corresponds with the dose of arsenic trioxide, *viz.*, 0.002 Gm. or $^1/_{33}$ grain. (For history of introduction of doses in U. S. P. see paper No. 1.)

(To be continued)

TEACHING THE USE OF THE MORTAR.

BY R. A. BAKER.*

In teaching the principle of grinding successive small portions of material rather than a single large portion, the following test has been found to be very efficient with a class of several hundred in freshman chemistry.

After a lecture demonstration and discussion of the proper method, each student is given in the laboratory an envelope containing 10 grams of cracked gypsum, previously freed from dust on a 20-mesh sieve. On the outside of this envelope he enters his name, the name of his laboratory instructor and the internal diameter of his mortar. This measurement is checked and initialed by his instructor. The class is then told that but two minutes will be allowed for grinding this gypsum and that the grade which each student receives on the exercise will depend upon the amount which he grinds fine enough to pass through a 60-mesh sieve. Beyond this the student is left to his own devices. At a given signal the grinding begins and at the end of the two-minute period a whistle (necessarily a loud one) announces that all grinding must stop. Each student then returns to the original envelope all material, ground and unground, and hands it to his instructor.

The grades are determined by actually sifting and weighing each sample. We have employed student help for this purpose, and are convinced that the expense is fully justified. The net cost to the department can be cut down by having the students grind some material, such as gypsum, for which there will be a demand later in the course. It is not necessary to make a quantitative separation of the powder for, if every sample receives the same treatment, the results will stand in the same relative order, which is the chief requirement in estimating the student's mark or grade.

In lieu of a mechanical shaker one can save considerable time by carefully following a few arbitrary rules to insure uniformity. (1) Use the same sieve for all samples. (2) Tap it sharply the same number of times after each sifting, first right-side-up and then up-side-down. (3) Use the same general motion. (4) Shake for 30 seconds only. (5) Have in the sieve one or more coins to aid in scattering the material. (Samples of gypsum, sifted in accordance with these rules, showed a 95% separation of the 60-mesh powder actually present.)

Over 1000 students, about half of them women, have already taken this test. The results have been analyzed in order to determine what allowance must be made for the size of the mortar and whether the same results could be expected from the women as from the men. This analysis appears in the following table:

	Weight of material.	Diameter of mortar.	Duration of grinding.	Weight of 60-mesh powder.	Extremes.
Men	10 Gm.	5 cm.	2 minutes	5.00 Gm.	1–10 Gm.
Men	10 Gm.	10 cm.	2 minutes	7.98 Gm.	2–10 Gm.
Women	10 Gm.	5 cm.	2 minutes	4.36 Gm.	2– 8 Gm.
Women	10 Gm.	10 cm.	2 minutes	6.46 Gm.	3–10 Gm.

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By means of this experiment students are readily converted to the practice of attempting to grind at one time only slightly more material than will cover the bottom of the mortar. The wide limits shown in the last column of the chart can hardly be attributed to anything but failure to observe this simple rule.

It should be added that the project method of approach and the element of competition combine to make this experiment very interesting to both students and instructors.

A BRIEF DISCUSSION OF THE IONIC THEORY IN ITS RELATIONSHIP TO CERTAIN LIFE PROCESSES.*

BY ROBERT C. WILSON.[1]

All life processes be they animal or vegetable are complex, and all materials for carrying on these processes are complex. Animal matter shows on analysis (chemical) that it is composed of many elementary substances which have associated themselves into various combinations, constituting many different kinds and types of molecules which vary in complexity from two to perhaps many hundreds of atoms. We cannot go very far into tracing the many chemical changes under which these elements may pass as they enter into and pass through complex life processes, without an application of certain principles which have come to us through a knowledge of "ionization."

A BRIEF RÉSUMÉ OF THE THEORY OF THE ION.

Pure water or a perfectly dry salt is a non-conductor of electricity. When HCl or a chloride or other salt or acid is dissolved in water, it is then found that the solution will conduct electricity. Something then has happened other than the mere physical phenomenon of "solution."

When a substance, on dissolving in water, gives to the solution the power to conduct electricity, that substance is called an "electrolyte." When an electrolyte dissolves in water, and we find that it has given this property of acting as a carrier for electricity, we have reason to believe that the electrolyte, on dissolving, is divided into its constituent atoms or groups of atoms, and that each atom or group of atoms bears a charge of electricity. Further, it is found that certain of these atoms or groups of atoms bear a positive charge of electricity while others bear a negative electrical charge, as evidenced by the fact that when a current of electricity is passed through such a solution, the atoms bearing a positive charge will collect at the negative pole, while those bearing a negative charge will collect at the positive pole. *Such an electrically charged atom or group of atoms is called the "ion"* and the "ion" may be composed of one or many atoms, *i. e.*, Cl, OH, SO_4, C_2H_5, etc.

The "ion" must not be confused with the atom, *i. e.*, NaCl or HCl on dissolving in water give no evidence of free Cl, but at the same time by disturbing the elec-

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* The address was delivered in response to a request from the Clarke County Medical Society, Athens, Ga.

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