Thus by means of a magnet, the lower end of the funnel may be brought directly over a number of outlet tubes sealed into the apparatus. Five of these outlets (only three are shown in the figure) have been found to be a convenient number. The outlet tubes are, in turn, sealed to flasks whose sizes are determined by the amounts of the various fractions. In some cases it may be found preferable to connect the outlet tubes to the flasks by means of ground glass joints with mercury seal.

CONTRIBUTION FROM THE DEPARTMENT OF CHEMISTRY
UNIVERSITY OF BRITISH COLUMBIA
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A Lecture Table Demonstration to Illustrate that the Conductivity of a Solution is Due to its Ions.—This demonstration visualizes the conductive property of the ions of an electrolyte and shows that as they form part of an undissociated compound or insoluble precipitate the concentration of the electrolyte is diminished with the consequent decrease in conductance.

The apparatus consists of a beaker containing platinum electrodes which are connected in series with an electric light bulb and an alternating current source. The electrolyte placed in the beaker is a 5% solution of barium hydroxide. As this is a moderately strong base, the light will burn brightly, showing the conductivity due to the barium and hydroxyl ions. While the solution is stirred, dil. sulfuric acid is added slowly from a buret. As the base becomes neutralized, the light gradually becomes dimmer. When just enough acid has been added to neutralize all of the base, the light goes out entirely indicating the absence of all ions. When, now, a slight excess of the acid is added, the current begins to pass again and the filament to glow due to the presence of hydrogen and sulfate ions. The neutralization is made more striking by the addition of phenolphthalein, which fades at the same time that the light goes out.

From a consideration of the equation, $Ba(OH)_2 + H_2SO_4 = 2H_2O + BaSO_4$, it is seen that this is a unique reaction in that both undissociated water and a very insoluble salt are formed, and at the neutral point the conductivity is at a minimum, as practically all ions are removed from the system. This also visualizes the principle upon which depends the determination of the concentration of an electrolyte by conductance measurements.

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The Action of Ammonium Hydroxide on Copper Ferrocyanide.—Treadwell and Hall[1] make the statement that copper ferrocyanide dis-

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[1] Treadwell and Hall, "Treatise on Analytical Chemistry," John Wiley and Sons, New York, **1916**, 4th ed., vol. 1, p. 220.

solves in ammonium hydroxide to give the intensely blue solution characteristic of cupri-ammonium ion. The writer has found, however, that when dilute ammonium hydroxide is slowly added to precipitated copper ferrocyanide, and the mixture shaken after each addition, the mahogany-brown precipitate is completely converted to a silky, dark brown solid, probably a substance of the formula $Cu_2Fe(CN)_6.4NH_3$.[2] This precipitate does not dissolve in concd. ammonium hydroxide, and is only slowly changed to copper sulfide when treated with hydrogen sulfide. Acetic acid, however, restores the copper ferrocyanide.

Scott[3] also states that the ferrocyanide of copper is soluble in ammonium hydroxide, and hence its presence must be avoided in the detection of traces of copper by the ferrocyanide method. When to two exceedingly dilute solutions of cupric sulfate, only one of which contained a trace of free ammonia, potassium ferrocyanide was added, the one without the trace of ammonia showed the usual characteristic deep red color, but the other developed a light brown color from which the silky, brown precipitate noted above settled on standing. These results could be duplicated as often as desired. They are to be interpreted as indicating that even the slightest trace of ammonia will seriously impair, if not completely obscure, the delicacy (1 part in 2,500,000) of the ferrocyanide test.

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E. D. CRITTENDEN

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FACTORS AFFECTING THE STABILITY OF MERCURIALS AND THE MERCURATION OF SUBSTITUTED PHENYLAMMONIUM SALTS

BY MORRIS S. KHARASCH AND LYMAN CHALKLEY, JR.

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It is a well established fact that amino and hydroxyl groups in a benzene ring enhance the ease of substitution of the *para* and *ortho* hydrogen atoms. We should expect, therefore, that any positive group,[1] *para* or *ortho* to an

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[2] Bunsen, *Pogg. Ann.*, **34**, 134 (1835). See also Messner, *Z. anorg. Chem.*, **8**, 393 (1895).

[3] Scott, "Standard Methods of Chemical Analysis," D. Van Nostrand Co., New York, **1918**, 2nd ed., p. 166.

[1] The term positive group is rather indefinite. There are various degrees of "positivity" of positive groups depending upon the position of the pair of electrons with respect to the carbon atom. The arrangement of positive groups in the order of their "positivity" will be given in a subsequent paper by one of us (Kh.) in conjunction with the heats of combustion of organic compounds.