$$\frac{A_a}{A_b} = \frac{\sigma_a}{\sigma_b} \frac{\sum n(1 - e^{-\lambda_a t_n})e^{-\lambda_a t'_n}}{\sum \gamma_n(1 - e^{-\lambda_b t_n})e^{-\lambda_b t'_n}} = \frac{\sigma_a}{\sigma_b} Y$$

Any observable quantity, $A'$, which is proportional to the true rate of disintegrations through a constant, k, may be used in comparing the relative cross sections for the two reactions, the only modification being the introduction of a constant, K, into the observed ratio:

$$\frac{A_a}{A_b} = \frac{k_a A'_a}{k_b A'_b} = \frac{\sigma_a}{\sigma_b} Y \quad \text{and} \quad \frac{1}{Y} \frac{A'_a}{A'_b} = \frac{k_b}{k_a} \frac{\sigma_a}{\sigma_b} = K \frac{\sigma_a}{\sigma_b} .$$

By using the counting rates observed in the differential method described in Section IV-A, which are closely related to the x-radiation from each isotope, values of $\left(\frac{A' \ 12 \text{ hour}}{A' \ 50 \text{ hour}}\right)$ have been obtained for 19 Mev, 16 Mev and 13 Mev deuteron bombardments of $Pu^{239}$, as well as for 38 Mev and 32 Mev helium ion bombardments of $Np^{237}$ (Table 2). The corresponding values of Y then enable the calculation of $K\left(\frac{12 \text{ hour}}{50 \text{ hour}}\right)$ for each particle and energy to be made. <Table 2

From these data certain facts become apparent: (1) the yield of the 12-hour isotope increases relative to the 50-hour isotope with decrease in kinetic energy of the incident particle, whether helium ions or deuterons are considered, (2) the variation in relative yields is not as great as is normally expected for the reaction (α,n) or (α,4n), compared to (α,3n) or (α, 2n)(or, similarly, for the (d,n) or (d,4n) reactions, compared to the (d,3n) or (d,2n)), and (3) the actual yield of 12-hour activity appears to be greater than that of 50-hour activity, since K is probably not very far from unity and for 38 Mev helium ions the value of $K\left(\frac{\sigma 12 \text{ hour}}{\sigma 50 \text{ hour}}\right)$ is quite large. At 38 Mev the (α,2n) and (α,3n) reactions are known to be predominant (similarly, the (d,2n) and (d,3n) reactions at 19 Mev), and at 13 Mev the (d,4n) reaction is expected to have a very low yield. Mass assignments which are entirely consistent with the observed data are: