

1. Base your answer on the diagram below which represents a cube of radioactive material (figure A) cut into eight identical cubes (figure B).

FIGURE A

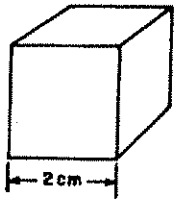
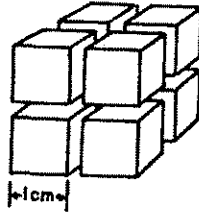


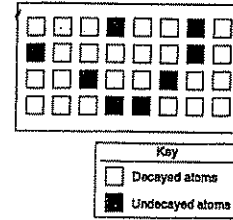
FIGURE B



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

- (1) 1/8 as long (3) 8 times longer
 (2) 1/64 as long (4) the same
2. The decay rates of radioactive substances remain constant when the substances are subjected to different temperature and pressure conditions. The best inference that can be drawn from this statement is that decay rates are
- (1) independent of external factors
 (2) independent of the isotope's composition
 (3) affected by the mass of the isotope
 (4) affected by pressure, but not by temperature
3. An archeologist found an ancient skeleton estimated to be 10,000 to 25,000 years old. Which radioactive isotope would be most useful for finding the age of the skeleton?
- (1) carbon-14 (3) uranium-238
 (2) potassium-40 (4) rubidium-87
4. Radioactive carbon-14 dating has determined that a fossil is 5.7×10^3 years old. What is the total amount of the original C^{14} still present in the fossil?
- (1) 0% (3) 50%
 (2) 25% (4) 75%

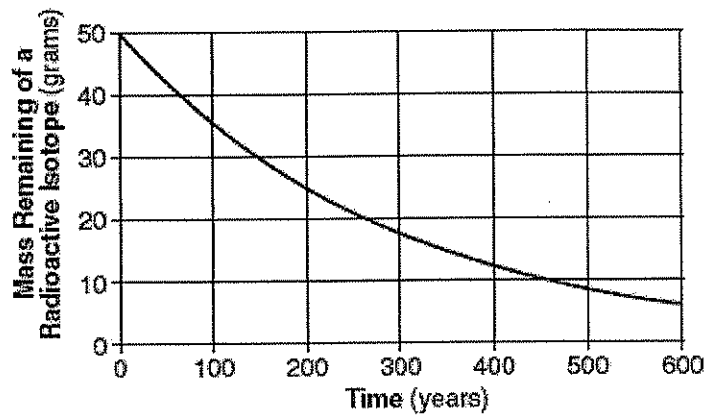
5. The diagram below represents the present number of decayed and undecayed atoms in a sample that was originally 100% radioactive material.



If the half-life of the radioactive material is 1,000 years, what is the age of the sample represented by the diagram?

- (1) 1,000 yr (3) 3,000 yr
 (2) 2,000 yr (4) 4,000 yr
6. A bone sample contains only $\frac{1}{4}$ of its original radioactive C^{14} content. How old is the bone sample?
- (1) 1 C^{14} half-life (3) 9 C^{14} half-lives
 (2) 2 C^{14} half-lives (4) 4 C^{14} half-lives

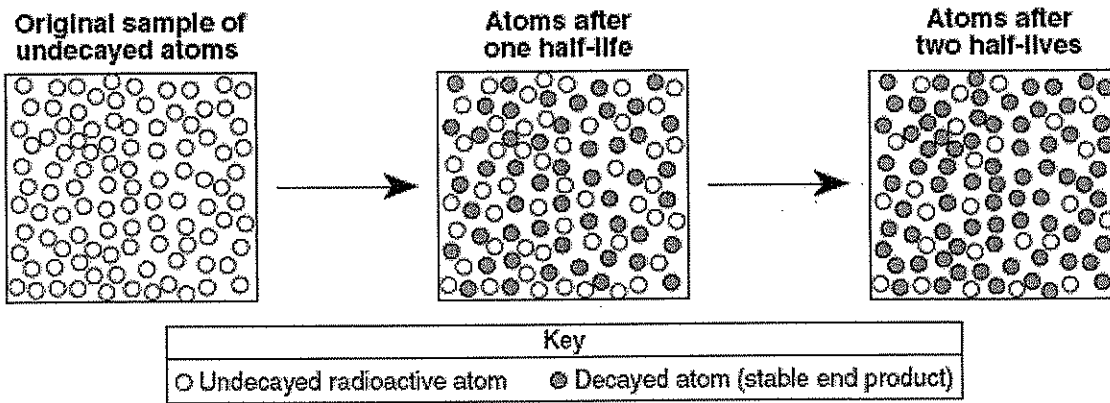
The graph below shows the radioactive decay of a 50-gram sample of a radioactive isotope.



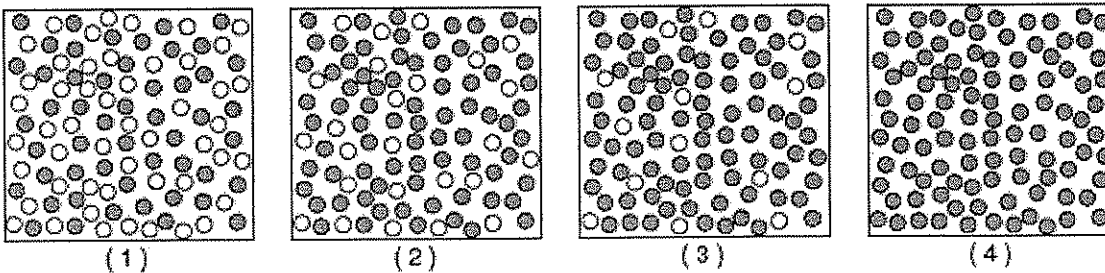
According to the graph, what is the half-life of this isotope?

- (1) 100 years
- (2) 150 years
- (3) 200 years
- (4) 300 years

15 The models below represent the decay of radioactive atoms to stable atoms after their first and second half-lives.



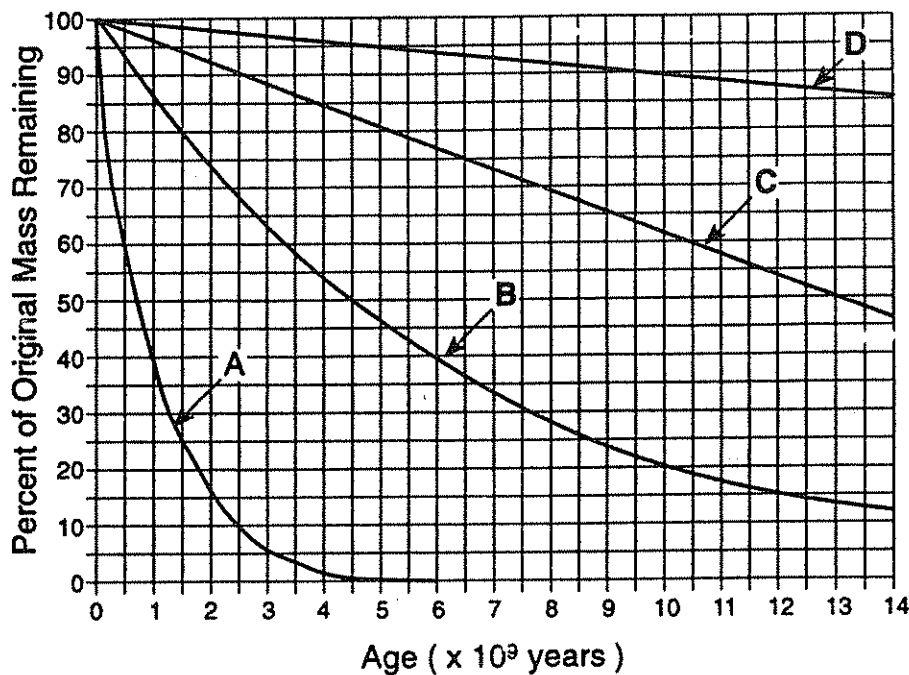
Which model best represents the number of undecayed and decayed atoms after three half-lives?



Group 7

If you choose this group, be sure to answer questions 86-90.

Base your answers to questions 86 through 90 on the *Earth Science Reference Tables*, the graph below, and your knowledge of Earth science. The graph shows the decay rates of four radioactive substances, A, B, C, and D.



86 Which radioactive substance has a half-life of 13 billion years?

- (1) A
- (2) B
- (3) C
- (4) D

87 The radioactive substance uranium-238 is represented by

- (1) A
- (2) B
- (3) C
- (4) D

88 When 90 percent of the original mass of isotope D remains, what total percent of the original mass of isotope B remains?

- (1) 10%
- (2) 22%
- (3) 33%
- (4) 90%

89 The half-life of these radioactive substances depends on the

- 1 pressure acting on the material
- 2 amount of the material
- 3 temperature of the material
- 4 composition of the material

90 Decay rates of radioactive substances such as these can be used to determine the age of rocks and fossils because radioactive decay occurs

- 1 at a steady, predictable rate
- 2 in all types of sedimentary rock
- 3 only when a living organism dies
- 4 in all organic and mineral substances

EARTH SCIENCE

RADIOACTIVE DATING

For the following problems use page 1 & 8-9 of your ESRT. Use the box method to solve all problems requiring you to find out how many half-lives passed.

1. What is the half-life of Carbon 14? (Include proper units) _____

2. If a bone collected from an archaeological site has 500 grams of C^{14} and 7500 grams of Nitrogen-14 (N^{14}), how many half lives have passed?

3. Using your answer to number 2 above, determine how old the bone sample is (number of half-lives passed * length of one half-life)

4. Divide your answer in #3 by 1,000,000 (one million) to get how many millions of years old this bone is. Round to the nearest hundredths place. Write this number below:

_____ million years old

5. What Geologic Period would this bone be from? (See pages 8&9 of your ESRT)

6. What is the half-life of Uranium-238? (include proper units) _____

7. If a rock sample collected from a geologic site has 2000 grams of U^{238} and 2000 grams of lead-206 (Pb^{206}), how many half-lives have passed?

8. Using your answer to number 6 above, determine how old the rock sample is.

9. Multiply this answer by 1000 to determine how many millions of years old it is. Write this below:

_____ million years old

10. What Geologic Era would this rock be from? (See pages 8&9 of your ESRT)