PROPERTIES.—Cyanide of zinc is a white powder, insoluble in water or alcohol.

CHARACTERS.—If a strong mineral acid be added to it, hydrocyanic acid is developed, and a soluble salt of zinc obtained. The latter is recognized by the tests before mentioned for a solution of zinc (p. 522).

COMPOSITION.—Its composition is as follows:—

	Eq.	Eq. Wt.	Per Cent.
Zinc	1	32	55·2
Cyanogen	1	26	44·8
Cyanide of Zinc	1	58	100·0

PHYSIOLOGICAL EFFECTS.—Its effects have not been carefully ascertained, but they are supposed to be similar to those of hydrocyanic acid.

USES.—It has been used principally in affections of the nervous system, as epilepsy, hysteria, and chorea. It has also been employed in cardialgia and cramps of the stomach, and as an anthelmintic in children.

ADMINISTRATION.—We may give it in doses of from a quarter of a grain to a grain and a half three times a day. It may be taken in the form of powder mixed with calcined magnesia.

ORDER 26.—IRON AND ITS COMPOUNDS.

Fer'rum.—Iron.

HISTORY.—This metal (called by the alchymists *Mars*) was known in the most ancient times. It was employed medicinally at a very early period, namely, above 3200 years ago. Indeed, it appears to have been the first mineral used internally; and a curious anecdote is given of its introduction into medicine. Melampus (a shepherd supposed to possess supernatural powers) being applied to by Iphicles, son of Philacus, for a remedy against impotence, slaughtered two bulls, the intestines of which he cut to pieces, in order to attract birds to an augury. Among the animals which came to the feast was a vulture, from whom Melampus pretended to learn that his patient, when a boy, had stuck a knife wet with the blood of some rams into a consecrated chestnut-tree, and that the bark had subsequently enveloped it. The vulture also indicated the remedy, namely, to procure the knife, scrape off the rust, and drink it in wine, for the space of ten days, by which time Iphicles would be lusty, and capable of begetting children. The advice thus given by Melampus is said to have been followed by the young prince with the most perfect success! (Le Clerc, *Hist. de la Médecine.*)

NATURAL HISTORY.—Iron is met with in both kingdoms of nature.

(*a.*) *In the inorganic kingdom.*—Few minerals are free from iron. It is found in the metallic state (*native iron*), in combination with oxygen (*hæmatite*, *micaceous iron*, *brown iron stone*, and *magnetic iron ore*), with sulphur (*iron pyrites*, and *magnetic pyrites*), with chlorine (*pyrosmalite*), with oxygen and an acid (*carbonate*, *phosphate*, *sulphate*, *arseniate*, *tungstate*, *tantalate*, *titaniate*, *chromate*, *oxalate*, and *silicate*.)

(*b.*) *In the organic kingdom.*—It occurs in the ashes of most plants, and in the blood and some other parts of animals.

EXTRACTION.—In Sweden, iron is extracted from magnetic iron ore and micaceous iron: in England, principally from clay iron ore (carbonate of iron.)

Clay iron ore (technically called *mine*) is burned with coal in large heaps, by which it loses carbonic acid, water, and sulphur. It is then smelted with a flux (in South Wales this is limestone; in the forest of Dean, clay;) and coke. The smelted iron is run into moulds, and is then called *cast iron* (*ferrum fusum*), or *pig iron*. This contains carbon, oxygen, silicon, and often sulphur and phosphorus. To separate these, it is submitted to several processes (called refining, puddling, and welding,) by which it is converted into *wrought iron* (*ferrum cusum*), (*Manufacture of Iron*, in the *Library of Useful Knowledge;* also, *Treatise on Iron and Steel*, in *Lardner's Cyclopædia*).

Properties.—The primary form of the crystals of native iron is the regular octahedron. Pure iron has a whitish grey colour, or, according to Berzelius, is almost silver white. When polished it has much brilliancy: its taste is peculiar and styptic; when rubbed it becomes odorous. Its ductility and tenacity are great; its malleability comparatively small. Its sp. gr. is 7·788, but diminishes by rolling or drawing. It is attracted by the magnet, and several of its compounds are capable of becoming permanent magnets; but pure iron retains its magnetic property for a short time only. It requires a very intense heat to fuse it; and it is not volatile at any known temperature; while in the softened state, previous to melting, it is capable of being welded. Its equivalent or atomic weight is 28.

Characteristics.—Iron readily dissolves in diluted sulphuric acid, with the evolution of hydrogen gas. The solution contains the protosulphate of iron, and produces, on the addition of caustic potash or soda, a greenish-white precipitate (the hydrated protoxide): this precipitate, by exposure to the air, attracts oxygen, and is converted into the red or sesquioxide. Auro-chloride of sodium forms a purple precipitate with the protosalts of iron. By boiling the solution with a little nitric acid, we obtain a persulphate of iron, recognized by ferrocyanide of potassium causing a blue precipitate; sulphocyanic or meconic acid, a red colour; gallic or tannic acid, or infusion of galls, a purple or bluish black; and succinate, or benzoate of ammonia, a yellowish precipitate.

Physiological Effects. (*a.*) *Of the metallic iron.*—Iron is probably inert so long as it retains its metallic form, but it readily oxidizes in the alimentary canal, and thereby acquires medicinal power. As acids promote this chemical change, acid wines and fruits assist in rendering the metal active, while alkalies and their carbonates have an opposite effect. The oxidizement of the iron is attended with the evolution of hydrogen gas, which gives rise to unpleasant eructations. If sulphur be taken along with iron, hydrosulphuric acid is developed. Like the ferruginous preparations generally, the internal employment of iron causes blackening of the stools. The nature of the effects produced by oxide of iron formed in the alimentary canal will be best examined hereafter, under the head of ferruginous preparations. I may, however, remark here, that it is one of the few metals which by oxidizement is not rendered more or less poisonous.

(*b.*) *Of the ferruginous compounds.* *a. On vegetables.*—Most of the compounds of iron do not appear to be hurtful to plants: at least this is the case with the oxides (Decandolle, *Phys. Vég.* 1337.) The sulphate, however, is said to be injurious (*vide* p. 551.)

β. On animals.—The effects of the ferruginous compounds on animals generally are similar to those on man. It is stated that in animals to

whom iron has been given for a considerable time, the spleen has been found smaller, harder, and denser—an effect which is supposed to be owing to the increased contractile power experienced by the veins of the abdomen. The liver is also said to have been affected in a similar manner, though in a somewhat slighter degree.

γ. *On man.*—The *local* effects of the sulphate and chloride of iron are those of irritants, and these preparations accordingly rank among poisons; but they are not equal in power to the mercurial or cupreous salts. Most of the ferruginous preparations are astringent; that is, they constringe the parts with which they are in contact, and thereby diminish secretions and check sanguineous discharges. Thus, when swallowed, they repress the secretions and exhalation of the gastro-intestinal membrane, and thereby render the alvine evacuations more solid, and even occasion costiveness. The sulphate and chloride of iron are the most powerful of the ferruginous astringents. Administered in large quantities, or when the alimentary canal is in an irritable condition, all the compounds of iron are capable of exciting heat, weight, and uneasiness at the præcordia, nausea, and even vomiting, and sometimes purging.

The constitutional or *remote* effects of the chalybeates are principally observed in the alteration induced in the actions of the vascular and muscular systems, and are best seen in that state of the system denominated *anæmia*, or more properly *hypæmia*, in which both the quantity and quality of the blood appear defective. We have a good illustration of this state in chlorotic patients. The skin appears pale and almost exsanguineous, the cellular tissue is œdematous, and, after death, the larger vessels as well as the capillaries are found to be imperfectly supplied with blood. Patients with this condition of system are affected with great feebleness, loss of appetite, and palpitation; and in females the catamenial secretion is frequently, but not invariably, defective. That the want of uterine action is not the cause, but in some cases is, perhaps, the effect of this condition of system, seems tolerably clear from the circumstance of the same constitutional symptoms of anæmia sometimes occurring with a perfect regularity of the uterine functions; moreover, we occasionally meet with anæmia in men. It is sometimes the consequence of hæmorrhages—at other times it occurs spontaneously, and without any known cause (Andral, *Pathol. Anat.* by Townsend and West, i. 97).

If in this condition of system we administer iron, the appetite increases, digestion is promoted, the pulse becomes fuller and stronger, the skin assumes its natural tint, the lips and cheeks become more florid, the temperature of the body is increased, the œdema disappears, and the muscular strength is greatly augmented. The alvine evacuations assume a black colour, as they always do under the use of the ferruginous preparations. After continuing the use of iron for a few weeks, we frequently find excitement of the vascular system (particularly of the brain); thus we have throbbing of the cerebral vessels, and sometimes pain in the head, a febrile condition of system, with a tendency to hæmorrhage. Mr. Carmichael (*Essay on the Effects of Carbonate of Iron on Cancer*, Dubl. 1806, p. 396) considers the *sanguine* temperament (marked by a high complexion, celerity of thought, remarkable irritability of fibre, and a quick pulse) as depending on an excess of iron in the

system; whereas the *leucophlegmatic*, or *relaxed*, temperament (characterized by a pale bloated countenance, dull eyes, mind heavy and slow in receiving and forming ideas, little irritability of fibre, and pulse small and feeble) as depending on a deficiency of iron.

When by the use of iron the state of the general system improves, the secretions resume their natural condition, and thus at one time we observe this metal promoting the uterine discharge, at another checking it, according as chlorosis or menorrhagia had been previously present; we cannot, therefore, regard the preparations of this metal as having any direct emmenagogue effect, as some have supposed.

Some refer all the other symptoms of anæmia to the abnormal state of the blood, and ascribe the beneficial influence of iron to the improvement in the quality of this liquid. It is certain that, under the use of the preparations of this metal, the blood frequently acquires a more scarlet colour, owing, as it has been fancied, to an increase in the quantity of its colouring particles; and it is said that the crassamentum becomes firmer and more solid, and even increased in quantity. This alteration of the physical and chemical properties of the blood is supposed to render it more stimulating, and thus the different organs, receiving a fluid of a more healthy character, resume their normal condition, and perform their functions in a proper manner. Tiedemann and Gmelin (*Vers. üb. d. Wege auf. welch. Subst. aus d. Magen u. Darmk.*) have detected it in the serum of the blood of the portal and mesenteric veins of horses and dogs, to whom they administered either the sulphate or chloride; occasionally, too, the urine has been found to contain it. Moreover, Menghini (*De ferrearum particul. progressu ad sanguinem.* In *Com. Acad. Bonon.* t. ii. pt. iii. p. 475) asserts the quantity of iron in the blood of dogs is increased by feeding them on substances mixed with this metal. Furthermore, it is not to be forgotten, that iron exists in no inconsiderable quantity in healthy blood, and is supposed to contribute to its colour, and probably to its stimulant properties; so that it is not unlikely any variation in the quantity of this metal would be attended with an alteration in the action of every organ.

Iron is a substance not readily absorbed, for it remains in the stomach and intestines many days after it is swallowed: in order, therefore, that the ferruginous preparations should have much effect on the general system, it is necessary that they be employed for some considerable time. It does not, like most other metals, act as a poison when it gets into the blood. Another circumstance connected with the operation of iron is likewise deserving of notice; namely, that it has no primary or specific effect on the nervous system, as arsenic, mercury, copper, zinc, bismuth, silver, and many other metals. It must not, however, be imagined from these remarks, that the preparations of iron never operate injuriously. On the contrary, we see them sometimes acting as local irritants on the alimentary canal, as already noticed; and by the use of them in too large quantities, or for too long a period of time, they bring on a hypersthenic or phlogistic diathesis.

Uses. (*a.*) *Of metallic iron.*—Iron filings have been used in those cases where the chalybeate preparations generally have been administered, and which will be presently noticed. In some instances, however, the efficacy of iron depends on its being employed in the uncombined state. Thus, when used as an antidote to poisoning by the

salts of copper, it is necessary that the iron be administered in the metallic state, in order to reduce the cupreous salts (*vide* p. 494). Iron filings have been regarded as anthelmintic, especially in the small thread-worm (the *Ascaris vermicularis*); they have been used also as an astringent application, to repress fœtid secretion of the feet.

(*b.*) *Of the ferruginous compounds.*—By a careful attention to the known physiological effects of the ferruginous compounds, the indications and contra-indications for their employment may be in great part learned. Thus, the impropriety of administering them where there is irritation or inflammation of the alimentary canal, in plethoric habits, and in persons disposed to inflammatory diseases, or to apoplexy, will be obvious from the foregoing remarks. On the other hand, in all cases characterized by feebleness and inertia of the different organs of the body, by a soft lax condition of the solids, and by a leucophlegmatic state of the system — where the patient appears to be suffering from a state of general anæmia, already described—the preparations of iron are indicated. It is hardly within the scope of my present object to instance particular diseases where this metal may be used, but rather to point out those conditions of system which affect the employment of iron in diseases generally. I may notice a few cases by way of illustration.

As *external* or *local* agents we rarely employ the preparations of iron, since we have other more efficacious and powerful remedies. Occasionally, however, they have been used as astringents, styptics, and caustics. Thus solutions of the sulphate and chloride have been used in the form of injection, in discharges from the urethra and vagina: and the tincture of the chloride is now and then applied as a styptic, or to repress the growth of spongy granulations.

The ferruginous preparations are principally resorted to with the view of affecting the general system. The are frequently given *to promote the uterine functions*, as in chlorosis, amenorrhœa, dysmenorrhœa, and menorrhagia, and often with success. When chlorosis depends on, or at least is accompanied by, that condition of the system before described under the name of anæmia, the ferruginous preparations are frequently useful; but if it occur in patients of a full habit, or if it arise from inflammation of some organ (as the lungs, stomach, or bowels), chalybeates will do harm. In cases of impotence, connected with or arising from general feebleness, it may be now and then useful; but in nine out of ten cases which we are called on to treat, this condition arises from indulgence in bad habits, which no medicine can affect. Sometimes iron is resorted to in sterility (though Dioscorides says the rust of iron hinders women from conceiving), but the conditions under which it is likely to be useful are precisely those before mentioned for other diseases. In discharges from the genital organs, as gleet and leucorrhœa, the internal employment of the tincture of the chloride of iron, sometimes conjoined with the tincture of cantharides, has been found useful.

In some *periodical diseases*—namely, ague, asthma, and tic douloureux—the ferruginous preparations have gained considerable repute, In the first of these diseases (that is, ague), the sulphate has been used by Marc (*Recherches sur l'Emploi du Sulf. de Fer dans le Traitement des Fièvres Interm.* Paris, 1810) and others, the subcarbonate by Buchwald, the ammoniacal chloride by Hartmann; but it has been almost wholly

superseded, of late years, by the sulphate of quinine and by arsenic. In asthma, Dr. Bree (*On Asthma*), who was himself a sufferer from the disease, regards iron as preferable to all other remedies. However, the experience of others has not confirmed his favourable opinion of it. The sesquioxide of iron has latterly been extensively employed, at the recommendation of Mr. B. Hutchinson (*Cases of Tic Doulour. successfully treated*), in tic douloureux, and with variable success; in some cases acting in a most extraordinarily beneficial manner, in others being of no avail.

In *diseases of the spleen and liver*, the ferruginous compounds are occasionally found useful. I have already alluded to the influence which they are supposed to possess over these organs; a supposition the more probable from the occasional remarkable effects produced by them in diseases of these organs. "I regard iron as a *specific*," says Cruveilhier, (*Dict. de Méd. et de Chir. Prat.* t. viii. p. 62), "in *hypertrophy of the spleen*, or *chronic splenitis;* whether primitive or consecutive to intermittent fevers." After noticing the symptoms attending this condition (such as paleness of the lips, &c. great lassitude, abdominal and cephalic pulsations, brought on by the slightest exertion; pain at the left side, disordered state of the digestive organs, accelerated pulse, and heart easily excited), he goes on to remark, "By the aid of iron I have obtained the complete resolution of enlargements of the spleen, which have occupied half, or even two-thirds, of the abdomen." In hypertrophy of the liver, iron has not been equally serviceable.

Some years ago the preparations of iron were strongly recommended in *cancer* by Mr. Carmichael (*op. cit.*) The grounds on which he was led to the use of them were the probability that cancer had an independent life—in other words, that it was a kind of parasite, as some preceding writers, more particularly Dr. Adams, had presumed; and secondly, the efficacy of iron in destroying intestinal worms, which led him to hope that it would be equally destructive to other parasites. With these views he employed (externally and internally) various ferruginous compounds—namely, the ferrotartrate of potash, the subcarbonate (sesquioxide) of iron, and the phosphates. Whatever hopes may have at one time been entertained of these remedies as curative agents, in this most intractable disease, they are now completely destroyed. That these medicines are occasionally useful as palliatives may perhaps be admitted; but they have no curative powers. Indeed this might have been suspected, from the hypothetical grounds on which they were introduced into use. The proofs of the parasitical nature of cancer must be much stronger than any yet offered, ere we can admit this hypothesis. Moreover, the preparations of iron, though useful, are not so "very effectual" in worms as Mr. Carmichael's remarks would lead us to imagine.

In certain affections of the digestive organs, the preparations of iron are occasionally used with benefit; as in some forms of dyspepsia, but only in the conditions of system already noticed. In some *affections of the nervous system* which occur in weak debilitated subjects, it is also useful; for example, in epilepsy, chorea, hysteria, and the shaking palsy produced by the vapour of mercury.

These are the most important diseases for which we employ the ferruginous compounds. There are many other diseases for which chalybeates are occasionally beneficial; but the general principles regulating

their use will be readily comprehended from the foregoing remarks, and I have only to add, in all diseases attended by debility and marked by atony and inertia of organs, more especially in those indicating a disordered state of the hæmatose functions, the preparations of iron will be found in most instances more or less serviceable. Furthermore, I may enumerate scrofula, rickets, dropsy, and gout, as diseases in which iron has been at times used with advantage.

Fer'ri Sesquiox'ydum.—Sesquiox'ide of I'ron.

History.—Gebert (*Invent. of Verity*, 280) was acquainted with this substance, which he calls *crocus martis*. It was probably known long before his time It is the *red* or *peroxide of iron* of some chemists.

Natural History. — It is found native in the crystallized state (*specular iron* or *iron glance*) and in globular and stalactitic masses (*red hæmatite*): the finest specimen of the first occur in the Isle of Elba; the second is found near Ulverstone in Lancashire, and in Saxony. The hydrated sesquioxide of iron (*brown iron stone*) is met with in Scotland and at Shotover Hill, Oxfordshire. *Yellow ochre* is a hydrated sesquioxide of iron.

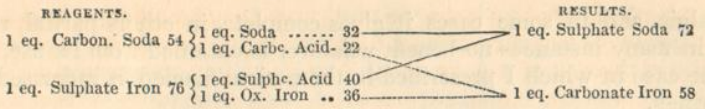
Preparation.—There are several modes of preparing this compound.

One method is to calcine crystallized sulphate of iron, by which, first the water and afterwards the sulphuric acid are expelled: the protoxide of iron of the sulphate is peroxidized at the expense of the oxygen of part of the sulphuric acid, and a portion of sulphurous acid gas is developed. The sesquioxide thus procured constitutes the *ferri oxidum rubrum* of the Dublin and Edinburgh Pharmacopœias: in commerce it is called *colcothar*, *caput mortuum vitrioli*, *trip*, *brown-red*, or *rouge*.

Rust of iron (*rubigo ferri*, Ph. Dubl.; *ferri subcarbonas*, Ph. Ed.) is the hydrated sesquioxide sometimes mixed with a little carbonate of the protoxide. It is directed to be prepared by exposing moistened iron (cuttings of wire or filings) to the air, whereby it attracts oxygen both from the air and water. It is then to be reduced to an impalpable powder, by levigation and elutriation. In the shops it is found in little conical masses.

Another mode of preparing sesquioxide of iron is by precipitation. In the London Pharmacopœia it is directed to be procured by mixing a solution of four pounds of sulphate of iron in three gallons of water, with a solution of four pounds and two ounces of carbonate of soda, also in three gallons of water. The precipitated powder, when washed and dried is a hydrated sesquioxide of iron, mixed with a portion of the protocarbonate. It is the *ferri sesquioxydum* of the London Pharmacopœia, (*ferri carbonas*, Ph. Dubl.; *carbonas ferri præcipitatus*, Ph. Ed.) When procured according to the above directions, its colour is reddish chocolate brown; but the greater part of that met with in the shops has been calcined, and is of a brownish red colour.

The *theory* of the last mentioned process is as follows:—One equivalent or 76 parts of sulphate of iron are decomposed by one equivalent or 54 parts of carbonate of soda; one equivalent or 58 parts of carbonate of the protoxide of iron precipitate, while one equivalent or 72 parts of sulphate of soda remain in solution.



By exposure to the air during the washing and drying, the carbonate of the protoxide of iron is decomposed, the oxygen of the air combines with the protoxide, and thereby converts it into sesquioxide, while carbonic acid is disengaged. A portion of protocarbonate usually escapes decomposition.

Properties.—The primary form of the crystals of native sesquioxide of iron is the rhombohedron; that of the native hydrated sesquioxide is the cube.

The artificial sesquioxide of the shops is a brownish red powder: when it has been exposed to an intense heat it sometimes has a purplish tint; the hydrated sesquioxide has a chocolate brown tint. It is odourless, insoluble in water, and not magnetic. Prepared according to the London Pharmacopœia it has a styptic taste; when calcined it is tasteless. When free from carbonate of iron, it dissolves in hydrochloric acid without effervescence.

Characteristics.—Its hydrochloric solution affords a deep blue precipitate with the ferrocyanide of potassium; a purplish black precipitate with tincture of nutgalls; a brownish red precipitate with the alkalies; and a red colour with sulphocyanic or meconic acid.

Composition.—Sesquioxide of iron has the following composition:—

	Eq.	Eq. Wt.	Per Cent.	Gay-Lussac.	Berzelius.
Iron	1	28	70	70·27	69·22
Oxygen	1½	12	30	29·73	30·78
Sesquioxide of Iron	1	40	100	100·00	100·00

When prepared by precipitation, it usually contains some carbonate of the protoxide; and, when digested in hydrochloric acid, some carbonic acid evolves. According to Mr. Phillips, the quantity of carbonate in the preparation of the shops is only 4 per cent.

Purity.—Adulteration is hardly to be apprehended. If it should contain copper, its hydrochloric solution will deposit this metal on a bright rod of iron. After the sesquioxide has been thrown down by ammonia from the hydrochloric solution, the supernatant liquor should give no indications of containing any other metal in solution; and chloride of barium ought not to occasion any precipitate.

Physiological Effects.—It is termed alterative, tonic, and emmenagogue. Its obvious effects on the body are very slight. It produces blackness of the stools; and in large doses occasions nausea, a sensation of weight at the pit of the stomach, and sometimes dyspeptic symptoms. It possesses little or no astringency. The constitutional effects, arising from the continued use of it, are those produced by the ferruginous compounds generally, and which have been before described (p. 534).

Uses.—It may be employed in any of the before mentioned cases (p. 536) in which the ferruginous tonics are indicated.

It has been strongly recommended by Mr. Benjamin Hutchinson (*Cases of Tic Douloureux successfully treated*, 1820) as a remedy for

neuralgia, and in some cases it gives complete, in others partial, relief. But in many instances no benefit whatever is obtained from its use, and in one case in which I prescribed it, the patient fancied it increased her sufferings.

Mr. Carmichael, as I have before mentioned (p. 537), has recommended it as a remedy for cancerous diseases.

The use of the hydrated sesquioxide of iron, as an antidote for arsenious acid, has been before noticed (p. 396).

Administration.—The usual dose of this preparation, as a tonic and emmenagogue, is from ten grains to half a drachm, combined with aromatics, to enable it to sit more easily on the stomach. In tic douloureux it is given in much larger doses, as from half a drachm to two, three, or four drachms.

Emplastrum Oxidi Ferri Rubri, Ph. Ed.; *Emplastrum Thuris*, Ph. Dub. (Litharge plaster, ℔ij.; frankincense [concrete juice of Pinus Abies] ℔ss.; red oxide of iron, ℥iij. M. Ph. Dub. In the Edinburgh Pharmacopœia, resin, wax, and oil, are substituted for the frankincense, and the quantity of oxide is nearly three times as much).—This is the old *emplastrum roborans* or *strengthening plaster*, and is employed, spread on a leather, as a mechanical support and slight stimulant, in muscular relaxation, lumbago, weakness of the joints, &c.

Fer'ri Ox'ydum Ni'grum.—Black Ox'ide of I'ron.

History.—It was first employed as a medicine by Lemery in 1735. It is the *martial Ethiops* (*Æthiops martialis*) of some writers, and the *oxydum ferroso-ferricum* of Berzelius. It is sometimes termed the *magnetic oxide*.

Natural History.—It occurs in the mineral kingdom under the name of *magnetic iron ore*, the massive form of which is called *native loadstone*. It is found in Cornwall, Devonshire, Sweden, &c.

Preparation.—In the Dublin Pharmacopœia it is directed to be procured by washing and drying the scales of the oxide of iron (*ferri oxydi squamæ*), and then separating them from impurities by means of a magnet. They are afterwards to be reduced to a very fine powder by levigation and elutriation.

Other modes of preparing this compound are described in chemical works. The above is a cheap method, and yields a product sufficiently pure for the purposes of medicine. The process of the Paris Codex is regarded as a superior one. It consists in covering filings of iron with water, and exposing the mixture to the air; then, by elutriation, separating the black powder.

Properties.—It is a velvet-black powder, soluble in hydrochloric acid without effervescence, and magnetic.

Characteristics.—Its hydrochloric solution affords a green or greenish-brown precipitate with a caustic alkali, and a greenish or blue precipitate with ferrocyanide of potassium. Its other characteristics are the same as those of the ferruginous compounds generally.

Composition.—It is a mixture or compound of protoxide and sesquioxide of iron. According to Mosander (Turner's *Elemetns of Chemistry*), scales of iron have the following composition:—

	Outer layer.		Inner layer.	
	Eq.	Eq.Wt.	Eq.	Eq.Wt.
Protoxide of Iron	2	72	3	108
Sesquioxide of Iron	1	40	1	40
Scales of Iron	1	112	1	148

PURITY.—It should be readily soluble in hydrochloric acid, without effervescence, by which the absence of metallic iron is shown.

PHYSIOLOGICAL EFFECTS.—Its general effects are the same as the ferruginous compounds already described (p. 534). It is a more valuable preparation than the sesquioxide, in consequence of being more readily soluble in the fluids of the stomach. When it contains metallic iron it causes eructations of hydrogen gas.

USES.—It is employed in the same cases as other chalybeates (*vide* p. 536).

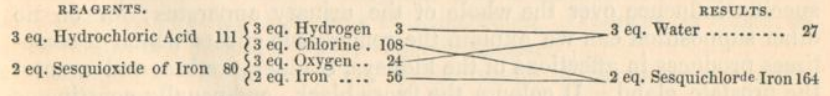
ADMINISTRATION.—The dose of it is from five grains to a scruple twice or thrice daily.

Tinc'tura Fer'ri Sesquichlo'ridi.—Tinc'ture of Sesquichlo'ride of Iron.

HISTORY.—This compound has been long in use, and is commonly termed the *tincture of the muriate of iron.* It is the *liquor of muriate of iron* (*muriatis ferri liquor*) of the Dublin Pharmacopœia.

PREPARATION.—In the *London Pharmacopœia* it is prepared by pouring a pint of hydrochloric acid upon six ounces of sesquioxide of iron in a glass vessel, and digesting for three days, frequently shaking; then adding three pints of rectified spirit, and straining. In the *Dublin Pharmacopœia,* one part of rust of iron, six parts of hydrochloric acid, and six parts of rectified spirit, are used; the hydrochloric solution is evaporated to one-third before the spirit is added, by which the excess of hydrochloric acid is driven off. In the *Edinburgh Pharmacopœia,* three ounces of the black oxide of iron, ten ounces (or as much as may be sufficient) of hydrochloric acid, and sufficient alcohol to make the whole amount two pounds and a half: this solution is more apt to decompose, owing to the presence of a larger quantity of protochloride, and the subsequent formation of sesquioxide.

By digestion in hydrochloric acid the sesquioxide becomes the sesquichloride of iron, and some water is formed.



As the sesquioxide of iron employed in the London and Dublin Pharmacopœias contains a small portion of protocarbonate of iron, a little protochloride of iron is formed, and slight effervescence, owing to the escape of carbonic acid, takes place. Both the chlorides of iron are soluble in water as well as in spirit.

PROPERTIES.—This tincture is of a reddish brown colour, and stains white paper yellow. It has a sour styptic taste, and an odour of hydrochloric ether, so that it would appear that a mutual reaction takes place between the hydrochloric acid and the alcohol. It reacts on vegetable colours as an acid. "Its sp. gr. is about 0·992, and a fluidounce yields,

when decomposed by potash, nearly 30 grains of sesquioxide of iron," (Mr. R. Phillips, *Transl. of the Lond. Pharm.*)

Characteristics.—Its reaction on vegetable colours, its inflammability, its remarkable odour, its affording chloride of silver when treated by nitrate of silver, and its reaction, like the other ferruginous compounds (p. 533), are properties sufficient to characterize it. It forms a brown semitransparent jelly with mucilage of gum arabic.

Composition.—This tincture consists of *rectified spirit*, a small portion of *hydrochloric ether*, *hydrochloric acid*, *sesquichloride of iron*, and a little *proto-chloride of iron*. Unless excess of hydrochloric acid be present, sesquioxide of iron is thrown down when the tincture is exposed to the air, owing to the iron of the chloride attracting oxygen, and becoming sesquioxide.

Sesquichloride of iron has the following composition:—

	Eq.	Eq. Wt.	Per Cent.	J. Davy.
Iron	1	28	34·15	35·1
Chlorine	1½	54	65·85	64·9
Sesquichloride of Iron	1	92	100·00	100·0

Purity and Strength.—The commercial tincture of sesquichloride of iron varies in its strength, owing to the varying strength of the hydrochloric acid employed. Moreover, a diluted spirit is frequently substituted for rectified spirit. These differences can only be discovered by examining the colour and specific gravity of the tincture, as well as the quantity of oxide which it yields.

Physiological Effects.—This is, in its local action, one of the most powerful of the preparations of iron. It acts as an energetic astringent and styptic, and in large doses as an irritant. The large quantity of free hydrochloric acid which the tincture of the shops frequently contains, contributes to increase its irritant properties; and in Dr. Christison's *Treatise on Poisons* is a brief notice of a case in which an ounce and a half of this tincture was swallowed, and death occurred in about six weeks—the symptoms during life, and the appearances after death, being those indicative of inflammation of the alimentary canal. When swallowed in large medicinal doses it readily disorders the stomach. The general or constitutional effects of this preparation agree with those of other ferruginous compounds. It appears to possess, in addition, powerfully diuretic properties. Indeed it would seem to exercise some specific influence over the whole of the urinary apparatus; for on no other supposition can we explain the remarkable effects which it sometimes produces in affections of the kidneys, bladder, urethra, and even of the prostate gland. It colours the fæces black, and usually constipates the bowels.

Uses.—It is sometimes, though not frequently, used as a topical agent. Thus it is applied as a *caustic* to venereal warts, and to spongy granulations. As an *astringent* it is sometimes employed as a local application to ulcers attended with a copious discharge; or as a *styptic* to stop hæmorrhage from numerous small vessels.

Internally it may be employed as a *tonic* in any of the cases in which the other ferruginous compounds are administered, and which I have already mentioned. It has been especially commended in scrofula.

In various affections of the urino-genital organs it is frequently used

with great success. Thus, in retention of urine, arising from spasmodic stricture, its effects are sometimes beneficial. It should be given in doses of ten minims every ten minutes until benefit is obtained, which frequently does not take place until nausea is excited. It has been used with success by Mr. Cline (*Med. Records and Researches*, Lond. 1798); by Mr. Collins (*Med. and Phys. Journ.* xvi. 250); by Drs. Thomas, Eberle, and Francis (*Eberle's Treat. on Mat. Med.* ii. 270, 2d ed.); and by Dr. Davy (Paris's *Pharmacologia*, ii. 478, 6th ed.) However, Mr. Lawrence (*Lond. Med. Gaz.* vi. 845), alluding to Mr. Cline's recommendation of it, observes, "I believe general experience has not led others to place any very great confidence in the use of this remedy." In gleet and leucorrhœa it is sometimes serviceable. I have found it occasionally successful, when given in conjunction with the tincture of cantharides, in the latter stage of gonorrhœa, after a variety of other remedies had failed. In passive hæmorrhage from the kidneys, uterus, and bladder, it is likewise employed with benefit.

Administration.—The dose of it is from ten to thirty minims gradually increased to one or two drachms, and taken in some mild diluent.

Antidotes.—In a case of poisoning by it the treatment should be the same as for the mineral acids (*vide* pp. 154 and 208.)

Fer'ri Ammo'nio-Chlo'ridum.—Ammo'nio-Chlo'ride of I'ron.

History.—This compound, which was known to Basil Valentine, has had various appellations, such as *flores salis ammoniaci martiales*, *ferrum ammoniacale*, or *ferrum ammoniatum*.

Preparation.—In the London Pharmacopœia it is directed to be prepared by digesting three ounces of sesquioxide of iron with half a pint of hydrochloric acid in a sandbath for two hours; afterwards adding two pounds and a half of hydrochlorate of ammonia dissolved in three pints of distilled water. The liquor is to be strained and evaporated, and the residue rubbed to powder.

By the mutual reaction of sesquioxide of iron and hydrochloric acid we obtain sesquichloride of iron and water, as explained at p. 541. A small portion of protochloride of iron must also be produced by the action of hydrochloric acid on the carbonate of the protoxide of iron usually contained in the sesquioxide of the Pharmacopœia. By evaporating the solution of the two chlorides with a solution of hydrochlorate of ammonia, we obtain a mixture of these bodies. There is no reason to believe that any chemical combination takes place.

Properties.—It is met with in the shops in the form of reddish orange-coloured crystalline grains, having a feeble odour and a styptic saline taste. It is deliquescent, and is soluble in both water and alcohol.

Characters.—Rubbed with quicklime or caustic potash, ammonia is evolved. Its solution affords chloride of silver when mixed with the nitrate of silver. It reacts as a ferruginous salt (p. 533).

Composition.—It is a mechanical mixture of hydrochlorate of ammonia and sesquichloride of iron, in the following proportions:—

Sesquichloride of Iron	15
Hydrochlorate of Ammonia	85
Ferri Ammonio-Chloridum	100

It yields about 7 per cent. of sesquioxide of iron when decomposed by an alkali (Phillips).

The yellow bands sometimes found in cakes of hydrochlorate of ammonia are probably a true chemical compound of sesquichloride of iron and hydrochlorate of ammonia (*vide* p 180; also Mr. Jackson, *Lond. Med. Gaz.* Aug. 4, 1837).

Physiological Effects.—It produces the general effects of the ferruginous preparations; but, on account of the small and variable quantity of iron present, it is a compound which is of little value. The hydrochlorate of ammonia, which it contains, renders it alterative, and in large doses aperient.

Uses.—It has been employed as a deobstruent in glandular swellings, in amenorrhœa, and other cases where the preparations of iron are usually employed.

Administration.—It may be given in substance in doses of from four to twelve grains.

Tinctura Ferri Ammonio-Chloridi, Ph. Lond. (Ammoniochloride of iron, ʒiv.; proof spirit, Oj. M.)—"A fluidounce yields by decomposition 5·8 grains of sesquioxide of iron," (Phillips, *op. cit.*) It should be expunged from the Pharmacopœia.

Fer'ri Io'didum.—Iodide of Iron.

History.—We are indebted to Dr. A. T. Thomson for the introduction of this substance into medicine (*Observat. on the Preparation and Medicinal Employment of Ioduret and Hydriodate of Iron*, 1834).

Preparation.—In the London Pharmacopœia it is directed to be prepared as follows:—Mix six ounces of iodine with four pints of water, and to these add two ounces of iron filings. Heat them in a sand-bath and when it has acquired a greenish colour, pour off the liquor. Wash the residue with half a pint of boiling water. Evaporate the mixed and strained liquors at a heat not exceeding 212° in an iron vessel, that the salt may be dried. Keep it in a well-stoppered vessel, the access of light being prevented. In this process one equivalent or 126 parts of iodine combine with one equivalent or 28 parts of iron to form one equivalent or 154 parts of iodide of iron. Dr. Thomson has "found the soft iron wire used for stringing pianofortes preferable to the filings."

Properties.—It is an opaque iron grey crystalline mass, with a faint metallic lustre and a styptic taste. It may be obtained in acicular crystals. It is fusible, volatile, very deliquescent, and very soluble in both water and alcohol. It readily attracts oxygen from the air, and forms sesquioxide and sesquiodide of iron.

Characteristics.—By the application of heat the violet vapour of iodine is evolved, and sesquioxide of iron is left. If this be dissolved in an acid (hydrochloric, nitric, or sulphuric), the liquid reacts as a solution of a ferruginous salt (*vide* p. 533). Thus, ferrocyanide of potassium strikes a blue, tincture of galls a bluish black, meconic or sulphocyanic acid a red, colour. Furthermore, the alkalies throw down from it the reddish brown sesquioxide of iron.

Composition.—The composition of crystallized iodide of iron, according to Mr. Phillips (*Transl. of the Pharm.*), is as follows:—

	Eq.	Eq. Wt.	Per Cent.
Iron	1	28	14
Iodine	1	126	63·3
Water	5	45	22·7
Hydrated Iodide of Iron	1	199	100·0

PURITY.—It should be perfectly soluble in water. By exposure to the air it forms sesquioxide and sesquiodide of iron: the latter is soluble, the former is insoluble, in water. To preserve a solution of this salt, a coil of soft iron wire is to be kept immersed in it: this prevents the formation of sesquioxdide of iron, though it does not that of sesquioxide.

PHYSIOLOGICAL EFFECTS. (*a.*) *On animals.*—Three drachms of iodide of iron were administered to a dog: vomiting and purging were produced, but in three days the animal was well. One drachm dissolved in a drachm of water killed a rabbit in three hours and a half, with the appearance of gradually-increasing debility: the stomach was found congested, and its lining membrane decomposed. Forty grains injected into the jugular vein of a dog killed the animal within twelve hours: the symptoms were dilatation of the pupils, staggering, vomiting, and bloody stools, (Cogswell, *Essay on Iodine and its Compounds*, p. 128, et seq.)

(*b.*) *On man.*—In *small and repeated doses* its effects are not very obvious, save that of blackening the stools. It passes out of the system in the urine, and both of its constituents may be detected in this fluid. When it does not purge, it frequently acts as a diuretic. In *full doses*, as ten grains, it on one occasion caused uneasy sensation at the epigastrium, nausea, slight headache, copious black stool, and, in two hours, a larger quantity of urine, containing both iron and iodine (Dr. A. T. Thomson, *op. cit.*) Its medicinal influence on the body seems to be stimulant, tonic, and alterative or deobstruent. Dr. Thomson regards it as possessing the combined properties of iron and iodine.

USES.—In scrofulous affections the united influence of iodine and iron is sometimes beneficial. In chlorosis, and in atonic amenorrhœa, Dr. Thomson found it serviceable; and his testimony of its good effects has been supported by that of others. Its operation must be promoted by exercise and an invigorating diet. In a case of anæmia, without any disturbance of the uterine function, I found it useless; while the compound iron mixture was of essential service. In secondary syphilis occurring in debilitated and scrofulous subjects, it is in some cases, according to the testimony of both Dr. Thomson and Ricord (*Journ. de Pharm.* xxiii. 303), a valuable remedy. The last-mentioned writer employed it in the form of injection (composed of from a half drachm to a drachm of iodide dissolved in eight ounces of water) in blenorrhœas, and in that of lotion in venereal and carious ulcers. Dr. Pierquin (quoted by Dierbach, *Neueste Entd. in d. Mat. Med.* 2te Ausg.) employed it internally and externally in leucorrhœa and amenorrhœa. It has also been used in incipient cancer and in atonic dyspepsia (Thomson).

ADMINISTRATION.—The dose of it is three grains gradually increased to eight or ten. Ricord has given forty grains per day. It may be exhibited in the form of tincture or of aqueous solution, flavoured with a little tincture of orange-peel. It must be remembered that acids, alkalies, and their carbonates, most metallic salts, all vegetable astringents, and many organic solutions, decompose it. Pierquin gave it in chocolate,

Bourdeaux wine, distilled water, diluted spirit, or made into lozenges with saffron and sugar. In leucorrhœa and amenorrhœa he employed an ointment (composed of a drachm of iodide to an ounce of lard), by way of friction in the upper part of the thighs.

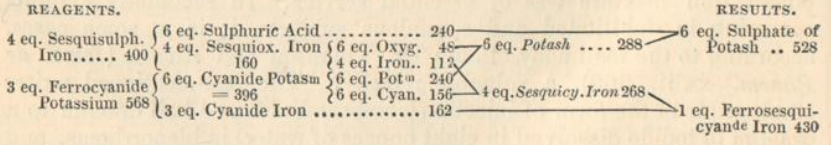
Fer'ri Fer'ro-sesquicyan'idum.—Fer'ro-sesquicy'anide of I'ron.

History.—This compound was accidentally discovered at the commencement of the last century by Diesbach and Dippel. It was termed *Prussian* or *Berlin blue* (*cæruleum Borussicum* seu *Berolinense*). In the London Pharmacopœia it is called *percyanide of iron* (*ferri percyanidum*); in the Dublin Pharmacopœia, *cyanuret of iron* (*ferri cyanuretum*); in the United States Pharmacopœia, *ferrocyanate of iron* (*ferri ferrocyanas*). It is sometimes termed *ferroprussiate of iron.*

Preparation.—It may be prepared by mixing a solution of persulphate or perchloride of iron with a solution of ferrocyanide of potassium.

In commerce it is procured by adding a mixture of two parts of alum and one of sulphate of iron to an impure solution of ferrocyanide of potassium (called *lixivium sanguinis*). A dingy-green precipitate falls, which, by repeated washing with very dilute hydrochloric acid, and exposure to the air, becomes gradually of a deep blue. It is then collected and drained in a cloth, and afterwards dried. By the reaction of ferrocyanide of potassium on sulphate of the protoxide of iron, sulphate of potash is formed in solution, and a white precipitate (cyanide of iron) subsides, which, by exposure to the air, becomes blue (ferrosesquicyanide of iron), in consequence of part of its iron combining with oxygen to form sesquioxide of iron. Ferrocyanide of potassium, with sulphate of the sesquioxide of iron, forms sulphate of potash and ferrosesquicyanide of iron. The green colour of the precipitate above alluded to depends on the presence of sesquioxide (thrown down by the carbonate of potash of the lixivium sanguinis), which is removed by hydrochloric acid. Commercial Prussian blue contains alumina (derived from the alum), and usually some sesquioxide of iron.

The following diagram illustrates the reaction of ferrocyanide of potassium on sulphate of the sesquioxide of iron:—



Properties.—Prussian blue occurs in masses of a rich dark blue colour. It is tasteless and inodorous. When broken it has a copper or bronze tint, somewhat like that of indigo, but which is distinguished from that of the latter by its being removed by rubbing with the nail. It is insoluble in water, alcohol, and the diluted mineral acids. Strong sulphuric acid forms with it a white pasty mass, from which water again separates Prussian blue. Both nitric acid and chlorine decompose it. Hydrochloric acid abstracts part of its iron.

Characteristics.—Its colour and copper tint above described form part of its characteristics. Boiled with water and binoxide of mercury

it yields bicyanide of mercury (*vide* p. 487). Boiled with solution of potash it forms ferrocyanide of potassium (*vide* p. 547). Heated in a retort it yields water, hydrocyanate of ammonia, then carbonate of ammonia, and leaves a black, carbonaceous, and ferruginous mass.

Composition.—The following is the composition of pure and anhydrous Prussian blue:—

	Eq.	Eq. Wt.	Per Cent.			Eq.	Eq. Wt.	Per Cent.
Iron	7	196	45·5	or	Protocyanide of Iron	3	162	37·8
Cyanogen	9	234	54·5		Sesquicyanide of Iron	4	268	62·2
Ferrosesquicyanide of Iron	1	430	100·0			1	430	100·0

Purity.—Prussian blue of commerce usually contains alumina and sesquioxide of iron. These may be detected by boiling the suspected compound with diluted hydrochloric acid, which dissolves both the impurities. Caustic ammonia added to the filtered solution will throw down the impurities; excess of the alkali will redissolve the alumina.

Physiological Effects. (*a.*) *On animals.*—Coullon gave it to dogs and sparrows without killing them; and Schubarth states that the only effect produced on a dog by two drachms was dejection (Wibmer, *Wirk. d. Arzneim*, ii. 356).

(*b.*) *On man.*—Its effects on man are not very obvious. It is reputed alterative, tonic, and febrifuge. Sachs (*Handwört d. prakt. Arzneim*, ii. 557) calls it a resolvent tonic.

Uses.—It has been recommended by Dr. Zollickoffer (*Treatise on the Use of Prussian Blue in Intermitting and Remitting Fevers*, Maryland, 1822) as a more certain, prompt, and efficacious remedy for intermitting and remitting fevers than cinchona; and particularly adapted for children, on account of its insipidity and smallness of dose. It may be administered during the paroxysm as well as in the intermission, and does not disagree with the most irritable stomach. Hosack (*New York Medical and Physiological Journal*, 1823, quoted by Richter, *Ausf. Arzneim*), Eberle (*Mat. Med.* i. 233), and others, have borne testimony to its good effects. Subsequently, Zollickoffer found it useful in dysentery. Kirkhoff (*Froriep's Notizen*, Bd. xvij. 340) used it for many years in epilepsy, with the best results, having cured some cases of several years' standing. It has also been employed by Dr. Bridges, of Philadelphia, (*United States Dispens.*) in a case of severe and protracted facial neuralgia, with very considerable relief. Lastly, it has been used in the form of ointment, as an application to foul ulcers.

In pharmacy it is employed in the manufacture of bicyanide of murcury.

Administration.—The dose of commercial Prussian blue is from four to six or more grains every four hours. The *ointment* above referred to may be prepared with a drachm of Prussian blue and an ounce of lard.

Potas'sii Fer'ro-cyan'idum.—Fer'ro-cy'anide of Potas'sium.

History.—This salt was accidentally discovered at the commencement of the last century. It has had a variety of appellations, such as *prussiate of potash*, *ferro-prussiate of potash*, and *ferrocyanate of potash*.

Preparation. — The usual method of obtaining it is the following:—"Into an egg-shaped iron pot, brought to moderate ignition, project a mixture of good pearl-ash and dry animal matters, of which hoofs and horns are the best, in the proportion of two parts of the former to five of

the latter. Stir them well with a flat iron paddle. The mixture, as it calcines, will gradually assume a pasty form, during which transition it must be tossed about with much manual labour and dexterity. When the conversion into a chemical compound is seen to be completed by the cessation of the fœtid animal vapours, remove the pasty mass with an iron ladle. If this be thrown, while hot, into water, some of the prussic acid will be converted into ammonia, and of course the usual product diminished. Allow it to cool, dissolve it in water, clarify the solution by filtration or subsidence, evaporate, and on cooling, yellow crystals of the ferroprussiate of potash will form. Separate these, re-dissolve them in hot water, and by allowing the solution to cool very slowly, larger and very regular crystals may be had," (Ure's *Dictionary of Chemistry*.)

Properties.—This salt crystallizes in large, beautiful, lemon-yellow, transparent, permanent, inodorous crystals, whose primary form is an octahedron with a square base. They have a peculiar toughness or flexibility somewhat analogous to selenite. Their sp. gr. is 1·832. They have a sweetish, yet somewhat bitter, saline taste. They are insoluble in alcohol, but dissolve readily in both hot and cold water. When moderately heated they evolve about 13 per cent. of water of crystallization, and are converted into a white friable powder (anhydrous ferrocyanide of potassium.) When heated to redness in contact with air, the cyanide of iron of the salt is decomposed and the residuum consists of cyanide of potassium, oxide of iron, and carbon: by a more continued heat hydrocyanic acid and ammonia are evolved, while the residue consists of sesquioxide of iron and carbonate of potash.

Characteristics.—A solution of this salt throws down, with the protosalts of iron, a white precipitate, which by exposure to the air becomes blue. With the persalts of iron it forms a deep blue; with the salts of copper a deep brown; and with those of lead a white precipitate: the precipitates are ferrocyanides of the respective metals. Heated with dilute sulphuric acid, hydrocyanic acid is evolved, and a white precipitate formed, which, by exposure to the air, becomes blue (*vide* p. 236.) Hydrosulphuric acid, the sulphurets, alkalies, or tincture of galls, give no precipitate with a solution of this salt; shewing that the iron which it contains is in some remarkable state of combination. If a solution of the ferrocyanide of potassium be boiled with binoxide of mercury, bicyanide of mercury is formed in solution, and sesquioxide of iron precipitated. The presence of potassium is best shown by calcining the salt, and detecting potash by the usual tests in the residuum. If chlorine be passed through a solution of ferrocyanide of potassium, it abstracts one equivalent of potassium from every two equivalents of the ferrocyanide, by which one equivalent of the ferrosesquicyanide of potassium is formed in solution, and by evaporation this salt may be obtained in the form of red crystals, which throw down a blue precipitate with the protosalts of iron, but occasion no change with the persalts of iron.

Composition.—Crystallized ferrocyanide of potassium has the following composition:—

	Eq.	Eq. Wt.	Per Cent.
Cyanide of Iron	1	54	25·35
Cyanide of Potassium	2	132	61·97
Water	3	27	12·67
Cryst^{d}. Ferrocyanide Potassium	1	213	99·99

Physiological Effects. (*a.*) *On animals.* — Schubarth (Wibmer, *Wirk. d. Arzneim.*) gave two drachms to one dog, and half an ounce to another, without observing any injurious consequences. Callies (Wibmer, *op. cit.*, also Christison's *Treat. on Poisons*) found the commercial ferrocyanide of potassium slightly poisonous, but when prepared with care he remarked that several ounces might be given with impunity. These and other experiments show that this salt possesses very little activity. The rapidity with which it is absorbed and gets into the secretions, as the urine, is most remarkable. Westrumb (*Müller's Physiology*, by Baly, i. 247) recognised it in the urine, in from two to ten minutes after it was taken into the stomach. Hering (*Lond. Med. Gaz.* iv. 250) has shown the amazing rapidity with which it traverses the body when it once gets into the blood. Thus, when it was placed in one jugular vein of a horse, he recognised it in the opposite one in from twenty to thirty seconds.

(*b.*) *On man.*—It has no great influence on man. D'Arcet swallowed half a pound of a solution of this salt, prepared as a test, without any ill effects (Merat and De Lens, *Dict. Mat. Méd.* ii. 532). "Similar results," observes Dr. Christison (*Treatise*, p. 699), "were obtained previously with smaller doses by Wollaston, Marcet, Emmert, as well as afterwards by Dr. Macneven and Schubarth, who found that a drachm or even two drachms might be taken with impunity by man and the lower animals."

Dr. Smart (*Amer. Journ. of Med. Sciences*, xv. 362), however, regards it as possessed of some activity. He asserts that its primary action is that of a sedative, softening and diminishing the fulness and frequency of the pulse, and allaying pain and irritation. In a healthy person, he says, a full dose will often reduce the number of pulsations ten beats in a minute, in a few minutes after being taken; and in a diseased state of the system, accompanied with increased arterial action, the sedative effects are much more striking. Occasionally also it acts as a diaphoretic (in cases accompanied with excessive vascular action and increased heat of skin) and astringent, as seen in its power of diminishing excessive discharges. In some cases, he says, it caused ptyalism, with redness, swelling, and tenderness of the gums, but unaccompanied with swelling of the salivary glands or fœtor. An over-dose, he tells us, occasions vertigo, coldness, and numbness, with a sense of gastric sinking; sometimes universal tremors, as in an ague fit. Further evidence, however, is required to confirm these statements, which do not accord with the observations before reported.

Uses. — Hitherto it has rarely been employed in medicine. Dr. Smart employed it as a sedative in diseases of increased action of the vascular system and morbid sensibility of the nerves, as in erysipelas, to allay pain, in cephalalgia, in inflammation of the brain, in chronic bronchitis, &c. In the last-mentioned disease it lessened the frequency of pulse, the sweating, the cough, and the dyspnœa. As an anodyne, he gave it in neuralgia. In hooping-cough he speaks highly of it. As an astringent, he administered it to check colliquative sweating in chronic bronchitis and phthisis, to diminish leucorrhœal discharge and to allay diarrhœa. Rau (Dierbach, *Neueste Entd. in d. Mat. Med.* i. 371, 1837) employed it in calculous complaints.

Administration.—The dose, according to Dr. Smart, is from ten to

fifteen grains, given in the form of solution every four or six hours. Rau gave as much as forty grains at a dose, and I have no doubt that very much larger doses may be given with safety.

Fer'ri Sul'phas.—Sul'phate of I'ron.

History.—Sulphate of iron is one of the substances which Pliny (*Hist. Nat.* xxxiv. 32) termed *chalcanthum*. This is evident from the circumstance of his statement that the Romans called it *atramentum sutorium*, or *shoe-maker's black*. It is frequently termed *copperas*, and in consequence has been sometimes confounded with the salts of copper (Dr. Cummin, *Lond. Med. Gaz.* xix. 40): *green vitriol* (*vitriolum viride*), *vitriol of Mars* (*vitriolum martis*), *salt of Mars* (*sal martis*), *vitriolated iron* (*ferrum vitriolatum*), are other names by which it has been known.

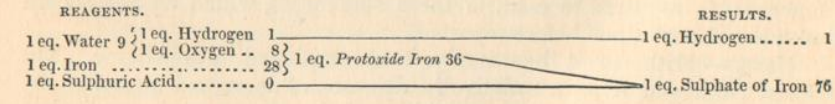
Natural History.—It is found dissolved in some mineral waters (*sulphated chalybeates*, vide p. 145), as those of the Hartfell Spa, Scotland. In the *aluminous chalybeate* waters it is associated with sulphate of alumina; as in the water of Sand Rock, Isle of Wight. The strong Moffatt chalybeate, and Vicar's Brig chalybeate, contain the sulphate of the sesquioxide of iron. Sulphate of iron is also found in the waters of several copper mines.

Sulphate of the protoxide of iron is rarely met native in the crystallized state. It occurs, however, in Rammelsberg mine, near Goslar; at Schwartzenburg, in Saxony; at Hurlet, near Paisley; and in New England (Phillips's *Mineralogy*, by Allan).

Dr. Thomson (*Mineralogy*) has described two native sulphates of the sesquioxide of iron, and an aluminous protosulphate.

Preparation.—Sulphate of the protoxide of iron is prepared by dissolving clean unoxidized iron in diluted sulphuric acid. The proportions employed in the London Pharmacopœia are eight ounces of iron filings, fourteen ounces of sulphuric acid, and four pints of water. The Dublin Pharmacopœia employs two pints more water.

In this process an equivalent or 28 parts of iron decompose one equivalent or 9 parts of water, combine with an equivalent or 8 parts of oxygen, and set free an equivalent or 1 part of hydrogen, which escapes in the gaseous form. The equivalent or 36 parts of protoxide iron, thus formed, combines with an equivalent or 40 parts of sulphuric acid, to form an equivalent or 76 parts of sulphate of iron.



The *common green vitriol*, or *copperas* of the shops, is prepared by exposing heaps of moistened iron pyrites (bisulphuret of iron) to the air for several months. In some places the ore is previously roasted. The moistening is effected by rain or by manual labour. The pyrites attracts oxygen, and is converted into a supersulphate of iron, which is dissolved out by lixiviation; and to the solution thus obtained old iron is added to saturate the free acid. It is then concentrated in leaden boilers, and run off into large vessels (lined with lead) to crystallize.

Properties. — Sulphate of the protoxide of iron crystallizes in

transparent pale bluish green crystals, the primary form of which is the oblique rhombic prism. Their sp. gr. is 1·82. They have an acid, styptic taste, and redden litmus. By exposure to the air oxygen is absorbed, and they acquire, first, a yellowish and darker green tint (sulphate of the black oxide), then slightly effloresce, and become covered with a yellow crust, which subsequently becomes a brownish (sulphate of the sesquioxide of iron). When heated the crystals undergo the watery fusion, give out water, and become white and pulverent: at an intense heat they are deprived of their acid. They are soluble in water, but insoluble in alcohol. They require two parts of cold, and three-fourths of their weight of boiling water, to dissolve them. The solution has a bluish green colour, but by exposure to the air it attracts oxygen, becomes reddish yellow, and deposits a tetrasulphate of the sesquioxide of iron.

Characteristics.—It is known to be a sulphate by chloride of barium (*vide* p. 265). Binoxide of nitrogen communicates a deep olive colour to a solution of this salt (*vide* p. 160). Ferrocyanide of potassium causes a white precipitate, which, by exposure to the air, becomes blue with a solution of the sulphate of the protoxide: if any sesquioxide be present, a bluish precipitate is obtained. Alkalies throw down the greenish white hydrated protoxide of iron (*vide* p. 533).

Composition.—The composition of this salt is as follows:—

	Eq.	Eq. Wt.	Per Cent.	Berzelius.	Thomson
Protoxide of Iron	1	36	25·9	25·7	26·7
Sulphuric Acid	1	40	28·8	28·9	28·3
Water	7	63	45·3	45·4	45·0
Crystallized Sulphate of the Protoxide of Iron	1	139	100·0	100·0	100·0

Purity.—This salt is frequently mixed with sulphate of the sesquioxide: this may be known by the yellowish green colour of the crystals, and by the blue colour produced on the addition of ferrocyanide of potassium.

The *common green vitriol*, or *copperas* of the shops, is a mixture of the sulphates of the protoxide and sesquioxide of iron. It sometimes contains copper, which may be recognized by immersing a clean iron spatula in a solution of it; the iron becomes incrusted with copper: or it may be detected by adding excess of caustic ammonia, and filtering the liquor. If copper be present, the liquor will have an azure blue tint. The ammoniacal liquid should yield, by evaporation, no fixed residuum.

Physiological Effects. (*a.*) *On vegetables.*—Sir H. Davy (*Agricult. Chem.* 4th ed. 186) ascribes the sterility of a soil to the presence of sulphate of iron.

(*b.*) *On animals.*—C. G. Gmelin (*Vers. ü. d. Wirk.* &c. 84) found that two drachms given to a dog caused vomiting only; that forty grains had no effect on a rabbit; and that twenty grains, thrown into the jugular vein of a dog, produced no effect. Dr. Smith (quoted by Wibmer and by Christison), however, found that two drachms proved fatal to a dog when taken into the stomach or applied to a wound. Orfila (*Toxicol. Gén.*) obtained similar results. The effects were local inflammation and a specific affection of the stomach and rectum. According to Weinhold (quoted by Richter, *Ausf. Arzneim.* v. 55), the spleen of animals fed with it becomes remarkable small and compact.

(*c.*) *On man.*—This salt acts locally as a powerful astringent, and, when employed in a concentrated form, as an irritant. The latter effect depends on its chemical action on the organic constituents (albumen, &c.) of the tissues. The remote effects of sulphate of iron are analogous to those of other ferruginous compounds, and which have been already described.

Swallowed *in small doses* it has an astringent operation on the gastro-intestinal mucous membrane, and thereby diminishes the quantity of fluids secreted or exhaled; hence its continued use causes constipation. It blackens the stools like other compounds of iron. It becomes absorbed, and operates on the system as a tonic, stimulant, emmenagogue, and astringent. *In large medicinal doses* it readily excites pain, heat, or other uneasiness at the pit of the stomach, and not unfrequently nausea and vomiting: this is especially the case in irritable conditions of this viscus. *In excessive doses* it operates as an irritant poison. A girl took, as an emmenagogue, an ounce of it in beer, and was seized, in consequence, with colic pains, constant vomiting and purging for seven hours. Mucilaginous and oily drinks soon cured her (Christison, from *Rust's Magazin*, xxi. 247).

Uses.—Sulphate of iron is to be preferred to other ferruginous compounds where there is great relaxation of the solid parts with immoderate discharges. Where the long-continued use of ferruginous compounds is required, it is less adapted for administration than some other preparations of iron, on account of its local action on the alimentary canal.

It is employed in lump, powder, or solution, as a styptic, to check hæmorrhage from numerous small vessels. A solution of it is applied to ulcerated surfaces, and to mucous membranes, to diminish profuse discharges; as in chronic ophthalmia, leucorrhœa, and gleet.

Internally it is administered in passive hæmorrhages, on account of its supposed astringent influence over the system generally: also in immoderate secretion and exhalation; as in humid asthma, chronic mucous catarrh, old dysenteric affections, colliquative sweating, diabetes, leucorrhœa, gleet, &c. In intermittents it has been employed as a tonic. It has also been found serviceable against tape-worm. Its other uses are the same as the ferruginous compounds generally (*vide* p. 536).

Administration.—The dose of it is from one to five grains, in the form of pill. If given in solution the water should be recently boiled, to expel the atmospheric air dissolved in it; the oxygen of which converts this salt into a persulphate. For local purposes, solutions of it are employed of various strengths, according to circumstances. In chronic ophthalmia we may use one or two grains to an ounce of water: as an injection in gleet, from four to ten grains.

Fer'ri Car'bonas.—Car'bonate of Iron.

History.—This compound must not be confounded with the sesquioxide of iron, which is frequently termed carbonate of iron.

Natural History.—It occurs native in the crystallized state, constituting the mineral called *spathose iron.* It is also found in most chalybeate waters (*vide* p. 145.)

Preparation.—It is prepared by adding a solution of an alkaline carbonate to a solution of a protosalt (as the sulphate) of iron, the atmos-

pheric air being carefully excluded. The carbonate of the protoxide of iron is precipitated. When we attempt to collect and dry it, decomposition takes place; oxygen of the air is absorbed, carbonic acid escapes, and sesquioxide of iron remains (*ferri sesquioxydum*, Ph. L. *vide* p. 538). Hence when employed in medicine it must be prepared extemporaneously.

PROPERTIES.—Native protocarbonate of iron is yellow: the primary form of its crystals is the obtuse rhombohedron. Carbonate of iron prepared as above directed is a white precipitate, which by exposure to the air becomes at first greenish, then brown (sesquioxide). It is insoluble in water, but dissolves in sulphuric or hydrochloric acid with effervescence. It also readily dissolves in carbonic acid water: the acidulo-chalybeate waters are natural solutions of this kind (*vide* p 145.)

CHARACTERISTICS.—It dissolves in diluted sulphuric acid with effervescence. The solution possesses the before-mentioned properties of the ferruginous solutions (*vide* p. 533).

COMPOSITION.—Carbonate of the protoxide of iron is thus composed:—

	Eq.	Eq.Wt.	Per Cent.	Stromeyer. (Native.)
Protoxide of Iron	1	36	62	59·6276
Carbonic Acid	1	22	38	38·0352
Carbonate of Iron	1	58	100	97·6628

PHYSIOLOGICAL EFFECTS.—It is one of the most valuable of the ferruginous compounds, on account of the facility with which it dissolves in the fluids of the stomach and becomes absorbed. Its local effects are very mild.

MISTURA FERRI COMPOSITA, Ph. Lond. and Dubl. (Myrrh, powdered, ℥ij.; carbonate of potash, ℥j.; rose-water, f℥xviij.; sulphate of iron, powdered, ℈iiss.; spirit of nutmeg, f℥ij.; sugar, ℥ij. Rub together the myrrh with the spirit of nutmeg and the carbonate of potash, and to these, while rubbing, add first the rose-water with the sugar, then the sulphate of iron. Put the mixture immediately into a proper glass vessel, and stop it).—This is a professed imitation of Dr. Griffith's celebrated antihectic or tonic mixture (Dr. M. Griffith, *Observ. on the Cure of Hectic and Slow Fevers, and the Pulm. Consump.* 1776): hence it is frequently termed *Griffith's Mixture* (*mistura Griffithii*).

In the preparation of it, double decomposition takes place: by the mutual reaction of carbonate of potash and sulphate of iron we obtain sulphate of potash, which remains in solution, and carbonate of protoxide of iron, which precipitates. To prevent the latter attracting more oxygen, it is to be preserved in a well-stoppered bottle. As more carbonate of potash is used than undergoes decomposition, the excess combines with the myrrh, and forms a kind of saponaceous compound, which assists in suspending the carbonate of iron in the liquid.

When first made, this mixture has a greenish colour, owing to the ferruginous carbonate; but by exposure to the air it becomes reddish, owing to the absorption of oxygen, by which sesquioxide of iron is formed, and carbonic acid evolves: hence it should only be prepared when required for use.

It is one of the most useful and efficacious ferruginous preparations, and which is supposed to be owing to its being readily soluble, and con-

sequently easy of digestion and absorption. Its constitutional effects are analogous to those of the ferruginous compounds in general, and which have been already described. Its tonic and stimulant operation is promoted by the myrrh: the excess of alkaline carbonate must not be forgotten in estimating the sources of activity of this medicine.

It is admissible in most of the cases in which ferruginous remedies are indicated; but it is especially serviceable in anæmia, chlorosis, atonic amenorrhœa, and hysterical affections. It is also employed with benefit in the hectic fever of phthisis and chronic mucous catarrhs. It is contra-indicated in inflammatory conditions of the gastro-intestinal membrane.

The dose of it is one or two fluidounces three or four times a day. Of course acids and acidulous salts, as well as all vegetable astringents which contain gallic or tannic acid, are incompatible with it.

Pilulæ Ferri Compositæ, Ph. Lond. and Dubl. (Myrrh, powdered, ℥ij.; carbonate of soda; sulphate of iron; treacle, āā ℥j. Rub the myrrh with the carbonate of soda; then, having added the sulphate of iron, rub them again; afterwards beat the whole in a vessel previously warmed, until incorporated).—This preparation is analogous in its composition, effects, and uses, to the preceding one. Double decomposition takes place between the two salts employed, aad the products are sulphate of soda and carbonate of iron. The carbonate of soda is preferred to the carbonate of potash, on account of the deliquescence of the latter. These pills, like the mixture, should only be made when required for use.

Twenty grains of this compound contain about one grain of protoxide of iron, or $1\frac{7}{10}$ grs. of protocarbonate. The effects and uses are precisely the same as the *mistura ferri composita*. The dose is from ten to twenty grains.

Carbonated Chalybeate Waters. — A most agreeable and efficacious mode of administering carbonate of the protoxide of iron is in the form of the carbonated chalybeate waters, as those of the Islington Spa, near London, of Tunbridge Wells, of Oddy's saline chalybeate at Harrowgate, and of the Spa in Belgium. The last-mentioned water contains a considerable excess of carbonic acid (*vide* p. 145). A convenient extemporaneous mode of administering carbonate of iron in imitation of these waters, is by intimately mixing equal parts (as 10 or 12 grains) of sulphate of iron and sesquicarbonate of soda, and dissolving in a tumblerful of carbonic acid water (soda water of the shops): the solution is to be taken in a state of effervescence.

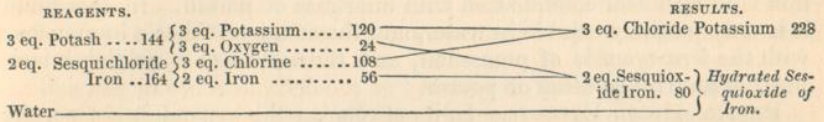
Potas'sæ Fer'ro-Tar'tras.—Fer'ro-Tar'trate of Pot'ash.

History.—This preparation was first described by Angelus Sala at the commencement of the seventeenth century. It is sometimes termed *chalybeated tartar* (*tartarus chalybeatus* seu *ferratus*), *tartarized iron* (*ferrum tartarizatum*); *ferri tartarum*, Ph. Ed.; *tartras potassæ et ferri*, Ph. Dub.; *ferri potassio-tartras*, Ph. Lond.

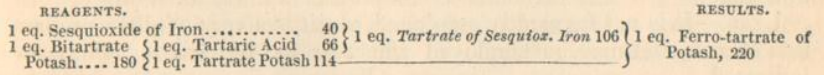
Preparation.—Soubeiran (*Nouv. Traité de Pharm.* ii. 486) directs it to be prepared thus:—Boil together one part of powdered bitartrate of potash, six parts of water, and as much moist hydrated sesquioxide of iron as the liquid will dissolve. Filter and evaporate to dryness by a gentle heat.

The London Pharmacopœia professes to follow Soubeiran's process, but the formula which is given is much more complex; it is as follows:—Mix three ounces of sesquioxide of iron with half a pint of hydrochloric acid, and digest for two hours in a sand bath. Add to these two gallons of water, and set aside for an hour; then pour off the supernatant liquid. Four pints and a half, or as much as may be sufficient, of solution of potash being added, wash what is precipitated frequently with water, and, while moist, boil it with eleven ounces and a half of bitartrate of potash, previously mixed with a gallon of water. If the liquor should be acid when tried by litmus, drop into it solution of sesquicarbonate of ammonia until it is saturated. Lastly, strain the liquor, and with a gentle heat let it evaporate, so that the salt may remain dry.

The *theory* of this process is as follows:—By the reaction of sesquioxide of iron and hydrochloric acid we obtain water and sesquichloride of iron (*vide* p. 541). On the addition of caustic potash, the sesquichloride is decomposed, hydrated sesquioxide of iron is precipitated, and chloride of potassium is left solution. These changes are illustrated by the following diagram:—



When the hydrated sesquioxide of iron is boiled with bitartrate of potash, one equivalent or 40 parts of sesquioxide combine with one equivalent or 66 parts of tartaric acid of the bitartrate of potash, and form an equivalent or 106 parts of tartrate of sesquioxide of iron, which combine with an equivalent or 114 parts of tartrate of potash, to form one equivalent or 220 parts of ferrotartrate of potash.



The processes of the Dublin and Edinburgh Colleges are much inferior to the above, and need not be minutely described. A mixture of iron, bitartrate of potash, and water, is exposed to the air, by which the iron is converted into sesquioxide, and combines with the bitartrate.

PROPERTIES.—It is an olive-brown inodorous powder, with a styptic inky taste. It reacts on vegetable colours, mildly alkaline. It is slightly deliquescent, probably from the tartrate of potash which it contains. It dissolves in about four times its weight of water, and slightly in alcohol.

CHARACTERISTICS.—Ferrocyanide of potassium does not occasion any blue colour with it, unless a few drops of acid be added. Potash, soda, and their carbonates, do not decompose it at ordinary temperatures, nor does ammonia or its carbonate even by the aid of heat. Tincture of nutgalls causes a dark-coloured precipitate. Sulphuric, nitric, or hydrochloric acid, throws down the sesquioxide of iron from a solution of this salt; an excess of acid redissolves it: the solution has then a very astringent taste. Tartaric acid causes the formation of crystals of tartar. Heated in a covered crucible, ferrotartrate of potash yields charcoal, carbonate of potash, and protoxide of iron.

Composition.—The following table exhibits the composition of this salt, according to Soubeiran (*op. cit.*) and Phillips (*Transl. of Pharmacopœia*).

		Phillips.		Soubeiran.
Tartrate of Sesquioxide of Iron	1	106	48·18	Sesquitartrate of Sesquioxide 45
Tartrate of Potash	1	114	51·82	Tartrate of Potash 55
Ferro-tartrate of Potash	1	220	100·00	„ 100

Soubeiran says it contains 13 per cent. of sesquioxide of iron; whereas, according to Mr. Phillips, the quantity is 18·18 per cent.

The ferro-tartrate of potash is to be regarded as a double salt, in which tartrate of iron is the acid or electro-negative ingredient, and tartrate of potash the basic or electro-positive constituent. On this view, we comprehend why ferrocyanide of potassium and the alkalies refuse to act on it in the way they do on the ordinary ferruginous salts, until an acid be added. Geiger (*Handb. d. Pharm.*) regards it as a combination of tartrate of iron and ferrate of potash.

Purity. — In commerce we frequently meet with an imperfectly prepared compound, in which none or only part of the sesquioxide of iron is in chemical combination with bitartrate of potash. In this state it is only partially soluble in water, and the solution strikes a blue colour with the ferrocyanide of potassium, and throws down a reddish-brown precipitate with solution of potash.

Physiological Effects.—In its effects on the system it agrees, for the most part, with other ferruginous compounds. Its taste, however, is comparatively slight, its astringency is much less than the sulphate or sesquichloride, and consequently its constipating effects are not so obvious, and its stimulant influence over the vascular system is said to be somewhat milder. These peculiarities in its operation are supposed to depend on the tartaric acid and potash with which it is in combination.

Uses.—It is not frequently employed, yet it is a very eligible preparation of iron, and may be employed wherever the ferruginous tonics are indicated.

Administration.—The dose of it is from ten grains to half a drachm, in the form of solution or bolus, combined with some aromatic.

Ammo'niæ Fer'ro-tar'tras.—Fer'ro-tar'trate of Ammo'nia.

This salt, commonly termed *tartrate of iron and ammonia*, or *ammonio-tartrate of iron*, is occasionally employed in medicine. It was first noticed by Mr. Aikin (*Lond. Med. Gaz.* viii. 438).

It may be prepared by adding caustic ammonia to a solution of tartrate of iron (prepared by digesting together, for two or three days, one part of tartaric acid, dissolved in hot water, with two or three parts of iron filings). The green solution thus obtained is to be evaporated to dryness by a gentle heat (Aikin, *op. cit.*)

It is in the form of shining brittle fragments of a deep red colour, not very unlike pieces of very deep-coloured shell-lac. It is very soluble in water. Its taste is strongly saccharine.

Its general effects are analogous to those of the other ferruginous compounds, except that it has very little of any astringency. Its advan-

tages over other chalybeates are its ready solubility in water, its palatable taste, and the facility with which it may be mixed with various saline substances, without undergoing decomposition. It contains more oxide of iron than the same quantity of sulphate. The dose for an adult is five or six grains in powder, pill, or solution. It may be exhibited in porter without being detected by the taste. It may be added to the compound decoction of aloes without suffering decomposition.

Fer'ri Ace'tas.—Ac'etate of I'ron.

History.—A solution of iron in acetic acid has long been known and used in the arts. It constitutes the *iron liquor* of the dyer.

Preparation. — In the Dublin Pharmacopœia acetate of iron is directed to be prepared by digesting, for three days, one part of carbonate of iron (sesquioxide) in six parts of acetic acid, and then filtering.

Properties.—It is a deep-red liquid, having an acid chalybeate taste. It reddens litmus.

Characteristics.—When heated, it yield acetic acid. Ferrocyanide of potassium strikes a blue colour with it; infusion of galls a purplish black.

Composition.—It consists of the acetate of the protoxide and acetate of the sesquioxide of iron.

The Physiological Effects and Uses are the same as other ferruginous compounds. The Dose is from ten to twenty-five drops, in water.

Ferri Acetatis Tinctura, Ph. Dubl. (Acetate of potash, two parts; sulphate of iron, one part; rectified spirit, 26 parts. Rub together the acetate and sulphate, then dry, and add the spirit. Digest for seven days, then filter.)—In this process sulphate of potash and acetate of iron are formed: the latter, as well as the excess of the acetate of potash, dissolves in the spirit. It is a claret-coloured tincture. It possesses the usual properties of a ferruginous compound. It is said to be an agreeable chalybeate, and was introduced into the Dublin Pharmacopœia by Dr. Perceval. The dose is from half a drachm to a drachm.

Tinctura Acetatis Ferri cum Alcohol, Ph. Dubl. (Sulphate of iron; acetate of potash, $\overline{aa}$ ʒj.; alcohol, ℥xxxij. Triturate together the sulphate and acetate, then dry, and when cold add the alcohol. Digest for twenty-four hours.)—The dose is twenty drops to a drachm.

Order 27.—Binoxide of Manganese.

Mangane'sii Binox'ydum.—Binox'ide of Man'ganese.

History.—Native binoxide of manganese has been long known and used in the manufacture of glass (*magnesia vitriariorum*); but until Kaim, in 1770, succeeded in extracting a peculiar metal from it, it was usually regarded as an ore of iron. It is commonly termed *native black* or *peroxide of manganese*, or for brevity *manganese*.

Natural History.—The oxide of manganese used in chemistry and pharmacy is the native anhydrous binoxide, called by mineralogists *pyrolusite*. It is found in great abundance in Cornwall, Devonshire, Somersetshire, and Aberdeenshire, from whence most of what is met with