Short-Lived Radioactivities of $_{14}Si^{27}$, $_{16}S^{31}$, and $_{18}A^{35}$

In an attempt to extend the well-known series of radioactive elements characterized by the formula $Z-N=1$, the following new reactions have been observed:

Reaction	Half-life
$_{12}Mg^{24}(\alpha, n)_{14}Si^{27}$	4.92 sec.
$_{14}Si^{28}(\alpha, n)_{16}S^{31}$	3.18 sec.[1]
$_{16}S^{32}(\alpha, n)_{18}A^{35}$	1.91 sec.

These reactions were produced by 16-Mev alpha-particles. Because of the short lifetimes the bombardments were performed outside of the cyclotron thus reducing the bombarding energy by a 0.6-mil aluminum window. The bombardment time varied from one to three seconds in an alpha-beam of about 0.05 microampere.

Since these periods are too short to identify chemically one must rely for their correct assignment on: (1) the fact that from simple theoretical considerations[2] it is expected that Si^{27}, S^{31} and A^{35} should be short-lived positron emitters; (2) the relative abundance of the stable isotopes of the elements bombarded; and (3) the elimination of possible radioactive isotopes by their known half-lives.

Si^{27} when produced by alpha-bombardment had previously been incorrectly assigned a half-life of 6.7 minutes; this was shown to be incorrect by Bethe and Henderson.[3] The Rochester groups[4] and more recently the Princeton group[5] have obtained this radioactive isotope by using high energy protons on aluminum. The half-life obtained by the latter group agrees well with that obtained by us.

The half-lives given above have been measured by means of a multiple scale Geiger counter circuit. The dial readings of the mechanical counter are photographically recorded at regular time intervals of $\frac{1}{2}$ or 1 second. Every point used in the determination of the half-lives had at least 50,000 counts and data were taken for a sufficiently long time so that any longer periods as well as the background could be subtracted out. The activities showed an exponential decay over at least three lifetimes.

Energy measurements of the positrons emitted are in progress.

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[1] Dr. Van Voorhis has informed us that the Rochester group using protons on phosphorus has obtained S^{31} with a half-life similar to that obtained by us.
[2] E. Wigner, Phys. Rev. **56**, 512 (1939).
[3] H. A. Bethe and W. J. Henderson, Phys. Rev. **56**, 1060 (1939).
[4] G. Kuerti and S. N. Van Voorhis, Phys. Rev. **56**, 614 (1939).
[5] Barkas, Creutz, Delsasso, Sutton and White, Phys. Rev. **50**, 38 (1940).