Chymistry.

The object of Chymistry is to ascertain the properties of matter. Every thing around us, commencing with the air, and ending with the earth, are subjects of chymical research. A correct knowledge of the laws or properties of bodies can only be acquired by noticing the changes produced on them in the various circumstances in which they are placed. — Chymistry, therefore, consists in a detail of those facts which are founded on experiments and observations.

Chymists have reduced all the variety of compounds around us into a few bodies which they cannot further decompose, or reduce. Those which they cannot further decompose are called simple or elementary bodies, and consequently all the bodies around us are compounded of these few simple substances or elements. Formerly chymists supposed that every thing was composed of 5 or 6 elements, of which fire, air, earth, and water were the principal; but the moderns have ascertained that there about 50 simple elementary substances which they cannot further decompose, of which the following are producible by art, viz. Light, Caloric, Sulphur, Phosphorus, Diamond, the Metals,

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Earths, Alcalies; and the 6 following substances not yet producible by art, viz. Oxygen, Nitrogen, Hydrogen, Muriatick radical, Fluorick radical, and Boracick radical.

Heat.

By heat is meant that which excites in us the idea of warmth. It is supposed to be a subtil substance flying off from bodies in the finest rays.— By some common people it is called fire; especially when accompanied with light and blaze.— By others it is called heat; and the Chymists call it Caloric.— All bodies expand by heat, but not in the same proportion; Thus clocks gain time in winter & go slower in summer; — It is the

the sudden expansion of that surface of glass to which heat is suddenly applied either by pouring hot water or holding it over the blaze of fire, that causes the glass to crack or fly to pieces.

The clothing of persons is more useful for keeping the heat of their bodies from escaping, than for keeping out the cold, as many suppose. Cotton and wool are better non-conductors of heat than linnen or silk, and are therefore best for winter, and the latter for summer.

Evaporation or vapor always produces cold.

Flints struck against steel, generates a heat sufficient to cause the steel to melt, which afterwards burns, which may be observed from catching

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the bits on paper, as they come off.

The heat of the Sun, collected by burning glasses, does not come from the sun, since it would require some time to penetrate the glass. It is, in all probability caused by the union of light with the body on which it acts whereby the capacity for heat is lost.

Burning of Wood.

In burning wood the fire is kindled at one part; the heat penetrates it and converts it into charcoal, and rarifies the charcoal into a kind of air. In this state, the air is quickly attracted, and an union follows, by which light and heat are set at liberty. Moderately blowing the fire presses the air closer to it, and causes it to burn the faster; blowing it too rapidly puts it out by carrying off the heat before it creates that state in the wood necessary for its union with air.

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Water extinguishes fire by carrying off part of the heat in the form of steam, and by preventing the contact of air.

If a cold body be laid down in summer, it absorbs sensible heat from the water in the air, which then becomes condensed in the form of drops on its surface; the same cause, that of the absorption of sensible heat, also causes drops of water to condense on windows and the walls of houses.

Experiment.

Mix, cautiously, in small quantities, nitric acid (aqua fortis) and spirit of turpentine – they will kindle into a flame – the most expeditious way of procuring fire.

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☞ Snow and ice seem to absorb light during the day, and to emit it during the night; so as to prevent total darkness.

Electricity.

The sparkling of the water of the sea, red-hot metals, &c: is probably owing to electricity.

Atmospheric Air.

Nitrogen air, is so called because the base of it is found in large quantities in nitre. – Some bodies, as sulphur, burnt in nitrogen air, become acid or sour, and produces oxigen air.

Of Atmospheric air, 100 parts contain 76 parts of nitrogen air, and 24 of oxigen air.

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Oxygen Air

only supports animal life. It may be procured from fresh gathered leaves put into an inverted bell-glass filled with pump water, and exposed to the action of the light of the Sun. The air will rise in bubbles, tolerably pure.

Or

If common nitre be heated in a glass retort, the air will come over pretty pure.

or.

It may be procured from black oxid of manganese.

Nitrogen Air.

This air, formerly termed azotic, because it killed animals (as other airs do) extinguishes burning bodies, &c. Its weight is $\frac{925}{1000}$ of common air. — It may be obtained by burning any body

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in confined atmospheric air; by which the oxygen is separated: or a mixture of potash and sulphur wetted into paste, and put into confined atmospheric air, over water, will absorb the oxigen in a few days, (one or two), &c.

Atmospheric Air

is compounded of oxigen & nitrogen, but contains many other substances which it holds in solution. All over the world it is found blended with water and fixed air. Its attraction for water is so great, that it can be had dry only, by confining it over caustic alkalies. 1/100th part or more is fixed air.

It sometimes contains substances destructive to animal life immediately, and sometimes such as cause their death (animals) by taking the place of vital air.

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Meteors.

Hydrogen air is sometimes found pure in nature, formed, no doubt, from the decomposition of water, as it issues from some springs & caverns and burns when fire is applied. In large marshes it is sometimes extricated and being set on fire by the electrik fluid, causes the singular appearance called Jack with a lanthorn. When it escapes to higher regions and there takes fire, it causes the meteors called falling stars.

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Common Charcoal,

resists putrefaction very much, & consequently all posts to be set in the earth should have their lower ends burned over.

Fresh charcoal completely destroys the disagreeable odour in clothes when folded in them.— Boiled with tainted meat it takes the taint entirely away. It is a most excellent application to old ulcers, and should be taken by persons labouring under bilious fevers, as alcalies.

Glass.

The principal kinds of glass are three Flint glass, crown glass, and bottle glass.

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Flint glass, or crystal is said to be made of 120 parts of pure white sand, 40 of pearl ash, 35 of red lead, 13 of common nitre, and 25 of black manganese. This is the best and most beautiful kind of all.

Crown glass contains no lead, and is made of soda and fine ~~common~~ sand, and is used for panes of windows, &c.

Bottle glass is the coarsest of all, and is made of soda and common sand. Its green colour is caused by iron.

Earthern Ware

From the coarset brown pitcher to the finest porcelain, is made of aluminous and silicious earths. China porcelain is of an intermediate nature between earthern ware and glass. It is semi-vitrified.

Common ware is glazed by an oxid of lead, or by throwing common salt over it in the furnace.

Bricks.

Common clays are composed chiefly of silex and alumine. The latter is often in too great proportion and causes the bricks to contract and crack, to remedy which sand is added. — The oxid of iron which gives the bricks their colour.

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Glue.

The strongest is made from the skin of the Rhinoceros. It is commonly made from the parings of hides, pelts, hoofs and ears of animals. They are first digested in lime water to clean them; then steeped in clean water, and then boiled in metalick vessels, and skimmed, &c. If glue dissolves in cold water, it is a sign it wants strength.

Plaster of Paris, or Sulphate of Lime.

3 or 4 bushels on an acre appear to increase remarkably its fertility.

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In the first place it no doubt acts by hastening the putrefaction of dead vegetable matter. 2^d. It is probably useful in imparting to the plants oxygen, which it contains in the sulphurick acid which one of its constituent parts. On the same principle a small quantity of sulphurick acid is of remarkable utility to plants, as is also salt petre, and indeed all substances containing oxygen and carbon.

Varnishes.

Resinous substances form the basis of all varnishes. A coat of varnish ought to resist the action of air, & not to change the colours ~~of~~ under it. It should be easily spread over

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surfaces without leaving cavities or pores. It should not crack off. Resins are the only substances possessed of these qualities.

Oil varnish is dissolved in oil: (expressed). — Essential oil varnish is usually dissolved in oil of turpentine. — Spirit varnish in ardent spirit. Spirit varnish is liable to crack, to prevent which a little oil of turpentine is added, which also increases its lustre.* The best kinds are made of the resins called Copal, Sandarach, & Mastich.

The Copal varnish is by far the most valuable, and is thus made.

(Spirit or oil of turpen^e^.

* Gum Copal will not unite well with

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The gum or resin, procured from a tree growing in N. & S. America, is a beautiful transparent gum of a slight brown tinge. When heated it melts, and being kept in that state till a sour, aromatic odour ceases to rise, mix it with an equal quantity of linseed oil which has been deprived of all its colour by exposure to the sun. It then unites with the oil, and forms a varnish which must be dried in the sun.

Ink Powder

The basis of common writing ink is the dark blue or black precipitate produced when vegetable astringents particularly gall nuts, is added to a solution of iron.

Good writing ink should possess the following properties.

1. A proper consistence to allow it to flow freely from the pen.

2. A deep uniform black color.

3. Durability so as the writing may not fade nor become illegible by age.

4. To dry speedily on paper.

5. It should not soften the pen, nor corrode the paper.

The best ink powder is made thus. Take 3 oz. of the best Aleppo galls, finely powdered. 1 oz of sulphate of iron, 1 oz. of logwood, finely powdered or rasped. 1 oz. of gum Arabic; 8 or 10 cloves, bruised, and

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$\frac{1}{4}$ oz. of sulphate of copper, and mix them all together. The whole will make a quart of ink, which should be made of equal parts of good vinegar and soft water, in a glass bottle, to which a lump of loaf sugar should be added. Let the bottle be kept near the fire for about 10 days, frequently shaking it.

If the ink be wanted in a very short time the galls and logwood may be boiled for $\frac{1}{2}$ an hour, in water and the decoction strained off while hot, and the vinegar and other ingredients and the whole shaken together in the bottle

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Experiments.

1. A lighted taper will not burn in carbonic acid gas.

Take 3 glass jars of equal heights; the 1st containing atmospheric, the 2d carbonic, and the 3rd oxygen gas. Plunge successively a lighted taper first, into the atmospheric air, when it will burn as usual; then into the carbonic, when it will be extinguished; & then into the oxygen, when the wick, being yet on fire, will light into a blaze.

2.

To make Carbonick acid Gas. —

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Put any quantity of marble or chalk broken into small pieces into a bottle and pour on it muriatic acid di- luted with about 3 times its bulk of water. A violent effervescence in- sues & the carbonic acid gas may be collected over water in the usual way.

Rationale. Chalk, &c. consists of carbonic acid & lime. The muriatic acid having a stronger affinity for lime than carbonic acid, seizes the lime & the carbonic acid is disen- gaged in the form of gas.

3.

To make Oxygen Gas.

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The easiest method, perhaps, is to put some powdered black manganese into a glass retort or bottle and pour upon it so much sulphuric acid as to form it into paste; then apply the heat of a lamp, and oxygen gas will be disengaged in abundance.

Rationale. — The sulphuric acid combines with the manganese and becomes solid, and the caloric which retained the sulphuric acid in a state of fluid combines with the oxygen of the manganese & escapes in the form of Gas.

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4.

Gas Lights.

In miniature, put common coal into the bowl of a pipe; cover it closely with clay paste made with water. When the clay is dry put the bowl of the pipe into the fire and heat it gradually. In a few minutes a steam of carburetted hydrogen gas* will issue from the end of the pipe accompanied with an aqueous fluid and tenacious oil or tar. The gas may be set on fire with a candle, which will burn with a bright flame as long as any gas is emitted.

Rationale. The result is the analysis of coal effected by heat. The coal contains some water; this some hydrogen: & this with oxygen burns.

* Coal gas.

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Hydrogen Gas.

Iron or granulated zinc. & Sulphuric or muriatic acid.

Rationale. — The gas is produced by the decomposition of water.

The metal has a greater attraction for oxygen than the gas; the oxygen therefore unites with it and forms an oxid of that metal, which is instantly attacked and dissolved by the acid; the other constituent part of the water is hydrogen, & is set free by which by uniting with caloric, forms the gas. The oxygen is therefore the bond of union between the metal and the acid:

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6.

Fill a bason with soap suds, & a bladder with a mixture of hydrogen & atmospheric air. With a pipe blow up bubbles over a considerable part of the suds; then if a lighted match be presented the whole will explode with a loud report.

7.

To make Detonating bubbles

Fill a bladder with 2 pts. hyd. & 1 pt. oxygen gas. Bubbles of this mixture will ascend, and if while ascending, a lighted candle is presented they will detonate with a loud report.

8.

Put a piece of phosphuret of

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[illegible] the biggest is a piece into a wine glass ½ filled with [illegible] will fall to pieces [illegible] bubbles of gas will [illegible] and take fire with a snapping noise [illegible]

Reasons. The oxygen [illegible] [illegible] [illegible] [illegible] contained [illegible] [illegible] sets fire to the [illegible] gas [illegible] [illegible] in [illegible] air.

To break glass [illegible] any [illegible] a piece [illegible] [illegible] spirits of turpentine [illegible] on the glass set it [illegible] [illegible] glass [illegible] [illegible] water.