

Name: _____

Geologic Time

Date: _____ Period: _____

Earth Science

Packet: Absolute Dating

CLASS NOTES

- Absolute Dating - _____

- Radioactive Decay - _____

- Isotopes - _____

 - Example: _____ carbon has a mass of 12 units called Carbon-12 and _____ carbon has a mass of 14 units called Carbon-14
- Half-life - _____

 - In a given sample of a radioactive isotope half of the atoms will decay to a _____ product, but the remaining half is still _____
 - Each element has its own half-life that range from fractions of a second to billions of years

Radioactive Decay Data

RADIOACTIVE ISOTOPE	DISINTEGRATION	HALF-LIFE (years)
Carbon-14	$^{14}\text{C} \rightarrow ^{14}\text{N}$	5.7×10^3
Potassium-40	$^{40}\text{K} \begin{cases} \rightarrow ^{40}\text{Ar} \\ \rightarrow ^{40}\text{Ca} \end{cases}$	1.3×10^9
Uranium-238	$^{238}\text{U} \rightarrow ^{206}\text{Pb}$	4.5×10^9
Rubidium-87	$^{87}\text{Rb} \rightarrow ^{87}\text{Sr}$	4.9×10^{10}

- The half-life of an isotope is not effected by any _____
such as _____, _____, or _____

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- Uranium-238 - _____

- Mass: 238 units
- Decay: Uranium-238 → Lead-206
- Half-Life: 4,500,000,000 years

- Carbon-14 - _____

- Mass: 14 units
- Decay: Carbon-14 → Nitrogen-14
- Half-Life: 5,700 years

- Lets give it a try...fill in data table below for C-14 and it's daughter element N-14

Half-life	Percentage of Unstable C-14	Percentage of Stable N-14	Number of Years
0	100%	0%	0
1			
2			
3			
4			
5			

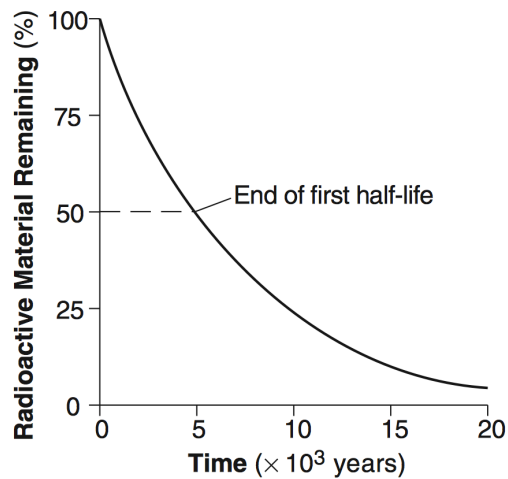
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PART I QUESTIONS: MULTIPLE CHOICE

1. Which radioactive substance would probably be used in dating the recent remains of a plant found in sedimentary deposits?
 - a. carbon-14
 - b. potassium-40
 - c. rubidium-87
 - d. uranium-238
2. Why is carbon-14 not usually used to accurately date objects more than 50,000 years old?
 - a. Carbon-14 has a shorter half-life and not enough carbon-14 has decayed after 50,000 years.
 - b. Carbon-14 has been introduced as an impurity in most materials older than 50,000 years.
 - c. Carbon-14 has a relatively short half-life and too little carbon-14 is left after 50,000 years.
 - d. Carbon-14 has only existed on Earth during the last 50,000 years.
3. If a radioactive material were cut into pieces, the half-life of each piece would be?
 - a. less than the original specimen's half-life
 - b. greater than the original specimen's half-life
 - c. the same as the original specimen's half-life
4. A rock contains uranium-238, which has a half-life of 4.5×10^9 years. If the rock is crushed and heated, the half-life of the uranium-238 it contains will
 - a. increase
 - b. remain the same
 - c. decrease
5. Why are radioactive materials useful for measuring geologic time?
 - a. Measurable samples of radioactive materials are easily collected from most rock types.
 - b. The half-lives of most radioactive materials are less than five minutes.
 - c. The disintegration of radioactive materials occurs at a predictable rate.
 - d. The ratio of decay products to undecayed material remains constant in sedimentary rocks.
6. Which radioactive element is best suited for determining the age of wooden tools used by prehistoric humans during the last ice age?
 - a. rubidium-87
 - b. uranium-238
 - c. potassium-40
 - d. carbon-14
7. Which radioactive element has a half-life of 4.5 billion years?
 - a. carbon-14
 - b. rubidium-87
 - c. uranium-238
 - d. potassium-40

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The graph below shows the decay of a radioactive material over time.



8. How long does it take for this radioactive material to decay through 2 half-lives?
- 1×10^3 years
 - 5×10^3 years
 - 10×10^3 years
 - 40×10^3 years
9. Due to radioactive decay, an igneous rock sample now contains one-fourth of the amount of potassium-40 that it originally contained. The age, in years, of this rock sample is approximately
- 0.7×10^9 years
 - 2.6×10^9 years
 - 1.3×10^9 years
 - 5.2×10^9 years
10. A rock contains uranium-238, which has a half-life of 4.5×10^9 years. If the rock is crushed and heated, the half-life of the uranium-238 it contains will
- increase
 - remain the same
 - decrease
11. If the amount of carbon-14 in the original sample had been 48 grams, about how much carbon-14 would have been left after 17,100 years?
- 12 grams
 - 6 grams
 - 3 grams
 - 24 grams