Name: _____

1) Which radioactive substance would probably be used in dating the recent remains of a plant found in sedimentary deposits?

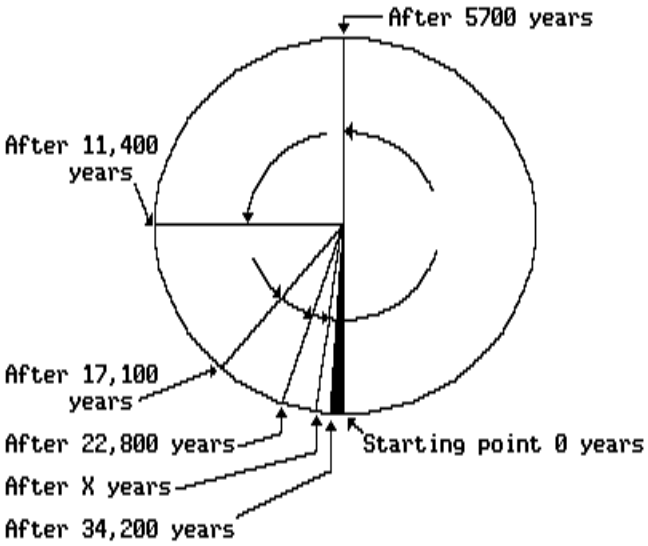
A) carbon-14
B) potassium-40
C) rubidium-87
D) uranium-238

2) Why is carbon-14 not usually used to accurately date objects more than 50,000 years old?

A) Carbon-14 has a relatively long 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.

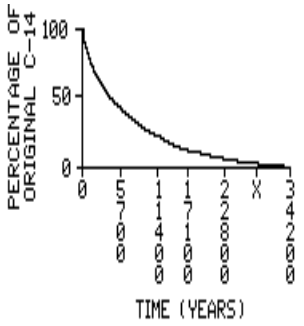
Questions 3 through 7 refer to the following:

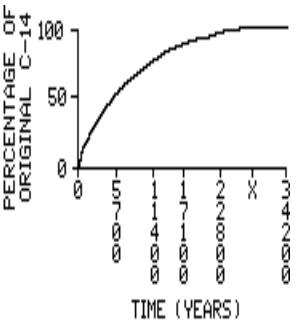
The diagram below is a model representing a certain amount of carbon-14, having a half-life of 5.7×10^3 years, and the amount of time it takes for various percentages of the carbon-14 to radioactively decay. The shaded portion of the model represents the amount of carbon-14 remaining in a given sample after 34,200 years had passed.

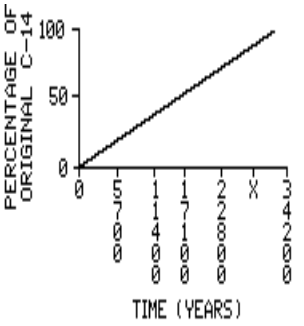


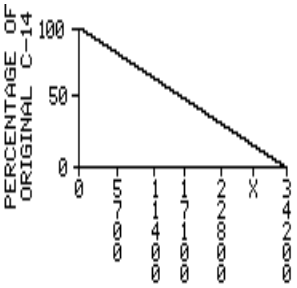
RADIOACTIVE DECAY OF C-14

3) Which graph best represents the decay of carbon-14 as shown in this model?

A)


B)


C)


D)


4) Carbon-14 is useful for dating organic remains from which geologic epoch?

A) Precambrian
B) Early Permian
C) Pleistocene
D) Mississippian

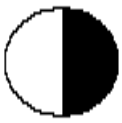
5) If the amount of carbon-14 in the original sample had been 48 grams, about how much carbon-14 would have been left after 17,100 years?

A) 12 grams
B) 6 grams
C) 3 grams
D) 24 grams

6) The line represented by *X* years indicates another half-life. How many years does *X* represent in the model?

A) 39,900 years
B) 29,900 years
C) 28,500 years
D) 25,500 years

7) Which model best represents the radioactive decay that would have occurred if this carbon-14 had been subjected to extreme heat and pressure during the first 5,700 years [The shaded area represents the amount decayed.]

A) 
C) 
B) 
D) 

8) The table below gives information about the radioactive decay of carbon-14. [Part of the table has been left blank for student use.]

Half-Life	Mass of Original C-14 Remaining (grams)	Number of Years
0	1	0
1	$\frac{1}{2}$	5,700
2	$\frac{1}{4}$	11,400
3	$\frac{1}{8}$	17,100
4		
5		
6		

What is the amount of the original carbon-14 remaining after 34,200 years?

A) $\frac{1}{8}$ g
C) $\frac{1}{16}$ g
B) $\frac{1}{64}$ g
D) $\frac{1}{32}$ g

9) 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.

10) The diagram below represents a cube of radioactive material (Figure *A*) cut into eight identical cubes (Figure *B*).

FIGURE A

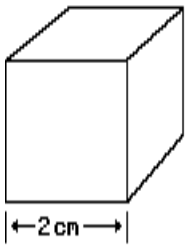
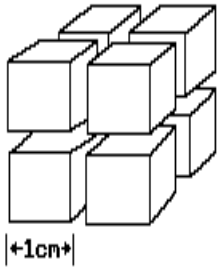


FIGURE B



Compared to the half-life of the material in figure *A*, the half-life of the material in each small cube in figure *B* is

A) $\frac{1}{8}$ as long
C) 8 times longer
B) $\frac{1}{64}$ as long
D) the same

11) According to the *Earth Science Reference Tables*, which radioactive element formed at the time Earth's origin has just reached about one half-life?

A) uranium-238
C) potassium-40
B) rubidium-87
D) carbon-14

12) According to the *Earth Science Reference Tables*, which radioactive substance has the longest half-life?

A) carbon-14
C) uranium-238
B) rubidium-87
D) potassium-40

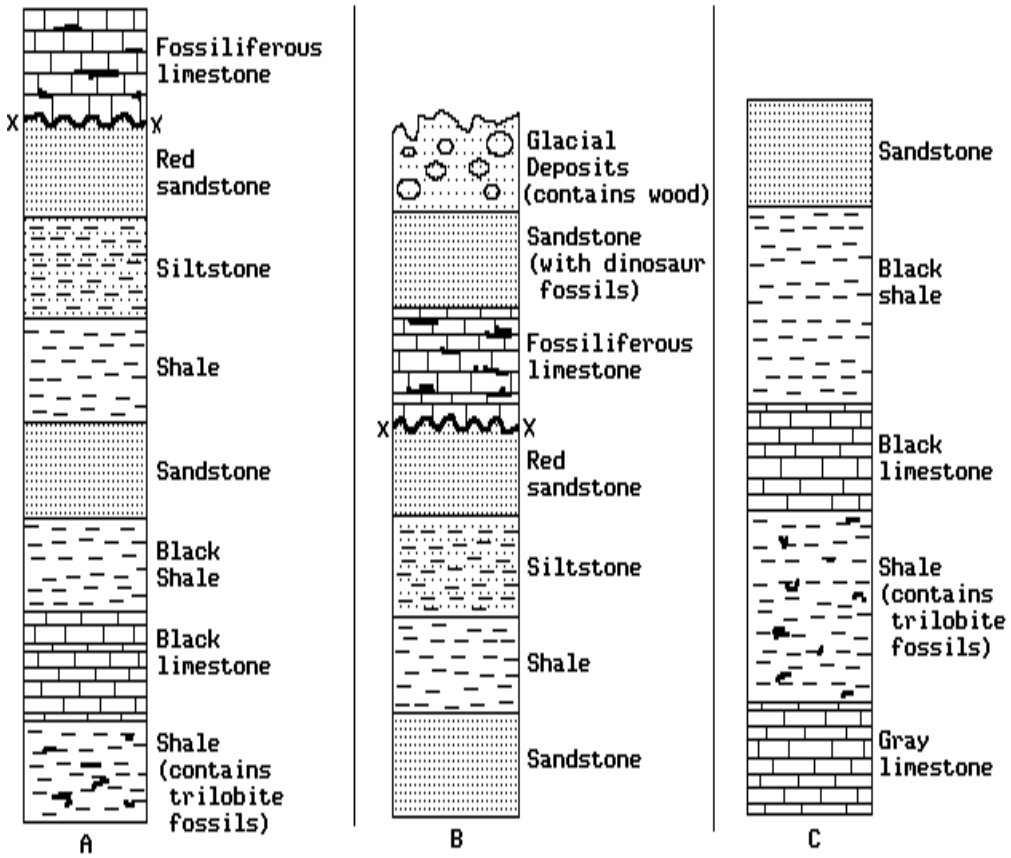
13) A sample of rock contained 100 grams of potassium-40 (^{40}K) when it was formed. Today the rock contains 50 grams of potassium-40 (^{40}K). According to the *Earth Science Reference Tables*, what is the age of the rock?

A) 1.3×10^9 years
C) 2.8×10^9 years
B) 5.6×10^9 years
D) 4.5×10^9 years

14) 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

15) The diagram below shows matching geologic columns from three different locations, *A*, *B*, and *C*. The locations are about 5 kilometers apart and the layers have not been overturned.

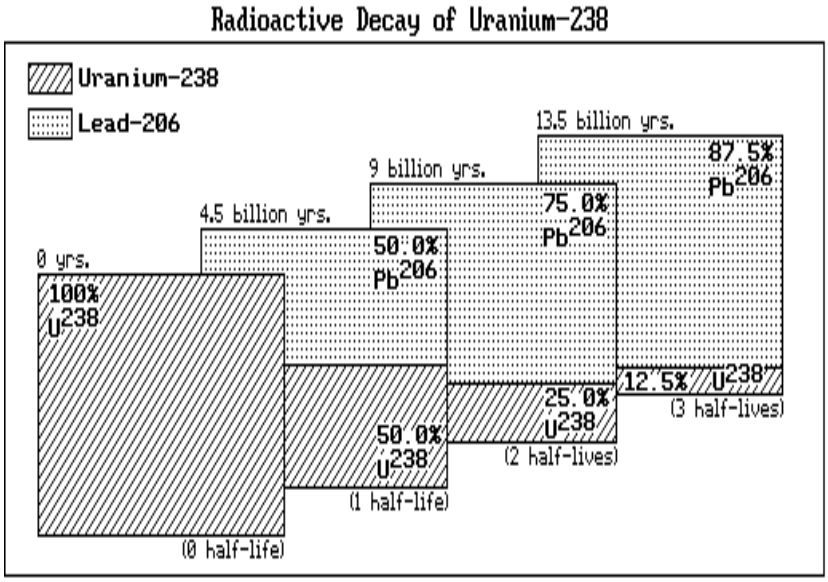


Radioactive carbon-14 would be most useful in determining the age of the

A) calcite in the black limestone
B) trilobite fossils in the shale
C) wood in the glacial till
D) iron oxide in the red sandstone

Questions 16 through 20 refer to the following:

The diagram below represents the radioactive decay of uranium-238 and shows the percentages of uranium-238 (^{238}U) and the stable element lead-206 (^{206}Pb) after three half-lives.



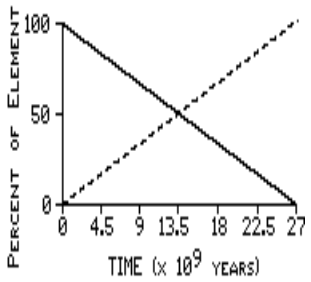
16) After three half-lives, how much of the original sample of ^{238}U remains?

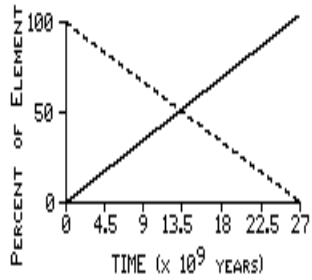
A) 25.0%
C) 12.5%
B) 87.5%
D) 50.0%

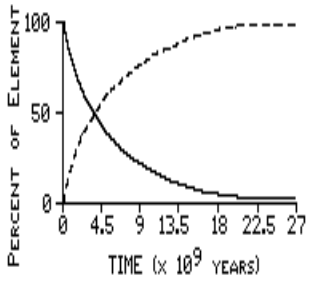
17) If an original sample of radioactive ^{238}U had a mass of 400. grams, what is the total amount of the ^{238}U sample that would be left after 9 billion years?

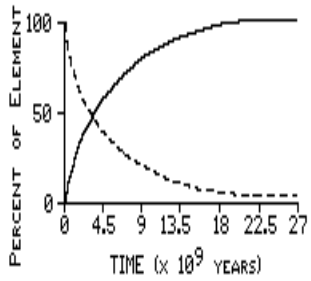
A) 100. g
C) 50.0 g
B) 200. g
D) 75.0 g.

18) Which graph best shows the changing amounts of ^{238}U and ^{206}Pb in a radioactive rock sample?

A)


B)


C)


D)


19) A rock sample containing uranium-238 was crushed into fragments. The half-life of the uranium-238 in each rock fragment is best described as

A) the same as that of the original sample
B) impossible to measure
C) longer than that of the original sample
D) shorter than that of the original sample

20) 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