# Alchemist symbols

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The symbols used by alchemists served as *aide memoir* for the researchers themself and for communication, even across language barriers. At the same time, however, their meaning was hidden except to a small group of specially trained practitioners. A list of alchemist symbols can be found on [1] and even more extensive ones in [2–4]. A few are standardised in unicode as miscellaneous symbols ("2600 – "26FF (astrology) and "1F700 – "1F77F (alchemy)) [5]. A list of synonyms for old chemical names in several languages can be found in [6], a dictionary of alchemical terms in [7].

The biggest difficulty understanding alchemist manuscripts is the inconsistent chemical nomenclature: the same name and symbol was used for different things (homonyms, for example, magnesia usually means MgO, but could also mean metallic bismuth), and many different trivial names and symbols existed for the same chemical (synonyms). I am sure, this resulted in the occasional lab explosion... In addition, orthography was, uhm, creative before it became standardised in the 19th century (in Germany with [8]).

Hermetic symbols are often derived from a few basic archetypes that were combined (see fig. 1). Gettings [3, pp. 324–410] tries to systematise the symbols by first counting the number of strokes (1–5) and then subdivide each of these groups on geometric grounds. However, what constitutes one or several strokes seems somewhat arbitrary. Also, for more than 3 strokes, the number of possible subdivisions explodes.

For this collection, I have left out symbols closely related to those included, for example, by addition or removal of serifs or by rotation. Of course, this choice is somewhat arbitrary.



Figure 1: Archetypes for hermetic symbols.

## 1 Astrology and astronomy

#### 1.1 Zodiac signs

Western zodiac signs originate from the Babylonians ("Chaldea" in Greek terms, in today's form  $\approx 400$  BC) and also have hellenistic influences. The constellations are located near the solar ekliptic (from Gr. ἐκλειπτική τροχιά ekleiptikē trochiá), the path that the sun apparently moves on during the year. Each of the signs occupies 30° of celestial longitude, due to the earth's orbital eccentricity corresponding to 20.4 d for Capricorn to 31.4 d for cancer.

Character	Name	Description
↑\$ <b>&amp;~</b> \%\\	Aries (Ram)	from the first day of spring (vernal equinox) 21.03. to 20.04.
<b>8</b> 2×4×5 84 847	Taurus	20.04. – 21.05.
I Y#\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\		21.05. – 21.06.
2 H Z X X X T Z Z H H  2 H Z X X X T Z H H	•	

Character	Name	Description
ω×40≈±84°, 2.0°€	Cancer	21.06. – 23.07.
01 71927270C 20 96 110 10 10 10 10 10 10 10 10 10 10 10 10	Leo	23.07. – 23.08.
$\mathcal{N}_{\mathfrak{D}}$	Virgo	23.08. – 23.09.
➡UI回뜫늗፠ţ+단단∰M	Libra	23.09. – 23.10.
Wom Tomman William Min	Scorpio	23.10. – 22.11.
3~~~ スペ/←⇔™************************************	Sagittarius	23.11. – 22.12.
<b>★</b> ‡ <b>‡ ‡</b>	Y	
		continued on next page

Character	Name	Description
りなり、まっらおしゃか そうしょとをよりない。 これもなるできる。	Capricorn	22.12. – 20.01.
₤ J�� <b>\</b> �� <b>\</b> ��		
≈3 <sup>6</sup>	Aquarius	20.01. – 19.02.
$\mathcal{L}$	Pisces	19.02. – 21.03.
V € € % H € ;;;;		
7	Ophiuchus	Serpent-bearer, 30.11. – 17.12.
000	Orion	

## 1.2 Solar system

#### 1.2.1 Planets

Since planets correspond to metals (Mercury – Mercury, Venus – Copper, Mars – Iron *etc.*), the symbols for the planet may be used for the metal and *vice versa*.

Character	Name	Description
Ŏ		
+	Mercury	
¥	Venus	
	venus	

Character	Name	Description
⊕℧	Earth	
Omx M 的 × 4 200 と A F Ø # 第 \$ \$ 7	Ĵ⊖ → Mars	
ロ サッチをガッリザ?	446 Jupiter	
\$\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	14 李 李	
古界5年3年2日2 キャグ	L/B	
50hb@4130		
xth&5#11-	₩ <b>Ģ</b> H	
N#NP9H#5. ↓♂今♥~+2Ncs	t. Do	
		continued on next page

Character	Name	Description
₩ <b>₽</b>	Uranus (Herschel) Neptun	
<u>*P</u>	Pluto	

#### 1.2.2 Asteroids

Character	Name Description	
<b>2</b> ⊊⊕	(1) Ceres	
\$ <b>9</b> \$	(2) Pallas	
<b>*</b> ♀ ♀ · · · · · · · · · · · · · · · · ·	(3) Juno (4) Vesta	
<b>♣</b> <b>₽</b>	(5) Astraea	
9	(6) Hebe (1862) Apollo	

Character	Name	Description
$\Box$	(1866) Sisyphus	
• •	(1000) Sisyphus	
6	(2060) Chiron	
Я	(2062) Aten	
	(2100) Ra-Shalom	
4	(2101) Adonis	
¥	(2340) Hathor	
$\Diamond$	(3753) Cruinthne	
<del>,</del>		
	(4179) Toutatis	
¥		
Ψ	(69230) Hermes	
<b>*</b> ઐ	(99942) Apophis	near-earth passage 2029-04-13
	(367943) Duende	near-earth passage 2013-02-15

### 1.2.3 Planetoids of the Kuiper belt

The most well-known object of this class is Pluto, which is officially no longer a planet.

Character	Name	Description
<b>*</b> \$ ***	(136199) Eris (225088) Gonggong (136108) Haumea	5

Character	Name	Description	
<u> </u>	(136472) Makemake		
@ <i>*</i>	(90482) Orcus		
$\Diamond$	(50000) Quaoar		
<u>at</u>	(90377) Sedna		

## 1.3 Important stars

Character	Name Description
% % <b>%</b> T*	Aldebaran alpha coronae borealis, Alphecca
<b>% %</b>	Alpha aurigae, Amalth <mark>ea, H</mark> ircus, C <mark>ap</mark> ella,
<b>ይ                                   </b>	Alayoch alpha Bootis, Arct <mark>ur</mark> us, A <mark>l</mark> chameth β Persei, caput <mark>alg</mark> ol
<b>&gt; &gt; &gt;</b>	Canis major, Sirius  Canis minor, Procyon
<b>⊁</b> ⊒	Cauda Capric <mark>or</mark> ni, δ Capricorni, Deneb Al- ge <mark>di</mark>
-• o o o co	Cauda leonis, finis Leonis et principis Vir-
	ginia, β leonis, ذنب الاسد šanab al-asad (lion's tail), Denebola

Character	Name	Description
OO 0000 000 Ms	Cauda scorpionis, finis Scorpionis et caput Sagittarii, ك Scorpii, الشو لاء al-šawlā, Shaula	
<b>₩</b> ₩ >>>	lpha Ursae Minoris, Stella Polaris, Cynosura	Pole star
<i>™</i> 📶 🛍	Cor Leonis, $\alpha$ Leonis, 'the little king'	
ᡨᢆᢪᢪᢪ ᡨᡥᢪᢪ	Cor Scorpionis, $\alpha$ Scorpii, Antares	
日の平台	Regulus	brightest star system (apparent magnitude of +1.35) in the constellation Leo
99 _		$(\alpha \text{ Leonis}).$
<b>}</b> •	δ corvi, Ala corvi, Algorab	double star
<sup>െ</sup> പ്പ് ഷവ	Pleiades	
<del>} {</del> •	Spica (α virginis)	

#### 1.4 Other

According to [9], the angle between two objects as seen by an observer on earth are described by the following terms (see also fig. 2):

Conjunction of angle of  $\frac{0}{12}360^{\circ} = 0^{\circ}$ . Objects appear close together on the celestial sphere (within  $\pm 10^{\circ}$ ). The minimal distance is called *appulse*. With respect to the sun, an object – as seen from earth – can be in

superior conjunction it appears to be behind the sun

inferior conjunction it appears to be in front of the sun

At new moon, the moon is in inferior conjunction with the sun. There are special sigils for planetary conjunctions:

Jupiter and Saturn  $\stackrel{2}{\rightarrow}$   $\stackrel{1}{\rightarrow}$  is called *great conjunction*, the one in 7 BC may be the *Star of Bethlehem* (Mt. 2<sub>2</sub>).

Saturn and Mars + 1

Jupiter, Saturn and Mars \*\* 本

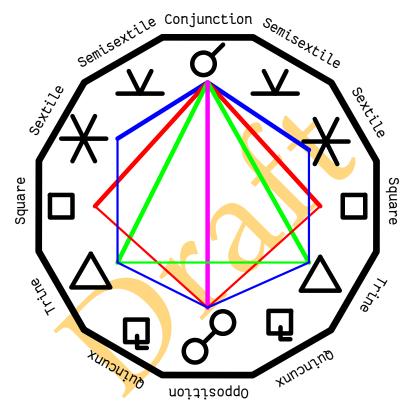


Figure 2: Ptolemaic aspects. For details see text.

Semisextile  $\leq$  SX  $\leq$  angle of  $\frac{1}{12}360^{\circ} = 30^{\circ}$ 

Sextile  $\times$  angle of  $\frac{2}{12}360^{\circ} = 60^{\circ}$ 

**Semisquare**  $\square$  angle of  $1/2\frac{3}{12}360^{\circ} = 45^{\circ}$ , tetragonum

Square  $\square$  angle of  $\frac{3}{12}360^\circ = 90^\circ$ 

Trine  $\triangle$  angle of  $\frac{4}{12}360^{\circ} = 120^{\circ}$ 

Quincunx  $\propto$  QX  $\approx$  angle of  $\frac{5}{12}360^{\circ} = 150^{\circ}$ 

**Opposition** of angle of  $\frac{6}{12}360^{\circ} = 180^{\circ}$  earth is exactly between the objects.

**Eclipse** one object moves into the shadow of another during an opposition (*e.g.*, the moon into the shadow of the earth during a lunar eclipse).

Transit an apparently smaller object moves in front of a larger during conjunction. For example, Venus or Mercury may pass in front of the sun as black spots.

Occultation during conjunction, an apparently larger object moves in front of a smaller and hides it. For example, in a solar eclipse the moon passes between earth and sun, hiding it. The moon is much smaller than the sun, but also much closer to earth, so that both appear to have about the same diameter. Occultation of planets by the moon also occur relatively frequently.

Aspects introduced by other authors include

**Decile,** angle of  $\frac{1}{10}360^{\circ} = 36^{\circ} \perp$ 

Octile angle of  $\frac{1}{8}360^{\circ} = 45^{\circ}$ 

**Septile** angle of 
$$\frac{1}{7}360^{\circ} = 45^{\circ}25'0''$$

Quintile angle of 
$$\frac{1}{5}360^{\circ} = 72^{\circ}$$

Bisquintile, sesquiquintile angle of 
$$\frac{3}{10}360^{\circ} = 72^{\circ} + 36^{\circ} = 108^{\circ}$$
 bQ  $\pm$ 

Trioctile, sesquiquadrate angle of 
$$\frac{3}{8}360^{\circ} = 90^{\circ} + 45^{\circ} = 135^{\circ}$$

Bisquintile angle of 
$$\frac{2}{5}360^{\circ} = 144^{\circ} \, bQ \pm 144^{\circ} \, bQ$$

A horoskop (from Gr. ιρα σκοπεῖν hōra skopéin = marker of the hour [of birth]) or natal chart was based on the theory that the movement of heavenly objects was causally linked to the events on earth ("like above, so below"). For this purpose were determined the

- prima domus (first house, ascendant), intersection of ekliptic and horizon, east angle
- medium coeli (midheaven, 10th house), intersection of meridian and ekliptic, north angle
- Descendant, setting sign, west angle
- imum coeli (opposite of medium coeli), south angle

as function of time and place of birth, using the geocentric perspective. Together, these form a cross.

If the plane defined by the orbit of a celestial body has an angle (inclination)  $\neq 0$  to a reference plane, then the orbit intersects the reference plane in two points. The one crossed by the north-moving body is called the ascending node (Latin caput draconis = dragon's head or Greek αναβιβάζων anabibazōn). The node of the south-moving body is called descending node (cauda draconis = dragon's tail or καταβιβάζων katabibazōn). In astrology, these terms refer to the crossings of the orbit of the moon with the apparent orbit of the sun across the sky.

The orbit of a celestial body around another is an ellipse and as such has two focal points. One is occupied by the heavier (resting) body, the second is called the *lilith*. It is empty and of no significance in astronomy. In astrology, however, the second focal point of the moon's orbit around earth is called *black moon lilith*.

In extensive scientific studies, if proper blinding is used, there is no significant (beyond what is expected randomly) connection between a horoskop and the character or biography of a person [10–12]. In particular, statements about personality are so vague and general that most people will believe they were tailored to them [13] (Barnum-effect, named after showman Phineas Taylor Barnum, 1810–1891).

Character	Name	Description
ቖ፞፞፞፞፞ቔ፞፞፞ቔ፞፞፞ቔ፞፞፞፞	<pre>prima domus = first house, ascendant</pre>	the zodiacal sign and degree that is ascending on the eastern horizon at the specific time and location
$\overset{\triangle}{\nabla} \Leftrightarrow \overset{\triangle}{\nabla} \overset{\triangle}{\nabla} \Leftrightarrow \overset{\triangle}{\nabla} \Leftrightarrow \overset{\triangle}{\nabla} \overset{\triangle}{\nabla} \Leftrightarrow \overset{\triangle}$	Ascending node  Descendant, setting sign, west angle of a horoscope	
$\begin{array}{c} \mathbb{C} & $	Descending Node Comet Fixed star	
<b>4</b> ⊕∅	Horoskope black moon lilith	second focal point of eliptical moon orbit around earth
	First quarter moon, waxing moon  Last quarter moon, wanning moon	

Character	Name	Description
<b>→</b> \$\$\\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\	Moon	
ਜ਼ਰੀ (π -( ∞ ∧	Fool hook Cardinality	last full moon before birth
<del>4</del>	Cardinal cross	four planets with square (90°) aspect
$\otimes \otimes \oplus \oplus \oplus \bigstar \boxtimes \boxtimes \mathcal{H} + \bowtie$	Lot of fortune	or lucky point (Lat. <i>Pars Fortunae</i> ), hypothetical point occupied by the Moon when the Sun is on the ascendant. If other bodies than the sun are meant, their sign is
<b>学</b> 540 540 早 <i>录</i>	Lunar eclipse Eclipse of the sun	placed next to the pars sign.
	Medium coeli, midheaven  rising setting	culminating degree of ecliptic in a horoscope
	Sun	also gold

Character Na	ame	Description
	anspluto	

## 2 Compounds

In general, *crocus of* or *saffron of* means a yellow compound, *magistery of* a compound purified by precipitation, *magistry of* a compound synthesised from the element and hence without impurities. *Flores* or *flower of* means substances purified by sublimation. *Mercury of* refers to philosophical mercury and can mean anything. *Spritus* refers to volatile compounds, *dead* substances are those where the spiritus (life) has been removed by heating. *Hepar* = liver are brownish substances, often containing sulphur. *Calx* = ashes are substances that have been heated until they glowed. A regulus is a metal drop after smelting.

Vitriol are sulphates, often named by their colour: green – iron, blue – copper, white – zinc, red – cobalt. Also named by their origin: roman – iron, cyprian – copper. Hungarian vitriol was originally copper sulphate, but as the copper in the mines was depleted in the 18th century, it contained more and more iron.

Character	Name	Description
<u></u> Å	Acid	
×¶⊕п⊅фЯ⊖Тп <del>∞</del> #	æs viride, flores virides æris, æris crystalli ærugo, Spanish green, crystallised verdi- gris, Hoganit	Copper(II) acetate
ᢕ᠋ᠰᠷᡗ᠐ᡧ᠌ᢦᢛᡏ ᡈᠯ᠇ᢣ᠐᠐ᢅᢞ		Double salt of a Metal(I) and a Metal(III) sulphate, usually $KAl(SO_4)_2 \times 12H_2O$

Character	Name	Description
ዏ₼≠∰ሤ⋉ቈ⋂ዏዏጜ —	Alumen calcinatum, alumen ustum, burned alum	anhydride of alum
ợfi⋇≠⊕⋰⋄⋄७輩 ◑Đㅂఆ⋇₽	Alumen plumeum, feather alum, halotrichite	$Fe^{2+}Al_2^{3+}(SO_4)_4 \times 22H_2O$
Ŏ	Alumen saccharinum	$KAl(SO_4)_2 \times 12H_2O$ crystallised from rose water and egg white, gives particular large crystals that look like rock sugar and were used for cosmetic purposes
⊕^ <b>●</b>	Ammonia	NH <sub>3</sub>
\$\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	Antimony	referred to the ore antimony sulphide (stibnite, black eagle, grey woolf), the metal was called "regulus of antimony"
	Antimony oxyde	Sb <sub>2</sub> O <sub>3</sub> , Senarmontit (cubic) and Valentinit (orthorhombic)
<b>నీర్</b> దార <b>్</b> శ	Antimonii flores, sublimate of antimony	Senarmontite Sb <sub>4</sub> O <sub>6</sub>
<b>*</b> * <b>₽</b>	<b>y</b>	• •
	Vitrum antimonii, glass of antimony	mixture of antimony oxyde and -sulphide vitrified in a clay pot (source of silicate!), stirred with an iron rod to get a reddish colour. Symbolises the conversion of the mercurial to the sulphuric.
		continued on next page

Character	Name	Description
#♥+00+A++\$=***	Aqua forte, spiritus nitri	Nitric acid HNO <sub>3</sub>
	Aqua gradaria	solvent that removes base metals from the surface of precious metal alloys. Various mixtures of nitric acid, hydrochloric acid and potassium dichromate, depending on the metal to be tested.
	Aqua regia, aqua regis, aqua caesaris	1 part nitric, 3 parts hydrochloric acid, gives NOCl that can attack gold and platinum group metals
<b>ં</b>	Acidum arsenici, Arsen <mark>ic acid</mark>	$AsO(OH)_3$
<b>∞</b> ◆	Arsenicum sulphurum, arsenic sulphate	$As_2(SO_4)_3$
	Gr. ἀρσενικόν arsenikón Auripigmentum, arsenicum flavum, arsenicum citrinum	Orpiment, royal yellow As <sub>2</sub> S <sub>3</sub>
$\odot$	Aurum fulminans	explosive gold hydrazide $Au^{3+} + 2NH_3 \rightarrow Au^{(1)}NH-NH_2 + 3H^+$ formed when the aqua regia is produced with salmiak instead of hydrochloric acid. Used as red pigment for porcelain and enamel.

Character	Name	Description
± <del>2</del> ↔ × <b>8</b> Ø	Aurum musivum, aurum pictorium, mosaic gold	tin(IV) sulphide SnS <sub>2</sub> produced by heating tin amalgame, sulphur and salmiak together
B	Lat. flores Benzoini, flowers of benjamine	Benzoic acid (C <sub>6</sub> H <sub>5</sub> -COOH)
立 <b>並</b>	Blend, false galena	sphalerite (from Gr. σφαλερός sphaleros = treacherous), (Zn, Fe)S
╸╬╨╬╩┇╬╬╬ ╬╨╬┇╬ ┸┈┈╬╨┇┇╚	Sal albus, borax	sodium tetraborate $Na_2B_4O_7 \times 10H_2O$
<b>፟</b> ‱ ዛልχ	Calcinated copper	Copper(II) oxyde
	Gr. καφουρά kaphurá, Lat. <i>Camphora</i> , (+)-Camphor	crystalline substance obtained from the wood of the camphor tree ( <i>Cinnamomum camphora</i> (L.) J.Presl 1825, Lauraceae) by steam distillation. Medically used against coughing.
Å⊬	Acidum æreum	carbonic acid H <sub>2</sub> CO <sub>3</sub>
33÷\$\\\$\\\$\\\$\\\$\\\$\\\$\\\$\\\$\\\$\\\$\\\$\\\$\\	Cinnabar, vermillion	mercury(II) sulphide HgS

Character	Name	Description
<b>♣ ♦</b>	Cinnabar of antimony	produced by heating of stibnite (antimony trisulfide) with corrosive sublimate (mer curic chloride) in a retort. This would produce butter of antimony (antimony tri chloride) first, then a red sublimate that is actually cinnabar (HgS).
⊕A €	red vitriol	cobalt(II) sulphate $CoSO_4 \times 7H_2O$ , intermediate of Co-extraction from ore, also used for blue colour of glass and por celain. Naturally as biebierite (hep tahydrate), moorhouseite (hexahydrate) aplowite (tetrahydrate) and cobaltkieser ite (monohydrate).
<b>kk</b> ∺ ∵ 4	crocus	bright yellow compounds. For the botan ical meaning look for "saffron" in the plants section
•	Crocus antimonii, antimony orange, golden sulfur of antimony	non-stoichiometric antimontrisulfid (ap proximate formula $2Sb_2S_3 \times Sb_2O_3$ ), used as orange pigment in textile printing and as photoconductor in vidicon cam eras. Prepared by reacting antimony tri chloride ( $SbCl_3$ ) with sodium thiosulfate ( $Na_2S_2O_3$ ).

Character	Name	Description
	Crocus martis, mars saffron, ferrum oxy- datum fuscum, magisterium vitrioli martis	Rust, $Fe_2O_3 \times H_2O$
	= Crocus of iron	
<b>\$</b>	Crocus metallorum, stibium oxidatum fus-	potassium thioantimonite
0 4	cum	$Sb_2O_3 \times 2KSbO_2 \times KSbS_2$
80€→¥96 <b>₽</b> \$≈₩₽	Crocus veneris, æs ustum, calx veneris cro-	yellow copper oxyde Cu <sub>2</sub> O (æs used here
₹₩¥₽₹₽₩₽₽ ₩₩¥₽₩₽₽₽	cus of copper, burned copper	as "copper" rather than "brass"). Sometimes also Cu <sub>2</sub> S.
٩٧٣٤ هه ١٤٤٤ <b>٥</b>		times also Cu <sub>2</sub> 3.
	Crocus solis, gold meta hydroxyde, auryl(III) hydroxyde	gold hydroxyde oxyde Au <sup>III</sup> O(OH) obtained by drying Au(OH) <sub>3</sub> over phosphor-
<b>~ ^</b>		ous pentoxyde.
$\mathfrak{I}$	Crystalli lunae, argentum nitricum, magis-	silver nitrate AgNO <sub>3</sub>
·	terium argenti, magisterium hydragogum, lapis infernalis, lunar caustic	
<b>大</b>		
$\Upsilon\Upsilon$	Copper antimonate	CuSb <sub>2</sub> O <sub>6</sub>
<b>ੰ</b>	Cuprum arsenicatum, Swedish green, Scheele's green	mixture of copper arsenites of approximate composition $CuHAsO_3$
		continued on next need

Character	Name	Description
$\bigoplus \bigoplus$	Chalcanthum; blue, hungarian (or cyprian) vitriol	copper(II) sulphate $CuSO_4 \times 5H_2O$
<b>②</b>	Calcinated vitriol	The first two mol of crystal water leave $CuSO_4 \times 5H_2O$ at 30 °C, two at 110 °C, the last at 250 °C, leaving the white anhydride $CuSO_4$
<b>₹</b> E	Tartarus stibiatus, tartarus emeticus, emetic tartar	obtained by boiling solutions of cream of tartar (potassium bitartrate KOOC-CHOH-CHOH-COOH) with antimony(III) oxyde (Sb <sub>2</sub> O <sub>3</sub> ) to get potassium antimonyl tartrate $K_2Sb_2(C_4H_2O_6)_2 \times 3H_2O$ . First synthesised by Paracelsus. Was used as emetic, to treat schistosomiasis and leishmaniasis and as aversive therapy against alcoholism. No longer in use because of severe side effects.
		continued on next page

Character	Name	Description
Æ	Emetic wine	wine stored in antimony cups until it contained small concentrations of emetic tartar.
₹\$	Spiritus vini, Aqua vitae	Ethanol
<b>₹ \$</b> \$	rectified ethanol	spiritus vini vulgaris (brandy) is distilled once, spiritus vini rectificati twice. By repeated distillation, a concentration of 94 % (188 proof) can be reached
<b>8 ♦</b>	Vinum sublimatum	absolute ethanol
P P P B	Ferrohydrosulphate  Ferrum sulphuratum Acidum formicarum  Gr. γύψος gypsos = Lat. gypsum, plaster of Paris	iron(II) sulphide FeS, synthetic formic acid HCOOH $ \text{CaSO}_4 \times 2\text{H}_2\text{O}, \text{ calcination at moderate temperatures leads to the hemihydrate (bassanite)} \times \frac{1}{2}\text{H}_2\text{O}  which sets within minutes after addition of water. If calcination is done under high humidity, the $\alpha$-hydrate is formed, which sets slowly but becomes harder. Under dry conditions, the $\beta$-hydrate is formed, which sets fast but results in a weaker cast. Calcination at high temperatures (> 300 °C) leads to the anhydride, which rebinds water only slowly (over days).$

<u></u>	
O Hepar antimonii	sulphantimonites Me <sub>3</sub> +SbS <sub>3</sub> obtained by fusing together antimony sulphide with alkaline sulphides, occur naturally as pearceite in Colorado
Canton's phosp	epar sulphuris calcareum, CaS by calcination of burned lime (from oyster shells) and sulphur, shows phose phorescence.
Hepar magnesiae	MgS
Hepar magnesiae  Hepar terraepone solaris  Acidum fluoris m  ★ ***  Acidum salis, mu	d, Litherophosphorus, lapis  BaS obtained by calcination of BaSO <sub>4</sub> shows phosphorescence. hydrofluoric acid HF
<b>▼</b>	
⊕⊕° / ⊕ \	num, sal (vitrioli) martis, Iron(II) sulphate $FeSO_4 \times 7H_2O$ en vitriol, copperas
iron vitriol, gree によってイムなされる。 Calx saturni, sal calcinated lead,	saturni, saccharum saturni, lead foil kept in a warm place in a lead salt sealed vessel over distilled vinegar It slowly turns into lead acetate Pb(CH <sub>3</sub> COO) <sub>2</sub> × 3H <sub>2</sub> O. Because of its sweet taste this compound was used to adulterate wine (lead sugar). L. VAN BEETHOVEN'S death is thought to have resulted from lead poisoning by this route!

Character	Name	Description
9	Liquor of calcinated lead	solution of lead acetate
# <u></u>	Anglesite	lead(II) sulphate PbSO <sub>4</sub>
ZQ⊕G∓CGE♦₩ FF	Lime	CaCO <sub>3</sub>
	Lime of gold	gold hydroxyde Au(OH) <sub>3</sub>
Q 2 = M 3(7(	from Gr. λιθάργυρος lithargyros = silver stone, Lat. spuma argentis, litharge	red lead(II) oxyde PbO with tetragonal structure. The yellow, orthorhombic dimorph is called massicot. Waste product of cupellation, also used as pigment
+ P <b>= 29 </b>	Litharge of gold	lead(II) oxyde produced during cupellation of gold and thought to have different properties from the same compounds produced by other routes
<b>९</b> † 71 ₹	Litharge of silver	Lead(II) oxyde produced during cupellation of silver
* 4 &	Lix calcis plena, aqua calcaria, lye of lime	solution of $Ca(OH)_2$ or $Ca(HCO_3)_2$ ?
4~	Lixivium, lye	NaOH or KOH obtained by treating the carbonate with burned lime
O-QYOM¥¾,bB	Magnesia	traditional basic magnesium carbonate (magnesia alba) $4MgCO_3 \times Mg(OH)_2 \times 5H_2O$ , in modern use magnesium oxyde (magnesia usta) MgO. As component of the philosopher's stone, "magnesia" may refer to anything.

Character	Name	Description
<ul><li>Φ</li></ul>	Manganese	actually the oxyde (brownstone, MnO <sub>2</sub> ). The element was called "regulus of manganese"
マスるペッエや… ¥ 55 ★日文☆☆ 〒★ ☆ 竹	Mercurius saturni præcipitatus, crocus saturni, red lead, minium, mercury of lead	lead orthoplumbate [Pb <sup>2+</sup> ] <sub>2</sub> [PbO <sub>4</sub> ] <sup>-4</sup>
$\checkmark$	Natron	sodium hydrogen carbonate NaHCO <sub>3</sub>
₩	Nitrogen dioxyde	NO <sub>2</sub> , brown gas from decomposition of HNO <sub>3</sub>
+⊗	Acidum sacchari	HOOC-COOH, oxalic acid
<del>1</del> 0	Acidum phosphori	H <sub>3</sub> PO <sub>4</sub> , phosphoric acid
→ H C 早 中 ® で B P P P P P P P P P P P P P P P P P P	Cineres clavellatis, lapis infernalis, sal tartari fixum, calx tartari, lye of ashes, potash	potassium carbonate K <sub>2</sub> CO <sub>3</sub>
CX Y C - Y T = 60 %  X C 7 X X - + R +	Calx viva, quicklime	calcium oxyde CaO

Character	Name	Description
Ŏ~4©~~~~~ ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Gr. σανδαράκη (sandarákē), Lat. arsenicum rubrum, sandarac, red arsenic, ruby	realgar As <sub>4</sub> S <sub>4</sub>
~&&\$\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	of arsenic, ruby of sulphur, red orpiment	anno antono della della NIII Ci
	Sal ammoniaci, salmiak	ammonium chloride NH <sub>4</sub> Cl
	sal nitri, sal nitrum, nitre, saltpetre	KNO <sub>3</sub> (sometimes also wall saltpetre
##\##\#\#\#\#\#\#\#\#\#\#\#\#\#\#\#\#\		Ca(NO <sub>3</sub> ) <sub>2</sub> ). In the very early literature may also refer to potash, as the difference between these compounds was not understood.
	Sal alkalinus from Arabic ال قلية al-qalya =	
(24220E+Cva	potash, Lat. <i>lixivium</i>	a mixture of $K_2CO_3$ and $Na_2CO_3$ from the ashes of marine plants, in particular saltworts (aka glassworts, various genera
45+12 PT		in the family of Amaranthaceae) or seaweeds.
		continued on next page

Character	Name	Description
<b>∌</b> ъ	Flores dianae, flores vitrioli, acidum bora- cieum, sal sedativum HOMBERGI	Boric acid $H_3BO_3$ , first synthesised by W. Homberg 1702
\$\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	Sal communis, salt	Sodium chloride NaCl
★ ( ) ( ( ) ( ( ) ( ( ) ( ( ) <	Sal marinus, sea salt	Aimpura sodium chlorida NaCl
# 6 0	sal urinæ	impure sodium chloride NaCl two varieties: <i>sal urinæ volatile</i> volatile salt from urine (ammonium carbonate (NH <sub>4</sub> ) <sub>2</sub> CO <sub>3</sub> ) obtained from urine by evap-
		oration of water followed by sublimation and <i>sal urinae fixum</i> , non-volatiole salt from urine (mostly urea (NH <sub>2</sub> ) <sub>2</sub> CO), extracted with water from the <i>caput mortuum</i> of <i>sal urinae volatile</i> sublimation
		continued on next page

Character	Name	Description
		Sodium chloride NaCl
	Salt of antimony salt of hartshorn	Antimony sulphate $Sb_2(SO_4)_3$ Ammonium carbonate $(NH_4)_2CO_3$ (see also <i>sal volatile</i> ) The aqueous solution is called <i>spiritus cornu cervi</i> = spirit of hartshorn
2m 1k ≈ @ Ø 1v # NNN	Natrum carbonicum, natrum præparatum, crystalli sodæ, sal sodæ, sal alkali minerale, soda	sodium carbonate $Na_2CO_3$ . Historically mined in the soda lakes in Egypt and used for mummification and glass making. Also used to name other sodium salts, <i>i.e.</i> , soda of $\langle$ acid $\rangle$
♥	Salt water	. ,
	Soap	sodium salt of mixed fatty acids
♦ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	Mercurius sublimatus corrosivus, sublimate of mercury	mercury(II) chloride HgCl <sub>2</sub>

Character	Name	Description
	<i>Mercurius sublimatus dulcis</i> , calomel, mild mercury	mercury(I) chloride Hg <sub>2</sub> Cl <sub>2</sub>
	Mercurius solubilis Hahnemanni	$mercury(I)$ oxyde $Hg_2O$
<b>艾桑桑</b>	Mercurius præcipitatus ruber, mercurius sublimatus rubeus non corrosivas, mercurius calcinatus	mercury(II) oxyde HgO
*	Precipitatus albus, fusible white precipitate	mercurammonium chloride NH <sub>2</sub> HgCl
0	Sublimate of antimony	senarmontite Sb <sub>4</sub> O <sub>6</sub>
<b>8 ★</b>	Sublimate of salt of antimony	an antimony oxyde from decomposition of the sulphate?
φ	Sublimate of copper	Copper(I) chloride CuCl
#	Spirit of amber	Succinic (butanedioic) acid $HOOC - CH_2 - CH_2 - COOH$
<del>ss</del> 66 ∞ ∑	sugar	
早 <b>35川</b> ¥¼4/※10年 ごこれルンで3504円 女台36車∞9	Sal tartari, tartar, winestone	potassium hydrogen tartrate, after purification: <i>cremor tartaris</i> = cream of tartar.

Character	Name	Description
Ť	crude wine acid	tartaric acid
<b>♥♀⋄♀⋄⋄⋄⋄⋄⋄⋄⋄⋄⋄⋄⋄⋄</b>	from arabic توتيا tutiya: tutty, pomphlix, flower of zinc	ZnO sublimated to cooler parts of the oven during brass smelting
★Xサ#×≈‡+t	Vinegar	acetic acid CH <sub>3</sub> -COOH.
#UX#XHZ\$ <b>L</b> \$	distilled vinegar	about 80 % could be achieved
$\bowtie$	Acetum cydoniorum, quince vinegar	
ı.48	Acetum vini rubri , red wine vinegar	
•	vinegar of antimony	Antimony(III) acetate Sb(CH <sub>3</sub> COO) <sub>3</sub>
	Oleum vitrioli, oil of vitriol, oil of sulphur	sulphuric acid H <sub>2</sub> SO <sub>4</sub>
ΦÇ	froth of nitre, wall salpetre, phosphorous of Baldwin	fine, gosamer-like calcium nitrate crystals formed by efflorescence on walls in contact with animal waste.
未wgopuffmos Ytbpv#	Arsenicum album, white arsenic	arsenic oxide As <sub>2</sub> O <sub>3</sub> , "powder of inheritance"

Character	Name	Description
<b>&gt; 15 も 2</b> た 11	Cerussa, plumbum hydrocarbonicum, flos plumbi, magisterium saturni, white lead, lead flower	basic lead carbonate $Pb(CO_3)_2 \times Pb(OH)_2$
	zinc oxyde <i>Atramentum album,</i> white vitriol	ZnO zinc sulphate ZnSO <sub>4</sub>

### 3 Concepts

Greek cosmology is described in the Τίμαιος (Τίπαιοs) by Πλάτων Ριάτον (ca. 428–348 BC) [14], but goes back to earlier philosophers (Ἐμπεδοκλῆς Empedoklés ca. 490–430 BC, Δημόκριτος Dēmókritos ca. 460–370 BC). Assume a cube of some material, say, iron. This cube could be cut in halves, those halves into halves again, and so on. However, this is not possible ad infinitum, but at some point one would reach a limit, where further division is no longer possible. These smallest possible particles are called atoms (from Greek ἄτομος átomos = undividable). There are 4 kinds of atoms, shaped like those Platonic bodies constructed from triangles: tetrahedron, octahedron, icosahedron and cube. These different atomic shapes correspond to the 4 elements: the atoms of fire are tetrahedrons (prickly), soil cubes (tessellates Euclidean space and causes the solidity of the soil), water icosahedras (flows out of the hands like little balls) and air octahedrons (smooth, can hardly be felt). Each of those elements embodies a particular combination of the primary qualities hot – cold and wet – dry: air is hot and wet, fire hot and dry, soil dry and cold and water wet and cold. Air is gaseous, water liquid and soil solid, fire is consuming. Fire represents the male, water the female principle, air and soil are transition elements.

Each of the basic elements is also associated with one of the 4 bodily fluids that must be in balance to avoid disease, they also correspond to temperaments: blood – air – sanguinic, black gall – soil – melancholic, yellow gall – fire – choleric and slime – water – phlegmatic (humoral pathology, Ἰπποκράτης Hippokrates 460–370 BC, Γαληνός Galenos, 129–199 AD, أبو Abū Alī al-Husain ibn Abd Allāh ibn Sīnā (Avicenna) 980–1037 AD).

The fifth platonic body – dodecaeder – is not composed of triangles, is considered the most noble and represents the cosmos or the spirit.

Alchemy had three goals:

• the preparation of chemicals, often in the context of practical purposes (e.g., metals and dyes). This is now handled

by chemistry.

- the preparation of medicines that can cure diseases. This is now dealt with by pharmacology.
- the transmutation of base metals (like lead) into noble metals like silver and gold (Gr. χρῦσός khrūsós = gold and ποιέω pœia = I make: chrysopoeia = gold making; ἄργὕρος árguros = silver: argyropoeia = silver making). Today we understand that this requires the transformation of elements (nuclei with different number of protons), which is not possible by chemistry. Nuclear physics can do so in particle accelerators by bombarding bismuth with high energy atoms to kick out 4 protons and 6–9 neutrons from the <sup>209</sup><sub>83</sub>Bi-nuclei to produce a variety of <sup>79</sup><sub>79</sub>Au-isotopes, of which only <sup>197</sup><sub>79</sub>Au is not radioactive [15]. Also, the process requires vast amounts of energy (worth about US\$ 5000 per h, for 1 d to produce a few thousand gold atoms) and is thus not cost effective. For true alchemists, however, transmutation was only a symbol for obtaining spiritual enlightenment by liberating ones essence from the worldly personality.

A good impression of alchemist working methods and chemical knowledge of the late 16th century gives [16], which should be read with the explanations in [17]. The alchemical work of the "last of the magicians", Isaac Newton, is discussed in [18]. For an extensive discussion of the laboratories and equipment used in various periods, see [19]. Direct translation of these old recipes into modern terminology, however, may not yield the expected result. The chemicals available to alchemists were often impure, and these impurities often formed a vital ingredient [20]!.

Later authors added the quintessence, an eternal substance that forms the basis of the other elements. Philippus Theophrastus Aureolus Bombast von Hohenheim (Paracelsus) 1493–1541 [21] replaced the 4 elements from antiquity with the *tria prima* (original trias) mercury (volatile), sulfur (burning) and salt (stabilising). He didn't mean the substances we take from the lab shelf, but their "philosophical" equivalent. Key to this was a hypothetical universal solvent, the *liquor alchahest*, which could extract philosophical elements from everyday material, which could then be purified and made available for recombination [22]. Joan Baptista van Helmont (1579—1644) developed this idea further, before it eventually fell into disfavour. How would one contain a solvent that dissolved literally everything? The difference between dissolution and decomposition was shady before modern atomic theory!

Paracelsus based medicine on observation rather than philosophical book wisdom and explored the pharmaceutical use of minerals, complementing the plants suggested by Galenos. He introduced the concept that substances toxic in higher doses may be curative in low (dosis sola facit venenum [23], only the dose makes the poison) and is the father of modern toxicology. In particular, he experimented with mercury against the "French disease" (syphilis), but the results were, at best, variable. It is thus not surprising that Paracelsus died from chronic exposure to mercury vapours as attested by the Hg-concentration in his bones.

Note that philosophical sulphur, salt and mercury have nothing to do with the chemicals we know under those names. For example, according to Frater Albertus Spargyricus (worldly name Albert Richard Riedel, 1911–1984), all three can be isolated from sage leaves ("mountain sage", genus *Salvia* L. (Lamiaceae), unclear exactly which of the 900 species is meant). The leaves are first subjected to steam distillation to get the essential oil (= alchemical sulphur), the leaves are then fermented and the alcohol formed rectified (= alchemical mercury). The reminder is calcinated, extracted with water and crystallised to get potash (= alchemical salt).

Production of the philosopher's stone goes through phases distinguished by their colour: black (*caput corvi* = raven head), iridescent (*cauda pavonis* = peacock tail), white (*albedo*, the product is now able to transmute base metals to silver), yellow (*citrinalis*) and finally scarlet red (rubedo, *sol philosoporum*, phænix). Before use, the phænix should be diluted with thousand-times the amount of gold by melting them together, lest it be too strong.

Character	Name		Description
出日中中国中央工工	Air	X	"Invisible Air which existed before the descent of Lucifer"
<b>ポン</b> ※ ゆ <b>。</b>	Amen		word of power
	Aleph, beginning		
$\forall \oplus \Box$	Black gall		4-fluid theory
<b>△</b> # /	Blood		4-fluid theory
Ω	Death		
$\mathscr{S}$	Dry		
$\Diamond$	Duality		
← ← + # † † E © ©	Elementum = element		all 4 classical elements (Fire, air, soil and water) together

Character	Name	Description
#+ 4 + 4	Essence	
STORMS DIETES	Fire	"heavenly, principal and spiritual" fire, not the burning gases we know
	grade of fire, combined with the sign of the element	
⊹८४६× ८०६× उ५६₩	grade of fire: air  Grade of fire: earth, igne cineris grade of fire: fire, igne aperto	bain arenae
8H ***	Grade of fire: water  Ignis fortis = hot fire  Ignis lentus = dull fire	balneum mariae
∆∧©€⇔△△ <u>~</u> ×∴	Ignis rotae, ignis rotam, ignis circulatorius, ignis reverberius, reverberating fire Heaven	fire from all sides
₹ × ·	Life philosophical lead	
≅8	Luna fixa, fixed silver	metal that has all the properties of gold (density, melting point, chemical resistance), except its colour. Intermediate stage of chrysopoeia.

Name	Description
Materia prima	first, yet unformed principle, source of all matter
Matrimony	the pact between the four elements underlying the phenomena of nature. Alchemists create a different marriage by their art.
Materia, matter	
philosophical mercury	Azoth, mercury from the tria prima sulphur, mercury and salt. Combines the properties "liquid" and "'metal" in ideal
	form.
Monas, Monad	founding principle. The monad is for numbers what the point is in geometry [24]
Gr. Ούροβόρος ourábóros, self-eater	snake of ethernity, circle of the alchemist processes heat, evaporate, cool, condensate. The Miðgarðsormr (Jörmungandr, world serpent) of Germanic cosmology and the Kirtimukha in India may go back to the same very ancient myths.
	Materia prima  Matrimony  Materia, matter  philosophical mercury

Character	Name	Description
$\overline{\ \ }$ .	Philosopher	
	Lapis philosophorum, Philosopher's stone	can cure all diseases of man, give ethernal life and can turn base (sick) metals into gold (healthy metal)
	phlegma	may refer to either one of the humours in the human body, or to sputum. Also used for the aqueous fraction of a distillation.
4	Phlogistone	substance that is lost from all burning matter
<b>♣</b> ▼	Pyrophorus	
\$\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	Quinta essentia, akashya, Quintessence	eternal, massless, immutable substance, ether. Also a pure healing principle obtained by distillation
Q# 2: #Z	Quintessence of wine	wine was considered the best starting material for isolating the quintessence. Distilled spirit was considered able to extract absolute virtues and healing power from, say, plants. In the world of the soul, separation of the good and ungodly was expected to be performed by "god's alembic" on judgement day.
-		continued on next page

Character	Name	Description
$\odot$	Salt	salt from the <i>tria prima</i> sulphur, mercury and salt
$\oplus$	Seed	
$\triangle \triangle \triangle \triangle \triangle \triangle A \otimes \bigoplus \ominus \ominus$	Soil, earth	means the philosophical element, not the
♥₹♥♥♥♥♥♥♥♥♥♥♥♥♥♥♥♥♥♥♥♥♥♥♥♥♥♥₩₽₩₩₽₩₽₩₽₩₽₩	*	planet earth (see table on solar system 1.2.1) nor the soil we dig up in the garden (see dust in table 7.4)
Q ~ <del>+</del> &	Spirit	
⊽⊞ឱ	Water	
*	hot water Aqua tepida, lukewarm water	
<b>NE</b> I	aqua frigida, cold water	
<b>N</b> €	νέφος <i>nephos</i> cloud, fog, condensed va-	
<b>ð</b> ⁵	aqua fontanae, fountain water, spring water	
ñ™₽₹♥Ω‱♥'nυ		
<b>Μ<sup>™</sup>? Φ</b> Ψ Ω <b>55</b> ¥ Ν	Aqua mercurii, aqua foetida	Water from a fountain near the <i>Porta Capena</i> in Rom, used by merchants during the <i>Mercuralia</i> to absolve themself from the false oaths sworn in the year before.
		continued on next need

Character	Name	Description
	Aqua pluvialis, rain water Aqua rorida	used instead of distilled water dew water
<b>W</b>	Sea water	
<i>∝</i> "T"	Oleum talci, oil of talc	intermediate (white) stage of producing the philosophers stone, can transmute base metals to silver
무 ×	Humidity	
¥	Seven metals of alchemy	copper/venus, gold/sun, iron/mars, lead/saturn, mercury, silver/moon, tin/jupiter
\$\frac{1}{4} \dagger \	Sulphur philosophicum, wise man's sulphur	sulphur from the <i>tria prima</i> sulphur, mercury and salt
ア¥	Red sulphur	hypothetical compound that represents the union of the male (philosophical sul- phur) and female (philosophical mercury) principles to reach completeness
	Ye <mark>llow</mark> gall	4-fluid theory

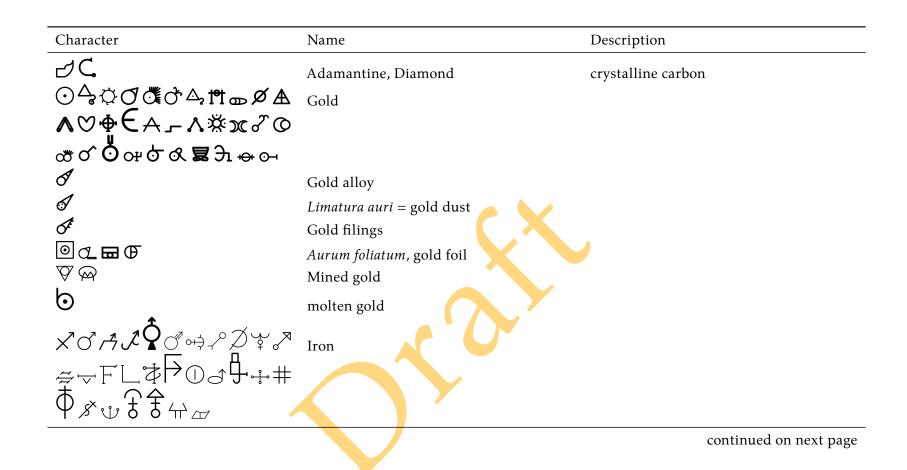
### 4 Elements

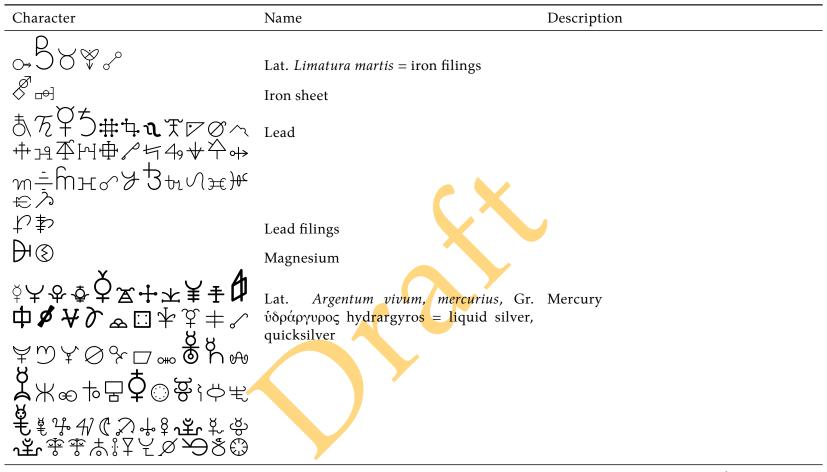
The alchemist's idea about elements (atoms shaped like different Platonic bodies) was very different from ours (different number of protons in the nucleus). In the following, we list elements in our modern understanding. Even then, however, there can be misunderstandings. "Regulus of antimony" is quite clear, a drop of antimony left after purification. However, "regulus of iron" and "regulus of copper" also mean antimony, but made by reducing antimony oxyde with iron or copper,

respectively. It was assumed that they were different because of the different synthetic route. The symbols for iron/Mars and copper/Venus are also used for male and female.

Name	Description
Aluminium	
Regulus antimonii, Regulus of antimony	drop of antimony left after metallurgic purification
Regulus antimonii medicinalis  Arsenic	Especially pure antimony for medical purposes like making emetic wine. May also refer to a red mass obtained by deflag rating finely powdered stibnite and salt peter (also known as antimonium diaphoreticum rubrum, probably a vitrified antimony oxyde stained by traces of iron, see vitrum antimonii in table 2).
Y	
arsenic sublimate	arsenic purified by sublimation (613 °C at 1 bar)
Yellow arsenic	allotrope of arsenic obtained by rapid cooling of arsenic vapours As <sub>4</sub> , soft, waxy tetrahedral. Unstable against light. Also used for arsenious sulphide (As <sub>2</sub> S <sub>3</sub> ).
	Aluminium  Regulus antimonii, Regulus of antimony  Regulus antimonii medicinalis  Arsenic  arsenic sublimate

Character	Name	Description
$\Theta$	Barium	
igorphi	Beryllium	
	Bismuth, plumbum cinereum Cadmium	
$\odot$ $\odot$	Calcium	
	Carbon	
₽ AB <b>A</b>	Cobalt	
≠+ Y O A ~ Q + + P Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q	<b>Э</b> Copper	
ℴℴ℁ℍ <del></del> ⅊ҰՋ▽℧℆ℴℴ	Ob	
∱©∺ℋズ‱႘ၨΩၨ		
$\bigcirc \mathbf{Q}$	copper filings	signs used for both copper in general and
≟	Y	for this specific form of copper
Л	copper leaf	
<i>D</i> ♀	copp <mark>er</mark> plate	
<del>*</del>	Copper <mark>s</mark> plint	continued on next nece





Character	Name	Description
$\oplus$ $\delta$	Niccolum, nickel	derived from the word for devil, as nickel look like copper ores, deceiving miners
lacktriangle	Phlogisticated air, nitrogen	
· •	Oxygen	
	Phosphorus Platinum	
$\Box \Psi \Phi$	Potassium	
<b>₩</b>	Regulus martis	Antimony prepared by reduction with iron
	Silicon	
¥ <b>)</b> ♦ <b>≜</b> ÅDOCÅ®₩	Lat. argentum, co <mark>rp</mark> us alb <mark>u</mark> m, fermentum al-	
	bum, lumen mi <mark>nus</mark> , mater, Diana, uxor odor- iter = silver	
PY B 2 F A OC P A W W W	<b>Y</b>	
<b>Q</b>	Silver filings	
© <b>□</b>	silver leaf	
$\mathfrak{D}$	Silver splint	
	Sodium	

Character	Name	Description
$\bigcirc$	Strontium	
\$\phi \phi \phi \phi \phi \phi \phi \phi	Sulphur	
40××4614++6		
XVD\$P=0		
\$\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	CX	
Ÿ\$m+	Sulphur vivum, sulphur virgineum, natural sulphur	naturally occurring sulphur, considered "alive"
\$\frac{1}{2} \hotage	Sulphur sublimatum, flores sulphuris, Flowers of sulphur	sulphur purified by sublimation as opposed to <i>sulphur vivum</i>
₩	Tellur	
~ # 7 × \$ \$ Ø ~ 4 \$ = 1 ~ A & D D D & A & A & A	Stannum, plumbum stridens, Tin	
\$#BOLF# <b>%</b> %%~u\		
#@XRDS~VT#X %G		
		continued on next page

Character	Name	Description
<b>\Constant</b>	Tin filings	
<b>€</b> ⁄2 ⊕	Tin leaf (staniol), tin sheet Yttrium	
#0Z0+808FV	Zinc Zinc	
<b>③</b>	Zirconium	

# 5 Measures

Units for weights and volumes were variable between countries and even cities within a country. The following may be used as approximate guidelines [25]:

Character	Name	Description
3 3°	Dram Half-Dram	1 dram ≈ 3.6 mL
9 <b>9</b>	Gutta, <mark>drop</mark>	considered 1 grain in weight
₩₩₩⋋ѿ҈Ӂ	<i>libra,</i> pound <i>libra semissis</i> = half a pound	1 pound = 16 ounces = 480 g
℥ <b>ℼℴ</b> ℾ℧℅ℱ	uncia, ounce	1 ounce = 2 Lot = 8 drachma = 30 g

Character	Name	Description
<b>3</b> € <b>3</b>	Half-Ounce	
a663.4	drachma	1 drachma = 3 scruple = 3.75 g
70F 9×67	scrupulus, scruple	1 scruple = 20 grain = 1.25 g
<b>₹5</b> ₹€%	grain	1 grain = 62.5 mg
β√C, P	pugilum, pinch	what can be held between thumb and two fingers, $\approx 1  \mathrm{g}$
თ <b>ā</b> ლ მ¤ 7 m ₭ე ₺, ₺ & ₺ Д	ana, equal parts Grade Part	as in one part of A and two parts of B
9,s	Pint Quantum sat <mark>is,</mark> quant <mark>u</mark> m sufficiens, enough	between $\approx 250  \text{mL}$ and $> 2  \text{L}$ depending on country. In Brittain 1/8 of a gallon.
gv B/C	sufficient  Quantum vis, as much as you wish  half	
м́мМ	manipule	handfull, with the open hand

Character	Name	Description
	<i>poignée</i> fascicule = bundle, armfull	fistfull, with a closed hand what can be carried with both arms
F L L S	Sextarius	Roman measure of volume, $1/48$ of a cubic foot 1 ft $\approx 29.6$ cm $\rightarrow 540.3$ mL
<i>~</i> Q	Spoonful	

## 6 Metals

Note that many alchemists did not strictly differentiate between copper, brass and bronze (similar to the outdated English term 'latten'). Thus, the signs for these, and even the Latin word æs, may simply mean "metal".

Character	Name	Description
<u></u>	Amalgama, amalgame	alloy containing mercury
<b>1</b>	Gr. ὀρείχαλκος oreíchalkos from ὄρος χαλκός όros chalkós = mountain ore, Lat. aurichalcum, pinch beck, Prince Rupert's metal, bath metal, primus metal, princes	brass from 4 parts copper and 1 part zinc, used for coins because of its golden colour
₽‡₹\$⊕\$°₽\$3 ₽~~&~~~	brass Bronze	alloy of copper and zinc

Character	Name	Description
<b>P</b>	bell metal	Simple bell metal is is a bronze of 78 % copper (Discriminating) and 22 % tin (All-Accomplishing), the alloy has low internal damping and sound velocity. Other metals may be added in small amounts: Zinc (mirror-Like), iron (equality), lead, gold and silver (absolute and relative
& x Z	crude metal Electrum	Truth).  naturally occuring alloy of gold and 10– 30% silver plus copper, iron and other
♂ ♀ Э Э	Ferrum auretum  Gilded copper  Gilded silver	components gilded iron
<b>Y</b>	Magnesia of gold  Magnesia of silver  Metal	brittle amalgame formed when gold foil is hung over mercury. silver amalgame
¥Jw¥ ĻD	μόλυβδοχαλκος molybdochalkos	alloy of 10 % copper and 90 % lead already used in ancient Egypt. Used on striking surfaces, where the soft lead acts as grease.

Character	Name	Description
<b>P</b>	auricalcum argentatum	silver-coated brass
25 dp +9 +%	Pars cum parte	alloy of equal parts gold and silver
Audie =	Sheet metal	
	011000 1110001	irrespective of the identity of the metal
	Charyos = steel	
→ O→ O# Q	Steel filings	

# 7 Mixtures

## 7.1 Of animal origin

Character	Name	Description
× 6	Bile Birds egg Blood Bone	fluid produced by the liver of vertebrates
cc { } xa to Y	Cornu cerui stag horn, hartshorn	ideally from male European deer ( <i>Cervus elaphus</i> L., Cervidae), but any deer species will suffice

Character	Name	Description
<b>₹%</b> \%	Cornu cerui ustum, calcinated hartshorn	horn of male deer hung over boiling water until they softened (philosophical calcination).
⊖ &	Conch	
O F J	Coral	from Gr. κοράλλιον korállion
<b>&lt; ⟨⟨│⊕ ८ ⊘ ४ ℤ</b>	Egg shell Egg white, albumen	also Lat. <i>album</i> = white, with the usual connotation of cleanliness and purity.
FYXSXAMABECXX ADD PARAMABECX		
1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Fimus equi = horse dung	used to keep samples warm, also leftover of an experiment
UN R	Milk Pearl Skull	especially human
⊡	Urina, urine	
<u></u>	Lat. Cera = wax	

Character	Name	Description
<del>9 + 3</del>	Wool	

### 7.2 Of mineral origin

### 7.2.1 Ores

Character	Name	Description
<b>♂</b>	Antimony ore	stibnite Sb <sub>2</sub> S <sub>3</sub> from Lat. <i>stibium</i>
华	Bismuth ore	bismuthinite $Bi_2S_3$ or bismite $Bi_2O_3$ ?
₽ <b>.4.</b> \$	æs vel cuprum Copper ore copper pyrite	
<b>♀ 🌣</b>	Marcasita cobrena, iron copper ore	chalcopyrite CuFeS <sub>2</sub>
ර් බ් ∕්	Iron ore	
© <b>里咖喱</b> /&8◆5¢ 4亩〒▽\$+∞日グ�	Colcotharum Paracelsi, hæmatite, bloodstone, jeweler's rouge, Falu red	iron(III) oxyde Fe <sub>2</sub> O <sub>3</sub> , either of natural origin or the calx left after distilling oil of vitriol (sulphuric acid) from green vitriol
		(iron sulphate).
PMJZ°0°±++&⊗⊕ ↓×	Lapis calaminaris, silex calaminaris (for the finely ground material), calamine (outdated). Corrupted from Gr. κἄδμἴ $\bar{\alpha}$ (kadmí $\bar{a}$ ).	` 2,

Character	Name	Description
于	Lapis tutiae	zinc oxyde, see also tutty in table 2
でり	Lead ore	Galena, leadglance PbS
ον⊕&Φ⊓M#	Lapis Magnes, Magnetit	Fe(II, III)oxyde, Lodestone Fe <sub>3</sub> O <sub>4</sub>
♥♥±₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩	Marcasite	rhombic $FeS_2$ (originally included the cubic iron pyrite or fools gold)
	Pyrite, fools gold, marcasita aurea	cubic FeS <sub>2</sub> . Originally any stone that would give sparks from steel.
DZ¥	Arsenopyrite, marcasita argentea, mißpickel	$Fe^{3+}(AsS)^{3-}$ . Various transition metals can substitute for iron, antimony for arsenic.
文争	Minera, ore	
þ	Mineral lead	elementary lead is a rare mineral, usually compounds are found (sulphide, oxyde, carbonate)
<b>(</b> , (, )	Silver ore	
来	Terra ponderosa (heavy earth)	Witherit BaCO <sub>3</sub>
<b>一</b>	Tin ore	Cassiterite SnO <sub>2</sub>

### 7.2.2 Other minerals

For historic uses of minerals for medical purposes see [26].

Character	Name	Description
₩	Absorbent earth, diatomaceous earth, celite or kieselgur	
<b>®</b>	Agate	semiprecious stone, used to make mortars and pestells
<b>3</b> 2€	Amber	fossile tree resin
+	Amethyst	Quartz ( $SiO_2$ ) coloured purple by $Fe^{4+}$ -defects
<b>舎</b> り	Gr. ἄσβεστος asbestos = in <mark>d</mark> estructible	fiberous mineral $Me_7^{2+}Si_8O_{22}(OH)_2$ , with $Me = Fe$ , $Mg$ , $Ca$ , some of the metal may be replaced by $Na^+$ or $Fe^{3+}$
<b>∆</b>	Asphaltum, bitumen	sticky, black, highly viscous liquid or semi-solid form of petroleum
患氧伞↓ㅊጵ❖ ✿♣♣♥	Sulphur nigrum, black sulphur	residue left after (volcanic) sulphur was sublimated away (brimstone)
	Bolus armenus, bole armoniac, rubrica synopica	Armenian bole. Red clay from Armenia, used medically, also for tooth cleaning, ceramics painting and as base for the gilding of books.
######################################	Bole	Bole = medicinal earth. Adheres to the tongue when applied dry. Coloured yellow and red by iron oxide.

Character	Name	Description
Φ	red bole	
$\Diamond O \Box \neg$	Creta = chalk	sedimentary rock formed from the calcite shells of plankton CaCO <sub>3</sub>
$ \forall $	Clay	1 3
ſſŢ <b>₽</b>	Coal	
	Lapis granatorum, carbunculus, Garnet	dark red semiprecious stone of composition $X_3^{\parallel}Y_2^{\parallel\parallel}(SiO_4)_3$ with $X^{\parallel}=Mg, Fe, Mn, Ca$ and $Y^{\parallel\parallel}=Cr, Al, Fe$
<b></b> हु <sup>†</sup>	Gravel	
\ <del>\$</del> +	"speckled stone" in Afroasiatic languages (e.g., Hebrew กระชา yashpeh) over Gr. ในอหาเร iaspis and Lat. iaspis to Engl. jasper	semiprecious stone, cryptocrystalline or microgranular silica, stained by impurit- ies
&	Kaolin	
to \$2?\$% N M H → + 8 N to	Lapis lazuli (Lat. <i>lapis</i> = stone, Arabic لازورد lāzurd = heaven.	blue semiprecious stone, also used as pigment for painting (ultramarine = from beyond the sea)
A	κυανός kuanos ( $\rightarrow$ cyan), Lapis armenus, lapis stellatus, cæruleum, azurite, mountain blue	blue basic copper carbonate $Cu_3(CO_3)_2(OH)_2$ with veins of green (weathering product malachite $Cu_2CO_3(OH)_2$ from Gr. $\mu o \lambda \acute{o} \chi \eta$ molochē (plant genus, now <i>Pavonia</i> Cav. , Malvaceae).

Character	Name	Description
Φ\$	Lapis prunellae, Chinese saltpetre	potassium nitrate KNO <sub>3</sub> from fossil bat guano, often contaminated with the sulphate. Mined, but also synthetically
Ø		produced by reacting wall saltpetre $(Ca(NO_3)_2$ , from rotted dung heaps) with potash $(K_2CO_3)$ .
~	Lapis pumex, spuma maris, pumice	volcanic glass with air bubbles (2/3 – 3/4 by volume), composed mostly of silicates. Finely powdered used as abrasive to remove calluses, as exfoliant or for toothpaste. Officinal was the light-coloured variety.
°°≯₩	Lapis silex, flint stone	sedimentary cryptocrystalline form quartz, used to make stone tools
<b>∅°°</b>	Lapis silex ustus, heated flint stone	flintstone slowly heated to 150–250 °C and then allowed to cool over night. Prevents flint tools from shattering easily.
×	from Gr. ἀχρός (ōkhrós) = 'pale', ochre	clay stained yellowish to brown to red by different amounts of iron, the darker si- ena and umbra contain in addition man- ganese.
←‰ೡષ× <b>~</b>	Yellow ochre	hydrated ferric oxide ( $Fe_2O_3 \times H_2O$ )
<i>y</i>	Gr. ὄνυξ onyx = finger nail	parallel banded variety of chalcedony, a silicate $(SiO_2)$ . Gems from onyx were worn to give eloquence or help mothers in childbirth.

Character	Name	Description
	from Sanskrit ਤੇਧਾਰ úpala = "precious stone" over Gr. ὀπάλλιος opállios = "to see a change in colour" to Lat. opalus, opal	hydrated amorphous form of silica $(SiO_2 \times n H_2O)$ , the play of colour is caused by diffraction and interference on the regular layers of 150–300 nm silica beads in cubic closed packing. Strain causes double refraction.
<i>§</i>	Ophite, verde antico, marmor thessalicum	breccia from serpentine, calcite, dolomite and magnesite. Takes a high polish and is used as facing stone in construction, also for statues.
%ዋm⊶ <b>෭</b> ∞×⊭ዥQ& Ֆ	Lat. Crystallus, quartz	Finely ground it was used orally against dysentery, bowel obstruction, bladder and kidney stones and to increase milk production in lactating females. None of these effects is clinically proven.
•	Rubeus = ruby	red variety of corund (aluminium oxyde, Al <sub>2</sub> O <sub>3</sub> ). The red colour is caused by Cr <sup>3+</sup> replacing several % of the smaller Al <sup>3+</sup> ions, thus the d-d transitions require more energy than usual for chromium, shifting the colour from green to red. In UV-light, rubies fluoresce red. The ruby is associated with the blood of Christ and considered the "stone of stones", which combines the magical power of all other stones. Ruby was the first material used for lasers [27].

Character	Name	Description
<b>∴</b> #4****	Lat. arena, sand	
<b>∓</b>	Sanskrit शनि प्रिय shani priya = beloved by saturn, Greek σάπφειρος sappheiros, Hebrew ז'פּסְ sappir, Lat. sapphirus, Arabic صفير şafīr = the beautiful	Al <sub>2</sub> O <sub>3</sub> stained blue by Fe <sup>2+</sup> , Ti <sup>4+</sup> , Co <sup>2+</sup> , pink by Cr <sup>3+</sup> , Ti <sup>3+</sup> (in higher intensities called ruby), purple by V <sup>4+</sup> or yellow-green by Fe <sup>3+</sup> . Leukosapphires have no other metals and are colourless. Was used as pickup for record players, Ti-sapphire lasers are used for 700–1000 nm. In esoterics blue sapphires are associated with calm, peace and purity.
<b>₡</b>	Gr. σεληνίτης λίθος (selēnitēs lithos) = moon stone, Lat. Lapis specularis, selenites, selenite	crystalline calcium sulphate $CaSO_4 \times 2H_2O$ . Was used to make windows before sufficiently clear glass became available. In powdered form additive for glossy paints.
◎◎⊕∮♥ベルħ☆☆! 丌₽~ねん☆≹=1。む	Soapstone, steatite	is a metamorphic rock containing 30–80 % talc. It is soft and used for carving, but becomes hard after firing to 1000–1200 °C.
	Stone	

Character	Name	Description
Ø¥×₹¢Ø⊕4F ♥., ₩, Ħ≥∳ऽ∫€	Talcum  Terra lemnia, lemnia sphragis, limnia miltos, terra sigillata, lemnian earth, sealed earth	Soil from the island of Lemnos prepared by slurrying and settling to separate the soil from sand and gravel. The soil was dried and cut into small troches, each carrying the seal of Artemis. Used as universal antidote, to accelerate wound healing and against parasites. According to mod-
6	Terrestrial from Gr. Τοπαζος <i>Topázios</i> via Lat. <i>Topazius</i> = St. John's Island in the Red Sea, where a precious stone now believed to be	ern investigations, it contains no healing components.  island silicate (no Si-O-Si-bonds)
$\widehat{\sim}$	olivine was mi <mark>ned</mark> . Alter <mark>nati</mark> vely Sanskrit तपस <i>्tapas</i> = fire. Topaz Turquoise	$\text{CuAl}_6(\text{PO}_4)_4(\text{OH})_8 \times 4\text{H}_2\text{O}$ , forms a solid solution with chalcosiderite, where the Al is replaced by Fe. Gem stone highly priced in several ancient cultures as lucky charm.
		continued on next page

Character	Name	Description
7.3 Of plant origin		
Character	Name	Description
ARRA .	Anise from Gr. ἄνηθον (anēthon) = scent dyer's alkannet (bugloss)	Pimpinella anisum L. (Apiaceae) root of Alkanna tinctoria (L.) 1753 Tausch 1824, (Boraginaceae)
<b>乘</b>	Balm	oily or resinous liniment containing essential oils. May also refer to plants of either genus <i>Melissa</i> or <i>Monarda</i> . Sometimes also used for the <i>elixir</i> of life that can heal all diseases and even resuscitate the dead.
<b>←  器 Ì</b> ≌	Oleum Christi Palmi, castor oil	fatty oil pressed from the seeds of the castor bean or palm of Christ ( <i>Palma Christi, Ricinus communis</i> L., Euphorbiaceae) and traditionally used as laxative. The cake left-over from pressing is highly toxic (ricin)!
IX.	Celandine	Plant, unclear whether this means the greater celandine or swallowwort ( <i>Chelidonium majus</i> L., Papaveraceae) used against warts or the lesser celandine or pilewort ( <i>Ficaria verna</i> Huds. 1762, Ranunculaceae), used against hæmorrhoids

Character	Name	Description
<b>£</b> \$€	Sanguis draconis, dragon blood	deep red resin from various plants of the genera <i>Dracaena</i> , <i>Daemonorops</i> , <i>Croton</i> or <i>Pterocarpus</i>
<b>#</b> 星 <b>②</b>	Essential oil	volatile component from plants that smells like the plant itself. Often ob tained by steam distillation.
<b>⊙ aa.</b>	Flour, meal	ground edible parts of grains and pulses may also refer to any fine powder
<b>∄</b>	Gr. ζιγγίβερις zingiberis probably from Sanskrit śṛṅgavera, Lat. <i>gingiber</i> , Ginger	Zingiber officinale Roscoe, Zingiberaceae officinel is the root Zingiberis rhizoma
sts tf 41	Gum arabic	hardened sap of either the gum acacia (Senegalia senegal (L.) Britton 1930) or the red acacia, (Vachellia seyal (Delile 1813 P.J.H.Hurter), both Fabaceae. Consists of a complex mixture of glycoproteins and polysaccharides, predominantly polymers of arabinose and galactose.
	Heliotrope, va <mark>l</mark> erian	Valeriana officinalis L., Caprifoliaceae. Pre parations of the root (Valerianae radix) are said to have sedative and anxiolytic effects.
<b>♣ ♣</b>	Horseradish oil	The root of horseradish plant ( <i>Armora cia rusticana</i> (L.) G.Gaertn., B.Mey. & Scherb. 1800, Brassicaceae), when in jured, produces allyl isothiocyanate from sinigrin. This mustard oil irritates mu cous membranes.

Character	Name	Description
~	Juice	
K° M √M M	Gr. κρῖνον (krīnon) = Lily Nutmeg	genus <i>Lilium</i> L., Liliaceae seed of <i>Myristica fragrans</i> Houtt. 1774, Myristicaceae. The arilus is traded as "mace". Spice, in concentrated form also psychedelic.
∴∞⊖⊅⁴¥÷ฅÅ⇔⊚	Oleum commune, plant oil	from any of the many plants that produce fat oil
⊕♥₹%♦₽₽₽₽₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩	Oleum olivarum, olive oil	
<i>⊗</i> ′ •••	Oleum cootam, boiling oil	
Ö\$ 	distilled oil	
早 <b>全</b> <sup>94</sup>	Oil of lilies Oil of roses	
。 中 子 本	<i>Resina</i> = resin	
<b>丫</b>	Granati cortex fructus, rind of pomegranate fruit (Punica granatum L. Lythraceae)	used for dyeing wool or cotton [28] beige- yellow (w/o mordant), golden (with Al- mordant) or grey-black (Fe-mordant), for example oriental carpets. Also as anthel- mintic. Active ingredient are tannins like ellagic acid.

Character	Name	Description
中 R X	Radix = root	
Y	rose colour	
~ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\	Rubber	
#4\$\$\$\$*********************************	Arabic عفران j za'farān, Lat. safranum, Cro- cus aromaticus, saffron	stigma and styles (threads) of the saffron crocus <i>Crocus sativus</i> L., Iridaceae), coloured bright yellow by crocin (a carotinoid) and flavoured by picrocrocin and safranal (monoterpens). These signs refer to the botanical term, for the alchemical see "crocus" in the compound section 2. 2
× &R ***	sap Gr. τερέβινθος terebinthos, crude turpen- tine	juice of plants oleoresin of the turpentine tree <i>Pistacia terebinthus</i> L. (Anacardiaceae), the volatile components are the turpentine oil, the non-volatile rosin (Κολοφωνία ἡητίνη <i>Κο</i> -
<b>A</b> A	Lignum = wood	lophōnía rhētínē colophony).
7.4 Other		
Character	Name	Description
ÆĆ <b>፠</b> ₽ <b>◎</b>	Cineres, ash	

Character	Name	Description
& N N (€	Plumbum ustum, ashes of lead, burnbed lead	"Lead suboxyde" Pb <sub>2</sub> O formed on molten lead exposed to air is actually a mixture of lead and its oxyde. Further oxydation leads to PbO used for lead glass and translucent ceramics glazing.
$\wedge$	ashes of tin	SnO <sub>2</sub> used for glazed pottery (faience) obtained by adding SnO <sub>2</sub> to PbO glazing, turning it opaque and white.
<b>€</b> ♀ <b>⊕</b> # %	ashes of wood	mineral components of plants
Ŷ.⊕ <del>  </del>	Aurum potabile, drinkable gold, extract of gold	Either colloidal gold produced from AuCl <sub>3</sub> and a reducing substance like hydroxymethylfurfural obtained by pyrolysis of honey. Particle size and colour of the colloid depends on reactant concentration. Alternatively, a menstruum that contains the "soul" (colour) of gold, but no longer its "body" (metal), that is, the alchemist gets the unchanged gold back after the operation is completed. Quack medicine.

Character	Name	Description
	Lapis bezoardicus occidentalis	bezoar in the llama ( <i>Camelus glama</i> L. 1758, (Camelidae)), consists mostly of calcium phosphate
	Lapis bezoardicus orientalis	bezoar found in the bezoar ibex (Capra aegagrus aegagrus Erxleben 1777, (Bovidae)), which occurs in the Caucasus and the Zagros Mountains. Consists mostly of organic acids from plants. Bezoars were so valuable that the export of the ibex was punished by death!
<b>*</b>	Bezoardicum minerale	Antimon(III,V)-oxyde Sb <sub>2</sub> O <sub>4</sub> produced by the action of aqua fortis (nitric acid) on butter of antimony (antimony trichloride) without additions. Has a diaphoretic effect thought to cleanse the body from poison.
4 7 7	Bezoardicum joviale	Bezoardicum minerale with addition of tin oxyde
$\mathfrak{D}\mathfrak{D}$	Be <mark>zoar</mark> dicum l <mark>u</mark> nare	Bezoardicum minerale with addition of silver oxyde
್ರ್ರಿ⊶	Bezoardicum martiale	Bezoardicum minerale with addition of iron oxyde
<b>©</b>	Bezoardicum solare	Bezoardicum minerale with addition of gold.

Character	Name	Description
5	Bezoardicum saturninum	Bezoardicum minerale with addition of lead.
<b>Q</b>	Bezoardicum venereum, turbith minerale	bright yellow basic mercury sulphate $HgSO_4 \times 2HgO$
茶	Blackmal, niello	used for painting on silver and gold. A mixture of Ag, Cu, Pb, S was molten; the resulting mixed sulphide ground, wetted with ammonia and added into engravings in the metal. After firing (lower melting point of mixtures!) the ornament was polished.
·····································	Black soap (ose-dudu) Brick	soap made with plant ash for saponification, from West Africa
<b>■ ••• •</b> • • • • • • • • • • • • • • • •	Later cibratus, farina laterum	powdered brick
₩₽Ŏテ┲≅¥œ⋈	Calamine	either zinc oxyde ZnO or basic zinc carbonate $2  \text{ZnCO}_3 \times 3  \text{Zn(OH)}_2$ used as cosmetic. There is an addition of about 2% iron(III) oxide to give a colour like skin. The effect is covering, astringent and antiseptic. Also available wetted with water as lotion. For the mineral calamine/kadmia see table 7.2.1

Character	Name	Description
₽¥ <b>X</b> 0↓₩ © <b>¥7</b> 06@ <b>©</b> €∞πд	Calx	oxydised residue left after calcination, also CaO
<b>★</b> ~	Calx ovorum	burned lime from egg shells
arceo°c⊿X×	Calx solis, calcinated gold	gold was heated with mercury or cinnabar (HgO) and sal ammoniak (NH <sub>4</sub> Cl). At low temperature the gold and mercury (formed by decomposition of HgO) will form an amalgam, from which at higher temperature the mercury will evaporate, leaving a gold sponge. It is unclear wether this procedure will also yield some AuCl <sub>3</sub> condensing at cooler parts of the apparatus.
G C <sup>k 1+3++</sup> 125+ 215 <del>±</del>	calcinated silver	black silver(I) sulphide Ag <sub>2</sub> S prepared by heating the elements together
╓╈╬╬╚┖┖╬╲╻┸┺ ╚╈╬╬	Calx tartaris, lixivium tartaris, nitrum fixum, calcinated tartar, lye of tartar, cream of tartar	tartar (potassium hydrogen tartrate) decomposes in heat to potash (potassium carbonate K <sub>2</sub> CO <sub>3</sub> ). Coloured impurities may be removed by extraction with <i>spiritus vini</i> (ethanol).

Character	Name	Description
₹ 6	Calx jovis, calcinated tin	tin oxyde SnO <sub>2</sub> prepared by melting the metal with access of air
⊙\$♂MAH⊗FzYM E	Caput mortuum, terra damnata	slag left after a purification. Volatile compounds were believed to have a spirit, the non-volatile residue was considered dead.
<b>↑ ™</b>	charcoal	carbon obtained by heating wood under exclusion of air
	Lat. <i>Chrysocolla</i> from Greek χρυσός (khrusós, gold) and κολλα (kolla, glue) = gold solder	alloy of copper and lead. Also a blue mineral (copper hydrosilicate $(Cu, Al)_2H_2Si_2O_5(OH)_4 \times nH_2O)$
፫፯ፘ፟፟፟፟፠፼፟፠፼፟ቜቜቜቜቜቜቜቜቜቜቜቜቜቜቜቜቜቜቜቜቜቜቜቜቜቜቜቜቜ	Cement cinders, embers Faex vini, dregs Dust	hot coal
8×X⊕⊕\$3 ••	Flavour  Lat. flores = flower	substance purified by sublimation, this often results in a crystalline powder
<u>ढ़</u> ढ़ ढ़ ढ़ ढ़ ढ़ ढ़ ढ़ ढ़ ढ़ ढ़ ढ़ ढ़ ढ़ ढ़ ढ़ ढ़ ढ़ ढ़	Glass	

Character	Name	Description
0020 ~7□RINDV 40749 \$\$ \$\$ \$\$	Lutum sapientiae, lutum philosophorum = philosophical glue	used to hermetically seal reaction vessels (lutation). Also used for alchemy as "hermetic art".
<i>Ø</i> Ø &	Gold paint	gold or, more commonly, brass particles in varnish. Not to be mixed up with <i>aurum musivum</i>
$\Box$	Ink	
7	Liquor	
V <del>V</del> ₽ i	Menstruum	liquid solvent that is able to dissolve solid substances or extract an active component or principle from it. A <i>menstruum particularia</i> is a specific solvent for one particular solute, a <i>menstruum universale</i> dissolves everything.
φ	Mercurius soli, mercurius auri, mercury of gold	gold was dissolved in <i>aqua regia</i> , the solution of HAu <sup>III</sup> Cl <sub>4</sub> evaporated to oily consistency (conc. Au <sup>III</sup> Cl <sub>3</sub> ), some of which decomposes to Au <sup>II</sup> Cl <sub>1</sub> +Cl <sub>2</sub> . The mixture (gold(I, III) chloride Au <sub>4</sub> Cl <sub>8</sub> ) is red, almost black (black stage) and on further heating decomposes to amorphous Au <sup>0</sup> . Reduction of gold chlorides (for example with hydroxymethylfurfural from the pyrolysis of honey) produces colloidal gold solution of various colours (red stage), this corresponds to <i>aurum potabile</i> [17, 29]. The name <i>Mercurius soli</i> is used for both the Au <sup>III</sup> Cl <sub>3</sub> and to the colloidal gold, but only the latter can be con-
	68	sumed safely.

Character	Name	Description
 ф.Д	Mercurius vitae (antimonii), mercury of life	mixture of antimony oxy- chloride and antimony oxides (Sb <sub>2</sub> O <sub>3</sub> ; Sb <sub>2</sub> O <sub>4</sub> , Sb <sub>2</sub> O <sub>5</sub> , SbOCl).
<b>첫</b> 위	Mercurius lunae, mercury of silver	AgCl or Ag <sub>2</sub> CO <sub>3</sub>
ŶĮ.	red oil of antimony	antimony glass dissolved in distilled acetic acid and hydrolysed with water, yielding insoluble antimony oxyde. However, iron present as impurity forms iron acetate, which dissolves in spiritus vini with red colour. The "oil" is analytically free of antimony and probably the only "antimony" preparation that can be ingested without danger for life and limb [20].
♥ ♥	oil of gold	preparation, that still has the spirit (colour) of gold, but no longer the body (metal). Was prepared with gold as catalyst, but that gold was quantitatively recovered. Quack medicine.
		continued on next page

Character	Name	Description
## <b>%</b>	oil of saltpetre	saltpetre dissolved in the water it draws from air
<b>☆* もたわたけ</b>	Oleum saturni, lead oil	lead acetate dissolved in the water it draws from air
	Oleum tartari per deliquium, oil of tartar by deliquescence	calcinated tartar $(K_2CO_3)$ dissolved in the water it draws from air
	Paste Patina of gold Patina of silver	
∀ □	refractory Sel vitri = glass foam	scum formed on glass during smelting from sand (partly $Na_2SO_4$ )
\$\$\$ X X X X X X	Argentum musivum, argentum pictorium, silver paint	3 parts tin and 2 parts bismuth molten together, then add 4 parts of mercury and also egg white
	Silver solder	alloy of silver, tin, lead and copper for a melting point of 180–200 °C. Cadmium is no longer used because of RoHS regulations.

Character	Name	Description
<u>₩</u> Y¤°2₩₫#÷	Smoke	
<b>℃</b> № %	Fuligo = soot	finely distributed carbon
₽	Sulphur tartaris, tinctura sulphuris	Alcoholic extract of sulphur. Quack medicine, as sulphur is insoluble in ethanol.
$\oplus 9 \rightarrow \Phi \oplus \pi \oplus$	ærugo, æs viride, verdigris, Spanish green	green patina on weather-exposed copper: cupric oxyde, hydroxyde, acetate, chlor- ide. Used for illuminating books.
#\(\frac{\frac{\psi}{\psi}}{\psi}\rightarrow\frac{\psi}{\p	Vinum, wine	used for any pottable fluid produced by fermentation
<u>-</u> □3	Vinum rubrum, red wine	
UM22%***********************************	Vinum album, white wine	
<b>∜</b> ☆ ~	boiling wine	
<b>公</b> 予	Spanish wine	
\A <b>-</b>	v <del>īnum Hippocr<mark>a</mark>ticum,</del> Hippocras	red or whitze wine, heated with spices and sugar, then filtered through a conical sleeve, the <i>manicum hippocraticum</i> .
<b>XX ⊗</b>	Vinum adustum, sugar cane juice (caldo) fermented to make garapo and "burned" (distilled)	Rum

Character	Name	Description
$\bigcirc$	Vinum circulatum	
$\Psi$	Lat. Vinum coctum, Fr. vin cuit, Turkish Üzüm pekmezi	grape juice, reduced to $1/2 - 1/4$ of the original volume, used to spice gravy and to make sweets
$ \checkmark $	Vinum medicatum medicated wine	often with bitter herbs (Cinchona spec. (Rubiaceae, fever trees), Marsdenia condurango (Apocynaceae, condurango), Cinnamomum spec. (Lauraceae), Gentiana spec. (Gentianaceae, gentian) to increase
$\nabla\nabla$	Vinum laxativum, purgative wine	appetite, but also with other herbs.

#### 8 Process

As mentioned, the *opus magnum* of gold making is really only an allegory of the journey to self-knowledge and, yes, eventually also to god [30, 31]. It required moral characteristics like faith, devotedness, diligence and discreetness, but beyond that also an accreditation by God [32]. For various authors the *opus magnum* would take 7 days (like creation), 9 months (like pregnancy) or one year (like the cycle of nature).

Calcination exposure of a sample to high, dry heat in the absence of oxygen /roasting is the equivalent with air access). Many substances under these condition loose weight, turn white and become easy to grind. First (black) stage of the opus magnum. The colour black represents chaos and death, and that what is hidden or buried, the materia prima from which all other things may be obtained. Spiritually, calcination means burning off our attachments to the world: the desire for status, fame, wealth and identity. Our preconceived notions about ourself are put to the test by fire, in an existential crisis, in the dark night of the soul. However, calcination cannot only be achieved by an actual, but also by a potential (corrosive chemicals) or philosophical fire (materials hung over boiling water until they softened).)

**Decoction** boiling of chopped, hard plant materials (wood, bark, roots), usually in water, for about 1–2 h. From Lat. *decoquere* "to boil down". If the boiling water is merely poured over the plant material and left to soak for 5–10 min, we

- speak of *infusions*, this is used for soft plant material like flowers or leafs. *Percolation* means that the boiling water is filtered through the (often ground) material. In either case, about 1 teaspoon of material is used per cup.
- **Dissolution** forming a solution. In the *opus magnum*, the ashes obtained during calcination are extracted with water, the symbol of the unconscious or hidden. In European alchemy this is seen in analogy to the creation report in Gen  $1_2$ : *And the Spirit of God moved upon the face of the waters.* Spiritually, we free ourselves from our inauthentic and acquired traits. The dissolution stage involves freeing repressed emotions from traumatic events that we have pushed down into our subconsciousness (dissolution of the ego [31]), and can be a cathartic step.
- Separation is the 3rd stage of the *opus magnum*, where the products of dissolution are filtered and separated. Whilst the first stages were associated with the elements fire and water, this one is associated with air. The pure essence is extracted from the mixture. Spiritually, we leave our acquired personality in form of engrained thought processes and emotional triggers to become our true, essential self. Collect all the things in you that are helpful for yourself and for others, and let go of everything else. After the turmoil of the first steps, we can now enjoy the stillness of being removed from all that is inauthentic and artificial.
- Conjunction means bringing together the elements purified in the first three stages by fire, water and air in the sign of the soil. Spiritually, we bring what is left of us together to form a new, authentic personality. The conflict of dualities like body and soul, spirit and matter, conscious and unconscious are resolved. Feminine qualities like emotion and intuition join male like intellect and logic.
- **Fermentation** exposure to microorganisms for longer time to achieve a chemical reaction and remove what is no longer needed.
- **Putrefaction** leaving a sample undisturbed, often after adding the desired material (seed). Both fermentation and putrefaction form the 5th stage of the *opus magnum*: the removal of the old, unauthentic self. This process can be painful, but we cannot see dawn before we have gone through the darkest of nights.
- **Distillation** process of vaporising and then condensing a substance. The different boiling points of the components of a mixture are used for purification of the essence. In spiritual alchemy, our core identity is freed from any inferior elements. The ego is no longer dominating, so that the soul can be heard.

**Coagulation** old term for crystallisation. The result is the philosopher's stone. Spiritually, the self comes together in a healing process. This is called *rubedo*. This word also refers to the state achieved by the mage where he is fully attuned to the *anima mundi*, the fountainhead of creation and source of the *prima materia*.

Apart from the processes involved in the *opus magnum*, the following methods were used by alchemists:

**Ceration** allowing a hard, dry substance to absorb water while it is heated (imbibition) for the purpose of softening it (from Latin cera = wax).

**Circulation** The sample is heated, any vapours produced are condensed and drip back into the reaction vessel.

**Cohobation** A sample is distilled, the collected volatile components are added back to the residue and the process is repeated. Not used in modern chemistry.

Cupellation Separation of noble from base metals. The sample is molten in a crucible from calcareous material like bone ash to oxydise base metals, the molten oxydes are wicked away by the crucible and a regulus of the pure noble metal remains. The process may also be used to assay the noble metal content of a sample.

**Digestion** heating a sample in an open vessel for long times, but without boiling it.

### Disposition

**Dissolve** disperse a solute in a solvent to make a solution. Contrary to dissolution, it is expected that the solute is (at least almost) completely soluble in the solvent (if enough solvent is added), whilest dissolution intents to separate the sample into a soluble and insoluble fraction.

dulcify remove soluble, in particular acidic, components by extraction with water

Fixation turning a volatile compound into a solid that does not loose weight in fire

**Lixivation** extraction to separate soluble and insoluble material. The soluble product is the *lixivium* 

macerate soften by steeping in liquid, with or without heat

**Multiplication** increasing the potency of an elixir or philosopher's stone, often by repeating the process by which it was originally obtained

**Precipitation** letting a solid form from a solution and collecting it.

Projection process of transmuting base metals to gold using the philosopher's stone

Purify increasing the concentration of a particular substance, if possible close to 100 %.

**Regulus formation** getting the pure form of a metal (especially antimony) out of an ore. The left-over is called *scoria* or *slag*.

**Solution** one component (solute) is homogenously dispersed in a second component (solvent, usually, but not necessarily, a liquid).

**Sublimation** heating a substance to turn it from the solid directly into the gaseous state and back, without forming a liquid first. The sublimate is called "flower".

**Tincture** extract in alcohol.

**Trituration** grinding several substances together to obtain a homogeneous powder with reduced particle size. For example, hormones are often effective in very small doses that cannot be handled. Triturating them with a several hundred- or even thousand-fold excess of an inert material, say sugar, solves that problem.

Character	Name	Description
A _~~\$\$\$=	Abstract Annealing	often used synnonymous with calcination, but may mean "fusing together" (e.g., enamel) or "change the microstructure" (e.g., metallurgy) or "remove stress" (e.g., glass)

Character	Name	Description
AAA XX 5M 3-5	Boil	heat to the boiling point (of water)
	Calcination	expose to real (fire), potential (caustic chemical) or philosophical (water vapour) heat
<b>合</b> sss sss ∭ 纵 上 纂 sS+	Cementare, stratify	place any substances <i>stratum super stratum</i> (layer upon layer) rather than mixing them
<b>✓</b>	Ceration	
C	Circulation	Refluxing, cohobation
₩       	Coagulation	
<b>&gt;</b> + 3°	Compose	
N	Condense	
SSZ A OHX	Congelation	
¥	Conjugation	
¥ ৵ <b>}</b> &	Convert	
ት ቆ	Cupellation	

Character	Name	Description
$ imes \mathcal{D} + \mathcal{B}$	Decoction	
<del></del>	Digerere	
	Digestion	
र्दुः	Disposition	
<b>0</b>	Dissolution	the ashes obtained during calcination are extracted with water.
√V↓+~~&+ P.√ ≈	Dissolve	disperse a solute in a solvent to make a solution. Set free, also in the sense of release from malignant magical influences.
	Destillare = distill	
	Distill in ashes	
:::	Distill in sand	
*** *	Lat. <i>ebullire</i> = to bubble forth, ebullition  Evaporation	rolling, overflowing boil
	Exaltation	to make more active, more volatile
₽TK	Exhalation	separation of volatile and non-volatile components by calcination, distillation

Character	Name	Description
⊕ ਮ ਿੰ∗	Extraction	separation of soluble from insoluble components by a solvent
7 <b>*2</b> % <b>\$</b> \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	Fermentation	
ƒã∽ቊቊ❷ឹዏ❖♥♥♥ ኴ♥♬	Filtrare = filter	
#¥ #¥ #¥ #¥	Fixation	
ъо;4F<\%	Flow	
<b>⋘</b>	Fracture	
<b>☆∌</b>	Fuse	
<b>*</b>	Grate	
★       + ○       3	Hermetically sealed	
<u></u>	<i>Imbibitio</i> = imbibition	to soak with liquid (lit. "drinking")
마 <b>등</b>	Inceration	smearing with wax
与	Liquefy	C
N772mir~~~	Lutation	hermetically sealing a vessel with <i>lutum</i> sapientiae
<b>→ ★ △</b>	Mixing	•
<b>≈</b> ○	Multiplication	
<u></u>	Precipitation	

Character	Name	Description
<b>ф</b>		
$\Xi$	process Projection	
$\mathbb{F}^{\mathbb{Z}}$	Pulvis, powder	
# <del>M</del>	•	
++- / / /	fac secundum artem, præparare, prepare in accordance with the standard procedures	
	of alchemy	
<b>₩</b> ♡⊷&n∪7E	Purification	
$\Omega \Psi \Psi + + + \Phi ES W II$	Putrefaction	
26	Reduction	
$\otimes \mathbf{x}$	Refine	
$m_{\alpha}$ $m$	Regulus	smelting of metall from ore
$\diamondsuit M_{\downarrow \!$	Separation	
<b>\$</b> ₹	Solve et coagulo	
10 €\$00 <u>~</u> 20 × 1. L. R	Sublimation	turning a solid into a gas without melting
<b>π</b> \ \$ \ ⊕		
& 4 <u>~</u> n⇒ 5	Sublimate	product of sublimation
アナス学で十つ	Lat. <i>Tinctura</i> = tincture	alcoholic extract

Character	Name	Description	
XW	Together		
<b>₩</b> ₩	Transform		
_ 	Trituration		

# 9 Time

Character	Name	Description
<b>¿</b> ♦ 20 M 22	Autumn	
ժợᄽੈੂҕ҂ᢏݛ┛┇М	Day (as in daylight hours)	
$oldsymbol{g}_{\Leftrightarrow oldsymbol{arphi}}$		
	Day and night (24h)	
Ŷ	Evening, sunset	
<b>∑%</b> ∋>₹/₹ <u>‡</u> 6π/4	Hour	
DENJESEZNA[]		
<b>Q</b>	Minute	
$\square \square \square \square \square                            $	Month	

Character	Name	Description
$\Diamond$	Morning	
$\mathcal{P}_{\varpi}$	Night	
X}8	Spring	
$\times\!$	Summer	
$\sum$	Week	
	Winter	
✐◒◙Ҋ៹┌▩▧┵ᆏ≖	Year	
╊·ᆉઝ፡③■ 	Annus philosophicus philosophical year	equals an <i>mensis vulgaris</i> = ordinary month

### 10 Tools

Alembic from Greek ἄμβιξ ambix = beaker over Arabic الإنبيق al-inbīq is a distillation apparatus consisting of two vessels connected by a bridge with downward-sloping tube (σωλήν sōlēn). In the fist (cucurbit from βῖκος bîkos) a sample was heated, the second (receiver, from φιάλη phialē over Arabic عَالِيَة qābila) received the vapours condensed in a connecting tube. Its invention is attributed to Maria Prophetissa of Alexandria in the 1st century AD (variously also called Maria the Jewess or Maria the Copt). The bridge of modern chemical glassware is the closest equivalent. The pot still used in modern alcohol production is derived from the alembic.

Athanor furnace with three chambers, for ash, fire and sample. They were constructed from bricks held together by clay. From the 16th century onward, the temperature could be regulated by variable slits for air, the *Piger Henricus* (Lazy Henry) had an opening from which the charcoal could drop into the fire chamber automatically, so that the alchemist did not have to tend the fire every few hours.

**Balneum mariæ** hot water bath allegedly invented by Maria Prophetissa and still used to keep food warm in refectories and the like (*bain de Marie*). It consists of an outer vessel half-filled with a hot fluid (usually water) and an inner vessel

- that is filled with the material to be kept warm and immersed in the fluid of the outer vessel. The material in the inner vessel is kept at a constant temperature, without hot or cold spots. Sometimes also called by the malapropisms balneum maris, balneum virginis.
- Balneum roris, balneum vaporosum steam bath. Used for medical purposes to evaporate essential oils to be breathed by the patient, but also for temperatures in between the water bath (balneum mariæ) and the sand bath (balneum arenæ, constructed like the balneum mariæ but with sand instead of water).
- Caduceus is the staff of Hermes (Gr.) = Mercury (Lat., god of traders and thieves) with two snakes and wings. It should not be mixed up with the staff of Asclepios (Son of Apollo) with one snake and no wings, which is a symbol of medicine. The astrological/alchemists sign of Mercury is an older version of the caduceus, with the snakes protruding from the staff (originally two branches wound together by envoys, similar to our white flag).
- Matrass glass flask with a round body and a long neck
- Retort (from Lat. retortus = curved backward) glass vessel used by alchemists. Heating it was an art in itself, as the sodalime glasses available at the time were liable to crack when heated unevenly. In the modern chemical industry, vessels of any shape and material used for pyrolysis are still called retort (production of shale oil, charcoal, recovery of Hg in gold mining). In the laboratory, the Liebig condenser has largely replaced the retort.
- Reverberatory furnace metallurgical oven where the fire and sample chamber are side-by-side. The heat and flue gasses are reflected into the sample chamber and from there into the flue. This separates the sample from the fuel (unlike the blast furnace), but not the flue gasses and fly ash. The Siemens-Martin oven is a special kind of reverberatory furnace, where oxydising flue gasses are used to remove the carbon and thus convert pig iron to steel (puddling).
- Scepter of Jove or bident, a pitchfork-like instrument with two prongs, was used in Roman time for the consecration of a place struck by lightning. It is probably a symbol for Jupiter's lightning bolt. The name may be derived from the young sheep sacrificed in the ritual (so young as to have only two teeth). The bident is also the symbol for Hades (Pluto), the god of the underworld.
- Staff of Asclepios Staff with a snake (allegedly a Aesculapian adder *Zamenis longissimus* (LAURENTI, 1768), Colubridae) wound around it. Originally, the "snake" is probably a Guinea worm (*Dracunculus medinensis* L., Dracunculidae), which already in ancient Egypt was removed from affected limbs by slowly pulling it out and winding it around a piece of wood.

**Trident** is similar to the bident, but has three prongs. It is the symbol of Poseidon (Neptune), god of the seas.

#### Starred Trident

*Venter equinus* Horse dung bath. Decomposition of organic material delivers a gentle, long-lasting warmth.

Wind furnace blast furnace that used natural strong winds (*i.e.*, monsoon winds) instead of bellows.

It is noteworthy that there were female alchemists at a time when females were generally limited to "kitchen, children and church", and that the work of these female alchemists was highly respected by their male colleagues. Maria Prophetissa and Cleopatra the Alchemist (Alexandria, ca. 3rd century AD, not related to the Ptolemaic queens) may be the most well-known of them.

Character	Name	Description
	Ahenum Alembic	Kettle from brass or iron Distillation apparatus consisting of cucur-
8	Aludel	bit, ambix and receiver  bottomless vessel from pottery, which were stacked for sublimation. The bottom
<b>**</b> **	Amphora	vessel with the sample was heated, in the top vessel the product was collected. earthenware bottle with conical shape that allowed safe storage on ships
\$	Staff of Asklepios	

Character	Name	Description
x <b>3</b> & ⊕ ⊖	Athanor	alchemistic oven for heating samples at moderate temperature for a long time.
** <i>B</i>	Balneum arenæ	Sand bath
ℬ▽☞┏ℋ℞╼∞	Balneum mariae	Water bath (bain marie)
<b>⊗</b>	Balneum vaporis	Steam bath (for medical purposes)
<b>₿</b>	botarion	glass instrument shaped like a breast used as a receiver for an alembic
<b>♦</b>	Ampulla, bottle	
<b>                                     </b>	Staff of Hermes	
€ 15.	Casserole	
Ϋ	Covered pot	
$ \begin{array}{c} \bullet \\ \bullet $	Crucibulum, tigilum, crucible, melting pot	a heat resistant ceramic vessel used to heat substances in fire.
%7 <b>&lt;</b> F		

Name	Description
Gr. βῖκος <i>bîkos</i> Cucurbit	vessel containing the sample to be distilled
Lat. <i>Cupella</i> : diminutive to <i>cupa</i> = vessel	crucible used for the process of cupellation
Fixum = fireproof	
Fornax = forge, furnace	fire place used to heat metal until it can be worked
Furnus cupellatori	
Furnus pubarion	
Lamp	
Librum = book	
Ovum philosophicum, phi <mark>losop</mark> hical egg	sealed container, in which a sample was heated
Phiola	small glass bottle
Receiver	part of a distillation apparatus
Retort	curved glass vessel
Reverberatory furnace	oven for smelting metal, the sample is heated by the flue gasses, not directly by the fire.
	Gr. βῖκος bîkos Cucurbit  Lat. Cupella: diminutive to cupa = vessel  Fixum = fireproof Fornax = forge, furnace  Furnus cupellatori Furnus pubarion  Lamp  Librum = book  Ovum philosophicum, philosophical egg  Phiola Receiver  Retort

Character	Name	Description
7 R X	Sand cupel	
*	Sceptre of Jove	
+1   ×   ▼   M   A<	Skillet	frying pan
ĊТ.	Test	large cupel used for refining gold and silver
 * •□ ፟፟፞፞፞፞፞ <i>ጟ</i>	Trident of Aquarius starred Trident	
	Wind furnace	blast furnace operated by wind rather than a bellow

### 11 Medical terms

Character	Name	Description	
<b>√</b> ↓ ↓	Tumour, swelling		
<b>L</b>	Ulcer		
<b>ਊ</b>			
$\nearrow \setminus$	V <mark>ene</mark> ralDiseas <mark>e</mark>		
$\checkmark$	Wou <mark>nd</mark>		
	Sal ad <mark>calcul</mark> um = salt of calculi	Kidney- or gall stones	

## 12 Symbols of unknown meaning

For several symbols I could not find out what they refer to. [6, 7] do not contain them, at least some of them may be based on misspellings and misconceptions.

Character	Name	Description
- <b>^</b> -	Aithali ouranou, celestial vapour	
4	Argentum cuprofoetum	
Ŧ	Ashes of hearts ease	unclear, see [33]. A neurotropic plant drug?
⑩‱∪ <b>⊄</b> ╳ℷᠻ穽Ҡਊ╭╴ 痊▥	Calx metallorum	metal oxyde?
ТG	Cane	
<b><u>\$</u>.</b>	Chalamint stone	
୳ <b>୷୵୷</b>	lat. Cineres saiicis = Ash of saints	
<b>ं</b> सु	Cohabitio	Process. Possibly identical to cohobation?
Ф- <del>X</del>	Coppervater	
<sub>ლ</sub> % &	Crystal of Saturn	
平幸 垈 🖺	Essence of tartar	
æ	Flower of steel	
<b>&amp;</b>	Lead of antim <mark>o</mark> ny	
<u>ት</u>	Lead salt	

Character	Name	Description
<u>\$</u>	Lime of lead	
→ 平 千 十 十 十	Lime of Vitriol	
<b>半</b> 星	Lime of metal	
₹	Magister of crocus	
	Magnesia of iron	ferropericlase (magnesiowüstite), a solid solution of FeO in MgO found near Mount Vesuvius? "Stones from Magnesia" from Anatolia contain MgO, MgCO <sub>3</sub> and FeO
\$\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	Mercury of antimony	and are magnetic.
ρφ	Mercury of copper	
χ	Mercury of iron	
<b>☆</b>	Metalum sulphuratum	
Ψ	Renovatio met <mark>al</mark> lorum	
→ & & b J X	Lat. <i>Reverberatio</i> = reverberation, echo	
<del>V </del> <del>V</del> ⊕	Sal me <mark>dius</mark> terrestris cum acido Sal medius terrestris cum alcali	

Character	Name	Description
$\sim$	Salt of death's head	
M	Sal medius metallicus cum acido	
₩0	Sal medius metallicus cum alcali	
<b>★</b> ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★	Silver mercury Silver oil	an amalgame or silver nitrate?
	Sliver on	
\$	Sol mercurii	
Ø ⊗ Le Åt	Stagnated	K
ــ لو	Sulphurous matter	
<u>8</u> †	Tin spirit	volatile compound?

### **Appendix**

### 12.1 Acronyms

RoHS Restriction of Hazardous Substances, directive 2011/65/EU

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