1. A radioactive isotope has a half-life of 2.5 years. Which fraction of the original mass remains unchanged after 10. years?

   A) 1/2 B) 1/4 C) 1/8 D) 1/16

2. What fraction of a Sr-90 sample remains unchanged after 87.3 years?

   A) $\frac{1}{2}$

   B) $\frac{1}{3}$

   C) $\frac{1}{4}$

   D) $\frac{1}{8}$

3. After decaying for 48 hours, $\frac{1}{16}$ of the original mass of a radioisotope sample remains unchanged. What is the half-life of this radioisotope?

   A) 3.0 h B) 9.6 h C) 12 h D) 24 h

4. Which radioisotopes have the same decay mode and have half-lives greater than 1 hour?

   A) Au-198 and N-16 B) Ca-37 and Fe-53
   C) I-131 and P-32 D) Tc-99 and U-233

5. What is the total number of years that must pass before only 25.00 grams of an original 100.0-gram sample of C-14 remains unchanged?

   A) 2865 y B) 5730 y
   C) 11 460 y D) 17 190 y

6. What is the half-life of a radioisotope if 25.0 grams of an original 200.-gram sample of the isotope remains unchanged after 11.46 days?

   A) 2.87 d B) 3.82 d
   C) 11.46 d D) 34.38 d

7. Which nuclide has a half-life that is *less* than one minute?

   A) cesium-137 B) francium-220
   C) phosphorus-32 D) strontium-90

8. An original sample of the radioisotope fluorine-21 had a mass of 80.0 milligrams. Only 20.0 milligrams of this original sample remain unchanged after 8.32 seconds. What is the half-life of fluorine-21?

   A) 1.04s B) 2.08s C) 4.16s D) 8.3s

9. An original sample of K-40 has a mass of 25.00 grams. After 3.9×10^9 years, 3.125 grams of the original sample remains unchanged. What is the half-life of K-40?

   A) 1.3×10^9 y B) 2.6×10^9 y
   C) 3.9×10^9 y D) $1.2 \times l0^9$ y

10. Which fraction of an original 20.00-gram sample of nitrogen-16 remains unchanged after 36.0 seconds?

    A) $\frac{1}{5}$ B) $\frac{1}{8}$ C) $\frac{1}{16}$ D) $\frac{1}{32}$

11. If $\frac{1}{8}$ of an original sample of krypton-74 remains unchanged after 34.5 minutes, what is the half-life of krypton-74?

    A) 11.5 min B) 23.0 min
    C) 34.5 min D) 46.0 min

12. What is the half-life of sodium-25 if 1.00 gram of a 16.00-gram sample of sodium-25 remains unchanged after 237 seconds?

    A) 47.4 s B) 59.3 s
    C) 79.0 s D) 118 s

13. What is the half-life and decay mode of Rn-222?

    A) 1.91 days and alpha decay
    B) 1.91 days and beta decay
    C) 3.82 days and alpha decay
    D) 3.82 days and beta decay

14. Based on Reference Table *N,* what fraction of a radioactive ^{90}Sr sample would remain unchanged after 56.2 years?

    A) $\frac{1}{2}$ B) $\frac{1}{4}$ C) $\frac{1}{8}$ D) $\frac{1}{16}$

15. How many days are required for 200. grams of radon-222 to decay to 50.0 grams?

    A) 1.91 days B) 3.82 days
    C) 7.64 days D) 11.5 days

16. Which radioisotope undergoes beta decay and has a half-life of less than 1 minute?

A) Fr-220 B) K-42
C) N-16 D) P-32

17. Based on Reference Table *N*, what fraction of a sample of gold-198 remains radioactive after 2.69 days?

A) $\frac{1}{4}$ B) $\frac{1}{2}$ C) $\frac{3}{4}$ D) $\frac{7}{8}$

18. After 32 days, 5 milligrams of an 80-milligram sample of a radioactive isotope remains unchanged. What is the half-life of this element?

A) 8 days B) 2 days
C) 16 days D) 4 days

19. According to Reference Table *N*, which radioactive isotope will retain only one-eighth $\left(\frac{1}{8}\right)$ its original radioactive atoms after approximately 43 days?

A) gold-198 B) iodine-131
C) phosphorus-32 D) radon-222

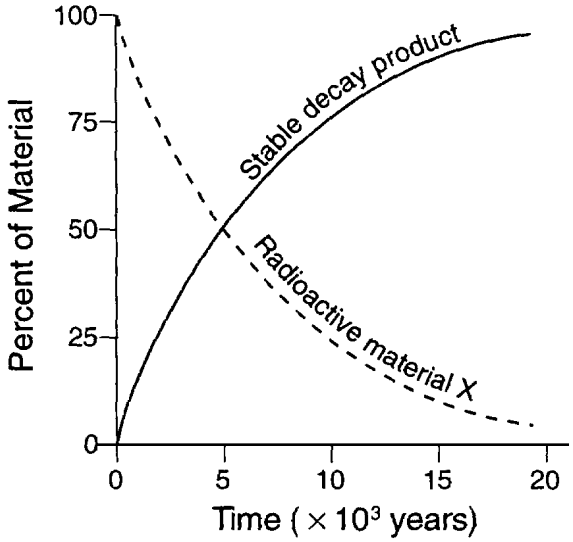
20. According to Table *N*, which radioactive isotope is best for determining the actual age of Earth?

A) ^{238}U B) ^{90}Sr C) ^{60}Co D) ^{14}C

21. As a sample of the radioactive isotope ^{131}I decays, its half-life

A) decreases B) increases
C) remains the same

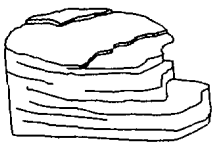
Base your answers to questions **22** through **25** on on the graph below. The graph represents the decay of radioactive material *X* into a stable decay product.



22. If radioactive material *X* were heated, the length of its half-life period would

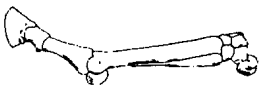
A) decrease B) increase
C) remain the same

23. Each of the objects below has different amounts remaining of the original radioactive material *X*. Which object is most likely the oldest?

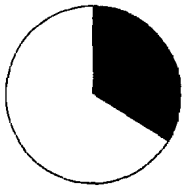
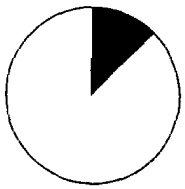
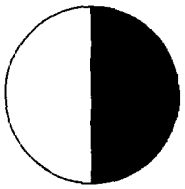
A) 
Rock
10% of the radioactive material remains

B) 
Wood
33% of the radioactive material remains

C) 
Shell
41% of the radioactive material remains

D) 
Bone
52% of the radioactive material remains

24. Which graph best represents the relative percentages of radioactive material *X* and its stable decay product after 15,000 years?(**The shaded region represents radioactive material while the non-shaded region represents stable decay products**.)

A) 
B) 
C) 
D) 

25. What is the approximate half-life of radioactive material *X*?

A) 5,000 yr B) 10,000 yr
C) 50,000 yr D) 100,000 yr

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26. The half-life of ^{131}I is 8.07 days. What fraction of a sample of ^{131}I remains after 24.21 days?

A) $\frac{1}{2}$ B) $\frac{1}{4}$ C) $\frac{1}{8}$ D) $\frac{1}{16}$

27. Approximately what fraction of an original Co–60 sample remains after 21 years?

A) $\frac{1}{2}$
B) $\frac{1}{4}$
C) $\frac{1}{8}$
D) $\frac{1}{16}$

28. What was the original mass of a radioactive sample that decayed to 25 grams in four half-life periods?

A) 50 g B) 100 g
C) 200 g D) 400 g

29. What mass of a 60.0-gram sample of ^{16}N will remain unchanged after 28.8 seconds?

A) 3.75 g B) 7.50 g
C) 15.0 g D) 30.0 g

30. What is the number of half-life periods required for a sample of a radioactive material to decay to one-sixteenth its original mass?

A) 8 B) 16 C) 3 D) 4