kg/cm² and 9390 kg/cm², T_λ was 0°C and +30°C. These points, together with T_λ at atmospheric pressure, enabled the equilibrium curve to be drawn. The slope at −30°C could thus be found, and was, in fact, 68.2 kg/cm²-deg., differing from the calculated value by 2 percent.

While the agreement is to a certain extent fortuitous, in view of the assumptions involved, the fact that the results will be of the same order can only mean further support for the thermodynamical interpretation of the λ-point phenomena.

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Microwave Spectra: Methyl Iodide*

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THE $J=1$ to $J=2$ rotational transition of the symmetrical top molecule, CH_3I, has been examined in the region of 30,000 megacycles with the method previously described.[1] Figure 1 shows the relative positions and estimated intensities of the eleven lines which were observed. Since no isotopes exist in sufficient amounts to cause detectable lines, the hyperfine structure observed appears to be caused by the interaction of the quadrupole moment of the iodine nucleus with the molecular field. About ten percent of the molecules would be in an excited vibrational state at the temperature of observation, and it is possible that some of the lines on the low frequency side originate from these excited molecules. We will test this by repeating the observations at lower temperatures.

The exact value of the moment of inertia, I_B, depends upon a quantitative interpretation of the hyperfine structure. The I_B determined from the strongest line, which is near the center of gravity of the group, is 111×10^{-40} g cm². Assuming the bond angles and CH distances to be the same as those in methane, the C—I bond length is determined as 2.13A. This value is probably accurate to one percent. The deviation from the configuration assumed for the CH_3 is not likely to influence the C—I distance more than one percent, and the uncertainty caused by the hyperfine frequency spread is of this order. Widely conflicting values for the C—I bond length in this molecule have been obtained from infra-red vibrational spectra[2] (2.00A) and from electron diffraction (2.28A). The value obtained in the present work is close to the electron diffraction value[3] for the C—I distance in CI_4 (2.12A).

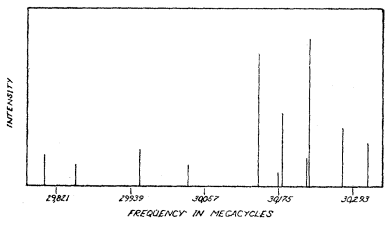

FIG. 1. Chart showing frequencies and estimated intensities of $J=1$ to $J=2$ transition in methyl iodide.

A more complete analysis of the spectra of this molecule is being made.

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Protons from the Deuteron Bombardment of Separated Neon Isotopes

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ENRICHED neon samples obtained by thermal diffusion have been bombarded with 3.2-Mev deuterons from the cyclotron. Samples of 99.5 percent Ne^{20}, of 0.5 percent Ne^{22}, and of 55 percent Ne^{20} with 45 percent Ne^{22}, have provided sufficient change in concentration of the heavy isotope to allow definite assignment of several proton groups to each of the two reactions $Ne^{20}(d, p)Ne^{21}$ and $Ne^{22}(d, p)Ne^{23}$.

The gas was bombarded within a bombardment chamber[1] at a pressure of approximately 15 cm of mercury. This pressure provided a sufficiently high yield of protons for fast counting, and sufficiently low absorption for the gas to be treated as a thin target (about 0.4 cm of air equivalent). The 3.7-Mev deuteron beam passed through an aluminum foil (1.86-cm air) into the gas bombardment chamber. Protons were counted at right angles to the incident beam by the use of double coincidence proportional counters.[2,3]

Composite curves of typical runs are shown in Fig. 1. The curve for the 99.5 percent Ne^{20} sample shows the proton groups from the $Ne^{20}(d, p)Ne^{21}$ reaction alone. Comparison with the curve for the sample enriched in the heavy isotope shows clearly the additional groups due to the $Ne^{22}(d, p)Ne^{23}$ reaction. Subtraction of curves of the two types (after correcting for the proportion of Ne^{20} present) allows a more accurate determination of the groups due to the heavy isotope. Table I lists the Q values

TABLE I. Reaction energies and energy levels of the neon isotopes.

Proton range (cm)	Q (Mev)	Energy level (Mev)
$Ne^{20}(d, p)Ne^{21}$		
20.7 ±0.6	0.90 ±0.11	3.58
28.1 ±0.5	1.65 ±0.10	2.83
40.3 ±0.5	2.73 ±0.09	1.75
59.4 ±0.7	4.17 ±0.09	0.31
63.6 ±0.8	4.48 ±0.10	0.00
$Ne^{22}(d, p)Ne^{23}$		
24.4 ±1.0	1.23 ±0.15	1.66
31.1 ±1.0	1.90 ±0.15	0.99
42.9 ±0.9	2.89 ±0.11	0.00