complete, the basic probability is 2 instead of 1 as in a perfect crystal and the resulting entropy would be

$$R \ln 2 = 1{\cdot}38 \text{ units as maximum.}$$

Molecule	Zero-point entropy	Author
N = N	$-0{\cdot}07 \pm 0{\cdot}20 \simeq 0$	Eucken, 1929.[1]
O = C = O	$+0{\cdot}32 \pm 0{\cdot}27 \simeq 0$	Eucken, 1929.[1]
C = O	$+1{\cdot}06 \pm 0{\cdot}25$	Clusius and Teske, 1929.[2]
	$+1{\cdot}12 \pm 0{\cdot}10$	Clayton and Giauque.[3]
N = N = O	$+0{\cdot}90 \pm 0{\cdot}32$	Clusius, Vaughen and Hiller, 1930.[4]
N = O	$+0{\cdot}75 \pm 0{\cdot}10$	Johnston and Giauque, 1929.[5]

The values of Giauque and his collaborators are explicitly given by these authors. The other data are calculated from the difference of the vapour pressure constant and the chemical constant. The latter has been found by using the value $59{\cdot}4 \times 10^{-40}$ C.G.S. units for the momentum of inertia for nitrous oxide and $70{\cdot}8 \times 10^{-40}$ C.G.S. units for the same quantity for carbon dioxide.[6]

The symmetrical molecules nitrogen and carbon dioxide show no appreciable effect, while the asymmetric carbon monoxide, nitrous oxide and nitric oxide show a definite discrepancy of the same sign, order of magnitude and presumably the same origin.

In conclusion, Nernst's theorem does not apply to structures composed of asymmetric molecules held in position in the lattice by relatively weak orientational forces. We intend to investigate in this laboratory other asymmetric molecules and the possibility of more complete arrangement at liquid helium temperatures. Otherwise it is to be expected that the residual entropy will diminish with increasing molecular asymmetry.

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Sept. 28.

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Eddington's Theory and Physical Constants

EDDINGTON'S[1] equation for the mass of proton or electron

$$10m^2 - 136m + 1 = 0 \qquad (1)$$

holds only for 'very mild' interaction between the elementary charges. It has been extended for interactions at intra-atomic distances and the equation comes out to be

$$10m^2 - 135m + 1 = 0 \qquad (2)$$

The 'free' mass from (1) and 'singly constrained' mass from (2) give two values of e/m in perfect agreement with the deflection and the spectroscopic values respectively. For intra-atomic problems the latter alone is applicable. By using Eddington's[1] relation $ch/2\pi e^2 = 137$ and the precise values for the Rydberg number for hydrogen (H_1) [2], Faraday's constant[2], the velocity of light[2] and the chemical atomic weight of monoprotonic hydrogen, from Bleakney's $H_1 : H_2$ ratio[2,3] the following precision values are obtained.

Chemical atomic weight of monoprotonic hydrogen	$H_1 = 1{\cdot}00774$	$\pm 0{\cdot}00002$
Rydberg number for infinite mass	$R = 109737{\cdot}516$	$\pm 0{\cdot}050$
Specific charge of free electrons	$e/m_0 = 1{\cdot}77001$	$\pm 0{\cdot}00013 \times 10^7$ e.m.u.
Specific charge of singly-bound electrons	$e/m_1 = 1{\cdot}75697$	$\pm 0{\cdot}00013 \times 10^7$ e.m.u.
Electronic charge	$e = 4{\cdot}81209$	$\pm 0{\cdot}00037 \times 10^{-10}$ e.s.u.
Avogadro's number	$N = 6{\cdot}01132$	$\pm 0{\cdot}00089 \times 10^{23}$
Planck's constant	$h = 6{\cdot}64879$	$\pm 0{\cdot}00102 \times 10^{-27}$
Compton shift for free electrons at 90°	$h/m_0c = 0{\cdot}0244557$	$\pm 0{\cdot}0000003 \times 10^{-8}$ cm.
Compton shift for singly-bound electrons at 90°	$h/m_1c = 0{\cdot}0242758$	$\pm 0{\cdot}0000003 \times 10^{-8}$ cm.
Wave-length of molybdenum $K\alpha_1$ line	$= 0{\cdot}709701$	$\pm 0{\cdot}000016 \times 10^{-8}$ cm.
Calcite grating space (Yuching Tu's crystal)	$= 3{\cdot}03749$	$\pm 0{\cdot}00048 \times 10^{-8}$ cm.
Wien's radiation constant	$hc/k = 1{\cdot}44128$	$\pm 0{\cdot}00013$
Stefan's radiation constant	$= 5{\cdot}65050$	$\pm 0{\cdot}00051 \times 10^{-5}$

Perry and Chaffee's[4] and Kirchner's[5] determinations of e/m have been analysed. Systematic errors in the method, procedure and apparatus have been found which account for a correction of more than $+0{\cdot}8$ per cent. So far as the corrections are determinable, calculations from both the data give the value $1{\cdot}770 \times 10^7$ in agreement with the e/m_0 value given above and not $1{\cdot}760 \times 10^7$.

Millikan's[6] value for e has been analysed and found to require a correction, due to the holes in the top plate of his condenser, amounting nearly to $+0{\cdot}8$ per cent. The values got by direct measurement of charge on α-rays by Braddick and Cave[7] and Ward, Wynne Williams and Cave[8] give a value in agreement with the above. Also the discrepancy between grating and crystal values of X-ray wave-lengths has been removed by the above, without calling into account the hypothetical mosaic structure suggested by Zwicky[9] against which there is already so much evidence, at least in the X-ray measurements.

The criticisms of Birge[2,10] against $ch/2\pi e^2 = 137$ have been analysed and found to disappear completely on using the corrected values of e and e/m'.

A detailed discussion will be published early.

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Occurrence of *Lithothamnion* in the South Indian Cretaceous

IN two previous communications[1] one of us reported the discovery of abundant algæ, chiefly *Lithothamnion*, in some of the limestones of Upper Cretaceous age from the Trichinopoly and Pondicherry areas of South India.

In the course of a recent examination of the limestone ridges near Cullygoody (Trichinopoly Cretaceous area) we have collected a number of specimens of a pebbly or conglomeratic rock, which is often found at the base of these limestones. In hand specimens, this rock shows a number of rounded or oval cream-coloured 'pebbles' and presents an appearance very similar to the pebbly character of some of the Niniyur flints and cherts.[2] A micro-