

CHEMISTRY

Chairman: EDWARD J. HUGHES, Eli Lilly and Company

Mr. F. B. Wade, Shortridge High School, Indianapolis, was elected chairman of the section for 1944.

An experiment for freshmen to place emphasis upon Avogadro's number. F. J. ALLEN, Purdue University.—In *Science* for July 17, 1942, a more precise value for Avogadro's number, 6.02331×10^{23} has been reported, based on X-ray studies of crystal structure. Millard's *Physical Chemistry* 5th edition gives a brief statement to show the sort of calculation involved, but the very excellent paper of DuMond and Bollman, (*Physical Review* 50, 524-537, 1936) should be consulted for a detailed description of the experimental apparatus and a thorough-going discussion. A proper concept of this number is of such importance that it should be stressed in every reasonable way in the elementary study of chemistry.

A slight modification of a well-known experiment has suggested itself as a suitable stimulus to interest. Into a two-quart bottle with a wide mouth and screw-top is placed some lumps of calcium chloride and a 50 ml. graduated cylinder containing some water. The water level in the graduated cylinder can be read with fair precision without opening the containing bottle. Readings are obtained over a period of days and the rate of evaporation calculated in terms of molecules of water per second.

If the level has fallen 3 ml. in 14 days, one may calculate:

$$\frac{3 \text{ g. H}_2\text{O} \times \frac{1 \text{ mole H}_2\text{O}}{18 \text{ g. H}_2\text{O}} \times \frac{6.02 \times 10^{23} \text{ molecules of H}_2\text{O}}{1 \text{ mole of H}_2\text{O}}}{14 \text{ days} \times \frac{24 \text{ hours}}{1 \text{ day}} \times \frac{60 \text{ min.}}{1 \text{ hr.}} \times \frac{60 \text{ sec.}}{1 \text{ min.}}}$$

to indicate an evaporation of approximately 8.3×10^{16} molecules of water per second.

Numerous variations may occur to teachers and students. One may calculate the evaporation in terms of molecules per second per square millimeter of surface. In place of the apparatus described one may use desiccators with different drying agents and with the water in pipetted amounts in petri dishes. Solutions may be substituted for water. The quantity of drying agent may be varied to see how much the evaporation slows down as the agent becomes "spent".

Sublimation rate in molecules per second may be calculated by ascertaining the time for a weighed sample of naphthalene to disappear.

For short time experiments one might dilute a standard solution of silver nitrate to a point beyond which addition of iodide crystals fails to show turbidity and calculate the number of silver ions per ml.

Experiments of the sort that have been mentioned are suggested primarily in the nature of projects for the class, for the class and teacher, or for the teacher, as circumstances warrant. They may be adapted to a long or short time basis. The object of this paper will be served if it causes even a few students to become more friendly with the Avogadro Constant.

Studies on the detection of oxygen in organic compounds. KENNETH N. CAMPBELL, BARBARA K. CAMPBELL and S. JOAN KING, University of Notre Dame.—Reliable qualitative tests have been devised for the detection of the elements commonly present in organic compounds, with the exception of oxygen. The object of the present work was to make a critical study of the few methods that have been proposed for the detection of organic oxygen, and to attempt to develop new methods.

A solution of iodine in benzene has been shown by others to change from a violet color to a brown one on the addition of an oxygen-containing compound. This test was found to be fairly reliable when positive, provided the organic compound did not contain iodine; a negative test was shown to be of little value, as many of the higher, more inert oxygen compounds, such as benzophenone, triphenylcarbinol, etc., failed to give the test.

The Davidson ferric thiocyanate test was found to be more reliable when negative than when positive. Practically all the oxygenated compounds tried gave a positive test, but many non-oxygenated ones did also, due to the presence of small amounts of oxygen-containing impurities. The thiocyanates of copper, chromium, cobalt and nickel were less satisfactory than the ferric derivative.

Attempts to use anhydrous cupric chloride, and similar metal chlorides as the basis of a test for oxygen failed. Some dyes were found which were more soluble in oxygenated liquids than in others, but the method could not be used with solids. The most satisfactory test so far is the ferric thiocyanate test.

Fundamental techniques of quantitative analysis. E. ST. CLAIR GANTZ, Purdue University (with the technical assistance of J. P. SCOTT and E. C. WERNER, Wabash College).—A moving picture. This 16 mm. film shows in detail the fundamental laboratory procedures for chemistry students as illustrated by the determination of calcium in bone ash.

Calcium can be precipitated as the oxalate, redissolved and the oxalate determined by titration with standard potassium permanganate solution. Using these reactions as a basis the following techniques are illustrated: drying the sample, the use of the analytical balance, solution, precipitation, digestion, filtration, volumetric titration and the recording of data.

The progress of chemurgy with special reference to Indiana crops. EDWARD J. HUGHES, Eli Lilly and Company.—The meaning of the word

"chemurgy" is now generally understood to include the activities of creative industrial chemistry, particularly as they apply to the utilization of agricultural products.

The recent acceleration of the chemurgic movement, leading to the development of new uses for surplus commodities and toward the industrial utilization of agricultural wastes and residues, is of primary concern to the chemist. The necessities of war are rapidly teaching us new methods of approach to the problem of establishing and maintaining a prosperous peace.

Through the combined efforts of the chemist, the bacteriologist and the engineer we are beginning to realize that the blessings of a more abundant life may be obtained by more intelligently drawing upon its abounding natural benefits that are constantly being renewed with the return of the seasons.

The central location of the agricultural State of Indiana places us in a very favorable position to make substantial contributions to the industrial and economic development of the Middle West.

The discussion includes some references to the opening of new industrial markets for our agricultural products, a brief consideration of the risks that may be involved in the absence of adequate knowledge and preparation, and also a few suggestions regarding the possibilities for future progress.

Some reactions of nitrogen peroxide with organic compounds. J. L. RIEBSOMER, DePauw University.—In this paper typical reactions of Nitrogen Peroxide with organic compounds such as nitration, oxidation, addition to olefins, etc., will be discussed. The new work which has been done up to the present is the reaction of nitrogen peroxide on certain ketones and on the alkali metal salts of certain acids producing the corresponding acid anhydrides. The experimental work is at this moment incomplete and not yet ready for publication.