Geologic Time – Part II – Practice Questions and answers

Revised October 2007

1. Determining the ages of rocks through their contained radioactive elements is known as _____ dating.

2. An isotope of a given element has the same atomic number as the element, but a different _____ _____.

3. An isotope contains the same number of neutrons as the non-radioactive parent element. True or false

4. U-238 and U-235 are two naturally occurring isotopes of _____.

5. The spontaneous disintegration of the nuclei of an atom is called _____ _____.

6. The parent of the U-238/Pb-206 isotope system is _____.

7. The daughter of the U-235/Pb-207 isotope system is _____.

8. The time that it takes a given amount of a radioactive isotope to be reduced by one-half is called the isotopes _____.

9. What is the name of the constant that reflects the rate at which a radioactive isotope decays per unit of time?

10. The number of parent isotopes remaining at time t is what parameter in the equation $N = No(e^{-\lambda t})$.

11. What is λ in the equation $N = No(e^{-\lambda t})$?

12. Given 100 atoms of an isotope, how many will be left after one half-life?

13. Given 100 atoms of an isotope, how many will be left after three half-lives?

14. What is the following equation called: $t = (1/\lambda)(\ln[(D/P)+1])$?

15. What is D in the equation $t = (1/\lambda)(\ln[(D/P)+1])$?

16. The amount of remaining original isotopic material is represented by what parameter in the equation $t = (1/\lambda)(\ln[(D/P)+1])$?

17. What isotope system would you use to date a very young rock?

18. What isotope system would you use to date a Pleistocene tree trunk?

19. What isotope system would you use to date volcanic deposits containing a dinosaur?

20. Of the isotopic systems mentioned in this chapter which has the longest half-life?

21. Of the isotopic systems mentioned in this module which has the smallest half-life?

22. What kinds of rocks are found at Jack Hills, NW Australia and why are they significant?

23. Minerals such as K-feldspar, biotite, and hornblende all contain the element K. What isotopic system would you use to date these minerals?

24. What isotopic system would you use to date a crystal of zircon?

25. What is the oldest material dated on planet Earth, and what is its age?

26. Where is the oldest material dated on planet Earth?

27. What and where is the oldest rock dated on planet Earth? What is its age?

28. What mineral and isotopic system were used to date the oldest detrital crystal and rock on planet Earth?

29. Can you date the age of the Earth from fossils?

Answers

1. isotopic dating or geochronology
2. atomic weight
3. false
4. uranium
5. radioactive decay or radioactivity
6. U-238
7. Pb-207
8. half-life
9. decay constant, λ
10. N
11. decay constant
12. 50
13. 12.5
14. age equation or fundamental age equation
15. amount of daughter product
16. P
17. C-14/N-14
18. C-14/N-14
19. K-40/Ar-40
20. Rb-87/Sr-87
21. C-14/N-14
22. Conglomerate. Detrital zircons were eroded, transported, and then deposited as part of the conglomerate. A single detrital zircon was dated at 4.4 b.y. using the U-Pb method.
23. K-40/Ar-40
24. U238/Pb206 or U235/Pb207
25. Zircon, 4.4 b.y.
26. Jack Hills, NW Australia
27. Acasta gneiss, NW Canada, 4.03 b.y.
28. Zircon, U-Pb
29. No, the first evidence for life on Earth does not occur until the Archean. In other words, there was no life on Earth until approximately 4.0 billion years ago. Without life there can be no fossils.