Short lab report on the Nuclear decay

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Date Performed:	February 3, 2016
Partners:	Whole class
Instructor:	Me

1 Objective

The objective of this following lab is to learn about the nuclear decay.

2 Nuclear Decay

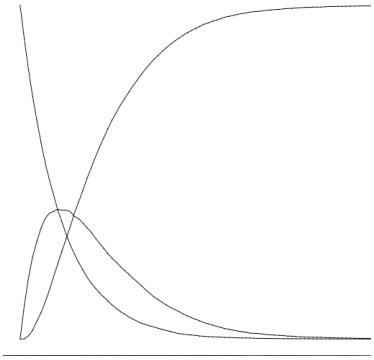
Nuclear Decay is the process by which a nucleus of an unstable atom loses energy by emitting radiation. A material that spontaneously emits such radiation which includes alpha particles, beta particles, gamma rays and conversion electrons is considered radioactive.

3 Simulation

Our teacher created a java program that can simulate the nuclear decay. The first thing that we had to do was to input the initial number of atoms in the terminal. I put 10000. Secondly, we had to put the probability of the decay for A to B. I put 0.1. Thirdly, we were supposed to input the probability of decay for B to C. I put 0.1.

```
Alexander-Mac:decay_sim-master sasha$ java Nuclear2
input the initial number of atoms.
10000
input P, the probability of decay for A to B.
0.1
input P, the probability of decay for B to C.
0.1
10000 0 0 9004 996 0 8085 1823 92 7275 2464 261 6560 2913 527 5893 3319 788 5283
 3611 1106 4773 3767 1460 4322 3823 1855 3868 3884 2248 3508 3861 2631 3144 3861
 2995 2818 3818 3364 2547 3674 3779 2292 3601 4107 2071 3481 4448 1855 3335 4810
 1675 3202 5123 1525 3026 5449 1381 2873 5746 1258 2714 6028 1139 2558 6303 1020
 2420 6560 911 2302 6787 820 2169 7011 745 2050 7205 660 1942 7398 595 1819 7586
 531 1714 7755 473 1595 7932 432 1478 8090 391 1371 8238 360 1258 8382 321 1184
8495 282 1094 8624 254 1015 8731 222 940 8838 190 879 8931 159 822 9019 146 752
9102 130 691 9179 118 635 9247 105 588 9307 89 539 9372 80 488 9432 69 455 9476
64 414 9522 61 380 9559 53 346 9601 46 309 9645 44 286 9670 37 264 9699 33 239 9
728 31 218 9751 29 199 9772 28 174 9798 23 169 9808 18 162 9820 17 149 9834 16 1
31 9853 13 124 9863 13 115 9872 11 108 9881 9 99 9892 8 87 9905 6 85 9909 6 72 9
922 6 66 9928 5 58 9937 5 55 9940 4 49 9947 3 50 9947 2 49 9949 2 42 9956 2 36 9
962 1 35 9964 1 30 9969 1 28 9971 1 28 9971 1 25 9974 0 23 9977 0 20 9980 0 18 9
982 0 17 9983 0 17 9983 0 16 9984 0 15 9985 0 12 9988 0 10 9990 0 10 9990 0 9 99
91 0 9 9991 0 9 9991 0 9 9991 0 7 9993 0 5 9995 0 5 9995 0 5 9995 0 5 9995 0 3 9
997 0 2 9998 0 1 9999 0 1 9999 0 1 9999 0 1 9999 0 1 9999 0 1 9999 0 1 9999 0 1
9999 0 1 9999 0 1 9999 0 1 9999 0 1 9999
```

With the help of this program we were able to recieve the graph for the nuclear decay.



4 Nuclear decay half-life estimations

$$A = Aoe^{-\lambda t}$$

Lambda is a decay constant

$$\frac{A}{Ao} = \frac{1}{2} = e^{-\lambda(T\frac{1}{2})}$$

$$ln\frac{1}{2} = -\lambda(T\frac{1}{2})$$

$$T\frac{1}{2} = \frac{ln(2)}{\lambda}$$

We can use these formulas to find the half life of the Nuclear Decay. By conducting the following estimations I found that the if the probability decreases twice the half life decreases too. So its behaviour is easy to predict.

if the probability of the decay is 0.01 the half life is 69.3 days.

if the probability of the decay is 0.02 the half life is 34.65 days

if the probability of the decay is 0.04 the half life is 17.33 days

if the probability of the decay is 0.08 the half life is 8.66 days

if the probability of the decay is 0.16 the half life is 4.33 days All of these leads us to a conclusion that on average the decay decrease with the same rate. It decreases twice.

5 Discussion

As we can see through this graph that is an exponential function. Consequently, it decays exponentially as it turns into a different form(radiation) per particular time. The decay gets lower and lower. Consequently, the rate gets smaller too. Moreover, a rate of decay is proportional to its origin. An atom looses its initial energy by emitting radiation.

References

Wikipedia, 2016, Physics: Radioactive decay