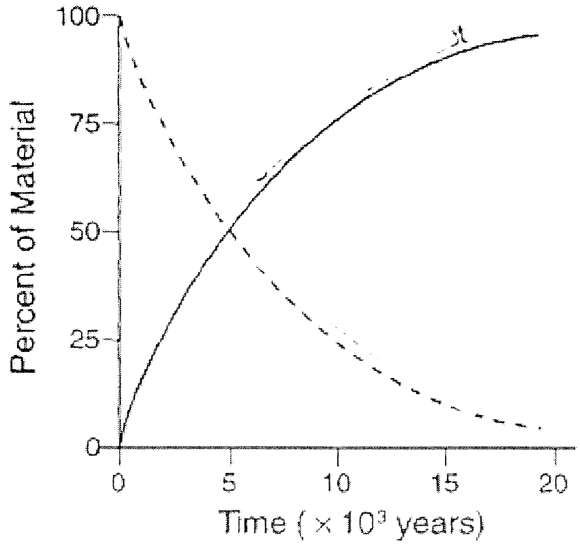
Questions: Use ESRT page 1 (Top, Left)

1. What is the half-life of **Potassium-40?** _____
2. What Isotope is used to date **Human bones**? _____
3. After **5.7×10^3 years**, what **percent of Carbon-14** remains **undecayed?** _____
4. After **1 half-life**, **what percent** of **Rubidium-87** remains **undecayed?** _____
5. What Isotope has the **SHORTEST half-life**? _____
6. What Isotope has the **LONGEST half-life?** _____

Fill out the data table below by calculating the % remaining after each half-life.
*** **Only use the values from the row directly above the one you are working on*****

# Half-Lives	Number of Years (Age) 5,700	**% Original C-14** remaining	Mass of C-14 remaining	Mass of N-14 (decay product)
0	0 years	100%	10 grams	0 grams
1	5,700 yrs	50%	5 grams	5 grams
2				
3				
4				
5				
6				

1. As ^{14}C decays what happens to ^{14}N?



Label which line represents ^{14}C and which represents ^{14}N.

—— Represents

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Review Sheet: *Interpreting Geologic History*

Regents Earth Science

Relative Dating: The Order of Geologic Events

1. **Relative dating** puts geologic events or structures into proper chronological order. A rock's relative age is its age **compared** to the ages of other rocks.
2. The principle of **uniformitarianism** states that the geologic processes that occurred in the past are basically the same as those that are occurring now.
3. The principle of **superposition** states that the **bottom** layer of a series of **sedimentary** layers is the **oldest**, unless the series has been overturned or thrust over by older rock.
4. Other clues that aid in determining a rock's relative age include the following ideas:
   a. Rock layers are older than **igneous intrusions** that cut through them or igneous extrusions above them.
   b. Rocks are older than **faults, joints, or folds** that appear in them.
   c. Fragments of **unmelted** material occurring within a rock are **older** than the rock.
   d. In sedimentary rocks, the sediments are older than the cements that bind them and the rock formation itself.

Correlation

Correlation is the process of showing that rocks or geologic events occurring at different locations are of the same age. Rocks may be correlated on the basis of similarities in appearance, composition, and position in relation to other layers.

2. There are several techniques and guides that can be used to correlate rock layers. These include:
   a. Walking the outcrop: Tracing the rock layer directly from one location to another.
   b. **Fossils** are the remains or impressions of ancient organisms. They are found almost exclusively in **sedimentary** rock. Fossils in rocks provide information about the environment in which the rock was formed.
   c. **Index fossils** are the remains or imprints of organisms that existed for a relatively **short period of time**, but were **widely distributed** over the Earth.
   d. Layers of **volcanic ash** in rock can be useful in correlation because they were deposited over a large area in a very short period of time.
   e. Correlation anomalies: Two similar rock formations may be of different ages, or a single formation may be older in some places than in others.
   f. An **unconformity** is a buried erosional surface. It is a **gap** in the rock record.

Geologic Time Scale

1. Geologic history can be divided into time units (eras and periods) based on fossil evidence.
2. Most of the geologic past (**Precambrian era**) has left practically **no fossil evidence**.
3. Man's existence is extremely short in comparison with the entire span of geologic time.

The Fossil Record

1. Fossil evidence suggests that a great variety of animals and plants have lived on Earth under a great variety of environmental conditions, and that most of them have become extinct.
2. Even though a large number of fossil types have been found, it is highly probable that a greater variety of organisms lived and died leaving no fossil trace.
3. Evolution is the gradual change in a species over long periods of time.
4. New studies of the fossil record have given rise to the theory of Punctuated Equilibria, which helps to explain the appearance of new species in relatively brief periods of geologic time.

Absolute Dating and Radioactive Decay

1. Used to give geologic events or structures an **actual (absolute) age.**
2. **Radioactive decay** is a process during which particles and/or electromagnetic energy are given off by atoms, and a new element (stable decay product) is formed.
   a. Decay of an individual atom occurs randomly
   b. The rate of radioactive decay occurs is **predictable**, and is a characteristic of an element. The **rate is not affected by external factors, such as temperature, pressure, or chemical reaction.**
   c. In a rock, as decay continues, the **amount of the original radioisotope present decreases, and the amount of the stable decay product increases.**
3. The length of time necessary for half a sample of a radioactive element to decay is the **half-life** of that element. Different radioisotopes have different half-lives.
   a. Radioisotopes with relatively **short half-lives**, such as C^{14}, are used for dating recent **organic** remains. Isotopes with longer half-lives, such as U^{238} and K^{40}, are used for dating older remains.
   b. By knowing the relative amounts of the original radioisotope and the decay product in a sample, and the half-life of the radioisotope, you can calculate the age of the sample.