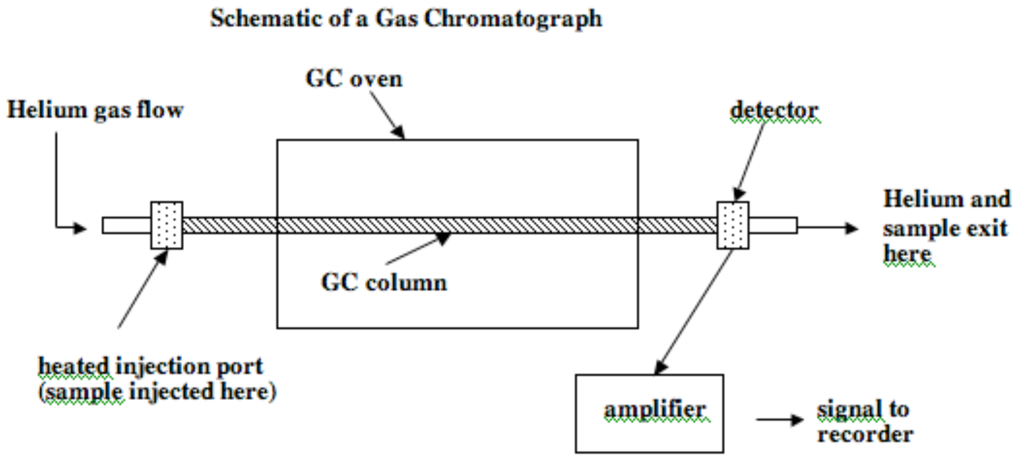
Gas Chromatography (GC).

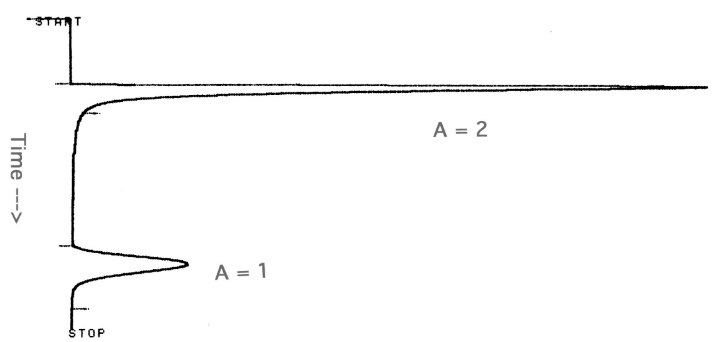


A very small sample (~ 0.1 μl = 0.0001 ml) is injected into the hot injector port.

The liquid vaporizes, helium pushes the plug of sample vapor through the thermostated column.

The lower-boiling liquid passes through more quickly than the higher-boiling liquid. As the vapor reaches the detector, a signal is sent to the amplifier and a recorder draws the chromatogram.

<u>An example</u>. The following GC trace is that of a mixture of a lower-boiling and higher-boiling liquid compound in a ratio of 2 : 1.



The injection point is at "start" at the top of the chromatogram. The peak labeled "A = 2" is due to the low-boiling liquid which reaches the detector first. The peak labeled "A = 1" is due to the high-boiling liquid which reaches the detector later.

The time between "start" and when the peak appears is known as the retention time.

The area of the peak, not the height, is proportional to the relative amounts of liquid 1 and liquid 2. (A on the chromatogram refers to area)

In our lab, the relative areas are reported by an electronic integrator.

This chromatogram would look similar to the chromatogram of a mixture of 2 parts cyclohexene to 1 part toluene.

Factors affecting separation in GC.

Column Material: chosen for compounds being separated.

Column Length: the longer the column, the longer the compounds take to go through, resulting in a potentially better separation.

Column Temperature: higher temperature, shorter retention time. Lower temperature, longer retention time. A longer retention time may lead to a better separation.

Helium Flow Rate: higher flow rate, shorter retention time. Lower flow rate, longer retention time.

In practice, the column material and length is chosen to work with a particular mixture of compounds. Fine tuning of the separation is done by adjusting the temperature and flow rate. For example, if a poor separation is observed (overlapping peaks), the column temperature could be lowered, which would probably result in a better separation.

Another example of a GC. The following is a GC of a fraction of crude oil (petroleum) approximately corresponding to a gasoline fraction, which contains the various isomers of the C4 – C7 hydrocarbons. Gasoline from different refineries and therefore different gas stations would have a slightly different amount of each compound. This would result in unique GCs which could be used for example as a “fingerprint” in arson investigations.