



Ministry of higher education and scientific research
AL-Mustaqbal University college
Department of medical physics



Analytical chemistry

Lecture 1

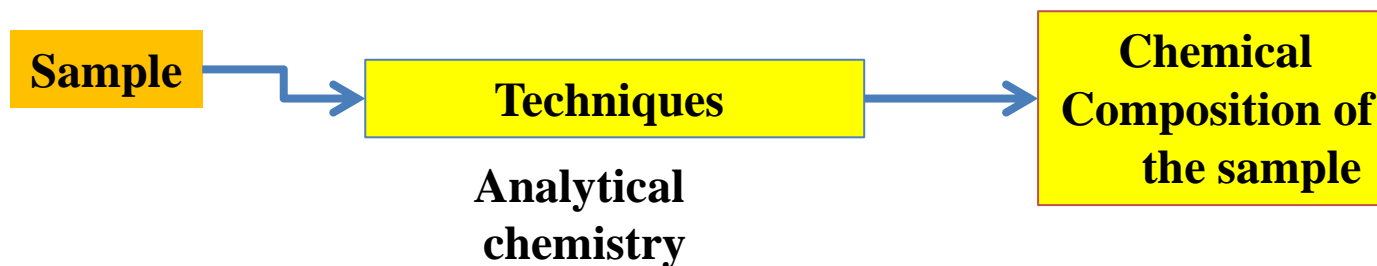
Introduction to Analytical chemistry ,definition,
scope ,classification and Gravimetric analysis

By

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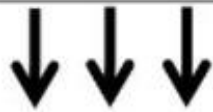
What is analytical chemistry?

It is the science of obtaining, processing, and communicating information about the composition and structure of matter.

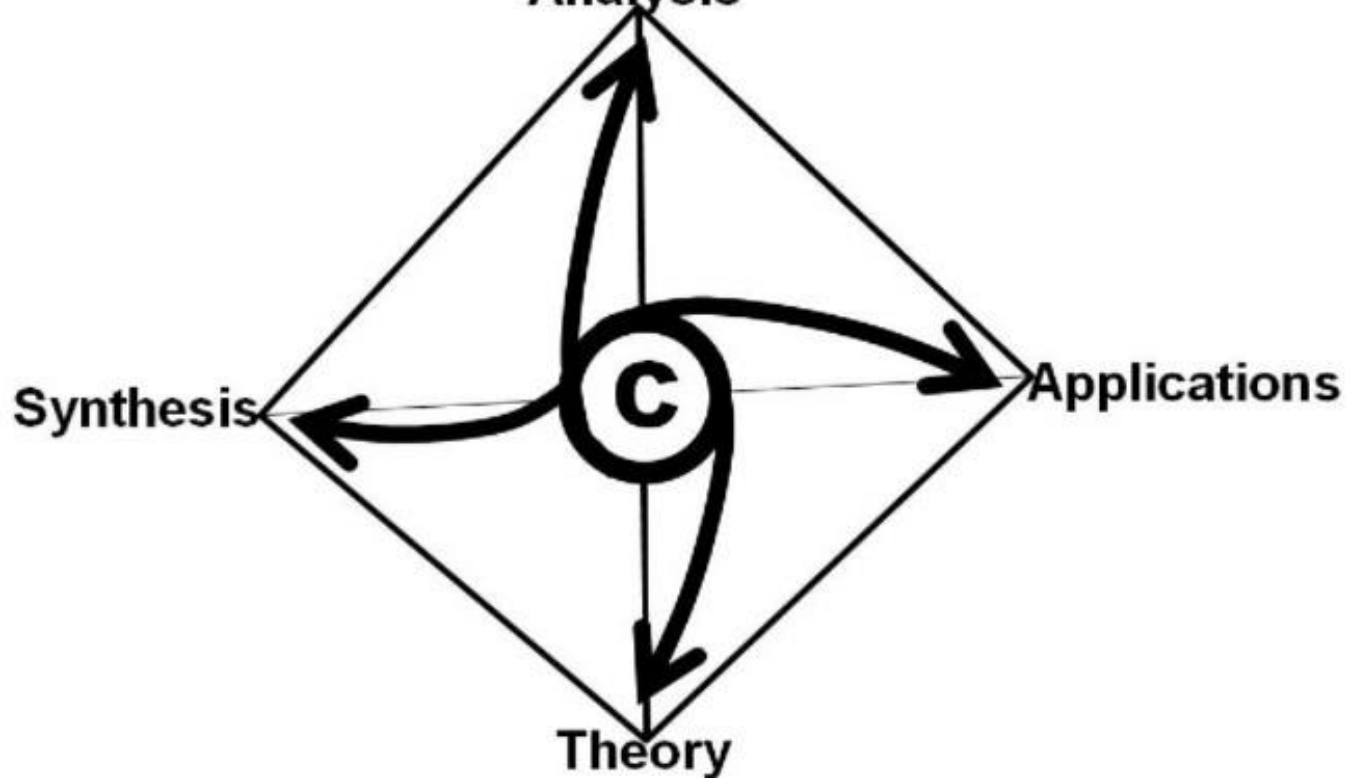


Like Using mass spectrometry to measure charged particles to determine the composition of a substance

ANALYTICAL CHEMISTRY



Analysis



In analytical chemistry, we often determine the amount of chemical species from mass measurements.

For such measurements, kilograms (kg), grams (g), milligrams (mg), or micrograms (μg) are used.

Volumes of liquids are measured in units of liters (L), milliliters (mL), or microliters (μL).

The units of volume is liter and it is defined as exactly 10^{-3} m^3 .

The milliliter is defined as 10^{-3} m^3 , 1 cm^3 or 10^2 dL .

What is the scope of analytical chemistry?

Analytical chemistry plays an enormous role in our society, such as in drug manufacturing, process control in industry, environmental monitoring, medical diagnostics, food production, and forensic surveys.

It is also of great importance in different research areas

Steps in analytical analysis

1. Define the problem

This means that the analyst should know what is the information required ,the type and amount of sample, the precision and accuracy of the result , the analytical method which can be used to achieve these results, etc.

- **Precision:** describes the reproducibility of a result.
- **Accuracy:** describes how close a measured value is to the true value.



High precision
High accuracy



High precision
low accuracy



Low precision
high accuracy



low precision
low accuracy

2. Obtain a representative sample:

A chemical analysis is usually performed on only a small portion of the material to be characterized. This portion needs to have the same characteristics of the whole sample in order to obtain the actual results.

3. Sample preparation:

Most analytical methods requires a liquid form of the sample rather than solid form. Therefore, samples need to be dissolved quantitatively and may also be diluted to the concentration range of the method if they are present in a high concentration.

4. Chemical separation:

The sample may contains solutes which interfere with the determination of the analyte. If this is the case, the analyte should be separated from the sample matrix by an acceptable procedure

5. Perform the measurement:

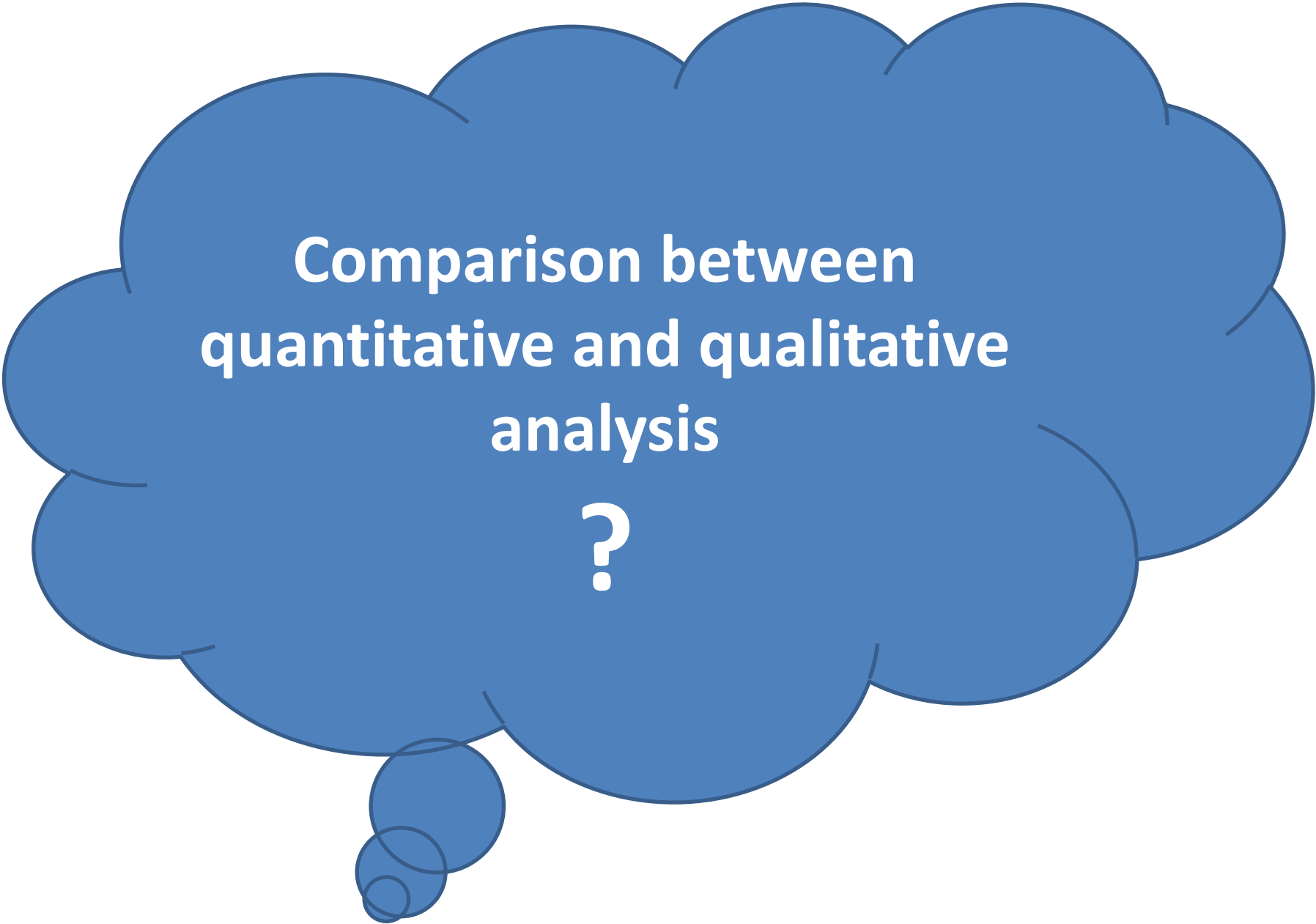
This implies conducting the analytical procedure and collecting the required data.

6. calculation:

The final step in the analytical process is to perform the calculation and report the result in an acceptable manner.

Analytical chemistry can be divided into two main types:

- **Qualitative analysis (identification)** : used to yield information about identity of species or functional groups of given sample (an analyte can be identified)
- **Quantitative analysis (how much is present)**: provides numerical information of analyte (quantitate the exact amount or concentration)

A large, blue, cloud-like thought bubble with a thin black outline. Inside the bubble, the text "Comparison between quantitative and qualitative analysis" is written in white, bold, sans-serif font, centered. Below the text is a large white question mark. At the bottom left of the main bubble, there are three smaller, overlapping blue circles of decreasing size, also with thin black outlines, suggesting a trail or continuation of thought.

**Comparison between
quantitative and qualitative
analysis**

?

Quantitative analysis can be divided into:

- ❖ Gravimetric methods (measurement in mass): the mass of the analyte or some compound chemically related to it is determined.
- ❖ Volumetric methods (measurement in volume) : the volume of a solution containing sufficient reagent to react completely with the analyte is measured.
- ❖ Electroanalytical methods: electrical properties such as potential, current, resistance, and quantity of electrical charge are measured.
- ❖ Spectroscopic methods: the interaction between electromagnetic radiation and analyte atoms or molecules or the emission of radiation by analytes is explored.

Gravimetric analysis

Methods used in analytical chemistry for the quantitative determination of an analyte (the ion being analyzed) based on its mass. The principle of this type of analysis is that once an ion's mass has been determined as a unique compound, that known measurement can then be used to determine the same analyte's mass in a mixture, as long as the relative quantities of the other constituents are known.

The four main types of this method of analysis are precipitation, volatilization, electro-analytical and miscellaneous physical method. The methods involve changing the phase of the analyte to separate it in its pure form from the original mixture and are quantitative measurements.



Thank You
For Your
Attention

