assignments especially if the mass number of one of the isotopes is known. In this case both are unknown. Since the half-lives of the isotopes are different, the calculation must be based upon an accurate knowledge of the cyclotron beam intensity at each time in the bombardment, if the latter is longer than, or comparable to, the half-lives of the isotopes. The beam intensity may, in some cases, vary widely from time to time, making summation methods necessary.

The number of atoms of a given isotope formed during a bombardment interval is given by

$$N = \frac{N_0 \sigma \varphi}{\lambda} (1 - e^{-\lambda t})$$

in which N is equal to the number of atoms formed; N_0, the number of target atoms per unit area; σ, the cross section for the reaction involved; λ, the decay constant of the product nucleus; φ, the intensity of incident particles; and t, the length of the bombardment interval. If observations are made at a time, t', after the end of the bombardment interval the equation must be modified:

$$N = \frac{N_0 \sigma \varphi}{\lambda} (1 - e^{-\lambda t}) e^{-\lambda t'}$$

Now, the number of disintegrations of the product nucleus, A, is related to the number of atoms, N, by the constant of proportionality, :

$$A = \lambda N$$

so that:

$$A = N_0 \sigma \varphi (1 - e^{-\lambda t}) e^{-\lambda t'}$$

If a given bombardment be considered as a series of intervals in each of which the intensity is relatively constant:

$$A = N_0 \sigma \sum_n \varphi_n (1 - e^{-\lambda t_n}) e^{-\lambda t'_n}$$

where t'_n is the time from the end of each bombardment interval to the end of the total bombardment (or to any other time of observation desired). It follows that the ratio of activities due to isotopes "a" and "b" is: