

duty to our loving Father to whom we owe all our blessings. By recognizing the brotherhood of man and the Fatherhood of God we can direct the compounding and the living of our lives as our Master would have us do.

CONCLUSION.

In conclusion let me say: If you aim to be true men and women in the fulness of perfection you must be true to yourselves, true to your neighbors and true to your God. There is a power within you that is your means. Through it each one of you should strive toward a *personal nobility*. You are endowed with faculties that are capable of creating for you things that are greater than you have ever dreamed of; but they need development, training and application. There is hardly a limit to the possibility of achievement. It matters not what vocation you follow; the possibilities are the same. Start from wherever you are. Your best thoughts and actions wisely and willingly carried out will find for you the place in the ranks of men in which you can be of the greatest usefulness and service to your fellows, and that is a fortunate and beneficent destiny short of which you should not be satisfied: an earthly destiny which I most sincerely wish for all of you.

THE EARMARKS OF A GOOD EXAMINATION QUESTION.

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The preparation of a good set of examination questions is not an easy task, and it is especially difficult for members of State Boards of Pharmacy, because they have to cover a whole subject with a few questions. The difficulty that here confronts the board members is well understood by teachers, because they are meeting it day by day in their work. The writer fully realizes the difficulty of the task and sympathizes with the one who has it to perform, therefore this article is not written for the purpose of criticising board questions, but with the hope that it may contain some helpful suggestions.

To my mind there are several requirements that a question should meet in order to be a good examination question, to wit:

1. Questions should be definite.
2. Questions should be practical.
3. Where possible they should test reasoning power rather than memory.
4. They should not be questions the true answers to which are impossible with the data given.
5. They should not be questions that can be answered by "yes" or "no," without explanation.
6. They should not suggest the answer.
7. They should not contain or imply an incorrect statement of fact.

The question should be definite: When a question is presented to a hundred different applicants, there are a hundred different minds interpreting it in a hundred different ways, if this be possible. All teachers have been surprised by incorrect interpretation of their questions by students who have been under their personal instruction and who were familiar with the ground to be covered by the examination. This is much more likely to be the case when a question is presented to applicants who are strangers to the examiner and are therefore unfamiliar with his method of asking questions and not acquainted with the ground the examiner wishes covered by the question. For this reason a question should be asked in such a way that there *can* be but *one* interpretation of it.

Here are some State Board questions that I consider indefinite:

1. "What is the specific volume of 10 pounds of sulphuric acid, specific gravity 1.8?" The examiner evidently wished the volume, but volume and specific volume are two different things and should not be confused. Yet they are often confused even in the minds of some examiners. For my part, I would be willing to omit "specific volume" from the pharmacist's vocabulary, because I feel that it has little, if any, practical value.

2. "What is the weight of 100 Cc.?" It makes a great deal of difference whether it be 100 Cc. of ether or 100 Cc. of mercury.

3. "Codeine, for what two reasons is it remarkable?" I must confess I do not know what the examiner here referred to, and I do not know where to find the answer to this question.

4. "What is uric acid a normal constituent of? Dose?" Does the examiner wish to know the dose of uric acid or of the substance of which uric acid is a normal constituent?

5. "How does the alkaloid morphine differ from other alkaloids?" An applicant could write a whole thesis in answer to this question and yet, perhaps, not hit the point the examiner may have been after.

Many more examples could be given, but I believe that these are sufficient to illustrate the point. This requirement of definiteness is violated more than any other. I believe that the reason for this is that the examiner has in mind an answer that requires a certain interpretation of his question, and it does not occur to him that any one would think of a different interpretation.

The question should be practical. This requirement permits of a great latitude of interpretation, for what one person considers practical another may consider impractical, therefore the good judgment of the examiner is at stake. Here are some board questions that I would call impractical, but all may not agree with me in this:

1. "Define and name the halogens, giving symbols and atomic weights of each. Calculate the percent of mercury in the two chlorides." I object to this question because it requires the applicant to remember the atomic weights of the elements, which I think is unreasonable.

2. "What is fortified oil and dose of same?" Fortified oil is a rare specimen in pharmacy. Ten practical druggists, old ones at that, were asked this question and not one of them had ever heard of "fortified oil." This, to me, is a good test of the practicability of a question, and this one failed to respond to the test.

3. "Moschus, what is the percent of ash not to be exceeded?" You would have to become a walking encyclopædia if you expect to be able to answer such questions. I believe that the U. S. P. or some other reference book should be used to obtain such facts when they are needed.

4. "What is an aneroid?" Easy enough to answer if you have ever used one and knew its proper name while you were using it, but how many pharmacists are familiar with one or will have an occasion to use one? There are plenty of important facts to ask for, and it seems foolish to seek out unimportant ones.

When possible, the question should test the reasoning power rather than memory. Much pharmaceutical knowledge must be gained solely by the application of the faculty of memory, and questions must be asked that appeal to this faculty only, but there are many questions that could easily be made to appeal to reasoning power as well as memory.

It is not enough that a pharmacist learn a fact; he should also be able to apply it.

Here are a few board questions that I believe could be improved upon in regard to this one point:

1. "Why make solutions of silver nitrate with distilled water?" The answer to this question can easily be learned parrot fashion. If the question had added "Explain fully your answer," the examiner could easily tell whether the applicant understood the reaction that takes place when tap-water is used.

2. "Name several good ointment bases." It is easy to learn several ointment bases, but can the applicant determine what one to use when he is asked to prepare an ointment? Had the question been stated, "Discuss the use of ointment bases from the following standpoints" (with aqueous substances, for different therapeutic effects), the applicant would be compelled to disclose his knowledge or ignorance in regard to the proper one to use.

The question should not be one the solution of which is impossible with the data given. It seems to me that this point needs no elucidation, yet many such questions appear. Here are a few:

1. "A bottle of quinine contains how many grains?" "Nuf sed."

2. "A stock solution of 10 percent KNO_3 is to be diluted with water to make 8 fluidounces of a 4 percent solution. How much stock solution and how much water should be taken?"

3. "How much boric acid would you use to make one fluidounce of a 5 percent solution in glycerin?"

4. "Reduce 5 gallons of alcohol to 40 percent alcohol. How much water will it take and how many gallons will result?"

All of these problems are impossible to solve correctly, because the specific gravity of the resulting solution is not given. If you assume the specific gravity to be 1, they can be solved. But the specific gravity is not 1, and to me it is a dangerous precedent to permit of such errors. The doctrine of "permissible errors" is a dangerous one, as it is liable to lead to trouble, especially in the hands of a person of poor judgment.

They should not be questions that may be answered by "yes" or "no," without explanation. This requirement is obvious, for the reason that an applicant that knows nothing about pharmacy has fifty percent of a chance to answer correctly.

Here are a few such board questions:

1. "Should bay rum be made with wood-alcohol?"

2. "Would you dispense a prescription calling for 3 grammes of arsenic to be given in 10 doses?"

3. "Is bichloride of mercury a poison?"

The question should not suggest the answer. If the answer is suggested in a question, the question is valueless, so far as testing the applicant's knowledge is concerned, and this is the very purpose of all questions. To illustrate:

1. "What would you do if you received a prescription calling for a poisonous drug, the dose of which you did not know?" Look up the dose, of course.

2. "Convert 50°C . to F . and 50°F . to C . ($\text{C} \times 1.8 - 32 = \text{F}$.) ($\text{F} - 32 \div 1.8 = \text{C}$.)"

With the above formulæ given, a sixth grader could obtain the correct result.

3. "Ethyl nitrite is very volatile. How would you preserve sweet spirit of nitre?" Why, seal the container, keep it cool, do anything that will prevent the volatile constituent from escaping. Any one would know that much from the way the question is put.

The question should not contain or imply an incorrect statement of fact. It is

a well-known rule of pedagogy that the incorrect form should never be given, even though the pupil knows that the form is incorrect, because he is liable to remember the incorrect form instead of the correct form. Some may argue that it makes an excellent "catch" question. I do not believe that "catch" questions should be asked in any examination. Any examination is not a true test of the applicant's knowledge and ability, but they are the best tests that can be given in the time devoted to it. Their efficiency, low at best, is reduced by "catch" questions. The following will illustrate the point:

1. "Give the official preparations of bryonia."

Bryonia is not official and has no official preparation.

2. "Give the official names of the chemicals represented by the following formulæ: NaCO_3 , H_2SO_4 , HNO_3 , KBr , Pb_3O_4 , CH_3OH , Na_2HPO_4 , and NH_4Cl ."

Two of these formulæ are incorrect, and the chemical represented by one of them is not official.

I know that members of our State Boards of Pharmacy try very hard to prepare good sets of questions, and, without doubt, many of us teachers could not do as well as they do. A friend of mine, a board member, once told me that he had prepared three different sets of questions for one examination and yet was not satisfied with his work, and I am sure that many others have had the same experience.

In closing, may I suggest that a good thing to do after a set is prepared is to test each question carefully by the following:

Is it definite? Is it practical? Is it correctly stated? Does it contain or imply any incorrect statement? Is it worded best to test the applicant's reasoning power as well as memory? Is it one that the applicant does not have a good chance to guess the answer to? Have all necessary data been given?

If your questions meet some such set of requirements, I feel sure they will be "passed by the board of censors."

MAKE PUPILS THINK.

Passive acceptance of the teacher's wisdom is easy to most boys and girls. It involves no effort of independent thought; it seems rational because the teacher knows more than his pupils, and it is the way to win the favor of the teacher unless he is a very exceptional man. Yet the habit of passive acceptance is a disastrous one in later life. It causes men to seek a leader, and to accept as a leader whoever is established in that position. It makes the power of churches, governments, party caucuses, and all the other organizations by which plain men are misled into supporting old systems which are harmful to the nation and to themselves. It is possible that there would not be much independence of thought, even if education did everything to encourage it; but there would certainly be more than there is at present. If the object were to make pupils think, rather than to make them accept certain conclusions, education would be conducted quite differently: there would be less rapidity of instruction, more discussion, more occasions when pupils were encouraged to express themselves, more attempt to make education concern itself with matters in which the pupils felt some interest.—Bertrand Russell in *Atlantic Monthly* for June: Education as a Political Institution.
