In support of such a constitution might be cited the remarkable avidity of the hydrocarbon for oxygen, and the possibility of oxygen to act as tetravalent. Such a possibility was foreshadowed by van 't Hoff as long ago as 1877.[1] There has since been accumulating a considerable amount of evidence of physical nature pointing to such a possibility. In connection with this may be mentioned the recent work of Kanonnikow. From a study of alcohols and ethers at their critical condition, Kanonnikow[2] comes to the conclusion that in these compounds, under these conditions, the oxygen behaves as if it were tetravalent. The extreme unsaturation of triphenylmethyl presents an excellent opportunity to test the theory of the tetravalence of oxygen. The above formulas for the two compounds must be looked upon, at present, as a mere suggestion. It is my intention to extend this study to other oxygen compounds, as well as to nitrogen derivatives, and I beg to reserve this field for further work.

CHEMICAL LABORATORY, UNIVERSITY OF MICHIGAN,
June 29, 1901.

[CONTRIBUTION FROM THE JOHN HARRISON LABORATORY OF CHEMISTRY, No. 56.]

THE ATOMIC WEIGHT OF ANTIMONY.

BY G. CLAUSEN FRIEND AND EDGAR F. SMITH.

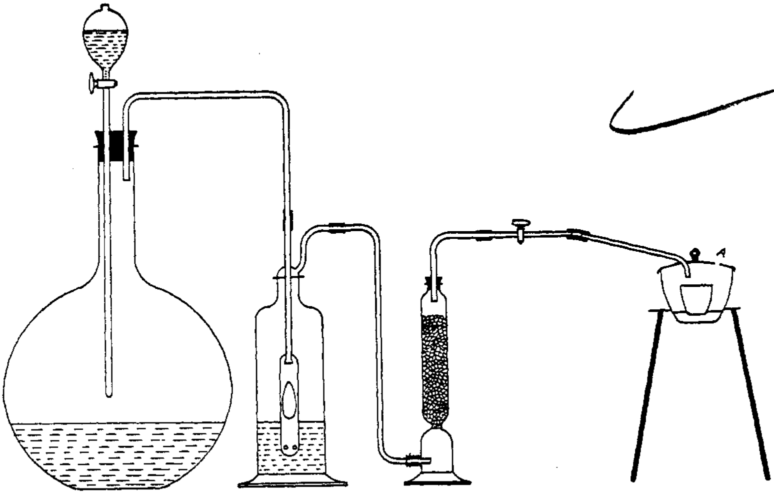
Received June 8, 1901.

KNOWING that antimony oxide could be completely expelled from its combinations in a current of hydrochloric acid gas it appeared probable that a new ratio might be established for antimony, by exposing potassium antimonyl tartrate to the action of this gas. It will be recalled that by this procedure the atomic weights of molybdenum and arsenic had been previously determined in this laboratory. In these particular instances sodium molybdate and sodium pyroarsenate were exposed in porcelain boats, at a moderate heat, to the action of the gas, and from the weight of the residual sodium chloride the respective atomic weights were calculated. The method of work adopted with these metals was pursued with potassium antimonyl tartrate, but it was soon discovered that as carbon dioxide and water escaped the salt swelled up and was projected from the boat, so that a double crucible was substituted for the latter. On trial this de-

[1] "Ansichten über die organische Chemie."

[2] *J. Russ. phys. chem. Soc.*, **33**, 197.

vice proved to be perfectly satisfactory, and it was possible in a crucible No. 00, from 1 to 1¼ inches in height, to operate with as much as 3 grams of material. The appended sketch represents the apparatus in detail .



A steady stream of hydrochloric acid gas was generated in the large flask by acting with pure, concentrated, sulphuric acid upon hydrochloric acid of like character. The gas was sufficiently dried by its passage through sulphuric acid and a column of calcium chloride and then introduced through a porcelain delivery tube into the crucible. The smaller crucible was supported in in the larger one upon a perforated porcelain plate. The lid of the larger crucible had two openings, one for the entrance, and the other (A) for the exit of the excess of acid gas. Platinum crucibles should not be used ; they are very severely attacked by the acid vapors.

In the experiments the dry gas was passed over the salt in the smaller crucible for half an hour, before any heat was applied. At the expiration of this period a small flame was placed under the crucible and it was heated to 150° for two hours, after which the temperature was gradually increased until the outer crucible showed a dull red color. This temperature was maintained until all of the volatile matter was expelled, when a stream of oxygen was substituted, for half an hour, for the acid. Most of the carbonaceous material was removed in this way, when the acid vapor was again introduced and the crucible contents allowed to cool in it. As the residual potassium chloride contained some carbon, it was dissolved in water and the solution filtered. The filtrate, with washings, was collected in a weighed platinum dish and evaporated upon a water-bath. The dish was supported upon a perforated glass plate. The dry potassium chloride was finally heated in an air-bath to 150°, then removed and gently heated over a flame to expel the last traces of moisture. On cooling, the salt was weighed. Two experiments made with potassium antimonyl tartrate, not especially purified, and with an ordinary balance and weights, gave the following results :

	Salt. Grams.	Potassium chloride. Grams.	Atomic weight of antimony.
1	2.0358	0.4691	120.44
2	2.5919	0.5973	120.41

This concordance in result and the ease with which the method could be executed, led us to prepare and purify large quantities of potassium antimonyl tartrate. To this end the purest commercial salt was recrystallized ten times, the first fraction only being used in each subsequent crystallization. The final 50 grams, intended for experiment, were dried at 150° for a period of sixteen hours. A weight was taken and the mass then again heated, cooled, and reweighed. There was no variation in the weight. This material was carefully tested for impurities (*e. g.*, arsenic, sodium, silica, etc.), and was found free from them. Portions of it were then acted upon as outlined in the preceding paragraphs.

The balance used in the subsequent experiments was constructed for atomic weight work by Troemner. It is sensitive to $\frac{1}{40}$ of a milligram with or without load. The weights of brass and platinum were carefully calibrated. All weighings were reduced to the vacuum standard. The specific gravity of potassium chloride was taken as 1.995 and that of the tartar emetic as 2.6 (Beilstein). The atomic weights used in the calculations were $O = 16$, $H = 1.008$, $C = 12$, $K = 39.11$, and $Cl = 35.45$. The results obtained with the pure material and with the observance of all the necessary precautions were :

	Potassium antimonyl tartrate. Grams.	Potassium chloride. Grams.	Atomic weight of antimony.
1	1.19481	0.27539	120.345
2	1.57004	0.36186	120.359
3	2.00912	0.46307	120.351
4	2.04253	0.47073	120.379
5	2.16646	0.49935	120.341
6	2.25558	0.51982	120.385
7	2.61255	0.60215	120.350
8	2.95272	0.68064	120.311

Mean = 120.353

Maximum = 120.385
Minimum = 120.311

Difference 0.074

The barium and silver antimonyl tartrates crystallize well and the hope was entertained that these salts might also be included in the circle of experimentation but thus far the results with them have not been satisfactory.

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THE CHEMICAL NATURE OF ENZYMES.

BY P. A. LEVENE.

Received May 18, 1901.

There is comparatively little known about the chemical nature of the enzymes. In fact it is only in recent years that some attention has been given to these substances. Even the supposition that enzymes are of a proteid nature is not based on irrefutable evidence. Nevertheless, this is generally accepted. Very recently Hans Friedenthal claims that the enzymes possess the nature of nucleo-proteids.

It is chiefly in view of this last research that I have published some of the results of the investigation on the chemical nature of enzymes. The object of this work is to determine whether enzymes are actually of proteid nature. It was established during the last few years by the researches of Morochowetz, Lawrom, and Kutcher that proteids can be digested by means of trypsin to such an extent that the product no longer gives the biuret test, in other words the entire proteid material is decomposed. It was also demonstrated by Gulewitch that trypsin does not act on nitrogenous substances of non-proteid nature. Hence it seemed possible to test the proteid nature of enzymes by subjecting them to tryptic digestion.