

I believe, however, that a decrease in the concentration of the excited atoms and in the mobility of the negative carriers—both effects very likely produced by the presence of negative ions—help to bring out well-defined striations, especially when the electro-negative and the electropositive ions have strong chemical affinity for each other.

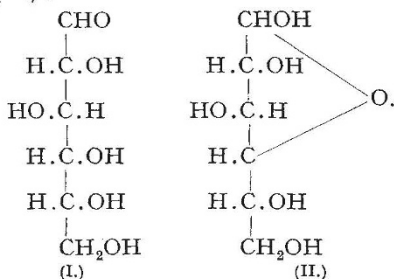
I shall now endeavour to publish the account of my work, as I have finally given up all hopes of getting suitable opportunity to perform further experiments on the subject done in the Cavendish laboratory between 1920 and 1922.

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A Revision of the Structural Formula of Glucose.

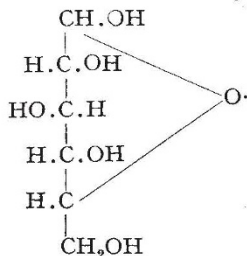
HITHERTO the balance of evidence as to the glucose structure has favoured the adoption of a γ -oxide ring formula (II.) which it is now customary to describe as a butylene- or 1:4-oxide structure. The property of mutarotation of sugars and the analogy which has been drawn between reducing sugars and their α - and β -methyl glucosides led to the abandonment of the older aldehyde formula (I.) for glucose in favour of (II.):



Whilst chemists have accepted the second of these formulæ as consistent with the experimental facts, yet it must be acknowledged that no direct proof of this structure has ever been advanced, and thus the allocation of a constitution to the commonest hexose rests mainly on the supposed analogy of the sugar with its related lactone, namely, gluconolactone.

In the aliphatic section of the Annual Reports of the Progress of Chemistry for 1924, published by the Chemical Society, the present writer expressed the opinion that current views regarding the formula of glucose would probably require revision. Meanwhile new evidence has been contributed by investigations conducted in these laboratories, and will shortly be published in detail, showing that normal tetramethyl glucose gives a δ -lactone on oxidation, whilst the corresponding γ -lactone is derived from the γ -sugar.

These results necessitate the adoption of the following constitutional formula for ordinary glucose:



In this formula the oxide ring shown in (II.) is displaced from the butylene-oxidic or 1:4 position, and

the attachment is that of a six-membered ring—that is, a 1:5 or amylenoxide; and as this has been shown also to apply to galactose, mannose, xylose, and arabinose, the generalisation is reached that all aldoses exist normally as amylenoxide forms. The γ -sugars of the aldose type must be regarded as butylene oxides.

Since glucose is an essential unit in most of the natural carbohydrates such as cane-sugar, maltose, lactose, starch, cellulose, it follows that the constitutional formulæ of these substances must undergo revision in the same sense.

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Compton's Theory of X-ray Scattering.

READERS of NATURE may be interested in a short account of two experimental tests of Compton's theory of scattering which at present are being carried out here. Both of these tests deal with the total energy of the recoil electrons produced by hard X-rays.

One method is to compare the ionisation produced by the rays in very small (0.5 c.c.) air-ionisation chambers of different light substances (pure metals and salts). The ionisation in such small chambers is due solely to the secondary electrons from the walls. If these secondary electrons all had been of the photoelectric type, their number and therefore the ionisation would have been proportional to the third power of the effective atomic number of the wall substance. Thus, for example, the ionisation in a magnesium chamber should have been $8 \left[= \left(\frac{12}{6} \right)^3 \right]$

times larger than the ionisation in a graphite chamber. Experiments show that for hard X-rays the ratio is considerably smaller, decreasing rapidly for decreasing wave-lengths. For the hardest X-rays which we have produced, the difference between the two chambers is only about 15 per cent. For the γ -rays there is no measurable difference. This decrease is due to the production of the recoil electrons, the energy of which is independent of the atomic number, and, as I have shown (Proc. Nat. Acad. Sci., 10, p. 441, 1924; *Zeit. für Phys.*, 29, p. 374, 1924), this energy can readily be determined by such measurements. For very hard X-rays ($\lambda < 0.15 \text{ \AA.U.}$) our experiments verify Compton's theory to within experimental errors, which may amount to about 10 per cent.

In the second method, we measure the true absorption of hard X-rays in light substances like water. Under our experimental conditions, this true absorption is practically due solely to the production of the recoil electrons. The method consists in measuring the reflection of a very wide bundle of approximately parallel (and homogeneous) rays from the surface of a large mass of the substance, and measuring also the intensity of the rays at different depths under the surface. The difference between the incoming and the reflected energy must equal the energy absorbed in the substance, this amount being obtained by multiplying the average value of the intensity in the substance by the coefficient of true absorption. By introducing a correction for the photoelectric absorption, the absorption corresponding to the production of the recoil electrons is thus derived.

For water and very hard X-rays ($\lambda < 0.15$) we here also verify Compton's theory to within the experimental errors (about ± 10 per cent.). (Compare *Phys. Rev.*, 25, p. 581, 1925.)