PART III.

PREPARATIONS AND COMPOUNDS.

ACIDS.

THESE are substances which have a sour taste: and are capable of combining with alkalis, earths, and metallic oxides, while at the same time they lose their acidity, and form compounds named neutral salts, in which the properties of the acid, the alkali, the earth, or the oxide employed, are lost. They change to red, the blue, purple, and green colours of vegetables; and unite with water in almost every proportion. These circumstances, therefore, may be regarded as characteristic of this class of substances.

Acids are supposed to be combustible bodies combined with oxygen, which is regarded as the principle of acidity from which they derive their properties; but although it is questionable, whether there is any acid that does not contain oxygen as an essential component, yet it is by no means true that the combination of every combustible with oxygen will constitute an acid. Thus the combination of hydrogen with oxygen forms water which is not acid; and it is now known that the alkalis owe their alkaline properties to the presence of oxygen, as much as the acids owe to it their acid properties.[1] For the formation of an acid, therefore, by the union of any body with oxygen, some principle must be previously present in the body, common, in a greater or less degree, to all bodies capable of being formed into acids, which may be regarded as the principle of acidity, although it be yet unknown.

On the supposition that all acids are compounds of oxygen with certain bases, the name of each is derived from the base of which it is formed; thus, from sulphur comes sulphuric acid: but the same base being capable of uniting with different proportions of oxygen, the terminations *ous* and *ic* are added to indicate the degree of acidification: thus when sulphur is united with the smaller proportion of oxygen, the acid produced is named sulphurous acid; when with the full proportion, sulphuric acid. One or two acids are moreover supposed to combine with a still larger proportion of oxygen, to denote which the syllable *oxy* (for oxygenized) is prefixed:

[1] See Davy's Discoveries, *Phil. Trans.* 1808.

thus muriatic acid supposed to be combined with an excess of oxygen becomes oxymuriatic acid.

The stronger acids require to be kept in glass bottles, furnished with well ground glass stoppers, and having the name of the acid which each contains engraved on the glass. They should be dispensed also in glass stopped phials. The acids known to chemists are very numerous; but of these a small proportion only is employed for medical and pharmaceutical purposes. In the London Pharmacopœia, the arrangement of which we have adopted, they are placed in alphabetical order; but in this place it may be proper first to exhibit them according to the nature of their radicals or bases.

I. ACIDS WITH SIMPLE RADICALS.

SULPHUR	1. SULPHURIC ACID.
NITROGEN	2. NITROUS ACID.
	3. NITRIC ACID.

II. ACIDS WITH DOUBLE RADICALS.

CARBON AND HYDROGEN	4. ACETIC ACID.
	5. CITRIC ACID.
	6. BENZOIC ACID.
	7. SUCCINIC ACID.

III. ACIDS WITH UNKNOWN RADICALS.

8. MURIATIC ACID.
9. OXYMURIATIC ACID.

ACIDUM ACETICUM. *Lond.*[1] *Acetic Acid.*

"Take of vinegar, *a gallon*; distil the acetic acid from a glass retort, placed in a sand bath, into a glass receiver kept cool: throw away the first pint, and preserve the six succeeding pints which are distilled."

ACIDUM ACETICUM TENUE. Edin. *Weak Acetic Acid.*

"Distil eight pounds of vinegar in glass vessels, with a gentle heat. The pound which first comes over, being too watery, is to be rejected; the five pounds that follow, will be the weak acetic acid. The distillation may be continued as long as a colourless acid comes over; but, this being too much burnt, and unfit for internal use, may be mixed with the pound which first came over, and preserved for various chemical uses."

ACETUM DISTILLATUM. Dub. *Distilled Vinegar.*

"Take of wine vinegar, *ten pints*; distil with a gentle heat *six pints*. The distillation must be performed in a glass vessel, and the first pound which comes over rejected."

The specific gravity of this acid is to that of water as 1006 to 1000.

Of the three appellations given to this preparation in the British pharmacopœias, that of the Edinburgh College only

[1] Vinaigre distillé (*F.*) Distillirter Essig (*G*) Aceto distillato (*I.*) Vinaigre distilado (*S.*)

is unobjectionable. It is the acetic acid in a more diluted state than that in which it exists in vinegar, but purer; being freed in a great degree from the mucilage, extractive, supertartrate of potash, and other extraneous matters which vinegar contains.[1] The distillation on a large scale is often conducted in the common copper still, or in a tinned still with a pewter worm; but both these practices, as they are apt to give dangerous metallic impregnations to the product, are highly reprehensible, when the distilled vinegar is to be employed for medicinal purposes.

In performing the process, it is more important to avoid carrying the distillation too far, than to reject the first eighth part which comes over; for although this is undoubtedly weaker, and contains a small portion of alcohol, yet it retains about one-twelfth[2] of the whole quantity of the real acid obtained: but by continuing the process a little too long, the whole product acquires an unpleasant empyreumatic flavour. This is avoided by changing the receiver rather before the quantity ordered has been obtained; and if to the residue be added an equal quantity of hot water and half an ounce of recently burnt animal charcoal[3], for every pint of fluid in the retort, the distillation may be recommenced, and an additional portion of the diluted acid obtained, equally pure and strong as the former. At the end of the operation, when dilution has not been employed, the residue is a deep red coloured liquor, strongly acid, very empyreumatic, and which deposits supertartrate of potash.

Qualities.—Distilled vinegar has a fainter and less agreeable odour than common vinegar; a grateful, not strong, acid taste; is limpid and colourless; and of a specific gravity varying from 1·007 to 1·0023. One fluid ounce of spec. grav. 1·007 should dissolve 13·8 grains of marble. It dissolves the gum resins and the acrid principles of plants, such as the squill and meadow saffron; and forms acetates with the alkalies and several of the metallic oxides. Darracq[4] ascertained that it differs from acetic acid in containing some uncombined mucilage and extractive matter, but that the acids are otherwise the same. It is owing to this extractive that, when distilled vinegar is boiled with potash, the solution has a deep reddish brown colour, and during evaporation carbonaceous matter is deposited. It is sometimes adulterated. Sulphuric acid is detected by a precipitate being produced on the addition of a solution of acetate of barytes; lead and tin, by a solution of sulphuretted hydrogen, forming a

[1] See *Acetum*, Part II. [2] *London Medical Review*, No. x. 125.

[3] Animal charcoal is made by calcining bones in a crucible, to which is luted a perforated cover. When no more flame issues from the aperture, it must be closed, and the heat raised for half an hour.

[4] *Annales de Chimie*, xli. 264.

dark-coloured precipitate; and copper, by the acid assuming a blue colour, when supersaturated with ammonia.

Medical properties and uses.—The same as those of common vinegar; but, as it is purer, and not liable to spontaneous decomposition, it is fitter for pharmaceutical purposes.

Officinal preparations. *Liquor Ammoniæ Acetatis.* L. E. D. *Potassæ Acetas.* L. E. D. *Acetas Ferri.* D. *Liquor Plumbi Subacetatis.* L. D. *Plumbi Superacetas.* L. E. D. *Acetum Colchici.* L. *Acetum Scillæ.* L. E. D. *Oxymel.* L. D. *Emplastrum Ammoniaci.* L. *Oxymel Colchici.* D.

ACIDUM ACETICUM. Dub.[1] *Acetic Acid.*

"Take of acetate of kali, (potash), *six ounces;* sulphuric acid, *three ounces by weight.* Pour the acid into a tubulated retort: then add to it in small portions and at different times, the acetate of potash, allowing the mixture to cool after each addition: finally, with a moderate heat, distil the acid until the residue be dry.

"The specific gravity of this acid is to that of distilled water, as 1070 to 1000."

ACIDUM ACETICUM FORTE. Edin. *Strong acetic Acid.*

"Take of dried sulphate of iron, *one pound;* acetate (*superacetate*) of lead, *ten ounces.* Rub them together; then put them into a retort, and distil in a sand bath with a moderate heat, as long as any acid comes over."

These processes furnish the same acid as that which is contained in distilled vinegar, but completely freed from extractive and mucilage, and much stronger. In the process of the Dublin College, the sulphuric acid, by reason of its superior affinity for potash, decomposes the acetate of potash, and sets free the acetic acid; which must necessarily come over in a concentrated form, as the acetate does not contain much water, and the greater part of the water of the sulphuric acid is retained by the sulphate of potash which is formed in the retort. The Edinburgh process is that of Badollier, an apothecary of Chartres[2], with the substitution of sulphate of iron for sulphate of copper. The affinity of the sulphuric acid of the sulphate of iron to the oxide of the acetate of lead, assisted by the heat, decomposes the acetate, and the sulphuric acid uniting with the lead, the acetic acid is disengaged, and distils over. The dried state of the salts enables the acid to be in a concentrated form.[3] The process of the Dublin Col-

[1] Acide Acetique (*F.*) Essigsäure (*G.*) Acido acetico (*I.*)

[2] *Annales de Chimie*, xxxvii. 3.

[3] The process of the edition of the London Pharmacopœia of 1787, for obtaining this acid by the simple distillation of dried subacetate of copper, afforded a much stronger acid than either of these processes. An excellent acetic acid is obtained by decomposing the superacetate of lead at once, by means of sulphuric acid; putting into the retort, before distilling, a small portion of oxide of manganese, as directed by M. Baup. Vide *Journ. de Pharm.* Dec. 1816.

lege is the best; the acid obtained being stronger, not contaminated with any metallic impregnation, and free from sulphurous acid, a small portion of which the other generally contains.[1]

Qualities.—Acetic acid has a grateful, fragrant, pungent odour; a very sour acrid taste; and, when applied to the skin inflames it and raises a blister, It is limpid, colourless, highly volatile, and if much concentrated, takes fire when heated in the open air. It becomes solid and crystallizes at 38° of Fahrenheit, liquefying again at 40°; is capable of oxidizing iron, zinc, copper, nickel, and tin; combines with alkalies, earths, and metallic oxides, forming acetates; dissolves resins, gum-resins, camphor, and volatile oils; and combines with alcohol, which, when aided by heat, it converts into a species of ether. With water it unites in any proportion, and during the mixture heat is evolved. From the experiments of Guy Lussac 100 parts of pure acetic acid appear to consist of 50·224 of carbon, 5·629 of hydrogen, and 44·147 of oxygen.

Medical properties and uses.— Acetic acid is stimulant and rubefacient. It is principally employed as a refreshing scent, in syncope, asphyxia, and nervous head-achs; and for obviating the unpleasant smell of the confined air of crowded assemblies and of the sick-room. It is, also, a useful application to warts and corns, which it seldom fails to remove; but in applying it care must be taken to avoid the surrounding skin.

Officinal preparation. *Acidum acetosum camphoratum.* E. D.

ACIDUM BENZOICUM. Lond.[2] *Benzoic Acid.*

"Take of benzoin, *a pound and a half*; lime fresh burnt, *four ounces*; water, *a gallon and a half*; muriatic acid, *four fluid ounces.* Rub the benzoin with the lime; then boil them in a gallon of water for half an hour, constantly stirring with a spatula, and pour off the liquor when it is cold. Boil what remains in four pints of water, and pour off the liquor as before. Afterwards mix the liquors together, and boil them to one half; then filter them through paper, and gradually drop in the muriatic acid until no more precipitation takes place. Finally, having poured off the liquor, dry the powder in a gentle heat; then put it into a proper vessel placed in a sand-bath; and with a moderate fire sublime the benzoic acid."

Edinburgh.

"Take of benzoin, *twenty-four ounces*; subcarbonate of soda, *eight ounces*; water, *sixteen pounds.* Triturate the balsam with the subcarbonate; then boil them in the water for half

[1] It may be completely freed from this acid by redistilling it from black oxide of manganese mixed with a small portion of carbonate of potash. *Nicholson's Journal*, xiii. 42.

[2] Acide Benzoïque (*F.*) Benzoesäure (*G.*) Acido Benzoico (*I.*)

an hour, stirring them constantly, and strain. Boil the residue of the balsam in other six pounds of water, and strain. Mix the strained liquors, and evaporate to two pounds; filter again, and drop in diluted sulphuric acid as long as any precipitation is produced.

"Dissolve the precipitated benzoic acid in boiling water: strain the liquor whilst it is hot through linen, and set it aside to crystallize. Wash the collected crystals with cold water; then dry, and preserve them for use."

Dublin.

"Take of benzoin, *any quantity.* Liquefy it in a wide-necked retort, to which a receiver is adapted but not luted, and sublime. The sublimed matter must be now and then removed from the tube of the retort, lest it accumulate in too great quantity. If it be soiled with oil, press it between folds of blotting paper to separate the oil, and repeat the sublimation."

The process of the Dublin College is the method recommended by Chaptal of separating the acid which the benzoin contains: but although the quantity contained be greater, yet if the fire be not very nicely regulated, a portion of empyreumatic oil is also volatilized, which gives the acid a brown tinge, and cannot easily be entirely separated from it.[1] The London process is in principle the same as that which Scheele published in 1775.[2] Lime separates the benzoic acid from the resin with which it is united in the balsam, combines with it, and forms a benzoate which is dissolved in the water; whilst at the same time a small portion of resin is also dissolved, and gives the solution a yellow colour. This benzoate is decomposed in its turn by the muriatic acid, which combines with the lime, and forms a soluble muriate; whilst the benzoic acid that is set free, being insoluble in cold water, precipitates in the form of a brownish powder. The subsequent sublimation frees the acid of this colour, and gives it the crystallized form and brilliant appearance of the acid originally obtained by sublimation, without any adhering oil. The Edinburgh process is a modification of this one, introduced by Gren, on the supposition that it is more œconomical, the sulphuric acid being cheaper than the muriatic acid.[3] The following are the quantities of acid obtained from one pound of benzoin by these processes, according to Mr. Brande's experiments.[4]

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1 This acid was originally obtained by sublimation. It was described under the name of *flowers of benzoin* by Blaise de Vigeneve, in 1608. *Thomson's Chemistry*, 4th ed. ii. 289. 2 *Scheele*, i. 124.

3 Mr. Hatchett has proposed a simpler process than any of the above. He digests the benzoin in sulphuric acid; during which the benzoic acid is sublimed in great quantity very pure, and beautifully crystallized. *Phil. Trans.* 1805.

4 *Nicholson's Journal*, x. 88.

	℥.	ʒ.	℈.	grs.
By Chaptal's (*that of the Dublin College*)	2	0	0	0
Scheele's (*the London*) - - - - -	1	6	2	19
Gren's (*the Edinburgh*) - - - - -	1	5	1	10

Benzoic acid may also be extracted from the other balsams.

Qualities. — Benzoic acid is, when perfectly pure, inodorous; but as it is usually found in the shops, it has a slight aromatic odour[1]: its taste is pungent, acrid and acidulous. It is in very minute acicular crystals and flakes, soft to the touch and not pulverulent, of a beautiful whiteness, and a silky lustre. Its specific gravity is 0·667. When heated, it melts, emits a suffocating, acrid, vapour and in a strong heat burns with a white flame. Benzoic acid is soluble in twenty-four times its weight of boiling water, and more abundantly in alcohol; but the water lets fall nineteen-twentieths in cooling. With the alkalies, earths, and metallic oxides, it forms benzoates, which are not used in medicine. According to Berzelius it is a triple compound of 74·41 of carbon, 5·16 of hydrogen, and 20·43 of oxygen.

Medical properties and uses. — This acid is stimulant; but, although it is retained by all the pharmacopœias, it is of little value as a remedy.

Officinal preparations. *Tinctura Camphoræ composita.* L. D. *Tinctura Opii ammoniata.* E.

ACIDUM CITRICUM. Lond.[2] *Citric Acid.*

"Take of lemon juice *a pint*; prepared chalk, *an ounce*, or a quantity sufficient to saturate the juice; diluted sulphuric acid, *nine fluid ounces*. Add the chalk by degrees to the lemon juice heated, and mix them; then pour off the liquor. Wash the citrate of lime which remains, in repeated portions of warm water, and then dry it. On the dried powder pour the diluted sulphuric acid, and boil for ten minutes; express the liquor strongly through a linen cloth, and filter it through paper. Evaporate the filtered liquor with a gentle heat, so that crystals may form as it cools. To obtain the crystals pure, dissolve them in water a second and a third time; filter each solution, boil it down, and put it apart to crystallize."

This process, which was contrived by Scheele, will seldom require to be performed by the apothecary, as the crystallized acid is now manufactured very pure, and sufficiently reasonable, on the great scale.[3] The theory of the process is very simple. The lime of the chalk unites with the citric acid that exists ready formed in the lemon juice, and produces an

[1] To free it from the oil on which its odour depends, dissolve it in alcohol, and precipitate by water. *Phil. Mag.* xiv. 331.

[2] Acide Citrique (*F.*) Acido Citrico (*I.*)

[3] The principal manufacturer in London, is Mr. Coxwell of Fleet Street.

insoluble citrate of lime, which precipitates united with some of the mucilaginous and extractive matter of the juice. These are separated by repeated washings; and the sulphuric acid, which is added to the dried citrate, decomposing it, owing to the superior affinity of the sulphuric acid for lime; a sulphate of lime forms while the citric acid is disengaged. The crystals of the first crystallization are dark coloured; which is partly owing to a portion of mucilage that still adheres to the citric acid, and partly to the excess of sulphuric acid acting on the citric acid and decomposing a portion of it. The repeated crystallizations free the crystals from this dark colour; but as it is of some importance to avoid any hurtful excess of sulphuric acid, and as the strength of lemon juice is variable and uncertain, it is better to determine the quantity of acid required by the quantity of chalk employed. For this purpose a portion of the sulphuric acid intended to be used must be previously saturated with the chalk, and the weight of the portion employed accurately ascertained; by the knowledge of which the exact quantity of sulphuric acid required to decompose the citrate may be found. According to the experiments of Proust[1], 94 ounces of lemon juice saturate 4 ounces of chalk with citric acid, and produce $7\frac{1}{2}$ ounces of dry citrate, which require for their decomposition, and the complete saturation of the lime they contain, 20 ounces of diluted sulphuric acid, composed of one part of the common acid and three parts of water, or of a specific gravity of 1·15. To ascertain, however, the exact point of saturation of the lime with the sulphuric acid, take a little of the clear supernatant fluid, filter it and add to it a few drops of acetate of lead; if no sulphuric acid be present citrate of lead only will be formed, soluble in nitric acid which does not dissolve sulphate of lead.

Qualities. — Pure citric acid is in white, transparent, persistent, rhomboidal prisms, or of two four-sided pyramids joined base to base. It is inodorous; has an extremely acid, almost caustic taste; and reddens strongly the vegetable blues. One ounce of water at 60° Fahrenheit dissolves one ounce and a quarter of this acid; and at 212° twice its weight. The solution when long kept is liable to undergo spontaneous decomposition. Citric acid combines with the alkalies, earths, and metallic oxides, and forms citrates. The sulphuric and nitric acids decompose it. Its components according to Berzelius are 41·37 carbon, 3·80 hydrogen, and 54·83 of oxygen, in unknown proportions. Citric acid may be adulterated with tartaric acid; or with citrate of lime. The first is discovered

[1] *Journal de Physique*, lii. 366.

by nearly saturating the solution with carbonate of potash, when an insoluble super-tartrate will be formed if the tartaric acid be present; the second is detected by dissolving the crystals in water, saturating the solution with ammonia, and adding to it some oxalate of ammonia, which will instantly precipitate the lime, if present.

Medical properties and uses. — The solution of this acid in water, in the proportion of ℥j of the crystals to Oj of water, answers nearly all the purposes of recent lemon juice; and is even preferable for forming the common effervescing draught with carbonate of potash. A solution of ℈j in Oj of water, sweetened with sugar that has been rubbed on fresh lemon peel, forms a grateful refrigerant beverage, resembling lemonade, and equally useful in febrile and inflammatory complaints. It is said that the crystallized acid is not equally useful in scurvy as the fresh juice of the fruit.

ACI'DUM MURIA'TICUM. Lond.[1] *Muriatic Acid.*

"Take of muriate of soda dried, *two pounds*; sulphuric acid, (by weight,) *twenty ounces*; distilled water, *a pint and a half*. First mix the acid with half a pint of the water, in a glass retort; and when the mixture is cold, add to it the muriate of soda. Pour the remainder of the water into the receiver; and having fitted it to the retort placed in a sand bath, distil over the muriatic acid into this water, with a heat gradually raised until the retort becomes red hot.

"The specific gravity of muriatic acid is, to that of distilled water, as 1·160 to 1·000. If a piece of limestone be immersed in a fluid ounce of it diluted with water, the quantity dissolved ought to be two hundred and twenty grains."

Edinburgh.

"Take of muriate of soda, which has been previously exposed to a red heat, sulphuric acid, water, of each *two pounds*. Pour the acid, mixed with eight ounces of the water and cooled, upon the muriate of soda, in a glass retort; to which adapt a receiver, containing the remainder of the water, and distil from a sand bath with a moderate fire. In a short time the vessels may be luted together, and the distillation continued to dryness.

"The specific gravity of this acid is, to that of distilled water, as 1·170 to 1·000.

Dublin.

"Take of muriate of soda dried, sulphuric acid, water, of each *six pounds*. Dilute the acid with the water, and after it

[1] Spiritus Salis, P. L. 1720. Spiritus Salis Marini Glauberi, P. L. 1745. Acide Muriatique (*F.*) Kochsalzsäure (*G.*) Acido Muriatico (*I.*) Ooppoo trāvagum (*Tam.*)

is cold, add it gradually to the muriate put into a glass retort; then distil the liquor until the residuum becomes dry.

"The specific gravity of this acid is, to that of distilled water, as 1·170 to 1·000."

The principal difference in these formulæ is in the quantity of sulphuric acid ordered for decomposing the muriate. The sulphuric acid is properly ordered to be diluted, to moderate the strong effervescence, and prevent the too rapid disengagement of the muriatic acid gas, which would both endanger the bursting of the apparatus, and render the process otherwise very unmanageable. The direction of the London and Edinburgh Colleges, to put part of the water into the receiver, is preferable to mixing the whole with the acid, and pouring it on the muriate, as it facilitates very much the condensation. In the manufacturing laboratories, although the process is in principle the same as the above, yet the retort is generally of earthenware or of iron, which communicates the yellow colour that characterizes the common muriatic acid, and which depends on a small portion of iron being raised, and brought over with the acid. Even when iron vessels are not employed the acid often assumes a yellowish colour, which depends either on a small portion of iron in the salt, or from the presence of some oxymuriatic acid.

In this process the decomposition of the muriate of soda is effected by the superior affinity of sulphuric acid for soda; but it would scarcely be so complete were not the affinity of the muriatic acid for the soda also weakened by the heat, which favours its tendency to assume the elastic form, in which state it passes over into the receiver, and is there condensed by the water. The residue of the process is sulphate of soda with an excess of acid; to separate which, without breaking the retort, boiling water may be poured into the retort, after its contents have cooled down to 212°.

Qualities. — Liquid muriatic acid, thus obtained, is a colourless or very pale straw-coloured fluid: it has a strong pungent odour, an intensely sour caustic taste; reddens strongly the vegetable blues, emits white suffocating fumes when exposed to the air, and erodes animal and vegetable substances. It unites with the alkalies, earths, and metallic oxides, forming muriates. When of the specific gravity directed by the Edinburgh and Dublin Pharmacopœias, 100 parts of it, according to Dr. Ure's experiments, contain about 26·32 of real acid; and that by the London 24·90: at least it should be so; but by the present process of the London College the sp. gr. of the acid obtained is 1·142 instead of 1·160; and f℥j; decomposes

204 grains of marble only instead of 220, as stated by the college.[1] The following part of a table, constructed by Dr. Ure[2], shows the quantity of real acid contained in 100 parts of fluid acid, of different densities, at the temperature of 60°:

Spec. Grav.	Real Acid.	Spec. Grav.	Real Acid.	Spec. Grav.	Real Acid.	Spec. Grav.	Real Acid.
1·1920	28·30	1·1698	24·90	1·1391	20·37	1·1155	16·98
1·1900	28·02	1·1661	24·34	1·1351	19·81	1·1115	16·41
1·1881	27·73	1·1587	23·20	1·1312	19·24	1·1037	15·28
1·1863	27·45	1·1550	22·64	1·1293	18·96	1·0999	14·72
1·1790	26·32	1·1510	22·07	1·1253	18·39	1.0883	13·02
1·1753	25·75	1·1491	21·79	1·1233	18·11	1·0805	11·88
1·1715	25·19	1·1471	21·51	1·1214	17·83	1·0707	10·47
1·1679	24·62	1·1410	20·66	1·1194	17·55	1·0590	8·77

Notwithstanding the endeavours of all the most eminent chemists to ascertain the components of muriatic acid, they remain still unknown. It cannot be obtained perfectly free from water; although in some combinations it is nearly so; in which state Sir H. Davy has ascertained that its acidity is suspended, but is instantly restored on the addition of water. The fluid muriatic acid found in the shops often contains sulphuric acid and small portions of iron, sometimes copper; the first is detected by diluting the acid with 5 or 6 parts of distilled water, and adding a few drops of muriate of barytes[3], which is precipitated white if sulphuric acid be present; iron is discovered by saturating the diluted acid with carbonate of soda, and adding prussiate of potash; if a blue precipitate be formed, it may be concluded that iron is present. A blue colour being produced by supersaturating the acid with ammonia detects copper.

Medical properties and uses. — This acid is tonic, and antiseptic. It has been efficaciously used in typhus fevers, and in some cutaneous eruptions. It is a common and useful adjunct to gargles, in the proportion of from f℥ss to f℥ij in f℥vj of any fluid, in ulcerated sore-throats, and cancrum oris; and, in a very highly diluted state, viz. ♏viij in f℥iv of water, it has been recommended as an injection in gonorrhœa.

This acid has even been regarded as an antidote in general syphilitic affections; but the observations of Mr. Pearson have

[1] *Philips's Experimental Examination*, p. 11.

[2] Dr. Ure has given satisfactory proofs of the erroneous data on which Mr. Kirwan's table was formed. *Annals of Phil.* vol. x. p. 369.

[3] Mr. Hume discovered that muriatic acid precipitates muriate of barytes when no sulphuric acid is present; but this does not happen when the acid is much diluted.

showed this opinion to be erroneous; yet, by its salutary effects on the stomach and general health, "it is a medicine capable of ameliorating the appearance of venereal ulcers, and of restraining for a time the progress of the disease," where it is desirable "to gain a little time, previously to the entering on a mercurial course."[1] The dose is from ♏x to ♏xx in a sufficient quantity of water. When taken as a poison, it may be detected by its sensible qualities; but if mixed with wine or other fluids, let a portion of it be distilled from a small retort over a candle, into a phial containing a solution of nitrate of silver. The precipitation of muriate of silver, which is soluble in ammonia, but not in nitric acid, will take place if the poison contain muriatic acid. The best antidotes, if exhibited in time, are soap and calcined magnesia suspended in water.

A very important property of muriatic acid, in the state of gas, is the power it possesses of neutralizing putrid miasmata, discovered by *Morveau in 1773*. It is therefore used as an agent for destroying infection in sick-rooms and hospitals, disengaged by pouring sulphuric acid on common salt.

Officinal preparations. *Murias Barytæ*. E. *Solutio Muriatis Calcis*. E. D. *Tinctura Ferri Muriatis*. L. E. D.

ACIDUM MURIATICUM DILUTUM. Dub. *Diluted Muriatic Acid.*

"Take of muriatic acid, and of distilled water, each *one pound by weight*. Mix them. The specific gravity of this acid is, to that of water, as 1·080 to 1·000."

This formula is intended to render the dose of muriatic acid more easily apportioned: 100 parts contain about 14 of real acid.

AQUA OXYMURIATICA. Dub.[2] *Oxymuriatic Water.*

"This is prepared by transmitting the superfluous gas of the process for making the solution of oxymuriate of soda, *aqua alcalina oxymuriatica*, by means of a proper apparatus, through a pint of distilled water.

"The specific gravity of this solution is, to that of water, as 1·003 to 1·000."

In the process by which this acid solution is prepared, the oxymuriatic acid comes over in the gaseous form, and is condensed in the distilled water, which is placed in a Woolfe's bottle, connected by a tube with a receiver that contains a solution of subcarbonate of potash. The gas first passes through the alkaline solution, part of it condenses and combines with the potash, forming a neutral salt, while the super-

[1] *Pearson on Remedies for Lues Venerea*, 194.

[2] Acide muriatique oxigéné (*F.*) Vollkomme Salzsäure (*G.*) Acido muriatico ossigenato (*I.*)

fluous uncondensed portion passes on to the next bottle, and there combines with the water; forming this solution, which is generally termed oxymuriatic acid. It ought to be preserved in opaque bottles, as light decomposes it.

This acid was discovered by Scheele in 1774, while making his experiments on manganese.

Qualities. — The saturated solution of oxymuriatic acid has a very offensive suffocating odour; and a harsh, styptic, but not acid taste. Its colour is a very pale yellowish green; it destroys all the vegetable colours, rendering them white; and is itself decomposed by exposure to light; owing either to oxygen gas being disengaged by the light; or, according to the new theory, to the decomposition of the water, the hydrogen of which, uniting with the chlorine, forms muriatic acid, that remains in solution in the water, while the oxygen is set free. At a temperature of 50° this solution contains about twice its volume of real acid, the constituents of 100 parts of which, following the old theory, according to the experiments of Berthollet, corrected by those of Chenevix, are 84 of muriatic acid, and 16 of oxygen.[1]

Medical properties and uses. — Fluid oxymuriatic acid is stimulant and antiseptic. It has been strongly recommended in scarlatina and malignant sore throat; and as an antisyphilitic remedy. In the latter disease the same opinion may be given of it as of the simple muriatic acid; but in scarlatina and cynanche maligna more benefit has resulted from its use. From f℥ss to f℥ij, mixed in f℥viij of water, and sweetened with a little syrup, may be taken in the course of the day, in divided doses.

But the most important use of oxymuriatic acid is in its gaseous form, as a fumigation for neutralizing putrid miasmata, and correcting the infectious atmosphere of hospital wards and rooms in which have been cases of contagious fevers. For these purposes it is better adapted than the common muriatic acid gas; but as both of them are highly deleterious to animal life, they should be employed in such apartments only as the sick can be removed from while the gas is extricated. The oxidized vapours are easily procured by pouring f℥vj of strong sulphuric acid on a mixture of ℥iv of pulverized manganese, ℥viij of common salt, and f℥ij of water, in a china cup. The doors of the room to be fumigated must be kept shut for two hours after the cup with this charge is placed in it; then be thrown open, and a free current of air permitted to pass through the apartment. By this process

[1] *Chemical Statics*, ii. 169.

the offensive odour of the sick room is destroyed, the chemical constitution of the deleterious atmosphere altered, and its freshness completely restored.

For the more convenient application of this powerful agent, Morveau has invented what he terms disinfecting or preservative bottles. The apparatus consists of a strong glass bottle or phial, covered with a plate of glass, which is fitted by grinding so as to shut accurately the orifice of the vessel. The bottle is fixed in a wooden frame; and the plate of glass kept in its place, and closely applied by means of a screw. If the bottle be of 25 cubic inches of capacity, the charge to be put into it may consist of 372 grs. of black oxide of manganese in coarse powder, 3·5 cubic inches of nitric acid of 1·4 specific gravity, and an equal bulk of muriatic acid of 1·134 specific gravity. As soon as the charge is introduced, the glass plate must be firmly screwed down in its place. When the apparatus is to be used, the screw is to be turned so as to allow the gas which is extricated to escape from under the plate of glass; and this must be again screwed down, as soon as the smell of the oxymuriatic gas is perceptible in the distant corners of the apartment. Bottles of any dimensions may be used, but the charge must in no case occupy more than one-third part of the capacity of the vessel.

ACIDUM NITRICUM, Lond.[1] *Nitric Acid.*

"Take of nitrate of posash dried, and sulphuric acid, each *two pounds*; mix them in a glass retort; and distil the nitric acid from a sand-bath, until red vapours are produced. Then having added an ounce of dried nitrate of potash, redistil the acid in a similar manner.

"The specific gravity of this acid is, to that of distilled water, as 1·500 to 1·000. If a piece of limestone be immersed in a fluid ounce of it diluted with water, 480 grains ought to be dissolved."

Edinburgh.

"Take of nitrous acid, *any quantity.* Put it into a retort, and having fitted a receiver, which must be kept cold, apply a very gentle heat until the reddest part shall have passed over, and the acid which remains in the retort already almost free from colour, have become nitric acid."

ACIDUM NITROSUM. Edin. *Nitrous Acid.*

"Take of nitrate of potash bruised, *two pounds*; sulphuric acid, *sixteen ounces.* Pour the acid upon the nitrate of potash in a glass retort, and distil from a sand bath with a gradually

[1] Acidum Nitrosum, P.L. 1787. Spiritus Nitri Glauberi. Aquafortis, P.L. 1745. Aquafortis simplex et duplex, P.L. 1720. Acide nitrique (*F.*) Salpeter säure (*G.*) Acido Nitrico (*I.*)

augmented heat, until the iron pot becomes obscurely red hot.

" The specific gravity of this acid is, to that of distilled water, as 1·520 to 1·000."

Dublin.

" Take of nitrate of kali, *six pounds;* sulphuric acid, *four pounds* by weight. Mix and distil until the residue becomes dry.

" The specific gravity of this acid is, to that of distilled water, as 1·500 to 1·000." [1]

In performing these processes it is advisable to use a Woolfe's apparatus, or a range of two or three globular receivers, the last of which should contain a small portion of water. The nitric acid is separated from its combination with potash in the nitrate by the superior affinity of the sulphuric acid for the potash, which, however, requires to be aided by quantity, a larger portion of sulphuric acid than is necessary for saturating the potash of the nitrate being used; and also by heat, which volatilizes the nitric acid as it is disengaged. As soon as the materials are heated, orange-yellow vapours are disengaged, which in a short time become paler, and continue so until the ingredients in the retort are nearly dry, and the heat is much augmented; when, owing to a partial decomposition of the acid next disengaged, nitrous oxide comes over in deep red fumes, with a quantity of permanently elastic pure oxygen, which may be collected in an inverted receiver filled with water, placed in a pneumatic trough, and connected with the last receiver by means of a bent tube. The nitrous oxide combines with the condensed acid in the receiver, deepens its colour, and gives it that form which constitutes nitrous acid. It is with the view of preventing this, that the London College has ordered so large a portion of sulphuric acid to be employed, the principal use of which appears to be to contribute a sufficient portion of water to preserve the constitution of the nitric acid; for although a larger proportion of this acid be obtained by following the directions of the London formula, yet it is actually weaker than that which is obtained either by the Edinburgh or the Dublin processes. The Edinburgh College orders the acid to be kept in this form; and as a medical agent it answers the same purposes as the colourless acid; for, when both are diluted with water, they have the same appearance, and are brought to the same state, the addition of the water expelling completely the nitrous

[1] For the preparation of this acid on a large scale in this country, rough nitre with half the weight of sulphuric acid is employed. These are put into a large glass *body*, to which a glass pipe is luted communicating with an empty receiver, which is connected, by means of pipes also, with several other receivers half filled with water.

oxide, which is only loosely united with the nitric acid to form the nitrous. The quantity of acid obtained is about half the weight of the nitrate employed; and the residue is a white spongy saline cake of sulphate of potash with an excess of sulphuric acid, which may be dissolved out of the retort by hot water.

By the London process the nitric acid is at first obtained tolerably free from nitrous oxide; but in general the re-distillation, as directed, will be found necessary. In the expulsion of the nitrous oxide, to change the nitrous into nitric acid, according to the directions of the Edinburgh College, a portion of the acid is carried over with the gas, as nitrous acid vapour; which should not be wasted, but be condensed by a small portion of water being put into the receiver, and thus form a diluted acid. Mr. Murray [1] justly observes, that the heat of a water-bath is best adapted for this operation, being sufficient for the purpose, and not too high to produce the decomposition of the acid. A completely colourless acid, however, is not obtained, unless the acid be re-distilled from a small portion of black oxide of manganese, but this is not at all necessary for medical purposes. [2]

As nitre sometimes contains a small portion of muriate of soda, nitric acid, in whatever method it has been procured, may be contaminated with a minute portion of muriatic acid; or of sulphuric acid, if a large proportion of this has been used for decomposing the nitre: the presence of the first is detected by dropping in nitrate of silver, which forms an insoluble muriate of silver; while the formation of a precipitate on the addition of muriate of barytes discovers the second. These contaminations do not affect the medicinal virtues of the acid.

Qualities. — *Nitrous* acid, as the term is understood in the Edinburgh Pharmacopœia, is a yellow or orange-coloured fluid, emitting, when exposed to the air, deep-orange-coloured extremely suffocating fumes. In its chemical affinities and other qualities it agrees in many respects with nitric acid. It consists of nitrous gas loosely combined with nitric acid and water; and the colour varies according to the proportion of nitrous gas which is present. From experiments made by Sir H. Davy [3] on this subject, the following appear to be the proportions in the three states in which nitrous acid is usually procured for pharmaceutical purposes.

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1 *System of Materia Medica*, ii. 184.

2 Nitric acid was first obtained by Raymond Lully, in the 13th century, by distilling a mixture of nitre and clay, a process still employed on the continent. The name *Nitric acid* was imposed in 1787, by the French chemists.

3 *Researches*, 87.

100 Parts of Acid.	Spec. Gravity.	Real Nitric Acid.	Water.	Nitrous Gas.
Pale yellow	1·502	90·5	8·3	1·2
Bright yellow	1·500	88·94	8·10	2·96
Dark orange	1·480	86·84	7·6	5·56

The Edinburgh College states the specific gravity too high, for it seldom exceeds 1·502, and scarcely ever 1·52.[1] When one part by weight of water is added to four parts of yellow nitrous acid, the colour is altered to a fine green; when equal parts of both are mixed, it becomes blue; and by another addition of water, or by allowing it to stand exposed to the air, it changes to a very pale straw-colour, or becomes nearly colourless.

Nitric acid is a colourless, or very pale yellow, limpid fluid, emitting, when exposed to the air, white suffocating vapours, and possessing strong acid properties. It is highly corrosive, and tinges the skin yellow, the tint remaining till the epidermis peels off. It unites with water in every proportion, and while mixing heat is evolved. The following table, constructed by Sir H. Davy[2], shows the quantity of real acid and water contained in 100 parts of fluid acid of different densities:

100 Parts Nitric Acid of specific gravity.	Contain of		100 Parts Nitric Acid of specific gravity.	Contain of	
	True Acid.	Water.		True Acid.	Water.
1·5040	91·55	8·45	1·3186	52·03	47·97
1·4475	80·39	19·61	1·3042	49·04	50·96
1·4285	71·95	28·35	1·2831	46·03	53·97
1·3906	62·96	37·04	1·2090	45·27	54·73
1·3551	56·80	43·12			

Nitric acid is volatilized by heat, and decomposed by light. It is also decomposed by all the simple combustibles, with great violence of action; is capable of oxidizing all the metals; and combines with the earths, alkalies, and metallic oxides, forming nitrates; one fluid ounce of specific gravity 1·500 should dissolve 476 grains of white marble. The constituents of nitric acid, independent of the water, which gives it the fluid form, are 25·97 azote, and 74·03 oxygen, in 100 parts.

Use. — Strong fluid nitric acid is used only for pharmaceutical purposes; except when extricated in the form of vapour

[1] Rouelle states the specific gravity of the strongest nitric acid that can be procured to be 1·583; Kirwan makes it 1·5543 only, at 60° Fahrenheit.

[2] *Researches*, 41.

when it is employed for destroying contagion. It is less powerful than the oxymuriatic acid, but is more generally useful, as it can be extricated in the chambers of the sick without proving deleterious to animal life.[1] For this purpose f℥ij of sulphuric acid may be poured over ℥iv of coarsely powdered nitre in a china cup, and placed in a pipkin of hot sand. This quantity is sufficient for fumigating a room of ten feet square; and, where a larger portion is required, it is more advisable to multiply the number of pipkins, than to put a larger quantity of the materials into one vessel.

Officinal preparations. *Acidum nitricum dilutum.* L. E. D. *Argenti Nitras.* L. E. D. *Ung. Hydrargyri Nitratis.* L. E. D. *Hydrargyri Nitrico-oxydum.* L. *Spiritus Ætheris nitrici.* L. E. D. *Unguentum Acidi nitrosi.* E. D.

ACIDUM NITRICUM DILUTUM. Lond. *Diluted Nitric Acid.*

"Take of nitric acid, *a fluid ounce;* distilled water, *nine fluid ounces.* Mix."

ACIDUM NITROSUM DILUTUM. Edin. *Diluted Nitrous Acid.*

"Take of nitrous acid, and of water, *equal weights.* Mix, avoiding the noxious vapours."

Dublin.

"Take of nitrous acid, and of distilled water, each *one pound.* The specific gravity of this mixture is, to that of distilled water, as 1280 to 1000."

These processes are intended for the more convenient apportionment of the dose in the exhibition of this acid. In the former edition of the London Pharmacopœia the proportions of acid and water were equal by weight; but the alteration in the present edition makes a very important difference of strength, in a given measure of the diluted acid, prepared after the former, and the latter of the above formulæ.

When prepared according to the directions of the London College, f℥i contains about grs. 68·17 of nitric acid, of 1·500 specific gravity, while the same measure of the same acid, prepared after the Edinburgh and Dublin, and the former London formulæ, contains grs. 390·5 of the same acid; a difference which may lead to errors in practice; and is, therefore, to be regretted, particularly as no reason is assigned for the change.

Medical properties and uses.—Nitric acid is tonic and antiseptic. When largely diluted with water it forms an agreeable and very useful beverage in fevers, particularly of the typhoid type. In larger doses, less diluted, it has been efficaciously administered in chronic hepatitis, even when dropsy has supervened; and has also been found serviceable in restraining

[1] *The Effects of Nitrous Vapour, &c. by J. C. Smyth, M. D.*

violent sickness, in dyspepsia, asthma, and the majority of the cachexiæ. From some observations of Mr. Scott, published at Bombay in 1796, this acid excited considerable attention as a remedy for syphilis; but after the most ample trials, by almost every practitioner of any eminence in the country, its antisyphilitic powers have not been found by any means to answer the accounts of them transmitted from India. The subsequent publications of Dr. Scott, however, have shown, that he did not employ nitric acid, but a mixture of three parts of muriatic acid, and two of nitric. It checks for a time the progress of the disease, but does not permanently remove the symptoms; and, as Mr. Pearson justly observes, "it would by no means be warrantable to substitute the nitrous (or nitric) acid in the place of mercury, for the cure of venereal complaints."[1] It is, however, in many cases of much benefit during a mercurial course, or prior to its commencement, when the constitution is impaired, and inadequate to support the effects of mercury; as by its tonic powers it promotes the general health, and lessens the action of the mercurial remedy on the mouth and fauces: yet when it is pushed far, it affects the mouth, and produces ptyalism. When dropsy supervenes on reiterated courses of mercury, which is not unfrequent in broken down constitutions, this acid, Mr. Carmichael observes, given in as large doses as the stomach will permit, conjoined with digitalis, is productive of the utmost benefit. We have found it of considerable service, given at the same time with mercury, in old obstinate ulcerations of the legs, although no venereal taint could be suspected: and it is employed with benefit as a local stimulant in the form of lotion, in the proportion of f℥ij of the diluted acid, to Oj of water, to fœtid ulcers, attended with a thin ichorous discharge, and in caries of the bones. In India, and in this country for some years past, it has been used combined with muriatic acid, in the form of a bath, and in this state produces the same effects as when it is taken internally. Diluted nitric acid has often been employed as a poison. It is detected by the orange-coloured spots, which are observed on the lips, chin, and hands of the patients; and, if death be the result, by the same colour being found in a large portion of the alimentary canal, the mucous membrane of which is converted into a fatty substance, and the stomach often perforated. If any of the fluid can be obtained, the extrication of orange-coloured fumes on boiling it over copper filings, is a certain test of aquafortis. Soap, and calcined magnesia suspended in water, are the best antidotes.

[1] *Pearson on Remedies for Lues Venerea*, 188.

The dose of the diluted acid is from ♏x to ♏xxx in ʒiij of water, given three or four times a day. When used as a bath, the mixed acid should be added to the water, until it is about as sour as weak vinegar.

ACIDUM SUCCINICUM. Edin.[1] *Succinic Acid.*

"Take of amber in powder, and pure sand, *equal parts*; mix and put them into a glass retort, of which they may fill one half. Having adapted a large receiver, distil from a sand-bath, with a gradually raised fire. A watery liquor with a little yellow oil will first distil over: then a yellow oil with an acid salt; and lastly, a reddish and black oil. Pour the liquor out of the receiver, and let the oil be separated from the water. Press the acid salt collected in the neck of the retort, and on the sides of the receiver, between folds of bibulous paper, that it may be freed from the adhering oil; then purify it by solution, in hot water and crystallization."

ACIDUM SUCCINICUM. Dub. *Succinic Acid.*

"Take of amber, and pure sand, each *a pound*. Distil, with a gradually increased heat, an acid liquor, an oil, and a salt discoloured with oil. Wrap up this salt in bibulous paper, and subject it to the press to separate the oil; then let it be again sublimed."

The use of the sand in these processes is to prevent the amber, which swells very much, from passing over into the receiver. The heat which is necessary for the complete decomposition of the amber is very considerable; and therefore, by following exactly the formulæ of the Colleges, this is scarcely ever accomplished. The succinic acid is partly dissolved in the water which condenses in the receiver, but the greater part is sublimed in the neck of the retort, and is so much contaminated with the oil, that after repeated solution and crystallization, and even resublimation, it still retains a portion of it. According to Guyton Morveau[2], it may be obtained perfectly pure by distilling from it a small portion of nitric acid, with a heat not strong enough to sublime the succinic acid.

Qualities.—The crystals of succinic acid are minute triangular prisms. When pure, they are white, translucent, and shining; have a slight penetrating sour taste; redden infusion of litmus, and are volatile and inflammable, burning away without leaving any odour. They are soluble in 24 parts of water at 60°, and 2 parts at 212°; the greater part however crystallizing as the water cools. They are also soluble in alcohol, and in sulphuric and nitric acid, without suffering decomposition. With the alkalies, earth, and metallic oxides, succinic acid combines

[1] Acide Succinique (*F.*) Bernsteinsäure (*G.*) Acido Succinico (*I.*)

[2] *Annales de Chimie*, xxix. 165.

and forms succinates. It is a triple compound of 47·600 parts of carbon, 4·512 of hydrogen, and 47·888 of oxygen.[1]

This acid is often adulterated with tartaric acid, muriate of ammonia, and sulphate of potash. The first is detected by carbonate of potash; the second, by nitrate of silver; and the sulphate by barytic water. It is altogether discarded from practice.

ACIDUM SULPHURICUM DILUTUM.[2] Lond. *Diluted Sulphuric Acid.*

"Take of sulphuric acid, *a fluid ounce and a half;* distilled water, *fourteen fluid ounces and a half.* Add the acid gradually to the water, and mix."

Edinburgh.

"Take of sulphuric acid, *one part;* water, *seven parts;* mix them."

Dublin.

"Take of sulphuric acid, *two ounces by weight;* distilled water, *fourteen ounces by weight.* Mix them gradually, and set the mixture aside to cool; then pour off the clear liquor. The specific gravity of this acid is, to that of water, as 1090 to 1000."

It is very much to be regretted, that the London College, when it altered the proportions of acid and water in this mixture, from those in the last edition of its Pharmacopœia, did not adopt the proportions ordered by the two other colleges, so that, in this preparation at least, a standard strength might have been fixed for the whole kingdom. The reasons which induced it to adopt the present proportions are not easy to be conceived; for the puerile reason stated by Dr. Powell, that "this mixture will be more conveniently made, and its dose more easily apportioned than the former one," cannot surely have operated in causing the alteration. The diluted acid of the former edition of the London Pharmacopœia consisted of eight parts by weight of water, and one of acid, or the mixture contained $\frac{1}{9}$ of strong acid; while the proportions of the present diluted acid are nearly five parts and a half by weight of water to one of acid; or, one fluid ounce of the diluted acid contains 78·82 grains of the strong acid: in the Edinburgh and Dublin pharmacopœias it constitutes an eighth part.

Owing to the great affinity of sulphuric acid for water, and the density of the mixture being much greater than the mean of the separated acid and water[3], a very considerable increase

[1] *Annals of Philosophy*, vol. v. p. 99.

[2] Acidum Vitriolicum dilutum, P. L. 1787. Acide sulphurique étendu d'eau (*F.*) Verdünnte Schwefelsäure (*G.*) Acido solforico diluito (*I.*)

[3] It is a curious fact that, after the mixture has cooled down to the temperature of the atmosphere, a considerable time elapses before it acquires its real density.

of temperature is produced during their combination, sufficient to crack the glass vessels in which it is made, if the two ingredients be at once mixed together.[1] To prevent such an accident, the acid must be gradually added in small portions to the whole of the water, and the mixture agitated after every addition. It is of importance always to ascertain the specific gravity of the acid before the mixture be made. The mixture, when it has cooled down to the temperature of the atmosphere, lets fall a white precipitate, consisting of a small portion of sulphate of potash, and of sulphate of lead, which the strong acid always contains, but which the diluted acid is incapable of holding in solution. The diluted acid is thus purer than the strong acid, which suffers no other alteration except in point of strength: and hence the Dublin College properly directs the clear liquor to be poured off when the mixture has cooled.

Medical properties and uses.—Diluted sulphuric acid is tonic, antiseptic, and refrigerant. Its tonic and antiseptic powers, render it extremely serviceable in low typhoid fevers, dyspeptic affections, diabetes, convalescencies, and in cutaneous eruptions. It restrains the colliquative sweats which attend hectic: locally applied, it is a common and useful adjunct to gargles in cynanche, and to check salivation; and as a refrigerant, it is given with certain benefit in passive hæmorrhagies, from whatever part they may arise. In the first-mentioned cases, the diluted acid may be combined with infusions of cinchona or other vegetable bitters, and aromatics; and in the latter, with infusion of roses, mucilage, or simple water sweetened with syrup. The usual dose is from ♏ x to ♏ xxx, but in malignant erysipelas, with a tendency to hæmorrhagy, it has been given to the amount of f℥j in twenty-four hours; and we have given it, with evident advantage, to the same amount, in violent uterine hæmorrhagies.

ACIDUM SULPHURICUM AROMATICUM. Edin.
Aromatic Sulphuric Acid.

"Take of alcohol, *two pounds*; sulphuric acid, *six ounces*. Drop the acid gradually into the alcohol. Digest the mixture in a covered vessel with a very gentle heat for three days; then add of cinnamon bark, bruised, *one ounce and a half*; ginger root, bruised, *one ounce*. Digest again in a closed vessel for six days; then filter through paper placed in a glass funnel."

This preparation is generally regarded as an imperfect ether; but we are of opinion that the reciprocal action of the acid and alcohol during the digestion is scarcely sufficient to produce

[1] If one part by weight of sulphuric acid of 1·845 specific gravity be mixed with one-fourth its weight of water, the caloric instantly evolved is sufficient to raise the thermometer from 60° to 300°.

such an effect; and the acid undoubtedly very much predominates. It is therefore a simple alcoholic solution of sulphuric acid, holding dissolved, also, the essential oil of cinnamon and of ginger.

Qualities.—The odour is peculiar and aromatic; the taste gratefully acid. It is limpid, and of a brownish colour.

Medical properties and uses.—This is an agreeable mode of exhibiting sulphuric acid in dyspepsia, chronic asthma, and most of the complaints for which the diluted acid has been found serviceable. The dose is from ♏x to ♏xxx in any convenient fluid vehicle, given three or four times a day.

ALKALIES[1] AND NEUTRAL SALTS.[2]

THE general term ALKALI comprehends under it substances possessed of very important chemical properties, and capable of producing very powerful effects on the animal œconomy. They have an acrid, urinous taste; are caustic, or dissolve animal matter; change the blue vegetable colours to green; serve as the means of combining oil and water; are capable of being fused and volatilized by a strong heat; have a great affinity for water; and combine with acids, forming neutral salts, in which the qualities of both the components are lost. The discoveries of Sir H. Davy have clearly established that the greater number of them are compound bodies. They are affected by the air, and require to be preserved in well-stopped glass bottles.

NEUTRAL SALTS have neither acid nor alkaline properties; but salts are formed by the combination of acids with alkalies, in which the properties of the one or the other predominate; and consequently, although these are *secondary* salts, yet they cannot, in strict language, be denominated *neutral* salts. When the acid predominates, the salt is designated by the syllables *super* being added to the appellation of the neutral salt, formed with the same acid and alkali; but when the alkali is redundant, the syllable *sub* is added: thus, if to car-

[1] The words *Kali* and *Alkali* are of Persian origin, and derived from the terms كلي and والحكي or *Kalia* and *Alkalia*, signifying the ashes of marine plants. Vide *Good's Nosology, Prelim. Disc.* p. xcv.

[2] The title of this section in the London Pharmacopœia is *Alkalies and their Salts*; but as these salts cannot be termed Salts of alkalies, in strict language, we prefer to translate the phrase *Neutral Salts*.