Half Life and Decay Rates

**Useful Formulas:**

Definition of a mol: **n = N/NA**, where **NA** = 6.02x1023 atoms/mol

or **n = grams/molar mass**

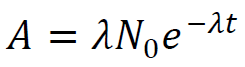
**1 min = 60 s, 1 hr = 3600 s, 1 day = 24x3600 s, 1 year = 365.25x24x3600 s**

|  |  |
| --- | --- |
| Activity:  (so A = λN, right)  N = current number of undecayed nuclei  No = original number of undecayed nuclei  λ = per atom per second probability of decay (s-1)  t = elapsed time (s)  A = activity (decays/sec) | Exponential decay:    N = current number of undecayed nuclei  No = original number of undecayed nuclei  λ = per atom per second probability of decay (s-1)  t = elapsed time (s) |

**Example #1**: - Radon 222 has an atomic mass of 222.02. How many grams of it do you have if your activity is 8.249 x 1016 decays/sec, and your decay probability is 2.098 x 10-6 s-1?

(Draw the half life lines in and then straight down at 50, 25, 12.5 on the vertical axis)



**Example #2:** Bi 211 has a half life of 128.4 s. What is the per-second probability of a nuclei decaying? If you start out with 32 grams of Bi 211, how much is left after 385.2 s? After what time is there 23 grams left? What is the activity when there is 23 grams left? (m = 210.987 u)