and free oxygen; carbon monoxide gives the carbonate; whilst nitrous and nitric oxides give the nitrate. A solution in hydro­chloric acid, consisting of the chloride and hydrogen peroxide, is used for bleaching straw under the name of soda-bleach; with calcium or magnesium chlorides this solution gives a solid product which, when dissolved in water, is used for the same purpose (Castner, *Journ. Soc. Chem. Ind.*, 1893, p. 603). Sodium dioxide is chiefly employed as an oxidizing agent, being used in mineral analysis and in various organic preparations; it readily burns paper, wood, &c., but does not evolve oxygen unless heated to a high temperature. Sodyl hydroxide, NaHO3, exists in two forms: one, Na·O·OH, obtained from hydrogen peroxide and sodium ethylate; the other, O:Na·OH, from absolute alcohol and sodium peroxide at 0°. They are strong oxidizing agents and yield alkaline solutions which readily evolve oxygen on heating. Sodium trioxide, Na2O3, is said to be formed from an excess of oxygen and a solution of sodam- monium in liquid ammonia. Water decomposes it, giving oxygen and the dioxide.

Generally speaking, sodium salts closely resemble the correspond­ing potassium salts, and their methods of preparation are usually the same. For sodium salts not mentioned below reference should be made to articles wherein the *acid* is treated, unless otherwise indicated.

Sodium combines directly with the halogens to form salts which are soluble in water and crystallize in the cubic system. The fluoride, NaF, is sparingly soluble in water (1 part in 25). For the chloride see Salt. The bromide and iodide crystallize from hot solutions in anhydrous cubes; from solutions at ordinary tempera­tures in monoclinic prisms with 2H2O; and at low temperatures with 5H2O. According to Μ. Loeb *(Journ. Amer. Chem. Soc.,* 1905, 27, p. 1019) the iodide differs from the other haloid salts in separating from solution in alcohols with "alcohol of crystallization.” Sodium sulphide, Na2S, obtained by saturating a caustic soda solution with sulphuretted hydrogen and adding an equivalent of alkali, is em­ployed in the manufacture of soluble soda glass. Sodium sulphite, Na2SO3, which is employed as an antichlor, is prepared (with 7H2O) by saturating a solution of sodium carbonate with sulphur dioxide, adding another equivalent of carbonate and crystallizing. The anhydrous salt may be prepared by heating a saturated solution of the hydrated salt. H. Hartley and W. H. Barrett *(Journ. Chem. Soc.,* 1909, 95, p. 1184) failed to obtain a decahydrate which had been previously described. The acid sulphite, NaHSO3, obtained by saturating a cold solution of the carbonate with sulphur dioxide and precipitating by alcohol, is employed for sterilizing beer casks. Sodium sulphate, Na2SO4, known in the hydrated condition (with ioH2O) as Glauber's salt, is manufactured in large quantities for conversion into the carbonate or soda (see Alkali Manufac­ture). It has long been doubted whether sodium yielded an alum; this was settled by N. I. Surgunoff in 1909 *(Abst. Journ. Chem. Soc.* ii. 1001), who obtained cubic crystals from a supersaturated solution of sodium and aluminium sulphates below 20°, higher temperatures giving monoclinic crystals. The acid sulphate, NaHSO4, also known as bisulphate of soda, is obtained as large asymmetric prisms by­crystallizing a solution of equivalent quantities of the normal sulphate and sulphuric acid above 50°. The acid salts Na3H(SO4)2 and Na3H(SO4)2∙H2O are obtained from the normal sulphate and sulphuric acid (J. D’Ans, *Ber.,* 1906, 39, p. 1534).

The manufacture of sodium carbonate, commonly called soda, is treated under Alkali Manufacture. The anhydrous salt is a colourless powder or porous mass, having an alkaline taste and reaction. It melts at 1008°. On solution in watér, heat is evolved and hydrates formed. Common washing soda or soda-crystals is the decahydrate, Na2CO3∙1oH2O, which appears as large clear monoclinic crystals. On exposure, it loses water and gives the monohydrate, Na2CO3∙H2O, a white powder sold as " crystal carbonate this substance, which is also formed on heating the decahydrate to 34°, crystallizes in the rhombic system. Both these hydrates occur in the mineral kingdom, the former as natron and the latter as thermonatrite. The heptahydrate, Na2CO3∙7H2O, is obtained by crystallizing a warm saturated solution in a vacuum; it appears to be dimorphous. The acid carbonate or bicarbonate of soda, NaHCO3, is produced in the ammonia-soda process for alkali manufacture. Another acid carbonate, Na2CO3∙2NaHCO3∙3H2O, is the mineral trona or urao. We may here notice the “ percar­bonates ” obtained by Wolffenstein and Peltner *(Ber.,* 1908, 41, pp. 275, 280) on acting with gaseous or solid carbon dioxide on Na2O3, Na2O3 and NaHO2 at low temperatures; the same authors obtained a perborate by adding sodium metaborate solution to a 50 ⅝ solution of sodium peroxide previously saturated with carbon dioxide. For sodium nitrite see Nitrogen ; for sodium nitrate see Saltpetre ; for the cyanide see Prussic Acid; and for the borate see Borax.

Of the sodium silicates the most important is the mixture known as soluble soda glass formed by calcining a mixture of white sand, soda-ash and charcoal, or by dissolving silica in hot caustic soda under pressure. It is a colourless transparent glass mass, which dissolves in boiling water to form a thick liquid. It is employed in certain printing processes, as a cement for artificial stone and for mending glass, porcelain, &c., and also for making the so-called silicated soaps (see Soap).

Sodium is most distinctly recognized by the yellow coloration which volatile salts impart to a Bunsen flame, or, better, by its emission spectrum which has a line (double), the Fraunhofer D, line, in the yellow (the wave-lengths are 5896 and 5890). The atomic weight was determined by Stas to be 22·87 (H = I) ; T. W. Richards and R. C. Wells *(Journ. Amer. Chem. Soc.,* 1905, 27, p. 459) obtained the value 23∙006(O = 16).

*Medicine.*

*Pharmacology.*—The metal sodium is not used in medicine, but many of its salts are employed. Besides *liquor sodii ethylaiis* the following salts and preparations are used in the British Pharma­copoeia. (1) *Sodii carbonis,* known as washing soda; this carbonate on heating yields *sodii carbonis exsiccalus* and *sodii bicarbonas;* from the latter is made *trochiscus sodii bicarbonatis.* (2) *Sodii phosphas.* From sodium phosphate are made *sodii phosphas effervescens* and *sodii hypophosphis* (see Phosphorus). (3) *Sodii sulphas* (Glauber’s salt), with its sub-preparation *sodii sulphas effervescens.* (4) *Soda tartarata* (Rochelle salt), a tartrate of sodium and potassium, from which is made *pulvis sodae tartaralae effervescens,* known as Seidlitz powder. (5) *Sodii citro-tartras effervescens,* a mixture of sugar, sodium bicarbonate, citric and tartaric acids. (6) *Sodii chloridum,* common salt. (7) *Sodii sulphis.*

For *sodii bromidum, iodidum* and *salicylatum* see Bromine, Iodine and Salicylic Acid respectively. For *sodii arsenas* and *cacodylate* see Arsenic. *Sapo durus* (hard soap) is a compound of sodium with olive oil, and *sapo animalis* (curd soap) is chiefly sodium stearate.

*Toxicology.—*Poisoning by caustic soda is rare, but occasionally it takes place by swallowing soap lees (sodium carbonate), which may contain some impurities of caustic soda. The symptoms and treatment are the same as described under Potassium. The salts of sodium resemble potassium in their action on the alimentary tract, but they are much more slowly absorbed, and much less diffusible; therefore considerable amounts may reach the small intestine and there act as saline purgatives. They are slowly absorbed into the blood, and are a natural constituent of the blood plasma,' which derives them from the food. Sodium is excreted by all the mucous surfaces and by the liver and kidneys. On the latter they act as diuretics, but less powerfully than potassium, increasing the flow of wâter and the output of urea and rendering the urine less acid. They arc said to diminish the secretion of the bronchial mucous membrane.

*Therapeutics: External Use.*—The liquor sodii ethylatis is a powerful caustic and is used to destroy small naevi and warts. A lotion of sodium bicarbonate is useful to allay itching. Solutions of sodium sulphite are used as mild antiparasitics. *Internal use.—* Sodium chloride is occasionally used in warm water as an emetic, and injections of it into the rectum as a treatment for thread worms. A 0-9% solution forms what is termed normal saline solution, which is frequently injected into the tissues in cases of collapse, haemorrhage and diarrhoea. It forms a valuable treatment in , diabetic coma and eclamρsia, acting by diluting the toxins in the blood. From this has developed the intramuscular injection of diluted sea-water in the treatment of gastro-enteritis, anaemia and various skin affections. Sodium chloride is an important constituent of the waters of Homburg, Wiesbaden, Nauheim and Kissingen. Sodium bicarbonate is one of our most useful gastric sedatives and antacids, relieving pain in hyperchloridia. It is the constituent of most stomachic mixtures. Effervescent soda water is a mild gastric sedative. Sodium phosphate and sulphate are cholagogue purga­tives and are used in the treatment of gallstones. The sulphate is the chief constituent of Marienbad and Carlsbad waters. Large doses of these salts are used to remove fluid in dropsy. Soda tar- tarate is purgative and diuretic, as is the citro-tartarate. These purgative sodium salts are most useful in the treatment of chronic constipation, and of the constipation associated with gout and hepatic dyspepsia. They should be dissolved in warm water and taken in the morning, fasting. In visceral gout and chronic catarrhal conditions of the stomach a course of alkaline waters is distinctly beneficial. Sodium salts have not the depressant effect so marked in those of potassium.

**SODOM AND GOMORRAH,** in biblical geography, two of five cities (the others named Admah, Zeboiim and Bela or Zoar) which were together known as the “ cities of the *Kikkar ”* (circle), somewhere in the neighbourhood of the Dead Sea. They occupied a fertile region, chosen by Lot for his dwelling (Gen. xiii. 10-12). They were attacked by the four great East­ern kings and spoiled, but restored by the intervention of Abram and his men coming to the aid of Lot (Gen. xiv.). They were proverbial for wickedness, for which they were destroyed by a rain of “ fire and brimstone ” (Gen. xix.). The site of the cities, the historicity of the events narrated of them and the nature of the catastrophe that destroyed them, are matters of hot dispute. Modern names, more or less similar to the ancient appellations, have been noted in different parts of the Dead