# Chemical Calligraphy

Using the Dscript BioChem Notation it is easy to turn organic chemicals into attractive calligraphy works. Dscript BioChem Notation is a component of Dscript Notation ( http://dscript.org/note.pdf ), which is built upon the Dscript Alphabetical 2D writing system ( http://dscript.org/dscript.pdf ).

Dscript BioChem attempts to simplify the memorization of the large complex molecules and structures in organic chemistry.

This method is **NOT** meant to replace standard notation.

This is primarily meant as a **mnemonic device** and **art form**.

To fully grasp the molecules and their properties you will still need to understand bond strength, and visualize the 3D molecule. Visualization is best done with computers and 3D rendering. Here we focus on the elements and their arrangement/connections.

Hydrogen is dropped entirely. In a biochemical environment hydrogens are bounced around, traded and swapped so much that we will consider them "like electrons".

This is not a replacement to standard studies, but a supplement. With a proper understanding of chemistry you should easily be able to use this to memorize the overall structure and then fill in the other details on top.

## Element #1 Carbon



Carbon can be drawn in 2 possible forms.
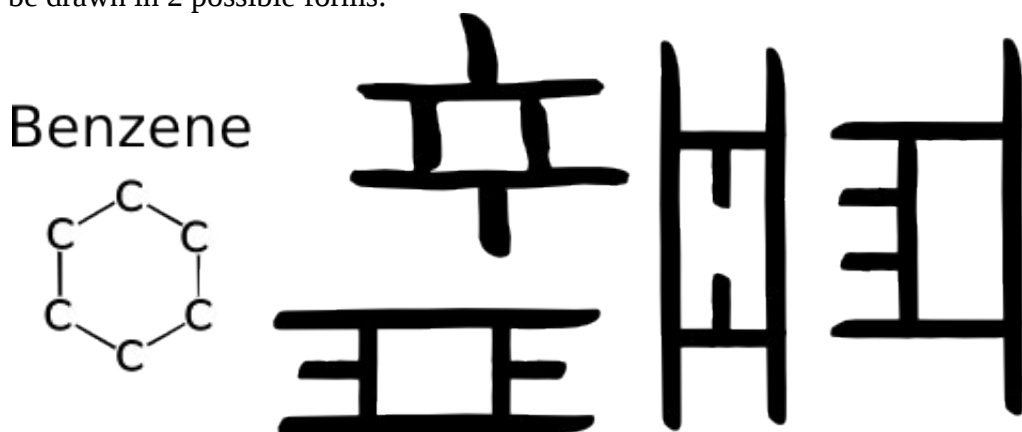


Above you see a Benzene ring. There are actually many ways to draw this, here are just a few. All of these read as "6 carbons in a ring".
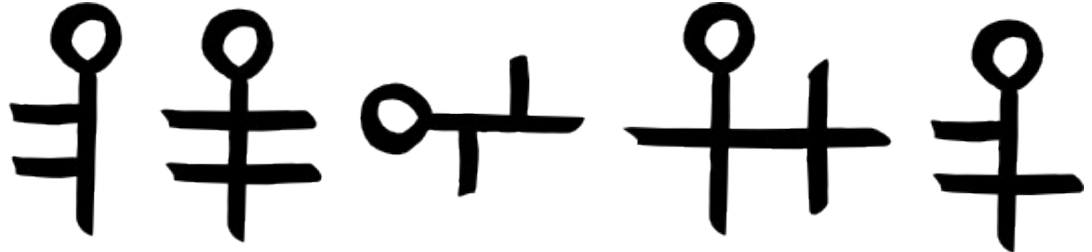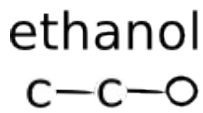
In all of these examples you will notice the intersection only has 3 lines, not 4 (which is also valid).

I find using only 3 lines makes it easier to process and memorize. The primary goal is to simplify.

# Element #2 Oxygen



Oxygen is drawn as a circle

**ethanol**
C—C—O



Above you see 5 possible forms of ethanol. All read exactly the same as "C – C - O" or "O – C - C"

Below we have an example that uses a benzene ring and some oxygen, as well as some more carbons.
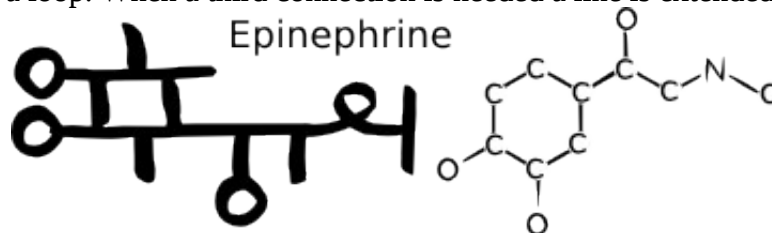
## acetylsalicylic acid
### aka Asprin



These are just 2 possible forms of acetylsalicylic acid, there are plenty more ways it could be drawn.

Determining which is the best mnemonic device is a personal issue, whatever works best for you!
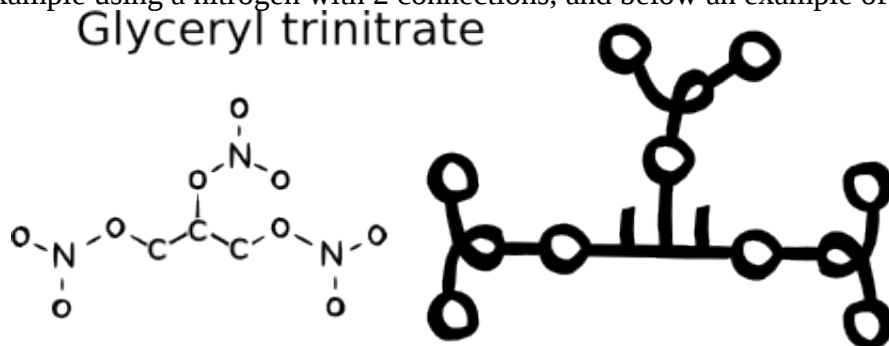
# Element #3 Nitrogen
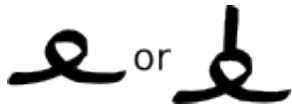


Nitrogen is drawn as a loop. When a third connection is needed a line is extended out of the loop,
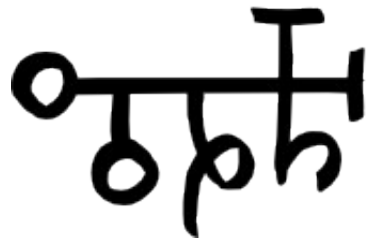
## Epinephrine



Above is a an example using a nitrogen with 2 connections, and below an example of 3 connections.
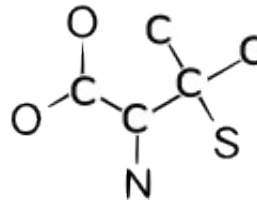
## Glyceryl trinitrate
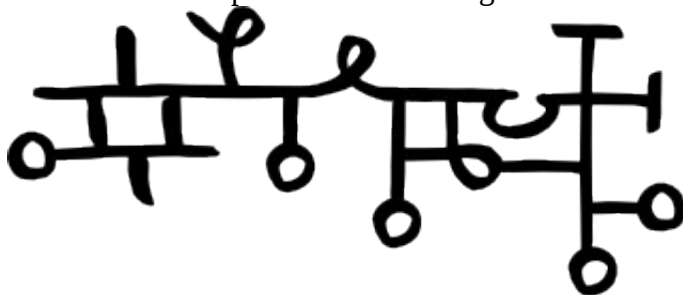
# Element #4 Sulfur



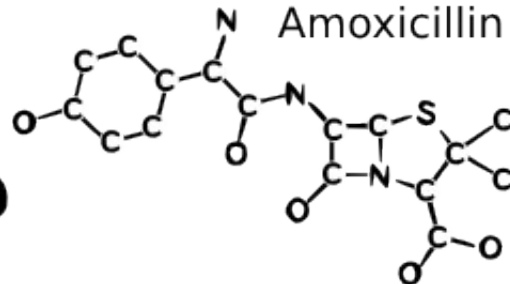sulfur is drawn a curve, connected on either side with sharp angles.

## Penicillamine



Above we see an example with sulfur using one connection, and below using 2 connections.

## Amoxicillin



# Element #5 Phosphorus



Phosphorus is an intersection of 2 lines with a third line making a triangle in one of the 4 quadrants.
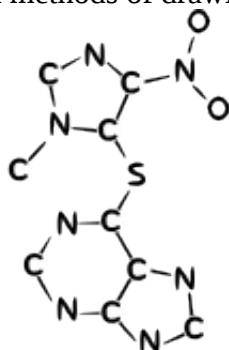


phosphate

Here is a simple example using all 4 connections.

# Complex Rings

Complex ring structures yield many possible ways of drawing them, and it can take some time to devise optimal methods of drawing them but there are elegant ways of drawing almost any structure.



Azathioprine

# Other Elements



Above is a periodic table of elements with a symbol for each element

When other elements are needed they can be drawn either....

1. cut off from the main structure, just like normal notation puts their letters in empty space and draws bond lines.
2. encapsulated in a circle and connected to from the edge of the circle

| | |
|---|---|
|  | On the left you see the **Chlorophyll _a_** molecule<br><br>Notice the loopy shape in the center<br>It is cut off from the rest of the strucutre<br><br>If you look at the table of elements above you will notice this shape identifies magnesium<br><br>Bond lines between the nitrogrens surrounding it could be drawn as well, but for this example I decided they are rather obvious and can be left out<br><br>To use the ecapsulation method the symbol for magnesium would simply be placed inside a circle and the circle's perimiter used for connections.<br>(just like oxygen, except with something drawn inside the circle) |

Here are some examples of the encapsulation method

The symbol for Mg(magnesium) can be simply encapsulated with a circle

Or you can try to conserve pen strokes by first drawing the circle then continue inwards with the Mg

Or you can be creative and first draw the M then continue into the circle and add the G curl after coming all the way around. (It looks correct even though the stroke order was changed)

Or you can be creative with the symbol itself, in this example we reverse the "G curl" to the left side. You must be very careful when altering the symbols to ensure it does not become ambiguous with other elements.

Here is Fe with the circle drawn fluidly after the element symbol

This is how the circle is added fluidly

Here is yet another way of drawing Fe, but this time drawing the circle out of the "F"

Here is K in 2 basic forms



This is Na, it can be drawn without lifting the pen at all



This is Ca in a few of its possible forms
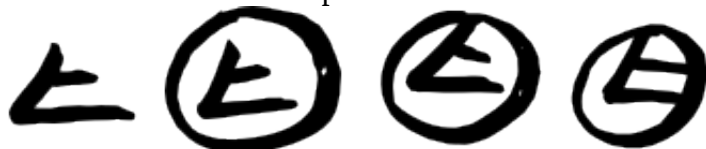


The system is designed for flexibility and creativity. But ambiguity is not acceptable, so be careful ;)

## Calligraphy Examples

Here are a few examples of what the calligraphy can look like.

Remember, each is just an example of 1 of the many possible ways a molecule could be represented with this system.

For the vitamins one form of each was chosen (many vitamins are actually groupings of many different molecules that all share a single function or purpose)

**Vitamin A**   (the symbols on the left are Dscript Alphabetical they read "vitamin a")
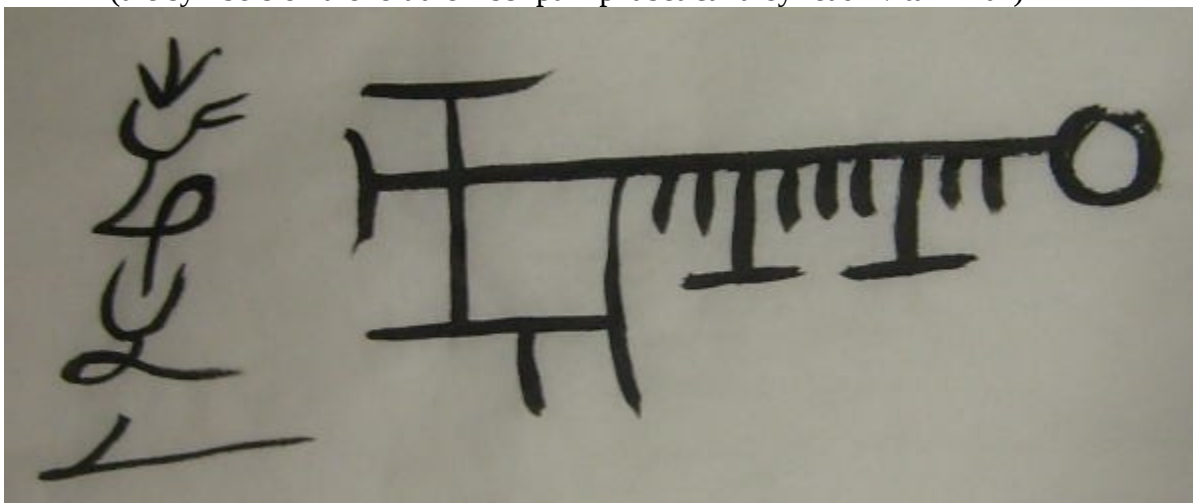
**Vitamin B1**
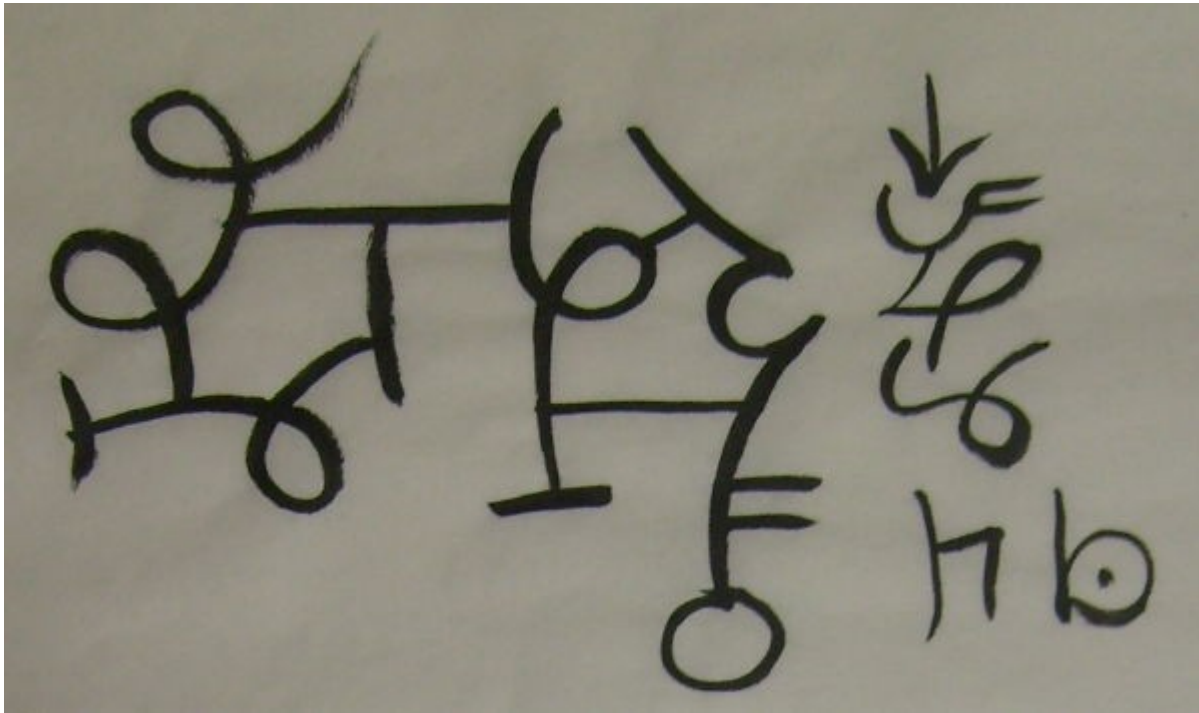


**Vitamin B2**
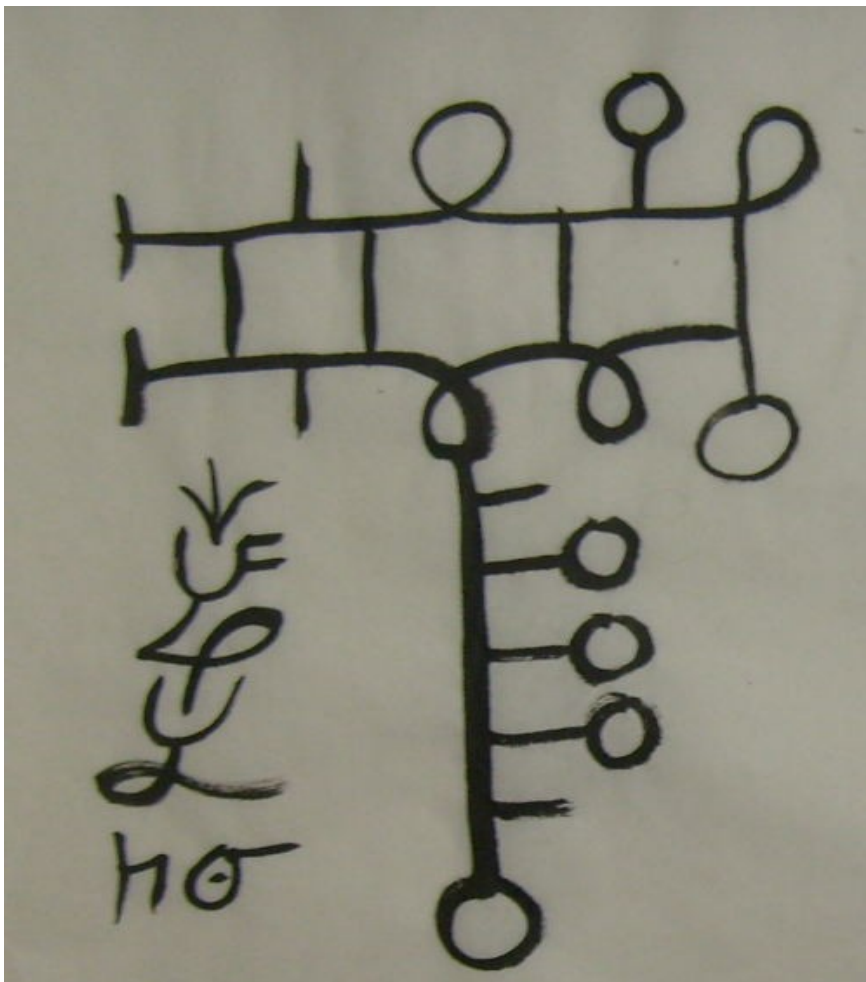
**Vitamin B5**
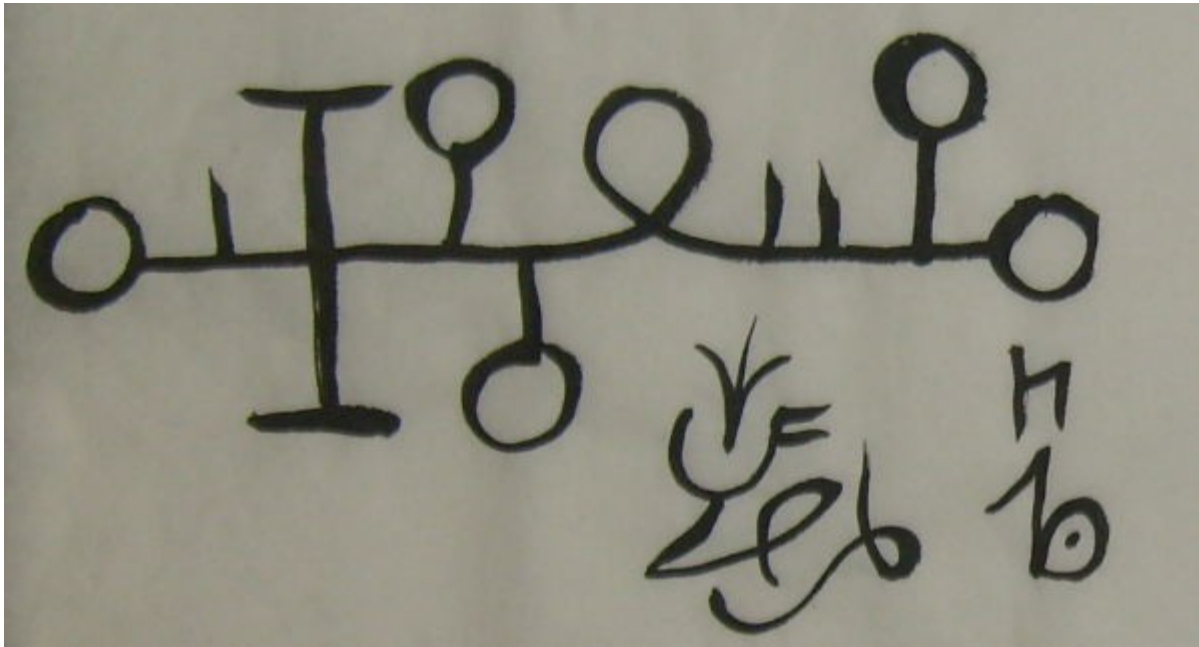


**Vitamin B6**
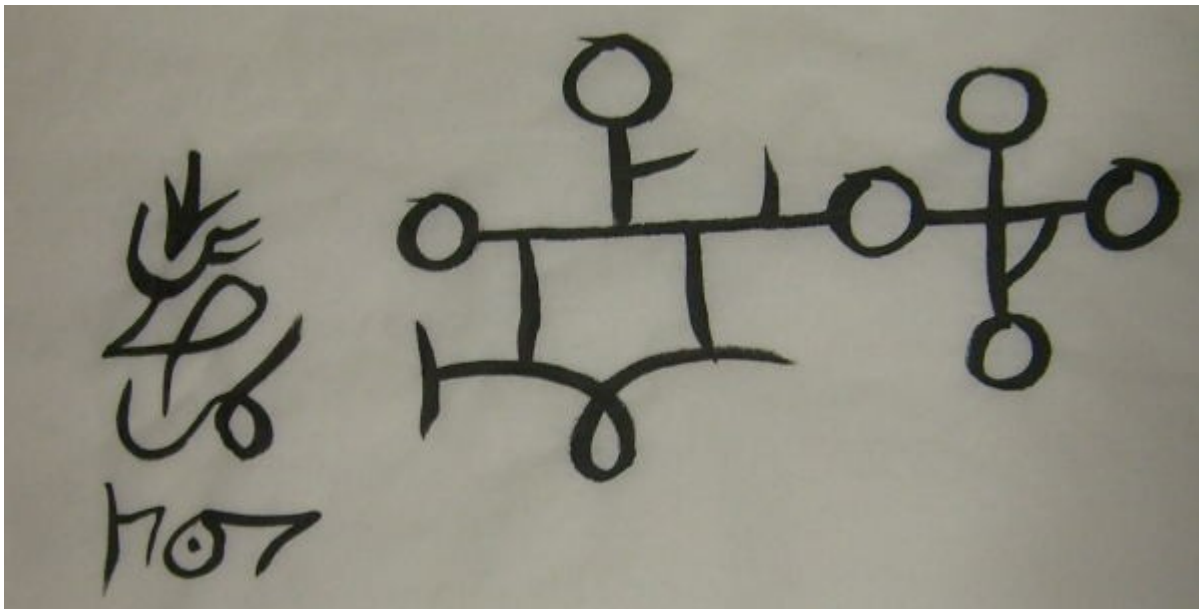
**Vitamin B7**
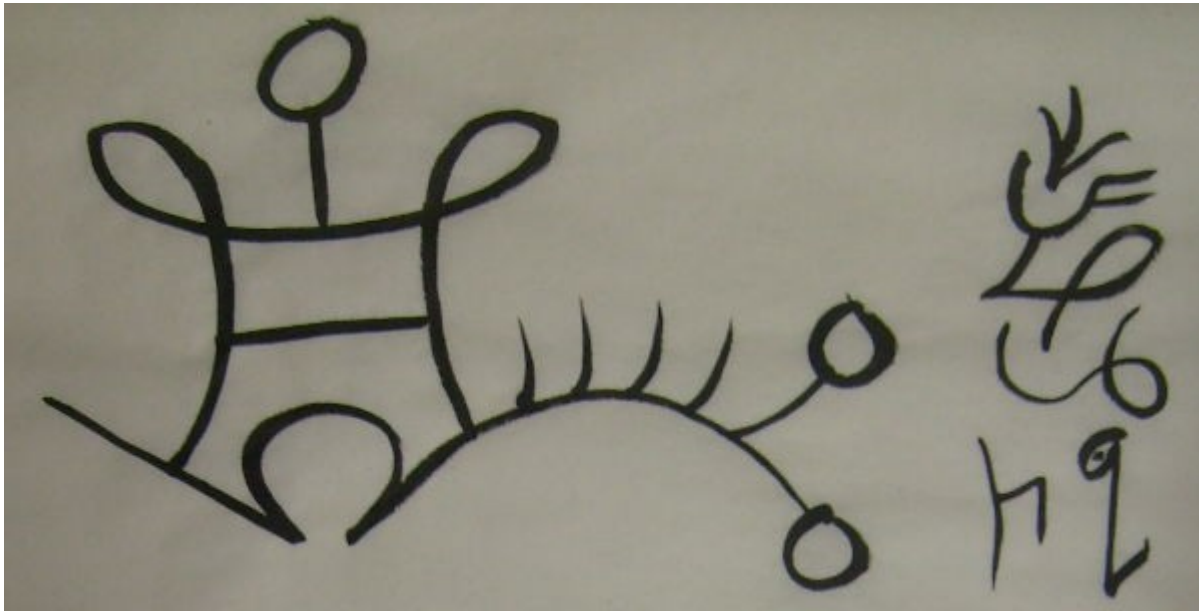


**Vitamin B9**
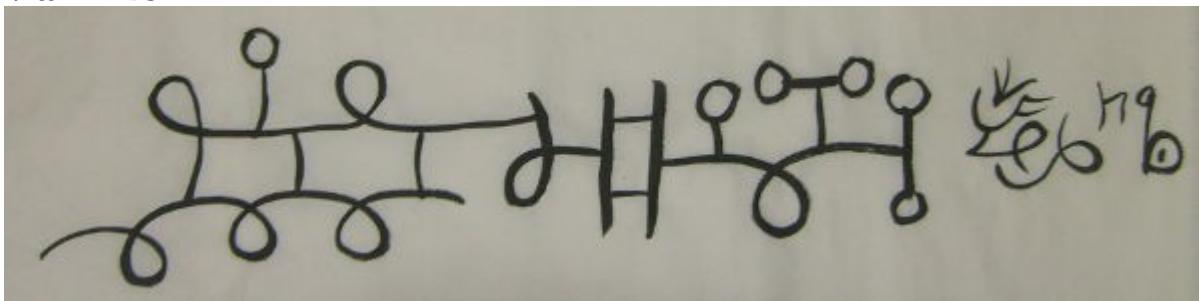


**Vitamin E**
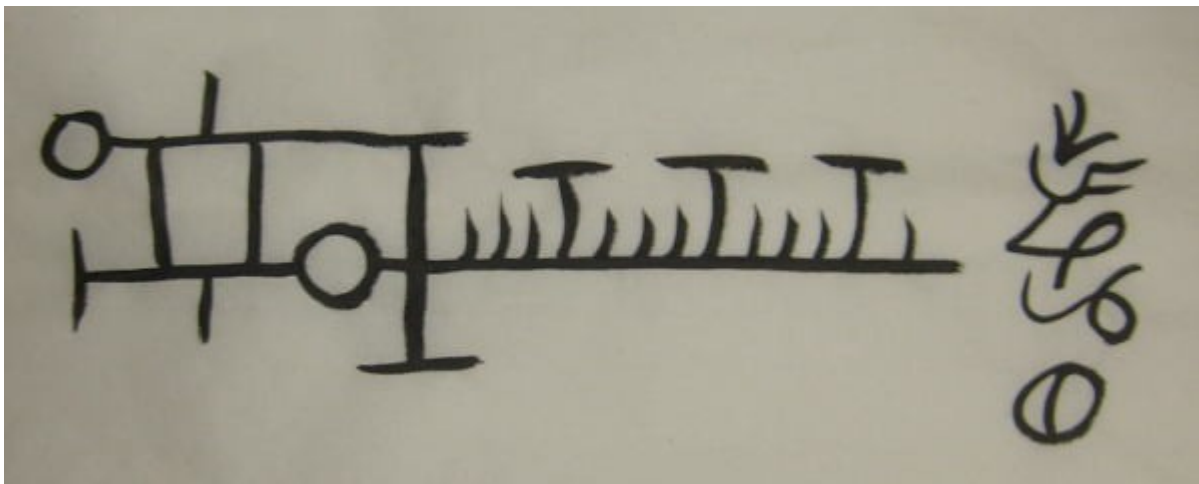
**Vitamin C**
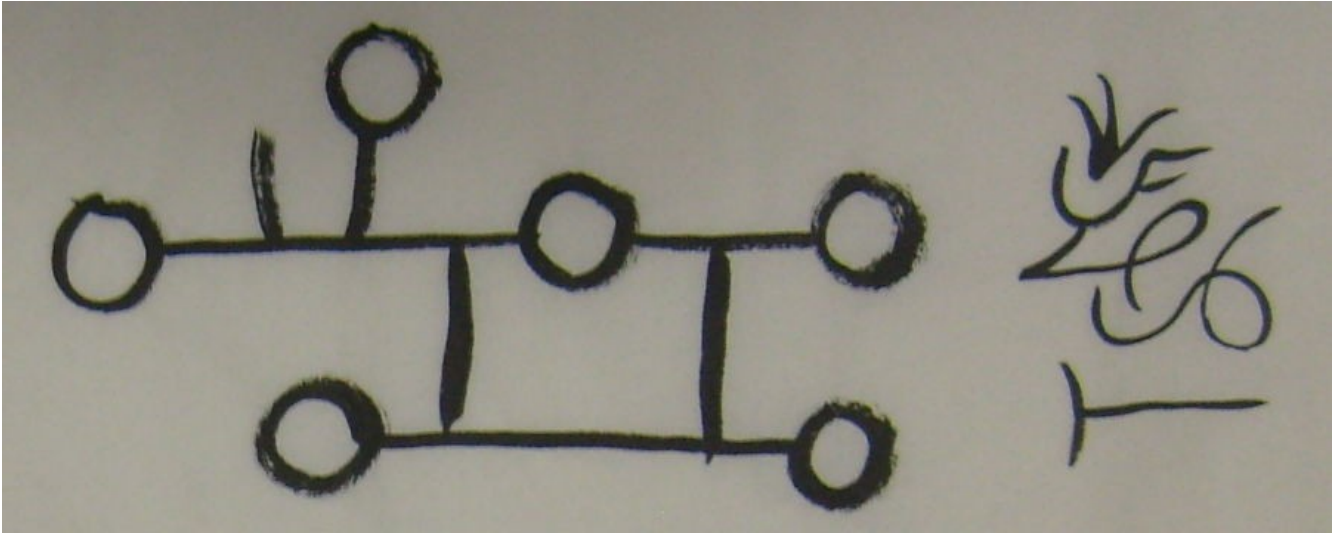


**Vitamin K**
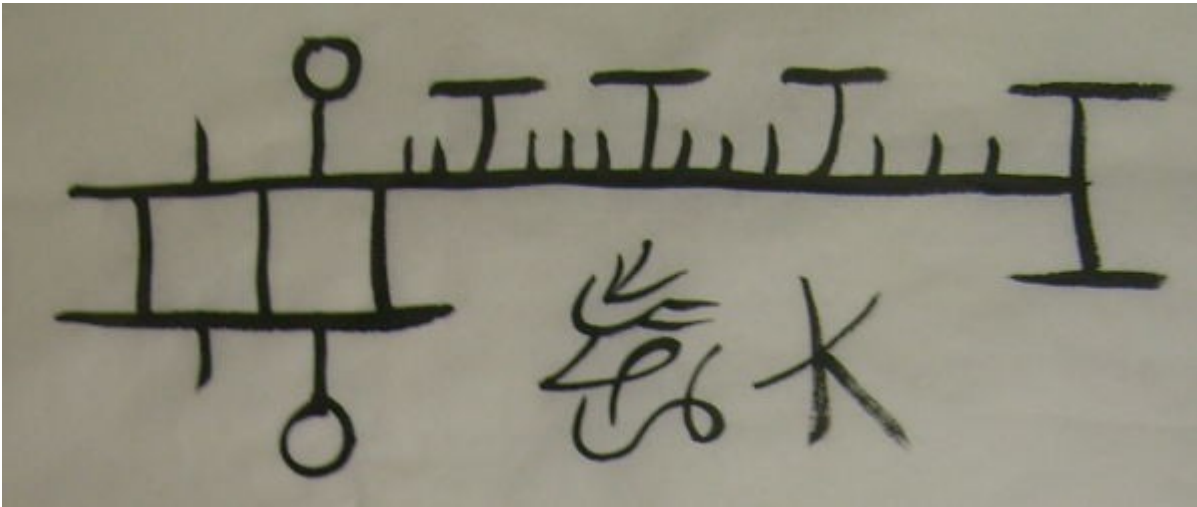
**Dscript - 2D writing system**

Adenine

Thymine

Cytosine
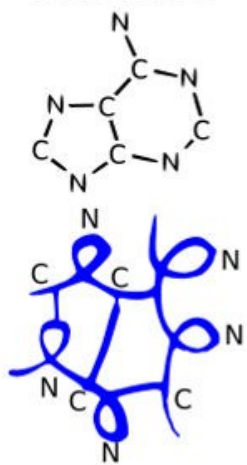
Guanine
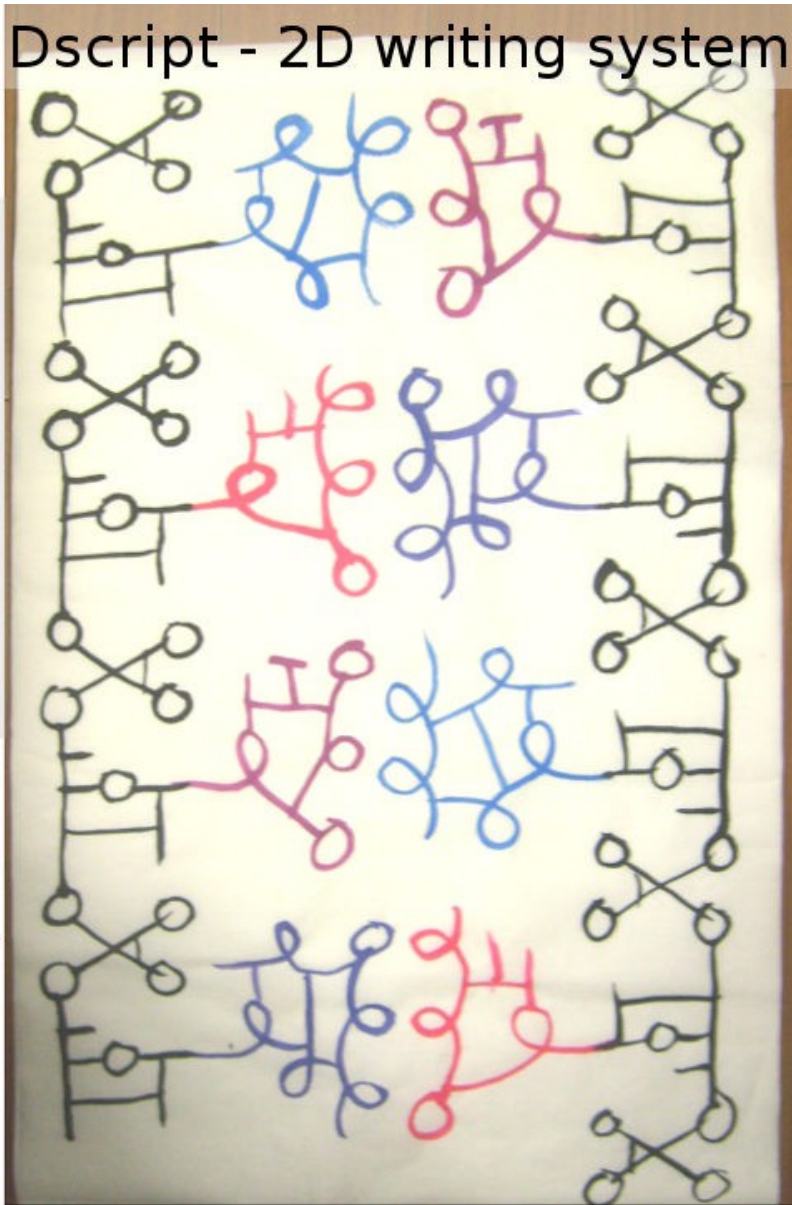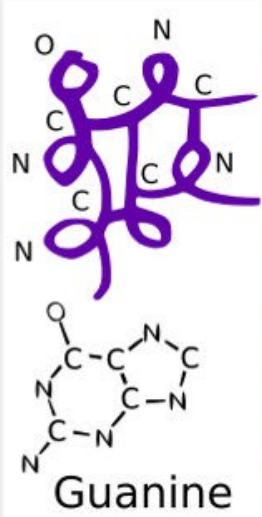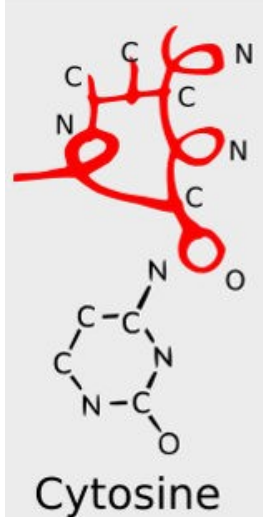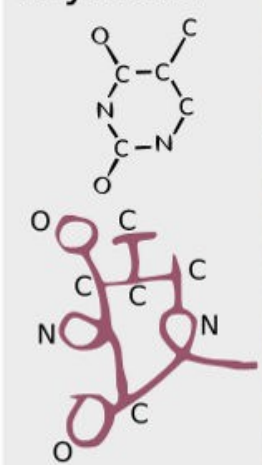
**Chemical Calligraphy - DNA**

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*"Mad Science"/"Technology Art" inventions and experiments. Great DIY fun.*
http://dscript.org/inventions.pdf