INTRODUCTION TO THE COURSE

Chem305 - Instrumental Analysis I

Chem306- Instrumental Analysis II

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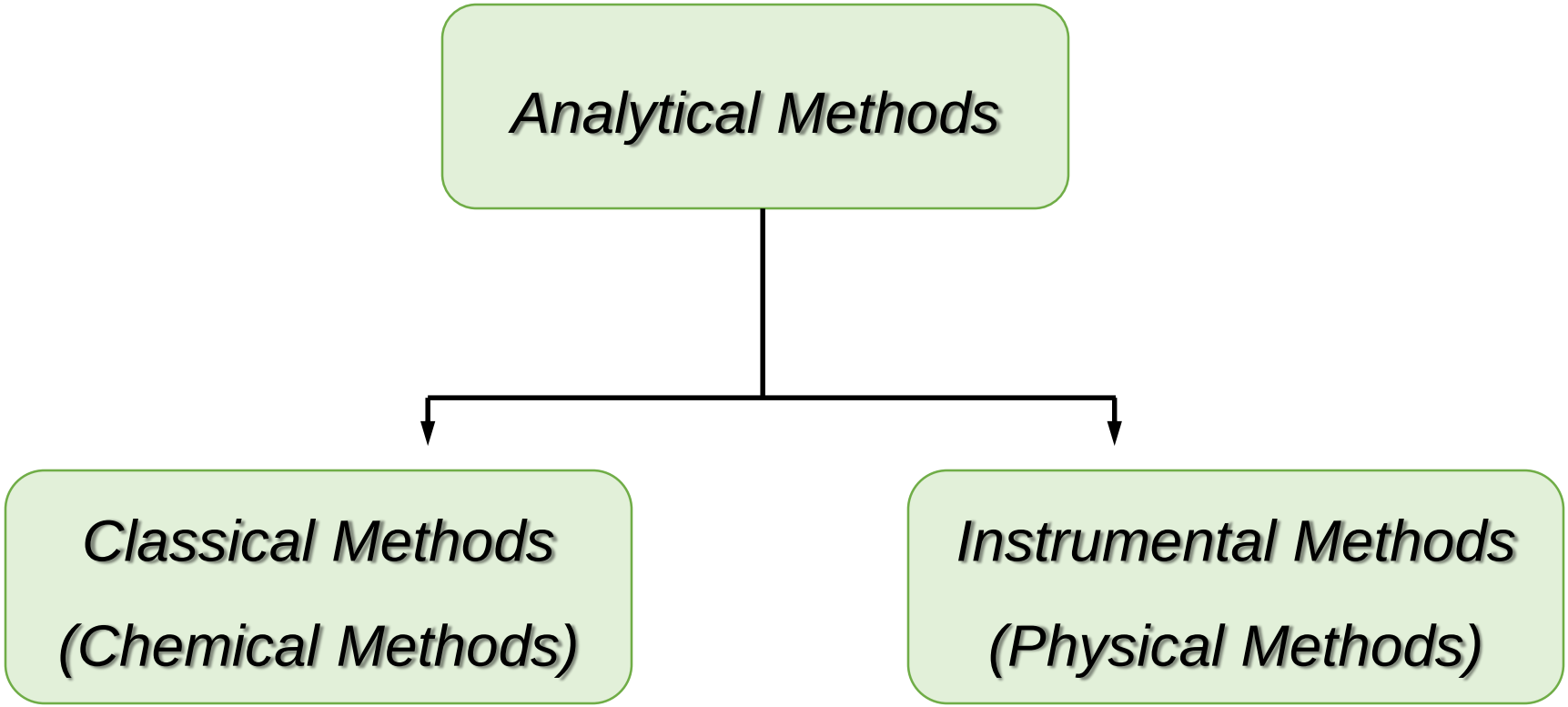
Introduction

- ✓ This course is about the measurement of chemical systems using instruments.
- ✓ Each type of instrument has a unique set of strengths and weaknesses that makes it suitable for measurements but not others.
- ✓ Some techniques are best for qualitative determinations and others are best for quantification
- ✓ During this course, you should develop an understanding of these advantages and disadvantages and ultimately be able to suggest suitable instrumental methods for particular problems.

Analytical Chemistry;

- ✓ deals with methods for determining the chemical composition of the samples both, *Qualitatively and Quantitatively.*
  - ✓ A qualitative method yields information about the identity of atomic or molecular species or the functional groups in the sample, (what is present ?).
  - ✓ A quantitative method, in contrast, provides numerical information as to the relative amount of one or more of these components, (how much is present?).

Classification of Analytical Methods



Classical Methods:

1- Gravimetric Methods:

the mass of the analyte or some compound produced from the analyte was determined.

2- Volumetric Methods:

also called titrimetric, procedures, the volume or mass of a standard reagent required to react completely with the analyte was measured.

increasing need for determining small amounts of analytes at low concentrations, the use of classical methods has decreased with the passage of time and the advent of instrumental methods to supplant them.

Instrumental Methods:

1- Spectroscopic Methods:

- UV-Vis-IR Spectroscopy, AAS, AES,

2- Electro Analytical Methods:

- Conductometry, Potentiometry, Amperometry, pH metry

3. Seperative Methods :

- Chromatography; LC, HPLC, GC, TLC

TABLE 1-1 Chemical and Physical Properties Used in Instrumental Methods

Characteristic Properties	Instrumental Methods
Emission of radiation	Emission spectroscopy (X-ray, UV, visible, electron, Auger); fluorescence, phosphorescence, and luminescence (X-ray, UV, and visible)
Absorption of radiation	Spectrophotometry and photometry (X-ray, UV, visible, IR); photoacoustic spectroscopy; nuclear magnetic resonance and electron spin resonance spectroscopy
Scattering of radiation	Turbidimetry; nephelometry; Raman spectroscopy
Refraction of radiation	Refractometry; interferometry
Diffraction of radiation	X-ray and electron diffraction methods
Rotation of radiation	Polarimetry; optical rotary dispersion; circular dichroism
Electrical potential	Potentiometry; chronopotentiometry
Electrical charge	Coulometry
Electrical current	Amperometry; polarography
Electrical resistance	Conductometry
Mass	Gravimetry (quartz crystal microbalance)
Mass-to-charge ratio	Mass spectrometry
Rate of reaction	Kinetic methods
Thermal characteristics	Thermal gravimetry and titrimetry; differential scanning calorimetry; differential thermal analyses; thermal conductometric methods
Radioactivity	Activation and isotope dilution methods