Exercise 5.23 – The half life

Q523-01 The half-life of radioactive ^{55}Cr is 1.8 hours. The delivery of a sample of this isotope from the reactor to your laboratory requires about 10.8 hours. What is the minimum amount of such material that should be shipped in order that you receive 1.0 milligram of ^{55}Cr?
  - A. 128 mg
  - B. 64 mg
  - C. 32 mg
  - D. 11 mg

Q523-02 The half-life of the isotope 14C is 5570 years. How many years will it take for 87.5% of a sample to decay?

Q523-03 For a first order reaction of half-life 150 min, what is the rate constant in min-1? [$t_{1/2}$ = 0.693 / k1]

Q523-04 A first-order reaction has a half-life of 14.5 hours. What percentage of the reactant will remain after 29.0 hours?

Q523-05 For a first order reaction that has a half-life of 72 s at 80 °C, what is the value of the rate constant, k?

Q523-06 The half life for the radioactive decay of ^{32}P is 14.3 days. How many days would be required for a sample of a radiopharmaceutical containing ^{32}P to decrease to 25% of its initial activity?

Q523-07 The half life of ^{231}Pa is 3.25 x 10^4 years. How much of an initial 10.40 microgram sample remains after 3.25 x 10^5 years?

Q523-08 Carbon-11 is a radioactive isotope of carbon. Its half-life is 20 minutes. What percentage of the initial number of C-11 atoms in a sample will have decayed away after 80 minutes?

Q523-09 How old is a bottle of wine if the tritium (^{3}H) content (called activity) is 25% that of a new wine? The half-life of tritium is 12.5 years.

Q523-10 A Geiger counter registered 1000 counts/second from a sample that contained a radioactive isotope of polonium. After 5.2 minutes, the counter registered 250 counts/second. What is the half-life of this isotope in seconds?