

&c. To obtain the gas pure it may be passed through a wash bottle. It cannot be collected over water as it is soluble in it, nor over Mercury, as it forms Mercury Chloride with it, but it may be collected by downward displacement, since it is heavier than air.

(b). When Cl. is passed into a solution of Potassium Hydroxide, Potassium Chloride and Potassium Hypochlorite are formed, thus $2KHO + Cl_2 = KClO + H_2O + KCl$, but this only takes place when the solution is cold. If the solution be hot no Potassium Hypochlorite will be formed, but Potassium Chlorate $6KHO + 3Cl_2 = 5KCl + KClO_3 + 3H_2O$. If the cold solution, through which Chlorine has been passed, be boiled, the Hypochlorite will be changed into the Chlorate $3KClO = KClO_3 + 2KCl$, for Potass. Hypochlorite is decomposed by heat into Potass. Chloride and Potass. Chlorate.

(c). Bleaching powder, or Chloride of Lime $CaCl_2 + CaCl_2O_2$ is a mixture of Calcium Chloride and Hypochlorite, and is obtained by the action of Chlorine on slaked lime. Chlorine gas, prepared as in (a) above, is passed into large chambers, on the floors of which a layer of slaked lime, about two inches thick is laid, the gas is all absorbed, and bleaching powder is formed. The reaction is $2CaH_2O_2 + 2Cl_2 = 2H_2O + CaCl_2 + CaCl_2O_2$.

6. (b). When Argentic Nitrate is added to a soluble Chloride, a precipitate of Argent Chloride is formed, which is soluble in Ammonia, $NaCl + AgNO_3 = NaNO_3 + AgCl$, or again by adding Mercurous Nitrate $Hg_2(NO_3)_2$ to a soluble Chloride as $2NaCl + Hg_2(NO_3)_2 = 2NaNO_3 + Hg_2Cl_2$, the precipitate formed, Mercurous Chloride, or Calomel, is white, but on the addition of Ammonia it is blackened—or another $MCl + MnO_2 + H_2SO_4 = Cl$. gas formed—known by its smell and bleaching power. (M is used here as a *general* term for any metal, &c.)

(b). The presence of free Iodine manifests itself at once by the brown color it gives to a solution. Argentic Nitrate gives with a soluble iodide a yellowish white precipitate of Argent Iodide, which is insoluble in Am-

monia, but turns white by the addition of it: or mix a soluble iodide with a starch solution and on the addition of a drop or two of Chlorine water, a blue color will be formed.

(c). The presence of a Fluoride may be detected by introducing the solution to be examined into a platinum vessel along with some Hydric Sulphate, and placing over the vessel a piece of glass, coated with wax, on which figures have been traced. On heating the vessel if a Fluoride be present, Hydric Fluoride will be formed, and will manifest itself by etching the exposed part of the glass.

7. *Analytically*.—Fill a glass vessel with acidulated water, to enable it to conduct electricity, invert two test tubes filled with water over the two terminals of a battery. The test tubes will be filled in a short time by two gases which may be tested, and it will be found that the gases are Oxygen and Hydrogen in proportion of 2 vols of H. to one of O.

Synthetically.—Fill the eudiometer with Mercury and invert it over a vessel of that metal. Hydrogen is passed in—say 100 vols—also Oxygen—say 75 vols,—the mixture is then fired by the electric spark, they unite with an explosion, and the column of Mercury rises, and we shall find 25 vols of gas left, which is found to be pure O. We thus see that 100 vols of H. require 50 vols of O. for complete combustion; hence water consists of two vols of H. and one of O.

8. Arsenic in solution may be detected by the evolution of Arseniuretted Hydrogen, on adding Zinc and Sulphuric Acid to the solution to be tested, on burning the gas evolved, Arsenic will be deposited in the metallic state upon a piece of cold Porcelain held in the flame. If any compound of Arsenic be heated on charcoal in the inner blow pipe. flame the characteristic garlic odor of Arsenic will be noticed.

Marsh's Test.—Into a wide-mouthed flask fit a cork through which a funnel passes nearly to the bottom, and another tube, having a bulb in it. Fit this last tube into another larger one containing Calcic Chloride, and to