



Introduction to analytical chemistry

-Qualitative analytical chemistry

-Quantitative analytical chemistry

Analytical chemistry is the science of obtaining, processing, and communicating

information about the composition and structure of matter. Methods that are useful in all fields of science, engineering, and medicine. In other words, it is the art and science of determining what matter is and how much of it exists. It uses instruments and methods used to separate, identify, and quantify matter. Analytical chemistry was the most popular field of work for chemists and can be divided into two types: qualitative and quantitative analysis.

Chemical analysis: Process that is associated with detection, identification and determination of different chemical species (atoms, ions, compounds, functional groups etc) in a particular sample.

Qualitative analysis an analysis in which we determine the identity of the constituent species in a sample. It solves many problems in analytical chemistry that begin with the need to identify what is present in a sample.

Qualitative analysis is performed by adding one or a series of chemical reagents to the analyte. Analytes are the components of a sample that are determined.

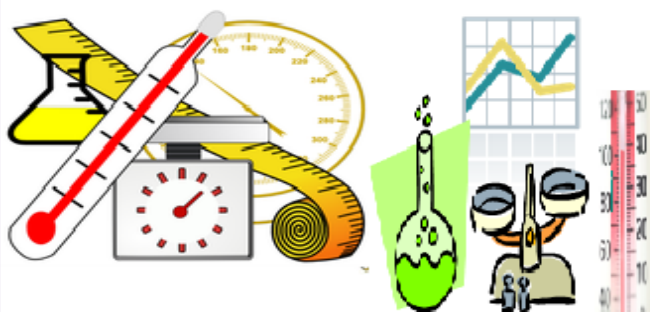
Quantitative analysis an analysis in which we determine how much of a constituent species is present in a sample. It is a branch of chemistry that deals with the determination of the amount or percentage of one or more constituents of a sample. A variety of methods is employed for quantitative analyses, classified as **chemical** or **physical**, depending upon which properties are utilized. Chemical methods depend upon such reactions as precipitation, neutralization, and oxidation. Physical methods involve the measurement of some physical property such as density, refractive index, absorption or polarization of light, electromotive force, magnetic susceptibility, and numerous others.

An analysis will often require a **combination** of methods: qualitative for separating desired constituents from a sample and quantitative for measuring the amounts present.

Quantitative Data

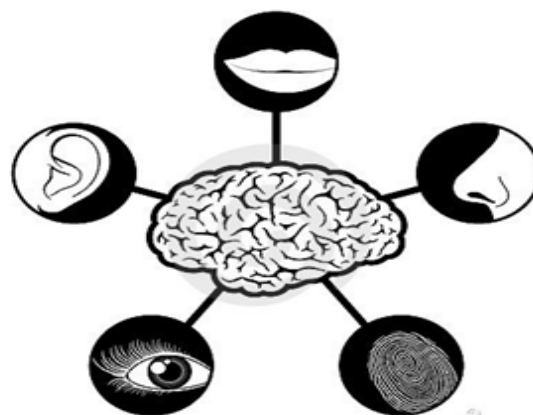
are made with instruments
These results are measurable.

(numbers)

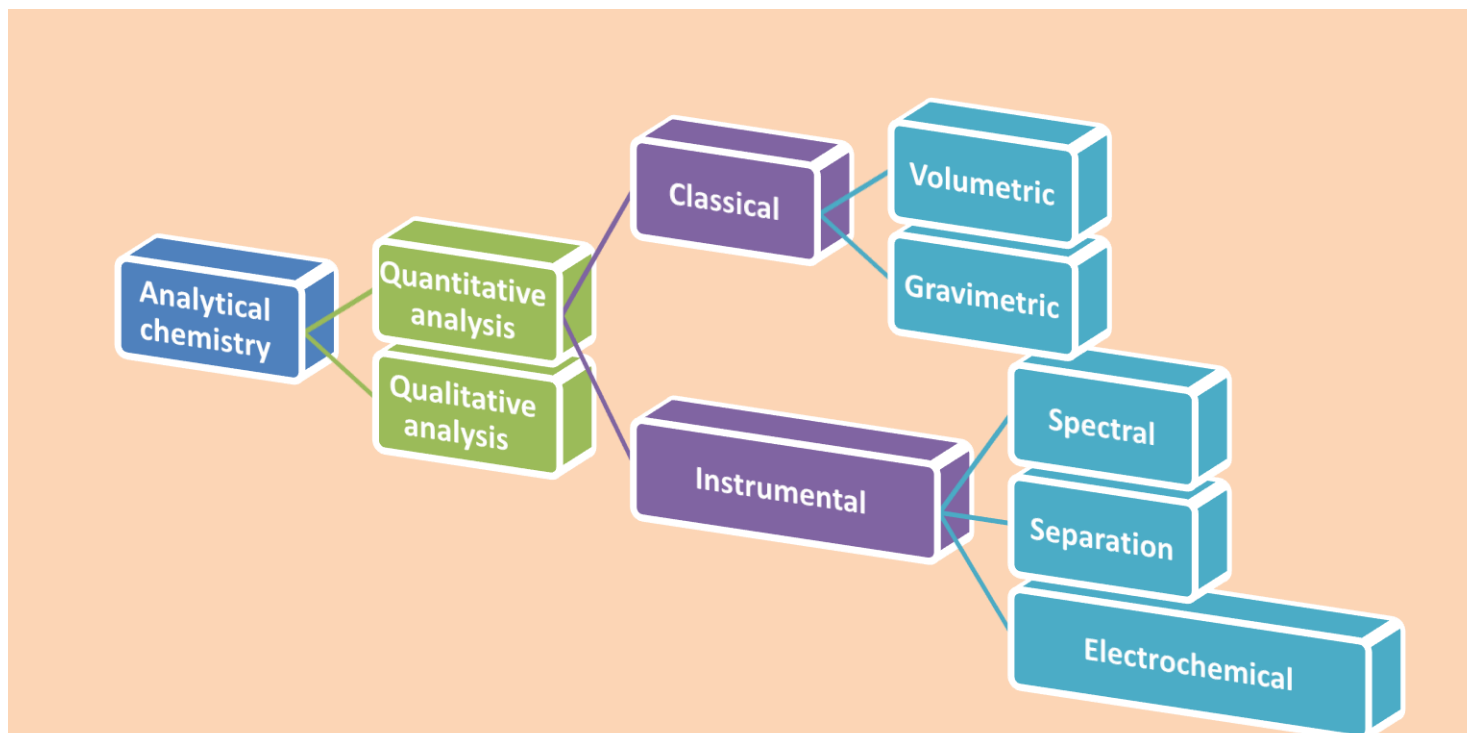


Qualitative Data

use your senses to
observe the results.



Qualitative analysis	Quantitative analysis
1 determine the identity of the constituent species in a sample	determine how much of a constituent species is present in a sample
2 Focuses on descriptive data.	focuses on numerical data
3 Results are in words or pictures or spoken narratives rather than numbers	Result that are based on numeric analysis (number) and statistic (mathematical calculation)
4 not have the advantage of scaling	Advantage of scaling



Quantitative chemical analysis can be classified into methods:-

1- Classical Methods (traditional)

a- Volumetric methods: measure the volume of a solution containing sufficient reagent to react completely with the analyte

b- Gravimetric methods : determine the mass of the analyte or some compound chemically related to it

2- Instrumental methods

a- Spectral methods: is a method to explore the interaction between electromagnetic radiation and analyte atoms or molecules or the emission of radiation by analytes.

b- Electrochemical methods: is a method to measure electrical properties such as potential, current, resistance, and quantity of electrical charge.

c- Separation methods: is a method to achieve any phenomenon that converts a mixture of chemical substance into two or more distinct product mixtures, which may be referred to as mixture



General steps in a chemical analysis:-

We can summarize general steps in the chemical process:-

Complete analysis consists of series of steps

- + Problem identification (Formulation the question)
- + Selection of a method (Selecting analytical procedures)
- + Sample collection
- + Processing the sample (sample preparation)
- + Preparation of standard
- + Calculation , discussion and conclusions
- + Check validity and reliability

A solution is a homogeneous mixture of two or more substances.

A minor species in a solution is called solute.

The major species in a solution is called solvent.