CHAPTER IV

ALCOHOLS

76. Properties of Methyl Alcohol (SECTION **56**).—(*a*) *Inflammability of methyl alcohol.*—Pour about 1 cc. of methyl alcohol into an evaporating dish and apply a burning match. (*Eq.*) Note the appearance of the flame.

(*b*) *Solubility of methyl alcohol.*—Test the solubility of methyl alcohol in water, ether, ethyl alcohol, petroleum ether, and benzene. Use about 1 cc. of the alcohol in each test.

(*c*) *Methyl alcohol as a solvent.*—Test the solubility of anhydrous calcium chloride and sodium chloride in methyl alcohol.

(*d*) *Methyl alcohol and sodium.*—Add a piece of sodium the size of a small pea to 5 cc. of methyl alcohol. (*Eq.*)

77. Tests for Methyl Alcohol.—*(a) Methyl salicylate.*—Mix together in a test-tube about 0.2 gram of salicylic acid, 1 cc. of concentrated sulphuric acid, and 1 cc. of methyl alcohol, and warm gently. Note and describe the odor. The compound formed is the methyl ester of a salicylic acid, $HO.C_6H_4.COOCH_3$.

(*b*) *Formaldehyde* (SECTION **177**).—Dissolve 5 drops of methyl alcohol in 3 cc. of water. Wind a piece of stout copper wire around a load pencil so that a closely coiled spiral about 2 cm. in length is formed; leave about 20 cm. of the wire to serve as a handle. Heat the spiral in the upper part of a Bunsen flame, and plunge it while red hot into the solution of methyl alcohol. Withdraw the spiral, cool the liquid under running water, and heat again with the hot spiral. In this way the methyl alcohol is oxidized by the hot copper oxide formed on the wire. Note the odor of the liquid while hot. Cool the liquid, add 2 drops of a 0.5 per cent solution of resorcin and pour the resulting mixture, slowly so the two liquids do not mix, down the side of an inclined test-tube containing about 5 cc. of concentrated sulphuric acid.

78. Preparation of Ethyl Alcohol by Fermentation (SECTION **58**).— (*a*) Dissolve 40 grams of commercial anhydrous glucose in 350 cc. of water in a 500-cc. bottle. Add one-fourth of a yeast

cake ground to a smooth paste with 50 cc. of water, and about 0.5 gram of Witte's peptone.[1] Close the bottle with a rubber stopper through which passes one end of a glass tube bent in two right angles to form three sides of a rectangle. The other end of the tube passes to the bottom of a test-tube which is held in place by means of cork along the side of which a groove is cut to allow the escape of gas. The test-tube is one-half filled with a solution of barium hydroxide. By using the apparatus arranged in this way, any gas evolved must pass through the solution of barium hydroxide before it escapes. Mark the bottle with your name by means of a label, and set it in a warm place (about 30°). Examine the contents of the bottle at the next laboratory exercise. Has the amount of yeast increased in quantity? What gas has been evolved?

The product obtained is a dilute solution of ethyl alcohol which contains small quantities of other substances. The alcohol should be separated, and the amount formed in the reaction determined as follows: Decant through a folded filter-paper, taking care not to disturb the sediment of yeast, about 250 cc. of the solution. While waiting for the solution to filter, weigh to centigrams a clean dry 100-cc. flask, around the neck of which has been pasted a narrow strip of paper to serve as a reference mark. Fill the flask up to the mark with distilled water, and weigh again. Place exactly 200 cc. of the filtered solution from the fermentation into a 500-cc. distilling flask, neutralize, using litmus paper, with a dilute (10 per cent) solution of sodium hydroxide, and distil into the weighed flask until the liquid fills it exactly to the mark. (For the arrangement of the distilling flask and condenser see Fig. 2, page 9.) Weigh the flask and contents. Save the distillate for a later experiment. Calculate the specific gravity of the distillate, which contains all the alcohol that was present in 200 cc. of the product of fermentation. By reference to a table of the specific gravity of aqueous solutions of alcohol, calculate the weight of alcohol obtained from the 40 grams of glucose used in the experiment. What was the total

[1] Yeast requires for its growth certain salts which are present in Witte's peptone. If the latter is not available it may be replaced by 20 cc. of a solution made by dissolving 10 grams each of potassium phosphate, magnesium chloride, and calcium nitrate in 1 liter of water.