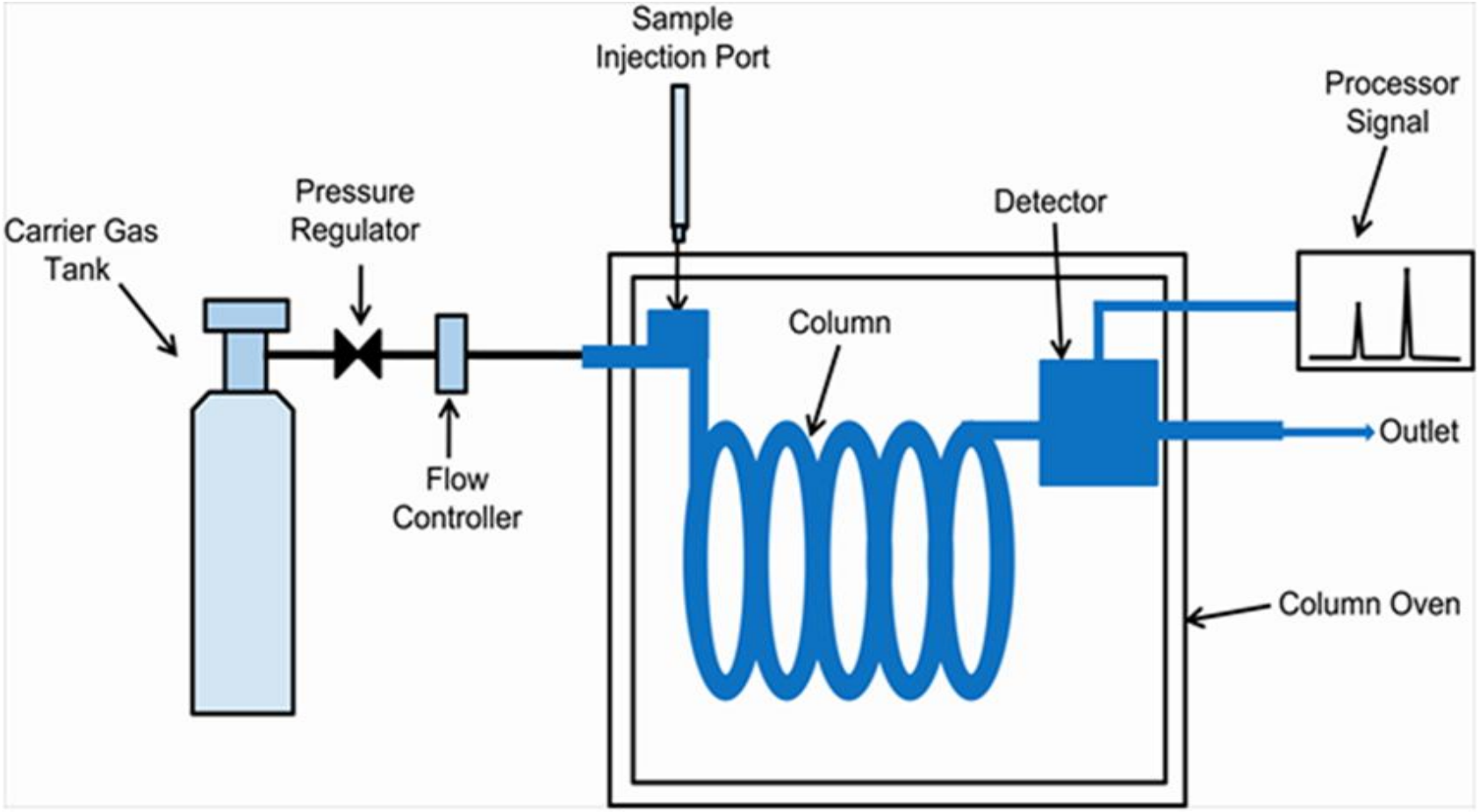
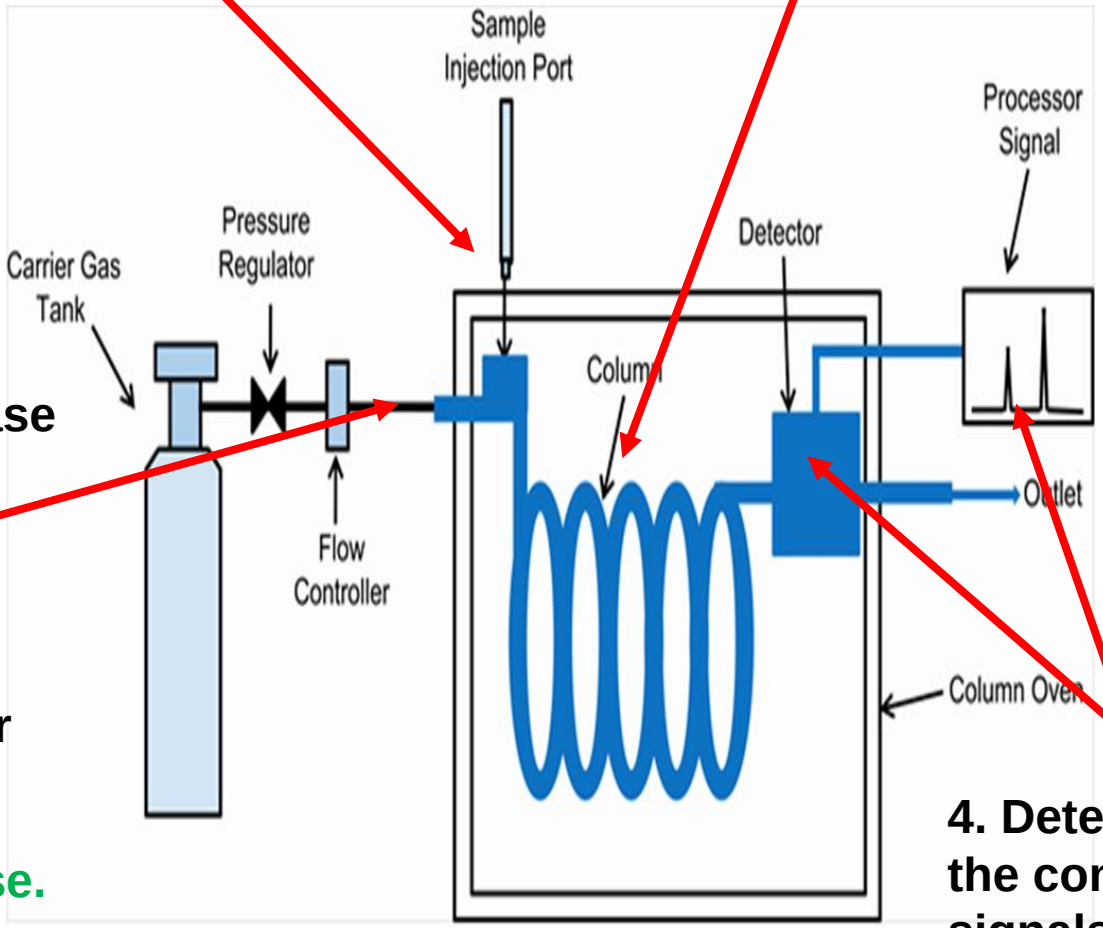
Gas Chromatography

Gas chromatography is a technique used for separation of volatile substances, or substances that can be made volatile, from one another in a gaseous mixture at high temperatures.



1. A sample containing the compounds to be separated is injected into the gas chromatograph.

3. As the carrier gas flows through the column, the components of the sample come in contact with the stationary phase. They are then separated according to their affinities to stationary phase

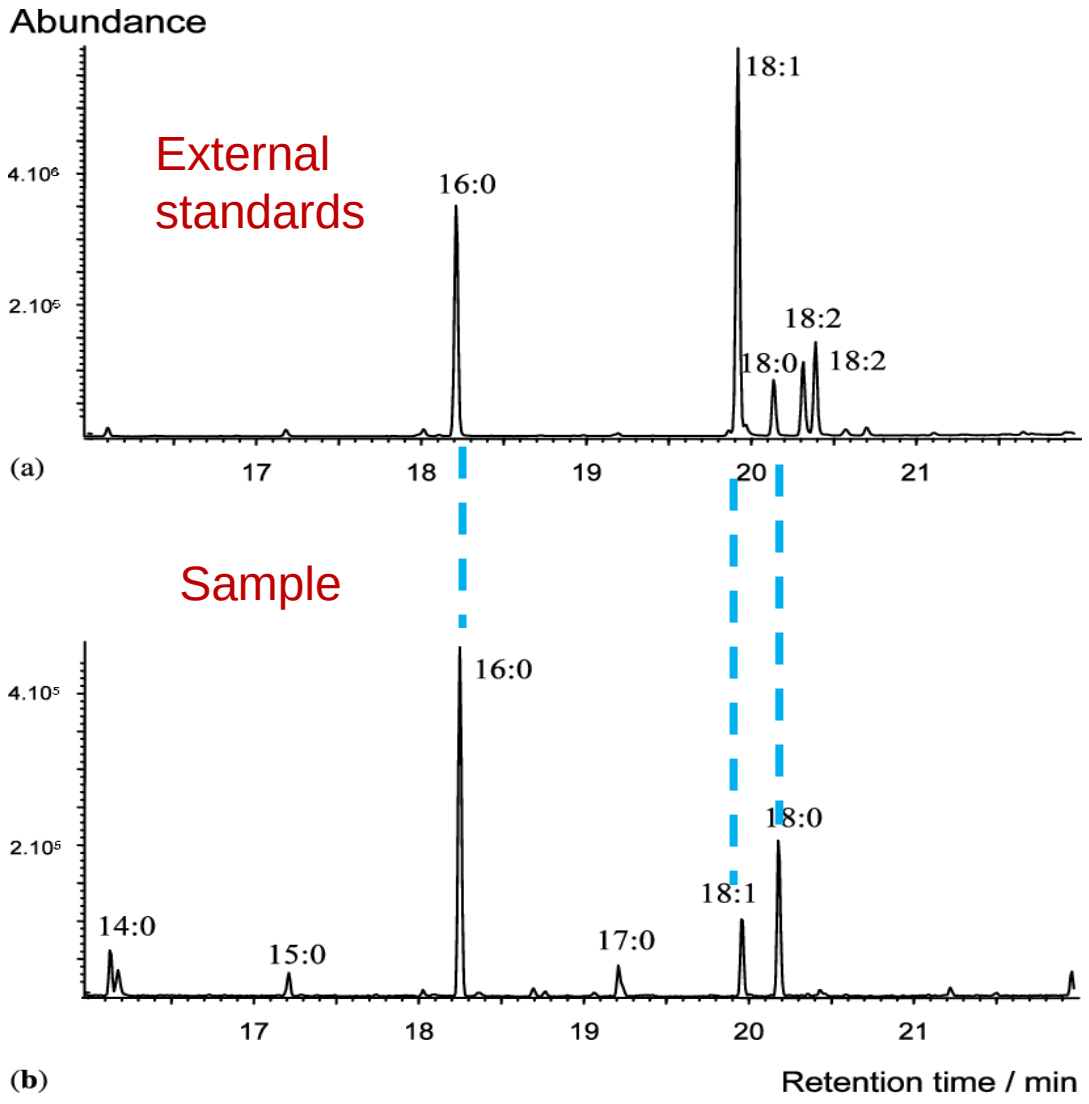


2. A mobile phase (carrier gas) moves them through a column that contains a wall coated or granular solid coated stationary phase.

4. Detectors convert the compounds to signals that are processed

Gas chromatography can be used for both qualitative and quantitative analysis.

For qualitatitive analysis, retention times of the materials in the sample are compared with the retention times of the external standards.

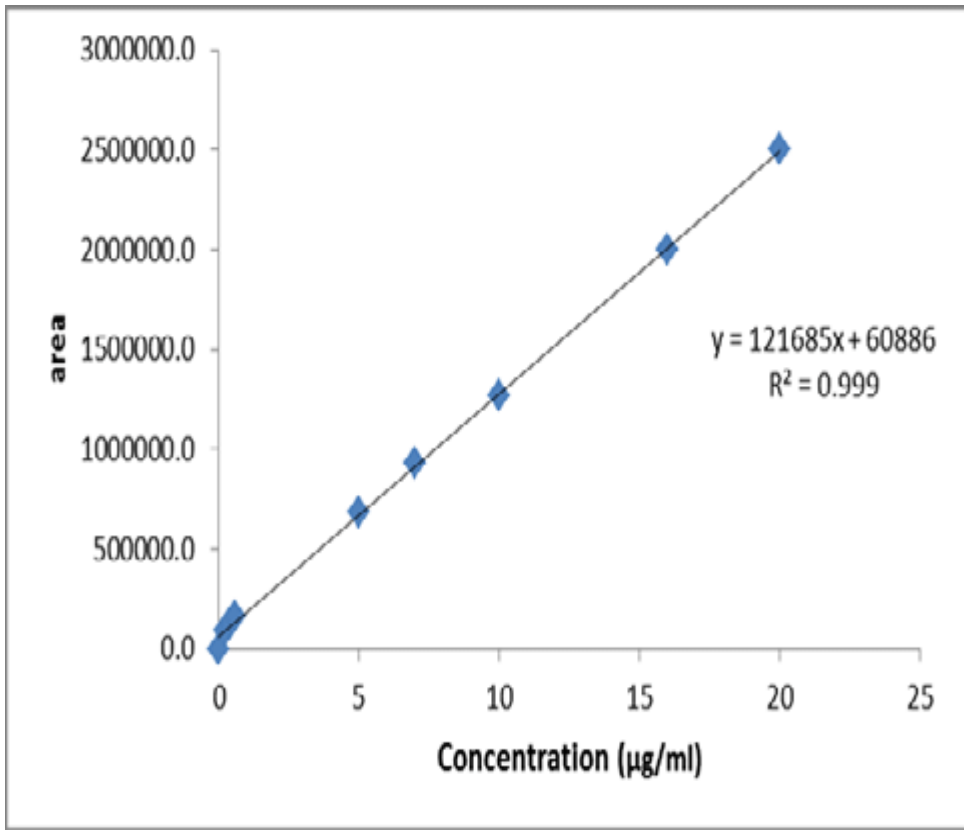


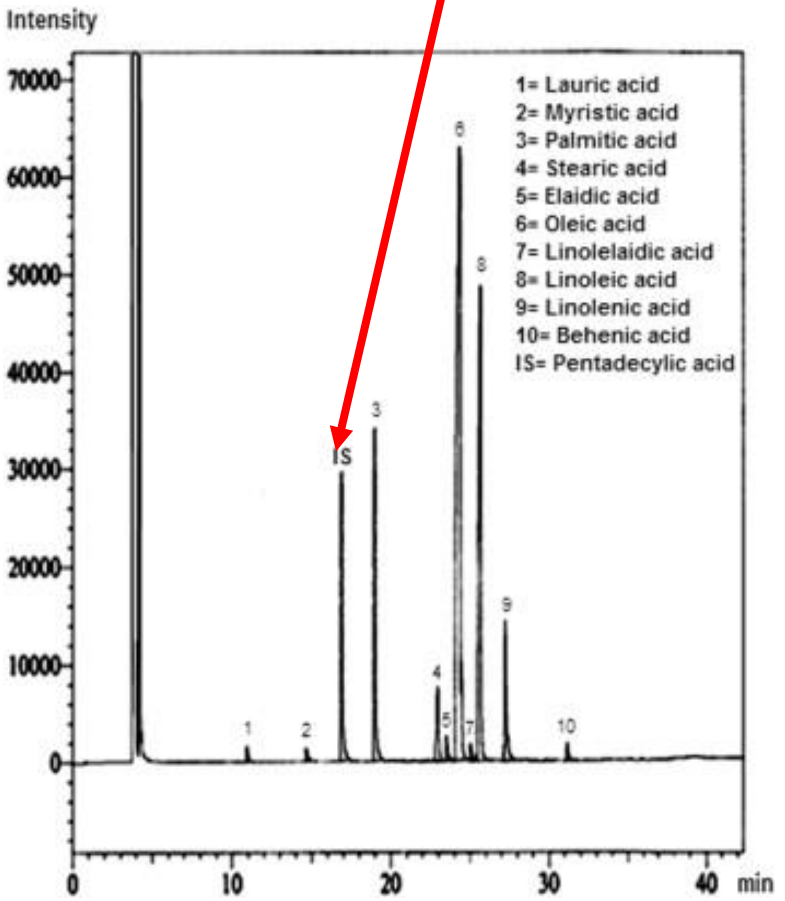
Quantitavie analysis is accomplished by using

a standard curve

or

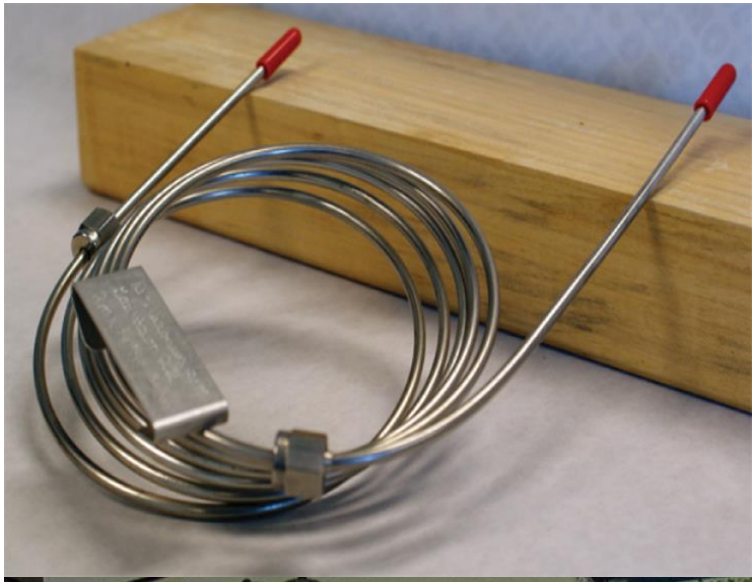
an internal standard

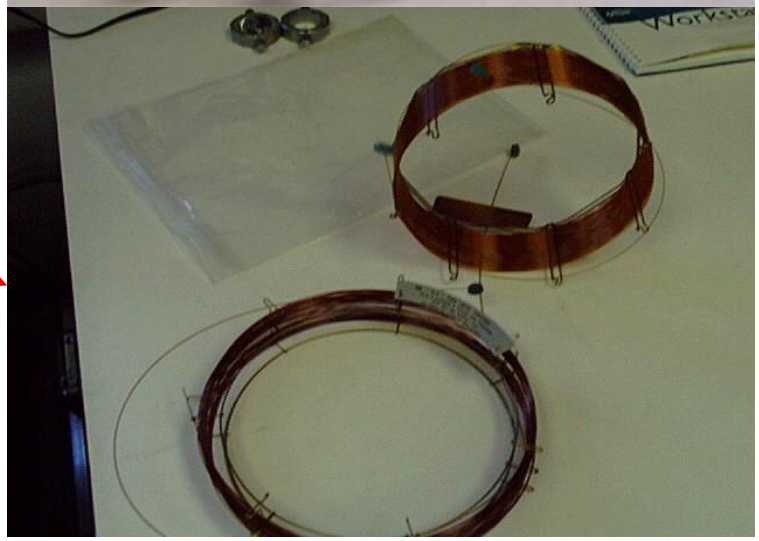




Column Configurations and Ovens

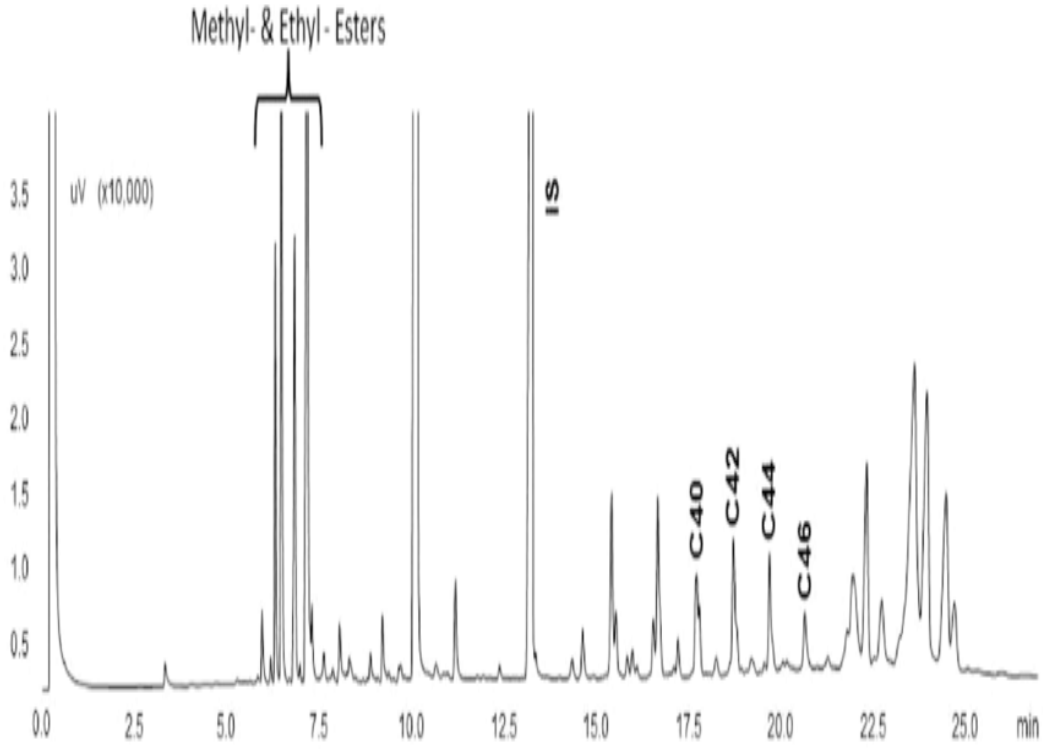
- The column in chromatography is the heart of the technique.
- A column can either be a packed or open tubular (capillar)
- Packed columns are relatively short (~2meters) while open tubular columns may be as long as 30-100 meters

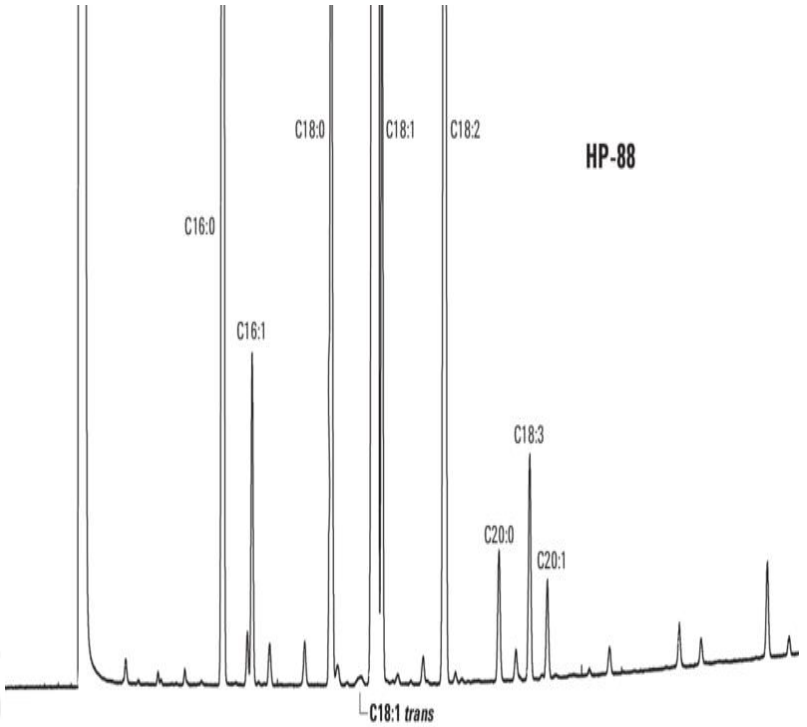




Non-polar stationary phases best for non-polar compounds, such as waxes

Polar stationary phases best for polar analytes polar compounds, such as fatty acids



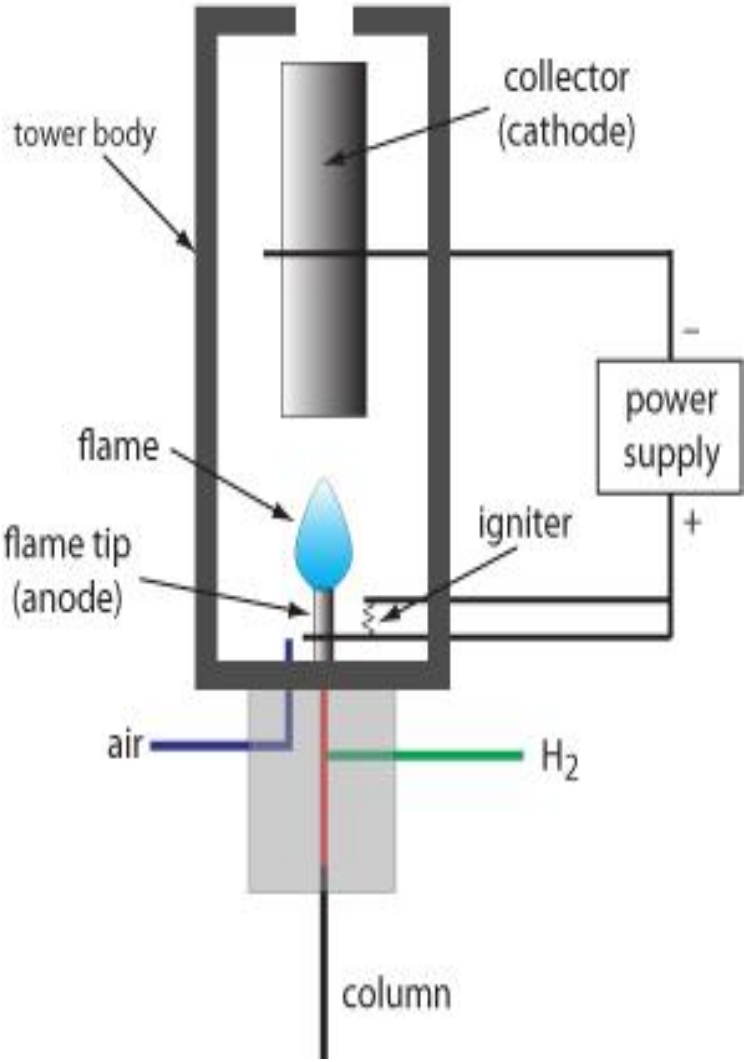


Waxes separated
by a nonpolar column

Fatty acids separated
by a polar column

Flame Ionization Detector (FID)

- This is one of the most sensitive and reliable destructive detectors.
- Separate two gas cylinders is used. One for fuel and the other for O_2 or air are used in the ignition of the flame of the FID.
- The fuel is usually hydrogen gas. The flow rate of air and hydrogen should be carefully adjusted (1/10) in order to successfully ignite the flame.



The FID detector is a mass sensitive detector where solutes are ionized in the flame and electrons emitted are attracted by a positive electrode, where a current is obtained

The FID detector is not responsive to air, water, carbon disulfide.