

in proportion to the needs of the hospital, as recommended and approved by the Section on Hospital Pharmacy of the AMERICAN PHARMACEUTICAL ASSOCIATION, and that such pharmacy should be under the immediate and personal supervision of a pharmacist licensed in the state in which the hospital is situated.

(b) That the AMERICAN PHARMACEUTICAL ASSOCIATION recommend that the State Departments of Health amend their public health laws so that it shall become mandatory for all hospitals to employ only registered pharmacists in the same capacity as they are employed in the retail pharmacy.

(c) That the AMERICAN PHARMACEUTICAL ASSOCIATION divide the United States into districts and assign a committee of members of the Sub-Section on Hospital Pharmacy to make periodic inspections, and such committee report in writing, together with recommendations for the approval or disapproval of such hospital pharmacy, and that such recommendations be forwarded by the AMERICAN PHARMACEUTICAL ASSOCIATION to the American College of Surgeons and American Hospital Association for their action in this matter.

(d) That the State Boards of Pharmacy shall be empowered to make their periodic inspections and enforce these regulations together with all their other regulations.

(e) That the AMERICAN PHARMACEUTICAL ASSOCIATION appoint committees to study this problem at length and make further recommendations.

EXAMINATIONS IN CHEMISTRY.*

BY EDWARD KREMER.

During a long life time I have not presumed to dictate to my younger associates on the instructional staff how they were to teach or conduct their classes. As a member of a State Board for several years, I have equally refrained from telling my colleagues on the Board how they should conduct their examinations. I have asked for the privilege to conduct my teaching and my examining in accordance with my own views. Having been granted that privilege, I deemed it but right and proper to accord the same privilege to others, no matter how divergent our views on the subject. In accordance with these principles I am to-day subjecting to your criticism a series of State Board examination questions, with the hope that a free discussion thereof may result beneficially to myself as well as others.

Possibly, I should preface my presentation with a few personal remarks. As a student, I have always been willing to do my duty by any subject required of me, be it irregular French verbs, or Kebler's laws in astronomy. But I greatly disliked examinations. As a mere lad, I would get up at sunrise and study Latin or Greek declinations and conjugations. Likewise, I uncomplainingly crammed zoölogical classification from the textbook, though I should have preferred to collect animals, and acquired a knowledge of zoölogical systematics by handling animals as I did, *e. g.*, with beetles. Examinations, however, as already stated, I detested. Hence, at the close of my junior year at the Philadelphia College of Pharmacy, when every-

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thing depended on the final examination, I took a nap before going to the college whereas my roommates crammed for the test. As a senior at Wisconsin, I spent from three to five hours every evening rewriting my lecture notes with the aid of several treatises on the subject. As a result, all I had to do for the fortnightly quiz, was to reread my notes once, whereas my classmates made hard work of "bucking." Even for the doctorate examination at Göttingen I could not persuade myself to cram. True, I did not get a "summa cum laude" but I did not care for the label attached to my degree. I had gone abroad, for knowledge it is true, but primarily for the inspiration that came from such teachers as Kekulé, Wallach, Strassburger and Schimper.

I deemed it desirable to preface my remarks with these personal statements, since what I have to say is naturally influenced by my personality.

I fully realize the difficulty of teaching students in large classes, but large classes we should strive to abolish. I also realize the strain under which an instructor labors when his teaching activity is judged so largely by the percentages of excels, goods, etc., his class can boast of, or the number of his students who pass the State Board examinations, no matter how vicious such examinations may be. I can appreciate all of these difficulties from a life-long experience. But in the long run, the instructor will not serve himself, much less his students, by compromising his ideals as teacher with the demands of his superiors or the clamors of so-called "practical" members of his profession.

The papers submitted will have to speak for themselves. A few remarks, however, may lead to a better understanding of them.

1. A certain amount of memory work is necessary in every branch of study. Unfortunately, memorizing is not infrequently employed as a substitute for acquiring knowledge. Cramming quiz compends is one thing. Knowledge acquired by observation and doing is a very different matter. Hence in each of the examinations, I have supplied the candidates with a mimeographed copy of two monographs from the U. S. P. or N. F., one inorganic, the other organic. Moreover, I have refrained from selecting complex chemicals, but have chosen simple ones.

The object of a State Board examination is not to ascertain how many facts the candidate has memorized, but to find out whether he "is safe." One of the best tests to ascertain this is to have him show that he can read his Pharmacopœia intelligently. As an aid to the candidate, each monograph is supplied with from half a dozen to a dozen questions, emphasizing points to be interpreted or explained. Finally, the candidate is given an opportunity to write all he knows about the chemicals under consideration. In order to reduce the mental strain as much as possible, but one written examination is given each of the four days. Three hours during the forenoon, are allowed for each written test. Moreover, these written tests are supplemented by a 3-hr. oral examination on the papers.

Now, what have been the results of this experience?

If the objective of the teacher of Chemistry is to teach, not chemicals, but Chemistry, so the objective of the chemical examiner is to ascertain whether the candidate can apply his knowledge of Chemistry, not necessarily of chemicals, in his professional work. To teach the properties of U. S. P. and N. F. chemicals, or even of the latest synthetic new remedies, is not necessarily Chemistry in its best

sense. Unless the candidate has grasped the spirit of Chemistry, his detailed factual knowledge of the latest new remedy may fail him when a newer one appears in his prescription practice.

A comprehensive knowledge of the subject, even if acquired at college, should be supplemented by a study of application in chemical industry. Thus the student may learn to apply the test for iodate in an iodide, but this is little better than mere book knowledge unless he knows something about the process of manufacture that necessitates the introduction of such a test in the U. S. P. True, not all students can visit a chemical factory in which potassium iodide is made. But out of numerous groups of candidates, not one had visited a gas works, a distillery, a tannery, etc. As a result one candidate stated that ammonia was obtained as a product of decomposition of proteins—book knowledge—but did not know that the bulk of commercial ammonia is obtained as a by-product in either gas works or coke works. Not one out of ten knew what malt is. An equally small proportion had seen a lime kiln, hence had only a book knowledge of the preparation of calcium oxide from calcium carbonate (limestone, marble, calcite, etc.). Not many more knew the difference between slaked lime (lime water) and air-slaked lime (plaster). Equally deplorable was their lack of knowledge of the different forms of natural calcium carbonate (limestone and dolomitic limestone, marl, stalactites and stalacmites, calcite (incl. Iceland spar) and aragonite), although they lived in the very midst of these rock formations and minerals and the industries based upon them.

Some of the candidates wrote about ions and electrons: had crammed an electron definition of valence but had no significance of valence itself.

College graduates, who had had a course in volumetric analysis, had no proper conception of a factor, hence made all kinds of mistakes when asked to explain a paragraph dealing with the volumetric determination of, *e. g.*, ammonia. Even more shocking was the failure to state in simple terms the meaning of percentage.

Hence the problem, "If the U. S. P. states that 10 cc. of ammonia water should not yield more than 0.003 Gm. of residue, what percentage of impurity is permissible?" resulted in the greatest variety of answers.

Now who is to blame? The candidate not so much as his teacher. State Board examiners have blamed college teachers that they do not teach their students sufficient Pharmaceutical Arithmetic. They do. But this elementary school task would be quite unnecessary if the grammar school teacher had done her duty. Unfortunately, the college teacher is only too apt to follow the methods of the grammar school teacher. It does not require many years of experience to find out that if a candidate has studied the "Pharmaceutical Arithmetic" by X he can pass satisfactorily an examination based on that text. However, if the examiner takes his questions from the "Pharmaceutical Arithmetic" of Y or Z the candidate is apt to fail. Yet the rules in all three texts may be the same. However, no sooner is a problem worded somewhat differently than the average candidate fails, as in the ridiculously simple test stated above.

Indeed, so simple is this problem that I was tempted to try it out on others than candidates for a Board examination. *First*, I submitted it to an ex-teacher of mathematics. She was stumped and pleaded ignorance of Chemistry. When I pointed out to her that no Chemistry was involved, her husband agreed with me. The second person was a college graduate who had majored in English and now

holds a position of responsibility in a large department store requiring frequent computations. She also failed. The third person was also a college graduate, but she had majored in mathematics. She made a mess of it.

In all three instances, I cared less about a correct answer than about the method of approach. So simple is the problem that, with a realization of the meaning of the word percentage, neither addition nor subtraction, division nor multiplication, the stumbling blocks even of expert mathematicians, need be involved. Yet all three tried to follow a rule, but failed to apply it successfully. Had they forgotten their rules and applied a modicum of reasoning they could not have gone wrong.

It is this failure to apply reasoning that is responsible for so much of our failure in education. If the teacher and examiner are satisfied with memorizing, what else can we expect of student and candidate?

What applies to Arithmetic, applies equally to Chemistry. In the simple statement of the U. S. P. on the volumetric estimation of NH_3 in ammonia water, with the actual factor given, most candidates could not give a rational explanation of its derivation. The answer given, they could not utilize the simple chemical equation, quantitatively interpreted, to show how it was derived.

We hear much these days about comprehensive examinations, a final cramming course, as a college president recently termed the latest fad in pedagogy. Yet with a whole page of U. S. P. text, and a dozen suggestions in the form of questions, few candidates will write more than fifteen to twenty lines for an essay of the subject under consideration. True, some will come with the smart Alec trick and use the words of the U. S. P. text slightly rearranged. But even when subdivisions of the topic were suggested, this aid to the candidate proved of little avail. Again something is radically wrong with our method of teaching if our graduates do not know how to express themselves. Also, State Board questions for fifty years have contributed nothing to this capacity on the part of candidates.

STATISTICS OF INTEREST TO PHARMACY.*

BY H. C. CHRISTENSEN¹ AND LILLIAN H. BOWEN.

At the 1935 N. A. B. P. convention in Portland, Oregon, the far-seeing Dr. Robert L. Swain presented a resolution, which was adopted, outlining a statistical survey and citing the necessity for a full understanding of the conditions under which Pharmacy is practiced in the various states as the soundest basis for legislation and pharmaceutical betterment.

The resolution was very explicit as to the types of information to be gathered and the central office of the ASSOCIATION undertook the job without realizing just what we had bargained for. We willingly admit, however, that the background of information gained as a result of this study has been of inestimable value to us in our work.

We have all heard of the three types of liars—of which the worst is the statistical liar. Statistical methods are simply a set of tools which are used to obtain,

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