reported here, we obtain 1.008992±0.000010 amu for the mass of the neutron. The probable error given includes an uncertainty of 0.3 percent in the absolute energy value for the ThC″ γ-ray. This neutron mass value is 0.051 mmu greater than the value quoted by Stephens[1] and gives a value for the $n-H^1$ difference of 0.804±0.009 Mev. The theoretical lifetime of the neutron is reduced by a factor of 1.3 when this new value for the $n-H^1$ difference is used.

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On the Radioactivity of K^{40}

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SOME years ago we published measurements of the quantum energy and the upper limit of the beta-ray spectrum of K^{40}. The values found by us are, respectively,[1]

$$E_\gamma = 1.54 \pm 0.1 \text{ Mev}, \quad E(\beta_{\max}) = 1.41 \pm 0.02 \text{ Mev}.$$

These data are in good agreement with later measurements by Meyer *et al.*,[2] Gleditsch and Gráf,[3] Dželepow *et al.*,[4] and Henderson.[5] Recently, Franchetti and Giovanozzi,[6] using the cloud-chamber method, obtained a much higher value for the maximum beta-ray energy of K^{40}, namely, 1.7±0.1 Mev. We believe that with respect to our measurements such a high beta-ray energy is rather improbable. Figure 1 gives the absorption curves obtained by us with P^{32} ($E_{\max} = 1.71$ Mev), Na^{24} ($E_{\max} = 1.41$ Mev), and K^{40} in the same geometrical arrangement. The points for K^{40} are taken up to 1/500 of the initial intensity and are all lying on the Na^{24} curve.

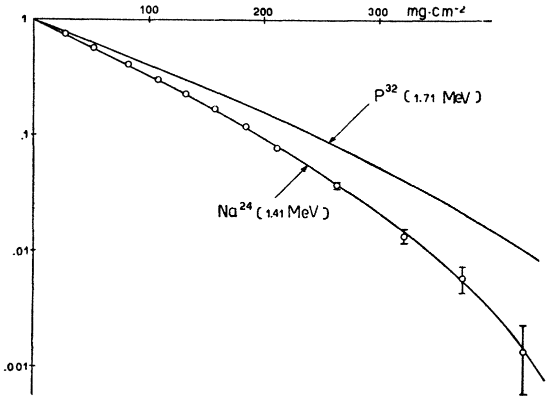

FIG. 1. Absorption curves in aluminium of P^{32} and Na^{24}. The points refer to K^{40}.

In addition we have determined the number Γ of quanta emitted per 100 beta-rays. For this purpose, the radiation from a thick KCl sample (cylindrical arrangement) was measured (a) with a thin-walled (27 mg/cm² Al) G-M counter and (b) with a cylindrical absorber, thick enough to absorb all the beta-rays, between the sample and the counter. The same measurements were performed with Al^{28}, which is known to emit one quantum of 1.8 Mev per beta-ray. The ratio of the sensitivities for γ-rays of 1.54- and 1.8-Mev quantum energies is 0.84 for Al counters, as computed by Bleuler and Zünti[7] and obtained experimentally by Bradt *et al.*[8] Taking into account the self-absorption of the beta-rays in the samples and their absorption in the counter wall, we obtain for Γ

$$8.7 \pm 1.2 \ \gamma\text{-quanta per 100 beta-rays.}$$

Furthermore we have determined the half-life of the transition $K^{40} \rightarrow Ca^{40}$. The number of counts from a thin sample (4 mg/cm²) of purified KCl (cylindrical arrangement) was compared with a very thin (<1 mg/cm²) U_3O_8 sample. The back-scattering from the holder (0.01-mm Al foil) was determined to be smaller than 1 percent. Taking into account the somewhat different absorption of the two beta-spectra in the wall of the G-M counter, as well as the very weak intensity of UX_1 and UY radiation passing through the counter wall, we get

$$T_{\frac{1}{2}}(K^{40}) = T_{\frac{1}{2}}(U^{238}) \times 0.246$$
$$T_{\frac{1}{2}}(K^{40}) = (11.1 \pm 1.9) \times 10^8 a.$$

The greatest contribution to the error in $T_{\frac{1}{2}}$ is given by the incertainty in the relative abundance of K^{40} (0.011±0.001 percent).[9]

We are very indebted to Professor P. Scherrer for his stimulating interest in this work.

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Observations of Naphthalene Scintillations Caused by Tritium Beta-Rays*

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IT seems desirable to report here some preliminary observations on the scintillations produced in commercial naphthalene by the beta-rays from tritium and by the bremsstrahlung coming from tritium occluded in tantalum. Of immediate interest is the lower limit set on the conversion efficiency from beta-ray to visible light energy.

A small amount of gaseous tritium was put in direct contact with finely powdered naphthalene crystals in a 15-cm³ glass Kjeldahl flask, an identical flask but without tritium being used as a control, to find the direct action of the betas. A tantalum disk containing tritium occluded throughout its volume was placed near a solid piece of