3. ***Emplastrum Saponis***, Ph. L. & Dub. (soap, lb. ss.; lead plaster, lb. iii.) This quantity of soap is said to be too much by one half. This plaster, spread on leather, is employed as a discutient and mechanical support. When two parts of it are mixed with three parts of resinous plaster (*emplastrum resinæ*, Ph. L.), it constitutes the *emplastrum saponis compositum*, vel *emplastrum adhærens*, Ph. D., and which, when spread by a machine on linen, is sold in the shops by the name of *adhesive plaster* (Dr. Duncan, *Edinb. Dispensatory*).

ORDER 12. COMPOUNDS OF BARIUM.

Bary tæ Car bonas.—Car'bonate of Bary ta.

HISTORY.—The earthy base called *baryta* was discovered in 1774 by Scheele. It was at first termed *terra ponderosa*. In 1783 Dr. Withering recognised the native carbonate of baryta, which has been called, after its discoverer, *Witherite*.

NATURAL HISTORY.—*Witherite* occurs in the lead mines of the north of England (as those of Anglesark, in Lancashire), and in various other localities. The mineral called *baryto-calcite* (a compound of carbonate of baryta and carbonate of lime) is found at Alston Moor, Cumberland. —[For some curious anecdotes respecting its discovery at the latter place, consult Parkes's *Chem. Essays*, vol. i. p. 324].

PREPARATION.—The native carbonate of baryta is sufficiently pure for the preparation of the other barytic salts, and is the kind meant in the Pharmacopœia. Absolutely pure carbonate may be prepared by the addition of a pure alkaline carbonate to a solution of some barytic salt; as the sulphuret (obtained from the decomposition of the sulphate by some carbonaceous matter), or the chloride; or it may be obtained by igniting (or boiling in water) finely powdered sulphate of baryta with three parts of carbonate of potash, and washing away the resulting sulphate of potash; or by decomposing sulphate of baryta by carbonate of ammonia.

PROPERTIES.—Native carbonate of baryta occurs massive, stalactitic and crystallized: the primary form of the crystals is the right rectangular prism. The sp. gr. of this mineral is 4·3. Heated before the blowpipe it melts into a white enamel, with the evolution of much light and the loss of carbonic acid. Artificially prepared, carbonate is a fine, tasteless, odourless powder. It is almost insoluble in both hot and cold water: 4,304 parts of cold, or 2,304 parts of hot water, being required to dissolve one part of carbonate. It is more soluble in carbonic acid water.

CHARACTERISTICS.—It dissolves with effervescence in hydrochloric acid, forming a solution of chloride of barium: the evolved gas, when collected, is found to be carbonic acid (*vide* p. 190). The hydrochloric solution is not precipitated by ammonia, the hydrosulphurets, or the ferrocyanides; but the soluble sulphates, phosphates, and carbonates, throw down white precipitates, which are, respectively, sulphate, phosphate, oxalate, and carbonate of baryta: sulphate of baryta is insoluble in both water and nitric acid. The salt (chloride of barium) obtained by the evaporation of the hydrochloric solution, tinges the flame of alcohol greenish yellow.

Composition.—The following is the composition of this salt:—

	Eq.	Eq. Wt.	Per Cent.	Berzelius.	Berard.
Baryta	1	77	$77{\cdot}\dot{7}$	77·9	78
Carbonic Acid	1	22	$22{\cdot}\dot{2}$	22·1	22
Carbonate Baryta	1	99	$99{\cdot}\dot{9}$	100·0	100

Purity.—It should be white, odourless, and tasteless. Neither caustic ammonia nor hydrosulphuric acid should produce any precipitate or change of colour in the hydrochloric solution, by which the absence of alumina and metallic matter may be inferred. If excess of sulphuric acid be added to this solution, no precipitate should be occasioned by the subsequent addition of carbonate of soda, by which the absence of lime is shown.

Physiological Effects. (*a.*) *On vegetables.*—Germination does not take place in carbonate of baryta. (Vogel, in Decand. *Phys. Végét.* p. 1341.)

(*b.*) *On animals.*—Cows and fowls have been destroyed by swallowing the native carbonate. (Parkes, *Chem. Essays*, vol. i. p. 330.) Orfila (*Toxicol. Gén.*) says a drachm of the powder killed a dog in six hours; but C. G. Gmelin (*Versuche über d. Wirk. des Baryts*, &c. p. 8) gave two drachms to a dog: vomiting took place, and the animal was well the next day. A drachm killed a rabbit in three hours. When applied to a wound it has proved fatal. (Campbell, quoted by Christison, *Treatise on Poisons*, 3d ed. p. 532.) From the above experiments carbonate of baryta appears to act as an acro-narcotic poison: when swallowed it causes vomiting, inflames the alimentary tube, becomes absorbed, and acts specifically on the nervous system, causing convulsions, paralysis, and insensibility.

(*c.*) *On man.*—Only one case illustrating its action on the human subject has been published. (Dr. Wilson, *Med. Gaz.* vol. xiv. p. 487.) A young woman swallowed half a tea-cupful of the powdered carbonate: in two hours she had dimness of sight, double vision, ringing in the ears, pain in the head, and throbbing in the temples, a sensation of distension and weight at the epigastrium, distension of stomach, and palpitation. Subsequently she had pains in the legs and keees, and cramps in the calves. A day or two after the cramps became more severe. These symptoms slightly modified continued for a long time.

Uses.—Carbonate of baryta is employed in the preparation of the chloride of barium. It is not administered as a medicine.

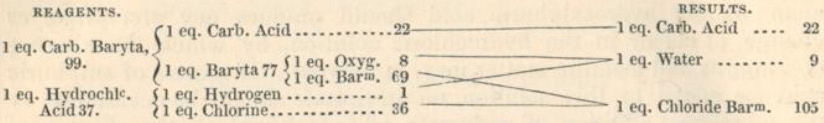
Antidote.—(Vide Barii Chloridum.)

Ba'rii Chlo'ridum.—Chlo'ride of Ba'rium.

History.—This compound was discovered by Scheele in 1775. It was at first termed *terra ponderosa salita*, and afterwards *muriate of barytes*.

Preparation. 1. *From the native carbonate of baryta.*—The following are the directions given in the London Pharmacopœia:—Add ten ounces of carbonate of baryta, broken in small pieces, to half a pint of hydrochloric acid mixed with two pints of distilled water. Apply heat, and when the effervescence has finished, strain and boil down, that crystals may be formed.

In this process one equivalent or 37 parts of hydrochloric acid react on one equivalent or 99 parts of carbonate of baryta: the products are one equivalent or 22 parts of carbonic acid, which escape ; one equivalent or 9 parts of water, and one equivalent or 105 parts of chloride of barium.



2. *From the native sulphate of baryta.*—As a sulphate of baryta can be obtained in greater abundance and cheaper than the carbonate, manufacturers usually prepare the chloride, as well as other salts, of barium from it. There are several modes of proceeding, but the most common one is the following :—Make finely powdered sulphate into a paste with about an equal volume (or a sixth part of its weight) of flour (or charcoal) ; and expose it in a covered crucible to an intense heat for two hours. The carbon combines with the oxygen of the sulphuric acid and of the baryta, and forms carbonic oxide, which escapes. The residue digested in water forms a solution of sulphuret of barium. To the filtered liquor add hydrochloric acid, which causes the evolution of hydrosulphuric acid gas ; filter the solution, evaporate, and crystallize. By re-solution, evaporation, and a second crystallization, the crystals may be obtained very pure and fine. Or sulphate of baryta may be decomposed by igniting it with chloride of calcium.

PROPERTIES.—Chloride of barium crystallizes in right rhombic plates or tables, sometimes in double eight-sided pyramids : the primary form of the crystals is the right rhombic prism. To the taste this salt is disagreeable and bitter. Its sp. gr. is 2·825. In dry warm air the crystals effloresce, but in the ordinary states of the air they undergo no change. When heated they decrepitate, lose their water of crystallization, and at a red heat fuse. At a white heat, according to Planiava, this salt volatilizes. It is soluble in both cold and hot water : 100 parts of water at 60° dissolve 43·5 of the crystallized salt,—at 222°, 78 parts. It is slightly soluble in ordinary rectified spirit, but is said to be insoluble in pure alcohol.

CHARACTERISTICS.—That it is a chloride is readily known by nitrate of silver (vide p. 105.) The tests by which the nature of the base can be determined have been before mentioned (p. 338.)

COMPOSITION.—The crystals of chloride of barium have the following composition :—

	Eq.	Eq.Wt.	Per Cent.	Berzelius.	Phillips.
Barium	1	69	56·09	85·201	85·5
Chlorine	1	36	29·26		
Water	2	18	14·63	14·799	14·5
Cryst. Chlor. Barium	1	123	99·98	100·000	100·0

PURITY.—The crystals should be colourless, neutral to test paper, permanent in the ordinary states of the air, (if they become moist or deliquesce, the presence of chloride of calcium, or chloride of strontium, may be suspected), and their aqueous solution should undergo no alteration of colour by the addition of ferrocyanide of potassium, hydrosulphuric acid, tincture of nutgalls, or caustic ammonia, by which the absence of metallic matter (as iron, lead, or copper), may be inferred. If excess of sulphuric acid be added, the filtered solution should be completely volatile when heated, and should occasion no precipitate on the addition of carbonate of soda, by which the absence of lime or magnesia is proved.

PHYSIOLOGICAL EFFECTS. (*a.*) *On vegetables.*—This salt is poisonous to plants. (Marcet, quoted by Decandolle, *Phys. Végét.*)

(*b.*) *On animals.*—The action of chloride of barium on animals is, according to Sir B. Brodie (*Phil. Trans.* 1812, p. 205), analogous to that of arsenic. Locally it operates as an irritant. After absorption it affects the nervous system, the organs of circulation, and the stomach. Its action on the nervous system is manifested by staggering, convulsions, paralysis, and insensibility; on the circulating system, by palpitations, with feeble and intermittent pulse; on the stomach, by vomiting from its application to a wound. According to Sir B. Brodie the affection of the stomach is slighter than that caused by arsenic. (See also the experiments of Orfila in the *Toxicol. Génér.*, and of C. G. Gmelin in his *Versuche über die Wirkungen*, &c.)

(*c.*) *On man.*—Administered in *small doses*, it at first produces no very obvious effects. In some cases the appetite appears to be improved. Soon we observe an increased secretion of urine, tendency to sweating, and not unfrequently loose stools. With no other obvious symptoms than these, glandular swellings or enlargements sometimes become softer and smaller, from which we infer that the absorbent system is stimulated to greater activity. If we persevere in the use of gradually increased doses, the appetite becomes disordered, nausea and vomiting, with not unfrequently griping and purging, come on: a febrile state, with dry tongue, is produced, the nervous system becomes affected, and the patient complains of giddiness and muscular weakness. Sometimes, according to Schwilgue (*Traité de Mat. Méd.* vol. i. p. 441, 3^{me}. ed.) under the continued use of it, catarrhal discharges from the eye, nose, ear, &c. take place; inflamed or suppurating lymphatic glands evince signs of an augmented excitation, wounds assume a more healthy appearance, and, in some cases, cicatrize.

In *large medicinal doses* very unpleasant effects have been occasionally observed from its use; such as vomiting, purging, sometimes griping, contracted pulse, giddiness, and great muscular debility, almost amounting to paralysis, with trembling. (See an illustrative case in *Medical Commentaries*, xix. 267.)

In *excessive* or *poisonous doses* (as an ounce) the affection of the nervous system is more obvious. In one recorded case the symptoms were convulsions, pain in the head, deafness, and, within an hour, death. (*Journ. of Science*, vol. ix. p. 382.)

In conclusion, it may be observed, that considered medicinally chloride of barium is most analogous to, though more powerful than, chloride of calcium, and is applicable in the same cases: regarded toxicologically it may be compared to arsenic, but it acts less energetically on the stomach, and more rapidly on the nervous system, and causes death in a shorter time.

USES.—The principal medicinal use of chloride of barium is in the treatment of *scrofula*, for which it was introduced into medicine by Dr. Crawford in 1790 (*Med. Commentaries*, Dec. 2d, vol. iv. p. 433, and *Med. Communications*, vol. ii.), and was subsequently employed by Hufeland (*Erfahr. üb. d. Gebr. u. d. Kräfte d. salzs. Schwererde*, Berl. 1794: and *Vollst. Darstell. d. med. Kräfte u. d. Gebr. d. salzs. Schwererde*, Berl. 1794), with great benefit. The latter writer has employed it in all the forms of this disease, but especially in excited and inflamed conditions, (particularly of delicate and sensible parts, as of the lungs and eyes) in painful ulcers, indurations which are disposed to inflame, and cutaneous affections. It has also been administered as a resolvent, deobstruent, or alterative, in some other diseases: for example, *scirrhus* and *cancer*, *cutaneous diseases*, *bronchocele*, &c. As a local application, a solution of it has been used as a wash in herpetic eruptions, and as a collyrium in scrofulous ophthalmia.

In pharmacy and chemistry it is extensively employed as a test for sulphuric acid and the sulphates.

ADMINISTRATION.—It is used in the form of aqueous solution. The ***LIQUOR BARII CHLORIDI***, Ph. L. consists of a drachm of the salt dissolved in an ounce of distilled water. The dose is ten drops gradually and cautiously increased until nausea or giddiness are experienced. The officinal solutions of the Edinburgh and Dublin Pharmacopœias are about 2½ times stronger. Common water, and all liquids containing carbonates, phosphates, or sulphates, are incompatible with it.

ANTIDOTES.—The antidotes for the barytic salts are the sulphates, which form therewith an insoluble sulphate of baryta. Hence sulphate of soda, sulphate of magnesia, or well or spring water (which contains sulphate of lime) should be copiously administered. Of course the poison should be removed from the stomach as speedily as possible. To appease any unpleasant symptoms caused by the continued use of large medicinal doses, opiates may be employed.

ORDER 13. COMPOUNDS OF CALCIUM.

Calx.—Lime.

HISTORY.—Lime, and the mode of obtaining it by burning the carbonate, were known in the most remote periods of antiquity. Hippocrates (*Popularium*, ii. sect. 5) employed this earth in medicine. Dr. Black in 1755 first explained the nature of the process for making it. In 1808 Davy shewed that this substance was a metallic oxide, and hence it has been termed the *oxide of calcium*. To distinguish it from the hydrate of lime, it is termed *caustic* or *quicklime* (*calx viva*), or *burned lime* (*calx usta*.)

NATURAL HISTORY.—It occurs in both kingdoms of nature.

(*a*.) *In the inorganized kingdom*.—In the mineral kingdom lime is found in the form of carbonate, sulphate, phosphate, silicate, arseniate, tungstate, borate, and titanate. Its base, calcium, occurs in combination with fluorine. "Lime is also disseminated through sea water, though in small quantities; so that calcium is widely distributed in land and water, being principally abundant in the central and higher parts of the fossiliferous rocks, and widely dispersed, in small quantities, throughout the more ancient rocks, and in the waters of the ocean." (De la Beche, *Research. in Theor. Geol.* p. 21.)

(*b*.) *In the organized kingdom*.—In vegetables, lime (or calcium) is an invariable ingredient, except, it is said, in the case of *Salsola Kali*. (Decandolle, *Phys. Végét.* p. 382.) It is found combined with carbonic, sul-