

It will be observed that both the activation energy and the non-exponential term Z are substantially independent of the presence of the solvent.

If Z is split up in the usual way into a steric factor and a collision frequency, then it can be seen that the collision frequency in the gas phase is of the same order as the 'apparent' collision frequency in solution. A full discussion of the experiments reported in this and in a previous note³ will be given elsewhere.

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¹ Diels and Alder, *Annalen*, **460**, 119 (1927); Alder and Stein, *ibid.*, **514**, 197 (1934).

² Kistiakowsky and Lacher, *J. Amer. Chem. Soc.*, **58**, 123 (1936).

³ NATURE, **137**, 497 (1936).

Velocities of Ultra-sonic Sounds

A SHORT time ago Pitt and Jackson¹ measured the velocities of ultra-sonic waves at the temperatures of liquid air and liquid hydrogen, using a vibrating quartz plate as a source. When an attempt was made to continue the experiment in liquid helium, it was found impossible to get the plate to oscillate vigorously; this led to the suspicion that quartz might show an anomaly in its piezo-electric effect at the temperature of liquid helium.

Experiments have now been carried out by both

statical and dynamical methods to test this point; the piezo-electric effect was measured at room temperature, the temperature of liquid air, and at various temperatures from 14° K. down to 4.2° K.

The constant at liquid air temperature was found to be 1.3 per cent less than that at room temperature; this decrease agrees with that reported by Onnes and Beckman²: "Thus we may conclude that the cooling from 290° K. to 80° K. causes a decrease of 1.2 per cent in the piezo-electric modulus. A further cooling from 80° K. to 20° K. causes a much smaller change. . . . The importance of this result is perhaps that the change in the piezo-electricity by cooling to low temperatures seems to take place chiefly above the temperature of liquid air."

In our experiments a further reduction in temperature to 4.2° K. produced a reduction of 12.4 (± 0.7) per cent, the greater part of this reduction occurring between 5.5° K. and 4.2° K. This result is remarkable since we should expect the elastic content of the quartz to be increased.

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¹ Pitt and Jackson, *Canad. J. Research*, **12**, May, 1935.

² Onnes and Beckman, *Leiden Comm.*, No. 132f (1912).

Points from Foregoing Letters

THE presence of 3-5 per cent of carbon dioxide in the air prevents or alleviates the untoward effects of a low oxygen content (8-9 per cent) on brain stem reflexes and also on vision, muscular co-ordination and mental processes, according to experiments by Prof. E. Gellhorn. The results are interpreted as being due to an improvement in respiration and circulation which leads to a better oxygenation of the brain.

Photomicrographs of bismuth crystals showing 'slip' deformation following upon compression are submitted by Dr. H. J. Gough and H. L. Cox, who point out at the same time that deformation by twinning is more frequent.

When positrons are annihilated (by combining with electrons), two quanta of energy are emitted in opposite directions as required by the law of conservation of momentum, according to experiments reported by Prof. A. I. Alichanian, A. I. Alichanow and L. A. Arzimovitch. The positrons were obtained from radio-phosphorus produced by bombardment of aluminium with alpha particles.

Prof. B. N. Singh and P. B. Mathur find that during the ripening of tomatoes considerable amounts of carbon dioxide accumulate in the fruit tissues. They suggest that the process of senescence is initiated by the accumulation of carbon dioxide, and that the accumulation in its turn is favoured by the greater oxygen intake and carbon dioxide production due to the greater permeability of the superficial tissues.

Curves showing the distribution in the size of cockles after one and two summers' growths in an artificial marine lake at New Brighton (Wallasey) are given by L. E. Bunting, A. Eslick, J. W. Jones and Prof. J. H. Orton. The rate of growth of the continuously submerged cockles is comparable with that

observed experimentally under normal tidal conditions and shows that the legal size is reached by about half the shells in two summers.

Measurements of the oxygen liberated by a green alga in intermittent light, made by W. A. Arnold and H. I. Kohn, are reported by the latter. It appears that the absorption unit within the plant is equivalent to about 500 chlorophyll molecules, and that quanta absorbed by a number of such units are pooled in order to reduce one molecule of carbon dioxide. The term unit does not imply a rigid structure.

Using a modified, carefully calibrated Gouy balance, Dr. V. C. G. Trew and Prof. J. F. Spencer find that the mass (diamagnetic) susceptibility of heavy water is 0.637 at 20°, in agreement with the results of Cabrera and Fahlenbrach.

The fact that the number of nebulae increases more rapidly than the cube of the distance is readily explained according to Prof. V. Varičák, if one uses Lobachevsky's geometry, according to which there are two parallel lines to a given line, meeting it at infinity, and hence a line has two distinct points at infinity and not one only as in ordinary geometry.

Dr. M. Wojciechowski reports that in detecting small amounts of water from its effect upon the boiling point of constant boiling (azeotropic) mixtures, a higher sensitivity is obtained by using *n*-propanol and toluene instead of an alcohol-benzene mixture.

The rates of combination of acrolein and cyclopentadiene in the liquid and in the gaseous state (at various temperatures) are compared by A. Wassermann. He concludes that the reaction in both cases is bimolecular and homogeneous, and no chain reaction is involved; consequently it is possible to estimate the collision frequency in solution.