reaction the difference is about 4 Mev. In both cases the correspondence between the curves for the proton- and nitrogen-induced reactions in Fig. 5 is much too close to allow such a difference in exit barrier heights. It therefore seems that these nitrogen-induced reactions do not proceed by direct interactions of the "stripping"[12] or "buckshot"[13] type. It would seem rather that the particles are emitted from a conglomerate nucleus which has proceeded toward thermodynamic equilibrium, at least to the point of being nearly spherical in shape. Alpha and two-alpha emission is more probable, however, in the case of nitrogen reactions by a factor of two and four, respectively, which, in an undoubtedly oversimplified classical picture, could indicate that complete thermodynamic equilibrium—that is, the compound nucleus assumed by Bohr[14]—is not always reached. Complete equilibrium would require that the relative probabilities of decay by α, 2α, and $2p$ emission be the same whether the compound nucleus was formed by an N^{14}-C^{12} or a p-Mg^{25} collision. This statement is contingent on the assumptions made in reference 10. In the reaction of nitrogen on carbon, the high cross sections for alpha emission may indicate a "memory" of the alpha-particle structure of the initial carbon nucleus.

[12] J. R. Oppenheimer and M. Phillips, Phys. Rev. 48, 500 (1935).
[13] Chackett, Fremlin, and Walker, Phil. Mag. 45, 173 (1954).
[14] N. Bohr, Nature 137, 344 (1936).

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Decay Characteristics of Some Short-Lived Nuclides of Low Atomic Number*

R. M. KLINE† AND D. J. ZAFFARANO
Institute for Atomic Research and Department of Physics, Iowa State College, Ames, Iowa
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The short-lived activities in Cl^{34}, K^{38}, Ca^{39}, Li^{8}, He^{6}, and O^{15} formed by high-energy bremsstrahlung irradiation have been examined, and some improved values for the half-lives of these nuclides are reported.

THE half-lives of the isomeric states in Cl^{34} and K^{38}, as well as the half-lives of Ca^{39}, Li^{8}, He^{6}, and O^{15} have been measured with an anthracene scintillation spectrometer using pulse-height discrimination and special timing equipment. These nuclides were formed by (γ,n) and (γ,p) reactions induced by bremsstrahlung whose maximum energy was kept below the thresholds of competing reactions.

Cl^{34} and K^{38} were of interest because of the recent report[1] of isomeric states in these nuclides. Ca^{39} was of interest because the "*ft* value" for this transition has recently been reported[2] to be somewhat higher than the *ft* values for some of the other "mirror transitions." A comparison with previously observed values for Li^{8}, O^{15} and He^{6} was of general interest.

TABLE I. Summary of half-lives measured.

Nuclide[a]	Half-life (sec)	Maximum beam energy (Mev)	Possible interfering reaction	Threshold for interfering reaction[b] (Mev)
Li^{8}	0.841±0.004	65	...	...
He^{6}	0.799±0.003	65	...	...
O^{15}	123.4 ±1.3	25	$O^{16}(\gamma,2n)O^{14}$	26.8
Ca^{39}	0.90 ±0.01	19.5	$Ca^{40}(\gamma,d)K^{38}$	17.6
Cl^{34}	1.53 ±0.02	22.0	$Cl^{35}(\gamma,2n)Cl^{33}$	23.8
K^{38}	0.935±0.025	22.0	$K^{39}(\gamma,2n)K^{37}$	24.0

[a] The first two nuclides listed were formed by (γ,p) reactions. The others were formed by (γ,n) reactions.
[b] All threshold calculations were based on semiempirical mass values given by N. Metropolis and G. Reitwiesner. Atomic Energy Commission Report NP-1980, 1950 (unpublished). The same thresholds calculated using semiempirical values given by W. H. Barkas, Phys. Rev. 55, 691 (1939), give consistently higher values.

The target selected for each bombardment was a chemically pure element or compound. When it was necessary to use a compound, care was taken to choose one which would give no short-lived background. In all cases the activity was followed for more than six half-lives. Weighted-least-squares analyses were used to obtain the numerical values for half-lives and probable errors quoted. Care was taken to observe and correct for the small constant and decaying long-lived background in each case. Because of the short pulse duration from the scintillation counter, no "dead-time" corrections were necessary.

Since all the nuclides studied except O^{15} had half-lives of less than two seconds, a cyclic programming device which channeled the scintillation pulses into nine scalers in the time succession was used.[3] Bombardment and counting durations were adjustable and were controlled by a master clock operating cascaded stepping relays. The beam duration and counting periods were optimized for each measurement.

The essential results of this work are presented in Table I. In each case the accuracy is thought to be improved over previous measurements.

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† Now at Sperry Gyroscope Company, Great Neck, Long Island, New York.
[1] P. Stähelin, Helv. Phys. Acta 26, 691 (1953).
[2] Hunt, Kline, and Zaffarano, Phys. Rev. 95, 611(A) (1954).
[3] The detailed experimental equipment and procedure are described in Atomic Energy Commission Report ISC-510 (unpublished).