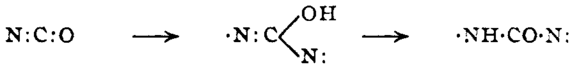
gram per cc. A study of the gradation of intensities represented on the different plates allows us to place the concentration of the solution in question at very nearly 0.000045 gram per cc. Furthermore, on comparing Plate VII with the standard series, already referred to, it will be seen that the solution contained approximately 64% neo- and 36% allo-chlorophyllan.

The chloroform solution obtained from the half leaf, used for this experiment, measured 130 cc., which is seven times larger than necessary for making the determination. In other words, a leaf whose green weight is only 0.2 gram suffices for determining the quantity and character of the chlorophyll it contains.

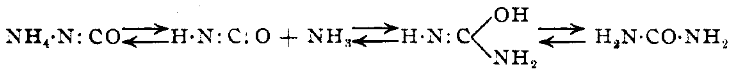
NOTE.

Note on the Transformation of Ammonium Cyanate into Urea.—Chattaway[1] says, "The course of the reaction which takes place when ammonium cyanate is transformed into carbamide has never been satisfactorily explained. Up to a few years ago it was universally regarded as a peculiar case of isomeric change and no consideration was given to the process by which the conversion was effected." He then states that various specified reactions of carbamide, cyanic acid, isocyanic acid and their esters may be simply explained "by regarding them as instances of the well known tendency of the carbonyl group to add groups such as R_2NH and ROH, followed by a subsequent atomic rearrangement involving only the transference of a hydrogen atom from an oxygen atom to a nitrogen atom connected with it through the doubly linked carbon atom, thus:



$$N{:}C{:}O \longrightarrow \cdot N{:}C\left\langle\begin{matrix}OH\\ N{:}\end{matrix}\right. \longrightarrow \cdot NH\cdot CO\cdot N{:}$$

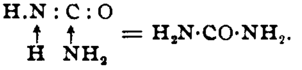
The conversion of ammonium cyanate into carbamide should therefore be formulated as follows:"



$$NH_4\cdot N{:}CO \rightleftarrows H\cdot N{:}C{:}O + NH_3 \rightleftarrows H\cdot N{:}C\left\langle\begin{matrix}OH\\ NH_2\end{matrix}\right. \rightleftarrows H_2N\cdot CO\cdot NH_2$$

The three stages, then, in the transformation are (1) the breaking up of ammonium cyanate into cyanic acid and ammonia, (2) the formation of an addition compound, and (3) a rearrangement of this compound.

A simpler explanation eliminates this addition compound and its rearrangement. I find in my note book on the lectures in Organic Chemistry by Professor H. B. Hill at Harvard University in 1896, this statement: Ammonium cyanate breaks up with heat into HNCO and NH_3 and then the NH_3 adds itself as follows:



$$\begin{matrix}H.N & : & C & :O\\ \uparrow & & \uparrow & \\ H & & NH_2 & \end{matrix} = H_2N\cdot CO\cdot NH_2.$$

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[1] Chattaway, *J. Chem. Soc.*, 101, 170 (1912).

I have used this explanation in my own lectures since that time. Essentially the same explanation is given by Willstätter in his lectures in Zürich. By introducing the idea of partial valence the mechanism is more readily conceived. The reaction is formulated thus:

$$\begin{array}{c}\mathrm{H{-}N\overline{\overline{++}}C{=}O}\\ \vdots\quad\vdots\\ \mathrm{H-NH_2}\end{array}\qquad\qquad\begin{array}{c}\mathrm{H{-}N{-}C{=}O}\\ |\quad|\\ \mathrm{H\ \ NH_2}\end{array}$$

The partial valences of the nitrogen and carbon atoms are represented by a number of very short lines, not dots, which should be reserved for ordinary valences. (The practise of writers in this matter is not uniform, but uniformity would be very desirable.) When the partial valences come into play in the presence of $H.NH_2$, one of the double bonds between nitrogen and carbon is broken, as represented in lecture practise by a double stroke across the bond and the partial valences resolve themselves into ordinary valences.

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NEW BOOKS.

Spectroscopy. By E. C. BALY. Longmans, Green & Co., 1912, 2nd edition. 687 pp. Price, $3.50 net.

The first part of this interesting and valuable book has undergone no revision. Chapter II is the same as previously published and at the end a short account of the work of the International Union of Solar Research in establishing standards of wave-lengths is added.

Chapter III which deals with slits, prisms and lenses, has additional data on the latest determinations of refractive indices. In the case of calcite, the table of old data has been replaced by the latest observations. Unfortunately Paschen's latest (1901) values of refractive indices of fluorite were overlooked. The reviewer finds that when these latest values are corrected for temperature coefficient they agree with the values of Langley and his assistants, thus clearing up a discrepancy which has been outstanding for some years. To be thoroughly up-to-date the old tables of infra-red refractive indices of quartz, fluorite, rock-salt and sylvite should have been replaced by the most recent determinations. The next chapter on the "complete prism spectroscope" contains additional examples of the latest attainments in the construction of spectroscopes and spectrographs while the following one (Chap. V.) on the prism spectroscope in practice gives additional information on interpolation formulas in measuring the wave-lengths of spectral lines.

Chapter VI on diffraction gratings contains an additional two pages on the latest experiments by Wood (echelette gratings) in attempting to determin the distribution of intensity among spectra, while the following chapter on gratings in practice contains a page of new material on replica gratings and auto-collimating devices.