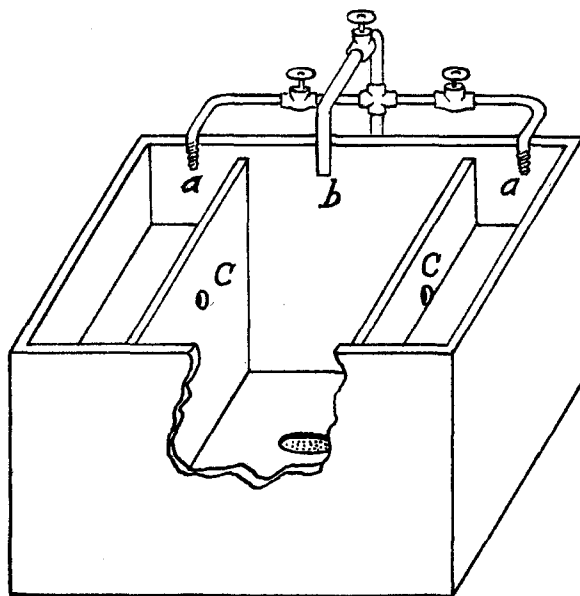


LABORATORY SINK

The accompanying sketch illustrates a convenient form of sink for laboratories in elementary and general chemistry. The main feature of the sink is its three compartments. The two smaller compartments drain into the larger center compartment by a 1-in. hole, *c*, which can be closed by a stopper. When filled with water it overflows into the center compartment. These smaller compartments are intended to be used for collecting gases. When in use it is not necessary to stop up the whole sink and make it entirely useless to all other students.

The sink is designed to be used by four students, two on either side of the desk. Three water faucets, *a*, *a*, *b*, are illustrated. *a* and *a* are small and tapering, making them especially adapted for attaching rubber tubing for condensers, etc.

The sink is made of albarine stone and as illustrated is 32 in. \times 16 in. outside dimensions. The smaller compartments are 14 in. \times 5 in. \times 4 in. deep on the lower overflow side, which is 0.5 in. lower than the top of the sink. The larger compartment is 18 in. \times 14 in. \times 10 in. deep. The drain is in the middle of



the large compartment and is protected by a sieve. The size of the sink can be altered to suit any space.

Solvents for Phosgene¹

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After the signing of the armistice, restrictions were placed on railroad transportation of liquefied phosgene in the United States. Previous to 1914 small cylinders of the liquid were imported from Germany to be used in producing a limited number of carbon compounds and for research purposes. It was produced in the country on a small scale after the blockade and before we entered the war, and was distributed in cylinders. Immense quantities were on hand when hostilities ceased. The greatest danger in the transportation of phosgene, liquid or in solution, would arise in case of fire or wrecks. Protection against leaky valves is quite simple.

While the demand for phosgene for the purposes mentioned is not great from the quantity point of view, nevertheless it exists. Oft expressed have been the hopes of finding more extensive uses for the poison gases of the World War in peace times. It seemed, therefore, worth while to endeavor to find other means for the transportation of and other applications for phosgene.

Among other qualifications, a liquid solvent for phosgene should be (1) inert to carbonyl chloride, (2) have a low vapor pressure, (3) hold notable amounts in solution, (4) admit of easy recovery of the gas, (5) preferably be noninflammable, and (6) involve minimum expense. The first and last of these qualifications are the most important, the former being primarily due to the reactivity of phosgene.

As a general statement it may be said that phosgene is soluble in ether, chloroform, liquid hydrocarbons,

carbon disulfide, and sulfur chloride, as well as in some of the liquid metal chlorides (stannic chloride and antimony chloride).

The following liquids were used by us as solvents: carbon tetrachloride, chloroform, gasoline, paraffin oil, Russian mineral oil, benzene, toluene, glacial acetic acid, ethyl acetate, and chlorococane. The last substance is paraffin which has been melted and treated with chlorine. It forms a light yellow compound, the formula of which has not yet been determined. This compound is used medicinally to dissolve dichloramine-T.

The method of procedure was to pass the gas through a Bowen's absorption bulb containing the solvent at atmospheric pressure. The solution was stoppered well in a dry test tube and allowed to stand for 2 wks. Various tests were made on each solution to detect any evidence of reaction.

The following is a table of results for the solvents mentioned above:

SOLVENT	Weight Solvent Grams	Weight Phosgene Absorbed Grams	Solubility Ratio by Weight COCl ₂ :Solvent	Evidence of Reaction on Solution	Comments by Numbers Below
Carbon tetrachloride	79.5	22	1 : 3.6	None	1
Chloroform	49.4	29	1 : 1.7		2
Gasoline	37.0	30	1 : 1.2		3
Paraffin oil	34.6	0	0		4
Russian mineral oil	30.1	10.8	1 : 2.8		5
Benzene	43.9	43.6	1 : 1	None	6
Toluene	50.3	33.5	1 : 1.5		7
Glacial acetic acid	31.4	19.5	1 : 1.6		8
Ethyl acetate	20.5	20.2	1 : 1	None	9
Chlorococane	25.2	7.8	1 : 3.2	None	10

All weighings were made at 20° to 21° C. The ratio values are not given with mathematical accuracy for obvious reasons.

(1) With carbon tetrachloride no evidence of reaction was observed. The boiling point of the solvent was the same before and after saturation with phosgene.

¹ Presented before the Division of Industrial and Engineering Chemistry at the 60th Meeting of the American Chemical Society, Chicago, Ill., September 6 to 10, 1920.

(2) and (3) In gasoline and chloroform, reactions were evidenced by heat of solution and change in boiling point.

(4) Paraffin oil was completely inert. No phosgene dissolved in it.

(5) Although Russian mineral oil did not show any evidence of reaction, it could not be used profitably because of the low solubility of phosgene in it.

(6) Benzene maintained the same boiling point before and after saturation. Phosgene and benzene in the presence of anhydrous aluminium chloride react to form benzoyl chloride and finally benzophenone. It was therefore undertaken to prove the absence of these substances in the solution of phosgene in benzene. Air was passed through a drying tower containing soda lime, and then through a solution of phosgene in benzene, through several U-tubes immersed in a freezing mixture, and finally through a solution of sodium hydroxide. The clean dry air, free of carbon dioxide, removed the phosgene from the benzene, the phosgene was liquefied in the U-tubes, and the excess air passed through the sodium hydroxide. At the same time if any hydrochloric acid were present in the benzene due to reaction, it would be carried over to the sodium hydroxide and there neutralized. The benzene free from phosgene was tested for benzoyl chloride and benzophenone by hydrolyzing with sodium hydroxide. A negative result was obtained. However, the sodium hydroxide in the train of apparatus was completely acidified, evidently due to phosgene which had been carried over. The benzene used in these experiments was not

free from thiophene. In saturating benzene with phosgene the solution increased in volume noticeably.

(7) Toluene showed a change in boiling point.

(8) Phosgene reacted with glacial acetic acid. Reaction was evidenced by heat of solution and an effervescence, also change of boiling point. This may have been due to a small amount of water in the acid.

(9) Ethyl acetate proved to be a solvent which closely rivaled benzene. It formed a 49.6 per cent solution with phosgene and was inert towards the latter.

(10) Chlorococane was inert and a fairly good solvent. However, it was not quite so good as benzene and ethyl acetate.

The vapor pressure of the saturated solution exerted at 20° C. was one atmosphere, while at 50° C., or the temperature of a hot sun, a further pressure of 308 mm. mercury or about 6 lbs. to the sq. in. developed. The problem of containers, therefore, is not serious. On heating the solution the phosgene is readily, and may be completely, driven off. Of the solvents tried; the two which gave most promise are benzene and ethyl acetate. Of these, benzene is probably the better, because it has a lower vapor pressure and is cheaper.

The imagination allows of possibilities of practical uses for such solutions in ridding lawns, etc., of moles, and in "mopping up" rats and other vermin.

ADDRESSES AND CONTRIBUTED ARTICLES

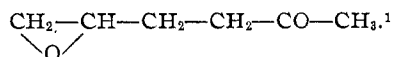
Studies on the Chemistry of Cellulose. I—The Constitution of Cellulose

By Harold Hibbert

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(Concluded)

It is also of interest that 1-chloro-2-hydroxy butyl methyl ketone ($\text{CH}_2\text{Cl}-\text{CHOH}-\text{CH}_2-\text{CH}_2-\text{CO}-\text{CH}_3$) when boiled with alkali does not yield the oxide

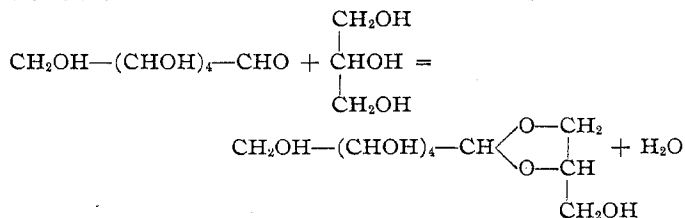


With respect to the second point, namely, the nitration of glycerol-sugar mixtures, it is known that the nitrogen content of these nitrated products is considerably lower than that of pure nitroglycerin. From the values customarily obtained in technical practice it would seem that the results are in general agreement with the assumption of a primary dehydration of the sugar molecule with the loss of one molecule of water, whereby two of the hydroxyl groups disappear, the remaining three undergoing nitration.

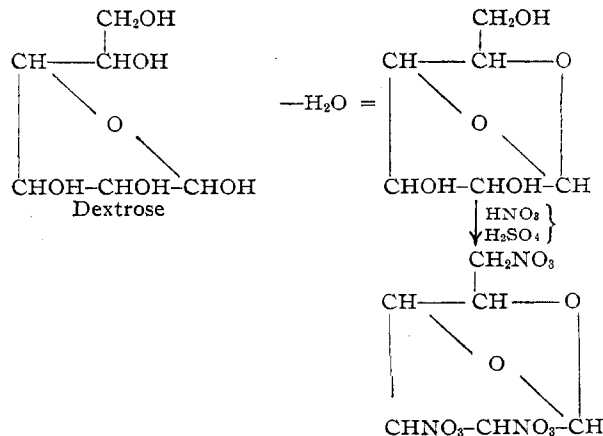
Recently it has been found possible, as indicated in the second part of the paper, to carry out some work on this subject.² It was found that when pure dextrose or cane sugar is dissolved in glycerol and nitrated with the usual $\text{H}_2\text{SO}_4\text{-HNO}_3$ glycerol nitrating mixture, the resulting nitrated product, judged from the nitrogen content, appears to contain only six nitrate groups, although there were eight hydroxyls originally present, *viz.*, five in the dextrose and three in the glycerol molecule. The same is true if we substitute a glycol for glycerol. In this case the

nitrogen content corresponds to only five nitrate groups, although the original mixture contained a total of 7 hydroxyl groups. How can such results best be explained? There are two possibilities:

1—The dextrose may undergo an *intermolecular* condensation with the glycol or glycerol, leaving six OH groups susceptible to nitration:



2—The dextrose may undergo, under the influence of the acid, an *intramolecular* condensation, to give a product, isomeric with



¹ Henry, *Bull. acad. roy. belg.*, [3] 36 (1898), 31; *Chem. Zentr.*, 1398 (2), 663. No indication is given as to the nature of the bodies formed and the subject is being investigated under the writer's direction by Mr. J. A. Timm.

² This work was carried out by Mr. R. R. Read at the Bureau of Mines, Pittsburgh, and the writer wishes to express his kindness to him for the assistance rendered; also to express his gratitude to Major Fieldner, Supervising Chemist, for kind permission to use the laboratory facilities.