Republic of Iraq
Ministry of Higher Education & Scientific research
Al-Mustaqbal University
Science College
Biochemistry Department

Analytical Chemistry Instrumental Analysis

For

Second Year Student/course 1

Lecture 1

By

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Overview of analytical methods in biochemistry

Analytical chemistry is the branch of chemistry which deals with the analysis of substances.

It is mainly divided into two categories:

(1) Qualitative Analysis

(2) Quantitative Analysis

Qualitative analysis is primarily concerned with the identification of the constituents present in a chemical substance or a mixture of substances.

Quantitative analysis is also primarily concerned with the exact determination of the amount of the number of constituents present in a chemical substance or a mixture of substances.

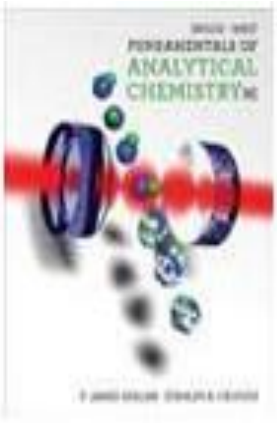
Methods of Analysis

Category	Method	Type/Example
Classical Methods	Volumetric Analysis	Acid–Base Titration Redox Titration Complexometric Titration Precipitimetry
Classical Methods	Gravimetric Analysis	Precipitation & Weighing
Instrumental Methods	Spectroscopic Methods	UV–Vis Spectroscopy IR Spectroscopy Atomic Absorption NMR, etc.
Instrumental Methods	Electrochemical Methods	Potentiometry Conductometry Voltammetry Coulometry
Instrumental Methods	Chromatographic Methods	Gas Chromatography (GC) High Performance Liquid Chromatography (HPLC) Thin Layer Chromatography (TLC)

Various methods like volumetric analysis, gravimetric analysis, polarimetry, refractometry, photometry, fluorimetry, electrochemical methods, chromatographic methods and biological methods comes under the category of quantitative analysis.

• Quantitative analysis is carried out mainly for determining the purity of chemical substances. • The method used for the determination of purity is called the assay method.

References



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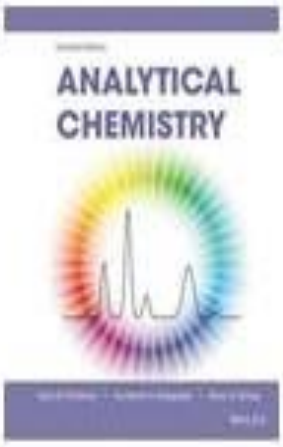

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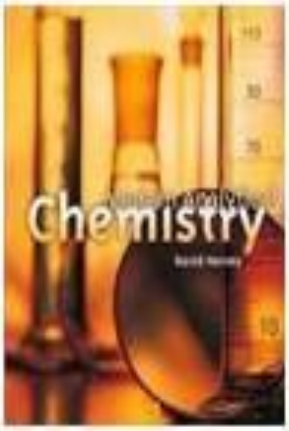


Modern Analytical Chemistry, 1st Edition, David T Harvey, ©2000

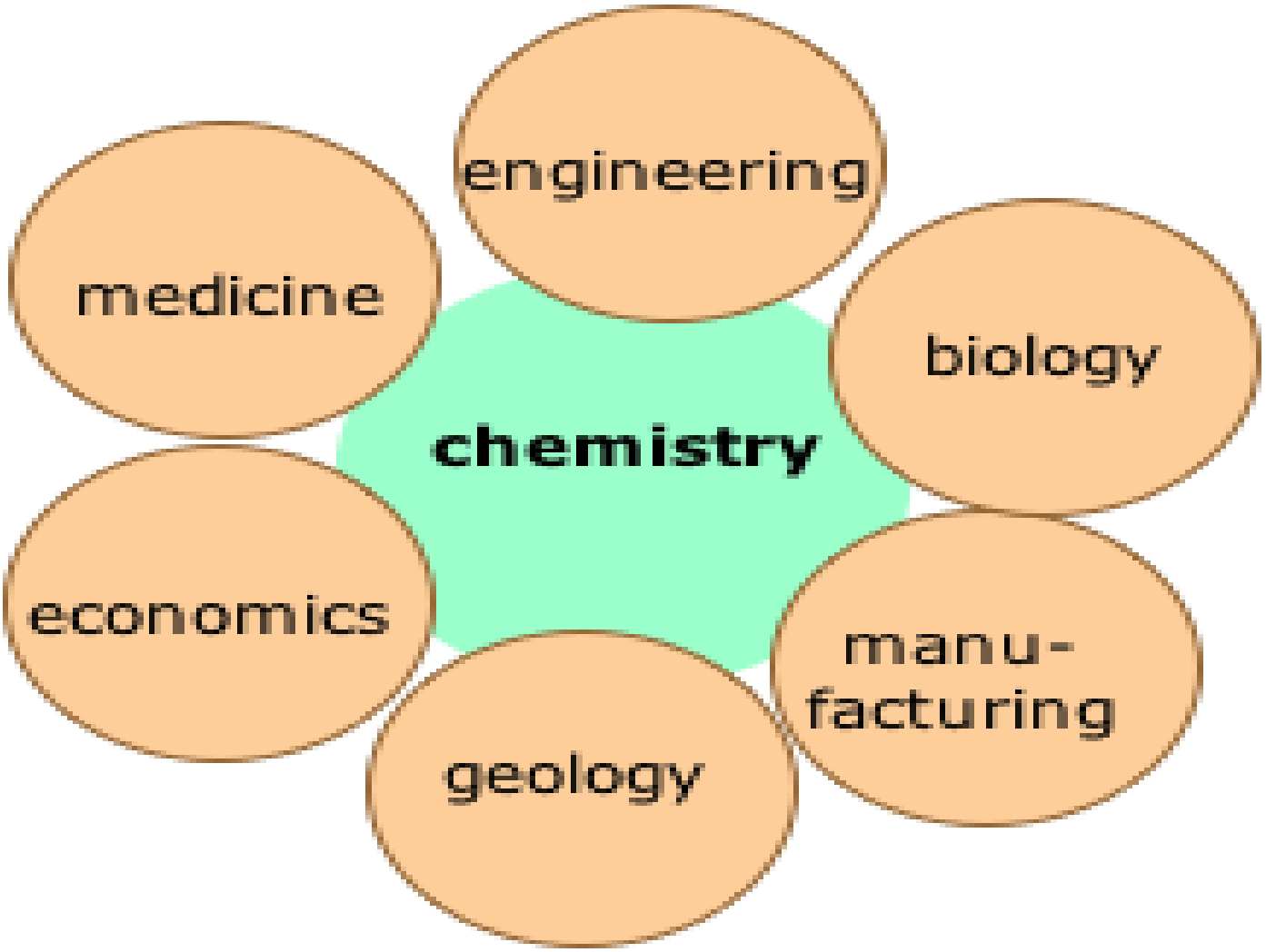
Chemistry play a very important role in all areas of science and technology :

A – health and medicine

B – energy and environment's

C – materials and technology

D – food and agriculture



Instrumental Methods of Analysis

The instrumental methods of analysis have a fundamental importance in pharmacy. By using a proper instrument and technique, the analyst can determine the nature and the amount of the substance in a drug, in dosage form, or in biological fluids.

Advantages of Instrumental Methods

1. Very minute quantities can be determined qualitatively and quantitatively, even in microgram or nanogram amounts.
2. The analyzed substance can be recovered and used again.
3. Spectroscopic methods allow routine analysis in a short time.
4. Mixtures of substances can be analyzed without separation.

Disadvantages of Instrumental Methods of Analysis

1. The instruments are mostly expensive.
2. Special knowledge must be present about the apparatus. In general, it is always followed by the principle of "black box"; i.e., it is not necessary to know every function of the instrument. It is only necessary to know the principal functions of the instrument and then to evaluate the spectra obtained through good interpretations.

Process:

substance → instrument → spectrum → interpretation

Spectroscopic methods in pharmacy

- ✓ The spectroscopy methods of analysis are the most frequently used techniques in pharmaceutical analysis.
- ✓ Many drugs interact with electromagnetic radiation (light).

- ✓ Most spectroscopic methods are based on the ability of molecules to absorb radiant energy.
- ✓ Spectroscopic analysis involves measuring the amount of light absorbed by a substance in solution.

Applications of Spectrophotometry:

1. Clinical field.
2. Industrial field.
3. Educational and research areas.
4. Analysis of drugs.
5. Analysis of food and beverages.
6. Analysis of water.
7. Analysis of body fluids.