**Half-Life Questions**

1. The activity of a radioisotope changes from 6000 Bq to 375 Bq over a period of 60 minutes. What is the half-life of this element?
2. A sample of iodine-131 was measured to have an activity of 832 Bq. The half-life of iodine-131 is 8 hours. How much time will it take for the activity to fall to 52 Bq?
3. Sodium-24 has a half-life of 15 hours. If a sample of this radioisotope has an activity of 10 million decays per second now, determine its activity in 5 days’ time. (This is best done mathematically rather than using a table.)
4. One product of nuclear power plants is the isotope caesium-137, which has a half-life of 30 years. How many years will it take for the activity of a sample of 137-caesium to reduce to one eighth of its original value?
5. C-14 is formed in the upper atmosphere by the interaction of nitrogen and cosmic rays. Living creatures breathe in C-14, dead ones don’t. The half-life of C-14 is 5730 years. One gram from a modern wooden spoon is tested and found to give, on average, 0.26 Bq. One gram of carbon is obtained from the tomb of Hemaka in Egypt. Over a one-hour period 480 counts are registered.
6. How many becquerels does this correspond to?
7. What date does this suggest for Hemaka’s tomb?
8. After an animal dies it no longer takes in carbon-14, so the ratio of radioactive C-14 to stable C-12 gradually decreases. C-14 undergoes -decay and has a half-life of about 5730 years. The decay rate of C-14 in a living animal is around 15 decays per minute per gram of carbon. An archaeologist finds an animal bone which has 200 g of carbon. The -decay rate from the whole bone is 748 decays/minute.
9. What is the equation for the -decay of C-14?
10. What is the approximate age of the bone?
11. A cave containing ancient human bones is discovered. Living matter with an equal amount of carbon had 8.0 times as much carbon 14 as the bones. Taking the half-life of carbon-14 as 5730 years, find the approximate age of the bones.