

Note on radioactive decay

It is observed experimentally that radium gradually decays into radon by emitting alpha particles. Each radium atom disintegrates independently of all the others. Each of the n_0 radium atoms initially present in the sample has the same probability $P(t)$ of disintegrating during an interval of t seconds. Suppose the disintegration of each radium atom is interpreted as a "success." Then the random variable $X(t)$ equal to the number of alpha particles emitted in t seconds, equals the number of successes in a series of n_0 Bernoulli trials with probability of success $P(t)$

$$P(X(t) = x) = \frac{\lambda^x}{x!} e^{-\lambda}, \quad (1)$$

where $x = 1, 2, 3, \dots$ and

$$\lambda = n_0 P(t) \quad (2)$$

is an average number of alpha particles emitted in t seconds.

References

- [1] Rozanov, Y.A., translated by Silverman, R.A. (1969) *Probability theory: a concise course* Dover Publications, Inc., New York
- [2] Piskorz, Pawel Jan (2016) *The Poisson Distribution* <http://www.avidenergy.com/pdf/PoissonDistribution.pdf>

Pawel Jan Piskorz (paweljs@gmail.com)