ucts. You take in the money, and assume all the responsibility, including that of accounts and collections. What would it cost you to give this service? I doubt that it could be handled on less than 25%, it might take 30. But whatever your estimate is, subtract it from 27⅓%, the average gross profit on prescriptions, and you have *your net profit.*

Is the result satisfactory?

Why should pharmacists place such a low value on their service? Or must we look elsewhere for the reason for this condition?

The concensus of opinion at the Convention in Boulder was that druggists as a rule do not know what part, if any, of the money taken in on prescriptions is profit, for considerable time is required to obtain figures like those shown above. No doubt that is the real reason.

You are entitled to a profit on the merchandise sold through the prescriptions as well as to a small fee for your professional service, knowledge and responsibility, and I believe it is worth your while to investigate whether or not you are getting what you should and what the public expects you to get.

The Pharmacist is a public servant carrying grave responsibilities, and public safety demands that he be compensated for his service.

*Think—Investigate*—and then *ACT.*

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## SOLUTIONS.*

J. ROEMER.

In a consideration of the subject relating to solutions, whether applying to such as are used in pharmacy for medication or to such as are used in the applied sciences as well as natural solutions, due observance should be directed to the fundamental factors which govern results obtained or sought.

The meaning of the word "Solution" as applied in pharmacy is restricted and in this relation the Pharmacopœia further restricts its application by designating such aqueous preparations only without sugar in which the substances acted upon are wholly soluble in water and in this by again further excluding volatile and gaseous substances.

This cannot be considered broad enough in scope of meaning to obtain a clear idea when we use the word solution, for as such it is applied in meaning to far greater extent and comprehensive intent.

In its widest latitude we understand a solution to be homogeneous mixture of two or more substances and from this definition can encompass the conditions of

* This contribution was intended for the Section on Practical Pharmacy and Dispensing, but reached Chairman Osseward after he had returned from the convention. We print this paper not only for its value, but to honor a man who served the Association and was a strong support of the Journal. Mr. Roemer was President of the New York Branch of the American Pharmaceutical Association. Notice of his demise will be found in this issue.

the three states of matter; gaseous, liquid and solid, which give rise to nine phases as solutions.

A diagrammatic arrangement of them would be as follows:

| | | | | | |
|---|---|---|---|---|---|
| | Gas, | | Gas, | | Gas, |
| Gas, | Liquid, | Liquid, | Liquid, | Solid, | Liquid, |
| | Solid, | | Solid, | | Solid, |

in which any homogeneous mixture as a gas with a gas, a liquid with a solid, a solid with a gas, etc., would be a true solution.

There is, however, another class which in speaking of solutions we must not overlook. These are not in the accepted use of the word true solutions, yet are so designated.

These are the colloidal solutions which to ordinary appearances exhibit the conditions of true solution but in reality differ from such in being heterogeneous and differ from them in a number of physical properties determined by lowering of freezing point, lowering of vapor tension of the solvent, and osmotic pressures.

From recent advances made in the study of the colloidal phases of matter, promise is fair to assume that this will occupy a most important place in pharmacy, and the more so when we realize that about 65% to 75% of the preparations of pharmacy are colloidal in their nature.

The present status of conditions in pharmacy is such that little attention is given to means employed for differentiation and to most of us when solution is mentioned our ideas are limited to mixtures of gas in liquids and solids in liquids in terms of substances and solvent.

In so far as this applies to solutions it must necessarily as well apply to the pharmacy in general of solutions: in which the essential result sought is to furnish such in manner and means admissible for medication.

As first consideration we direct attention to the laws of physics and these laws govern results obtained.

All solutions are subject to condition and influence which determine their nature.

When a substance is brought into contact with a solvent it enters the solvent by reason of a force quite as a gas will enter a vacuum, wherein diffusion takes place until homogenity is produced and a definite ratio is established between the concentration of the substance and solvent.

Saturated solutions are solutions in which equilibrium between the substances as solid and solvent is brought about when the concentration of the non-dissociated portion of the substances has reached a definite value. This value is constant and definite for each particular substance in relation to its solvent at any given temperature and pressure.

In true solutions the accepted ideas are fundamentally based upon the solvate theory of solution and this in particular as generalization holds that there is a reciprocal exchange between substance and solvent in which the substance not alone is combined with the solvent, but also that the solvent combines with the substance.

Colloidal solutions on the other hand are solutions of substances in which the

substance is not dissolved but is dispersed in the presence of a solvent and according to fineness of division is termed either a colloidal solution or colloidal suspension.

To the latter class belong most of our pharmaceutical preparations as fluid extracts, mucilages, most tinctures, syrups, aromatic waters, emulsions, etc.

A knowledge of the physical properties of substances will determine the class of solutions which substances and solvent will produce.

Perhaps of greater concern to pharmacy is, not the scientific aspect of the various factors which enter into the problem of solutions, for that is experimentally obtained and results given in books of references, but attention is directed more to the factor of stability and possible changes which may occur from time of preparation until such are used, yet a knowledge of the fundamentals which enter in the preparation of solutions will often obviate and prevent disaster. Of the many solutions called for aqueous solutions by far predominate and in this relation we will first consider such as to stability. We must of necessity direct our attention to the physical properties and knowing such we can give definite answer to question of permanence.

Decomposition is a change brought about in solutions wherein degree of inherent energy is weaker than the energy of influence to which it is exposed, whether this be through the agencies of light, heat, electrical current, bacteria or enzymes.

The application of this can be drawn still closer and we can classify substances in relation to decompositions a little more definitely and predicate. That all inorganic substances which per se are strongly electrolytic will produce permanent aqueous solutions even to very high dilution. Similarly all derived organic substances with strong electrolytic radicals will produce permanent aqueous solutions.

Inorganic substances of weak electrolytic activity will decompose in aqueous solution even in high concentrations.

Derived organic substances are divided into two classes dependent upon inherent potential energy—those of strong influence giving rise to permanency in aqueous solutions and those of weaker activity subject to decomposition.

To obviate decomposition in solution gives rise to a number of procedures such as the addition of substances to act as preservative in case of solution being subject to decomposition by bacteria. Sterilization and subsequent means to exclude possible contamination, this being effected in various ways to meet the need of the occasion.

Under conditions of substances in solution, as solutions being affected by agencies of light or heat, this to great extent is prevented by precautionary measures and further attention to exclude these agencies.

The decompositions in solutions that may arise through reaction of different substances are subject to the known reaction which chemistry now, but physics to come, determines and can be wholly eliminated from knowledge of the principles involved.

Clarity—This condition of solutions is wholly dependent upon constituents and nature of purposes intended.

Processes entering for classification are dependent upon physical means and determined by nature of object sought.

Solutions other than aqueous for which occasion requires preparation may include an infinite range encompassing every conceivable substance with respective admissible solvent from the mechanical suspension as mixture to the typical solution, yet each and all are dependent upon the influences of broad generalizations applying.

It is not the purpose as perhaps was intended by Mr. Osseward when he requested me to contribute a theme along lines of practical pharmacy to detail specific instances upon individual solutions for that in itself would of necessity be very limited owing to lack of experimental data, yet it would no doubt prove intensely practical and I trust the future will permit a presentation along such lines.

The foregoing, though somewhat concise in statement, will furnish themes for future elaboration and if sufficient interest is aroused, it will have served its purpose at least, for a subject which is infinite in magnitude, for in its application to observed phenomena all such is dependent upon solution.

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## THE COÖPERATION OF SCIENCE AND INDUSTRY.*

A. R. L. DOHME.

Individuals, firms, corporations, states and nations have begun to realize and appreciate that coöperation among themselves for the attainment of any end is essential if the best attainable results are to be achieved. Let us take as a concrete example for all the above the rather remote but timely and pertinent subject of price cutting and the European war, both of which are menacing and crying evils.

Price Cutting—A manufactures a standard article which sells at 50 cents retail according to A's business plan. It probably costs 20 cents to produce and with advertising and the profit to the jobber and retailer nets the manufacturer 10 cents profit. The retailer instead of coöperating with the manufacturer and making his 25 percent net profit on it cuts the price and makes 5 percent, using it to advertise his store as a place to buy cheaper than at other stores. If it only went so far there would not be lack of coöperation and the manufacturer would be satisfied. Instead, however, the retailer induces the customer to buy his own manufactured article upon which he makes a good profit, or the retailer is seduced by competing manufacturers to buy a bulk supply of the same article under another name, which is sold in place of the originally advertised and controlled article. Both of these methods show entire absence of coöperation between the retailer and manufacturer and result in lack of real success to the manufacturer and the retail trade as a whole.

The European war is the result of commercial rivalry or rather lack of coöperation. If nations had been satisfied to live and let live and permitted each other to work out to perfection unmolested those products of nature and industry espe-

*Read before Scientific Section, San Francisco meeting.