



# Al Mamoun University College

Laser and Optoelectronics Engineering Department

## Chemistry

### Lecture One

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# *Chapter One*

## *Introduction to Analytical Chemistry*

 *The nature of Analytical  
Chemistry*

 *The Role of Analytical  
Chemistry*

 *Methods of Analytical  
Chemistry*

 *Quantitative Analytical  
Method's*

 *Typical Quantitative  
Analysis*

 *Applications of Analytical  
Chemistry*

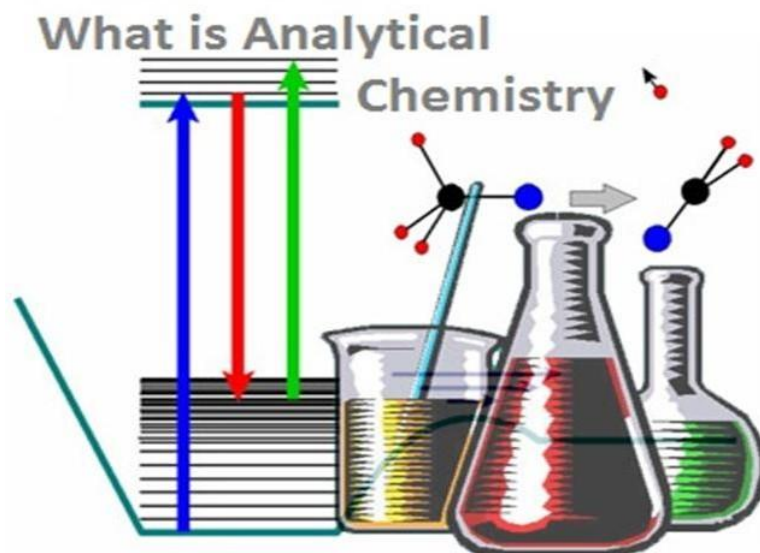
***Chemistry:*** is the branch of ***science*** that deals with the properties, composition, and structure of elements and compounds, how they can change, and the energy that is released or absorbed when they change.

***Science of chemistry can be classified into:***

- a) Analytical chemistry.
- b) Inorganic chemistry.
- c) Biochemistry.
- d) Physical chemistry.
- e) Organic chemistry

## What Is Analytical Chemistry?

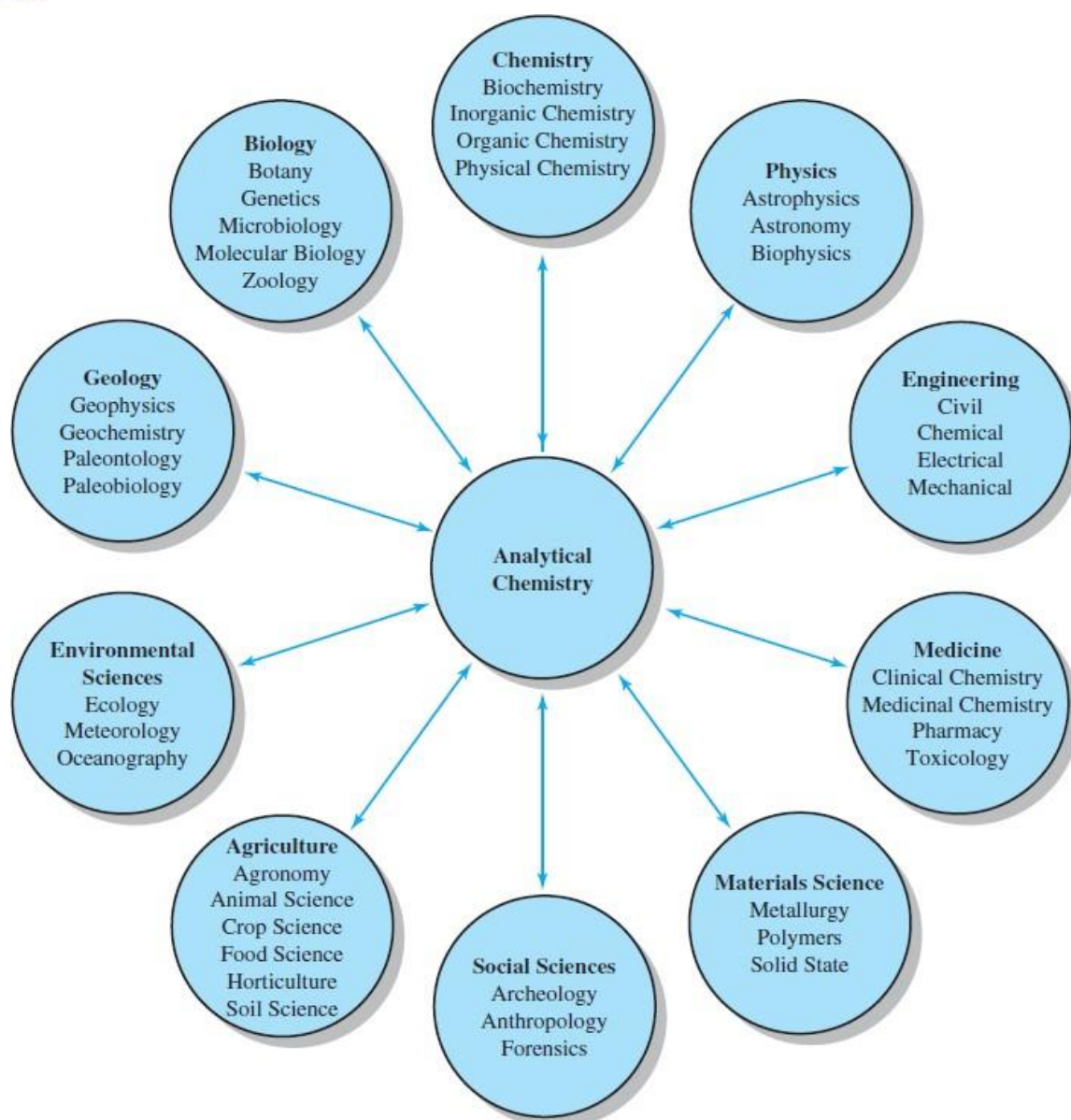
*“Analytical chemistry is what analytical chemists do.”*



*Analytical chemistry* is often described as the area of chemistry responsible for characterizing the composition of matter, both qualitatively (what is present) and quantitatively (how much is present). It was dealing with the identification and determination of compound.

## *The Role of Analytical Chemistry:*

All branches of chemistry draw on the ideas and techniques of analytical chemistry. Analytical chemistry has a similar function with respect to the many other scientific fields listed in the diagram.



**Fig (1) The relationship between analytical chemistry, other branches of chemistry**

### Important Definitions :

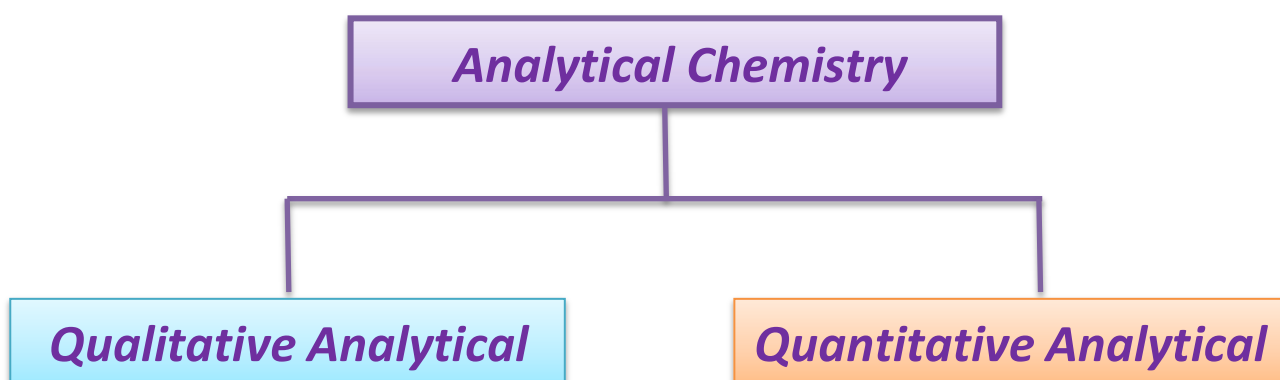
Analyte: The substance to be identified, detected, or separated in some manner.

Sample: representative of the population or gross sample

Matrix: all other constituents in a sample except for the analyte.

### Classification of Analytical Methods

Analytical Methods consist of:



## Quantitative Analytical Method's

We compute the results of a typical quantitative analysis from two measurements. One is the mass or the volume of sample being analyzed. The second measurement is of some quantity that is proportional to the amount of analyte in the sample such as mass, volume, intensity of light, or electrical charge, and we usually classify analytical methods according to the nature of this final measurement:

*1- Volumetric method (Titrimetric Analysis)*

*2- Gravimetric Analysis*

*3- Electroanalytical Methods*

*4- Spectroscopic methods.*

### **1- Volumetric method (Titrimetric Analysis)**

Measure the volume of a solution containing sufficient reagent to react completely with the analyte.

**Volumetric Analysis** → measure the volume of both the analyzed sample and the standard solution needed for complete reaction with this sample.

**Volumetric Analysis** is done by **Titration Process.**

**The element of**

**Titration Process:**

- 1- *Sample*
- 2- *Titrant (standard solution)*
- 3- *Indicator*

2- **Gravimetric Analysis(quantitative analysis by weight)** Determine the mass of the analyte or some compound chemically related to it. In this process of isolating and weighing a final product with a known, pure, stable and definite chemical structure.

**Step of gravimetric Analysis:**

- 1- Converting the substance to precipitate
  - 2- Isolating precipitate and drying
  - 3- Weighing the precipitate for determination of the concentration
- 
- 3- **Electro-analytical methods:** measure electrical properties such as potential, current, resistance, and quantity of electrical charge.
  - 4- **Spectroscopic methods:** we explore the interaction between electromagnetic radiation and analyte atoms or molecules or the emission of radiation by analytes.



### *Typical Quantitative Analysis:*

A typical quantitative analysis **includes the sequence of steps**

1- Choosing a Method

2- Acquiring

the Sample

3 Processing

the Sample

4- Eliminating Interferences

5- Calibrating and Measuring

Concentration

6- Calculating Results

7- Evaluating Results by Estimating Reliability

*The analytical process involves a sequence of logical events including:*

*1- Defining the Problem*

*2- Obtaining a  
Representative Sample*

*3- Preparing the Sample*

*for Analysis*

*4- Chemical Separations*

*5- Performing the Measurement*

*6- Calculations*

*Applications of Analytical Chemistry:*

Analytical chemistry used in many fields:

**1. In medicine**, analytical chemistry is the basis for clinical laboratory tests which help physicians diagnosis disease and chart progress in recovery.

**2. In industry**, analytical chemistry provides the means of testing raw materials and for assuring the quality of finished products

**3. Forensic analysis** - analysis related to criminology;

DNA fingerprinting, finger print detection; blood analysis.

**4. Bioanalytical chemistry and analysis** - detection and/or analysis of biological components (i.e., proteins, DNA, RNA, carbohydrates, metabolites, etc.).

**5. in pharmacy sciences:**

- Pharmaceutical chemistry.

-Pharmaceutical industry (quality control).

-Analytical toxicology is concerned with the detection, identification and measurement of drugs and other foreign compounds

*THE END*