

## Half-Life Calculations

Name: \_\_\_\_\_

1. If 100.0g of carbon-14 decays until only 25.0g of carbon-14 is left after 11,460 years, what is the half-life of carbon-14?
2. What is the half-life of a 100.0g sample of nitrogen-16 that decays to 12.5g of nitrogen-16 in 21.6 seconds?
3. A 208g sample of sodium-24 decays to 13.0g of sodium-24 within 60.0hrs. What is the half-life of this radioactive isotope?
4. Thallium-208 has a half-life of 3.053 minutes. How long will it take for 120.0g to decay to 7.5g?

5. The half-life of hafnium-156 is 0.025 seconds. How long will it take a 560g sample to decay to 140g?
  
  
  
  
  
  
  
  
  
  
6. Chromium-48 has a half-life of 21.6 hours. How long will it take 360.0g of chromium-48 to decay to 11.25g?
  
  
  
  
  
  
  
  
  
  
7. Gold-198 has a half-life of 2.7 days. How much of a 96g sample of gold-198 will be left after 8.1 days?
  
  
  
  
  
  
  
  
  
  
8. Potassium-42 has a half-life of 12.4 hours. How much of an 848g sample of potassium-42 will be left after 62.0 hours?

9. Actinium-226 has a half-life of 29 hours. If 100mg of actinium-226 disintegrates over a period of 58 hours, how many milligrams of actinium-226 will remain?
10. Selenium-83 has a half-life of 25.0 minutes. How many minutes would it take for a 10.0mg sample to decay and have only 1.25mg of it remain?
11. How old is a bone if it presently contains 0.3125g of carbon-14, but it was estimated to have originally contained 80.000g of carbon-14. The half-life of carbon-14 is 5730 years.
12. The half-life of cobalt-60 is 5.26 years. If 50 grams are left after 15.8 years, how many grams were in the original sample?

13. The half-life of polonium-218 is three minutes. How much of the isotope should you buy if you need a 0.10g sample of this material and you know the polonium-218 will take 30 minutes to reach you?
14. The half-life of tritium is 12.3 years. If 48.0mg of tritium is released from a nuclear power plant during the course of a mishap, what mass of the tritium will remain after 49.2 years?
15. Iron-59 is used in medicine to diagnose blood circulation disorders. The half-life of iron-59 is 44.5 days. How much of a 2000mg sample will remain after 133.5 days?

16. A doctor suspects that his patient may have Grave's Disease, a thyroid disorder. To be sure he asks the technician to perform radionuclide scanning. This procedure requires the use of iodine-131 which, when given in small doses, is used as a medical tracer to detect thyroid disorders. A patient swallows 10 grams of the iodine-131. Sixteen days later, the detectors observe 2.5 grams of iodine in the patient's thyroid. What is the half-life of iodine-131?
17. To prevent food spoilage, food can be irradiated with gamma rays from cobalt-60. If the half-life of cobalt-60 is 5.3 years, how much of a 75g sample will remain after 1.3 years?
18. Scientists use carbon-14 dating to determine the age of archeological artifacts up to 50,000 years old. Carbon-14 has a half-life of 5730 years. A 10,000 year old fossil currently contains 1.8g of carbon-14. How many grams of carbon-14 did the fossil originally contain?

19. Manganese-56 decays by beta emission and has a half-life of 2.6 hours. How many mg of a 20.0mg sample will remain after 13 hours?

20. Uranium-238 has a half-life of 4.46 billion years. How long will it take for a 12g sample to decay to 0.1875g?