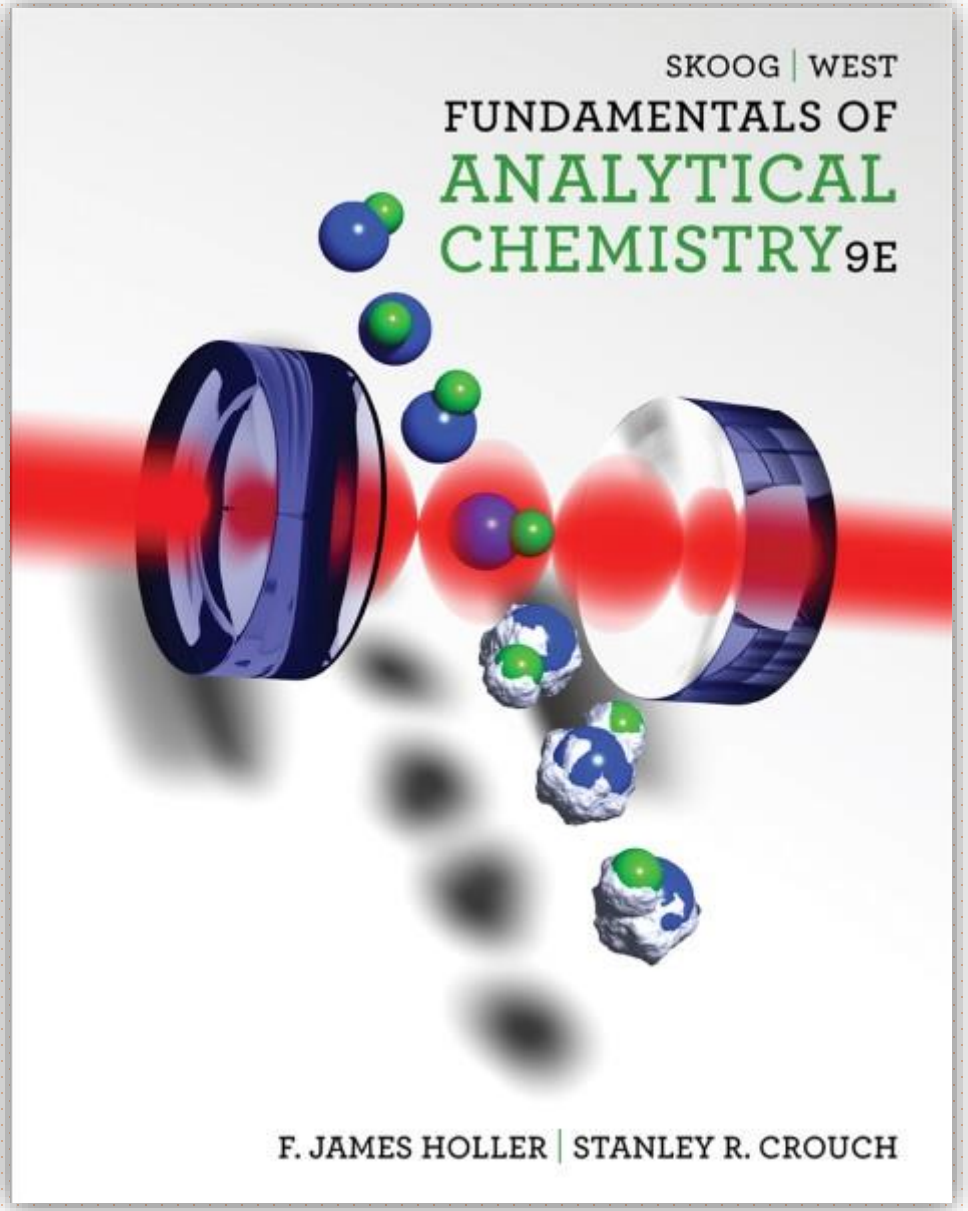
Introduction to Chemical Analysis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FUNDAMENTALS OF
ANALYTICAL
CHEMISTRY 9E
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Chemical analysis includes any aspect of the chemical characterization of a sample material.

1.) ANALYTICAL CHEMISTRY: The Science of Chemical Measurements.

3.) Techniques used in Analytical Chemistry:

a.) Wet Chemical Methods: titrations, colour-forming reactions, precipitations, etc.

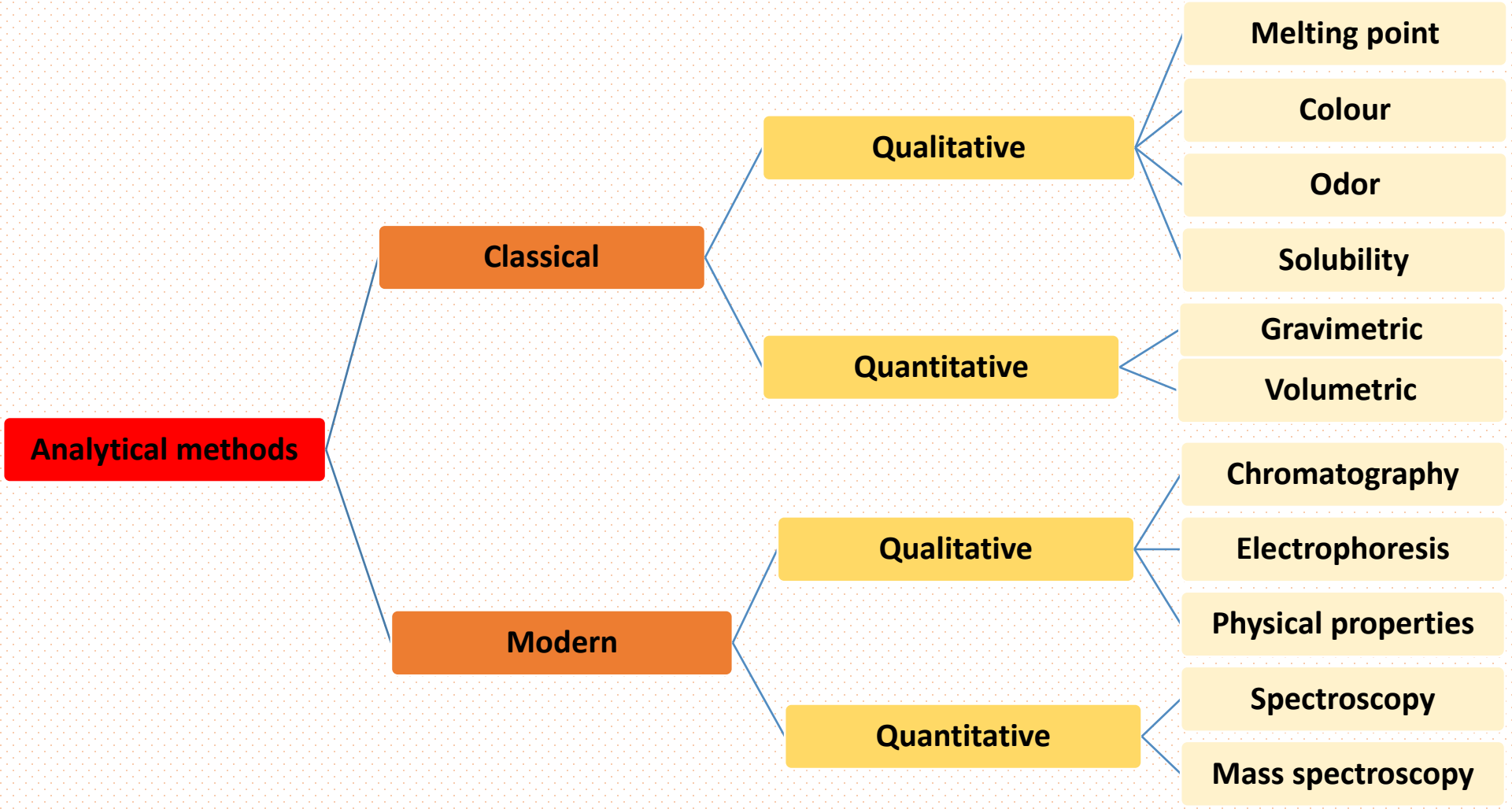
b.) Instrumental Methods: spectrometry, chromatography, etc.

- Areas of Chemical Analysis and Questions They Answer
- Quantitation:
  - How much of substance X is in the sample?
- Detection:
  - Does the sample contain substance X?
- Identification:
  - What is the identity of the substance in the sample?
- Separation:
  - How can the species of interest be separated from the sample matrix for better quantitation and identification?

Types of Questions Asked in Analytical Chemistry

a.) What is in the sample? (qualitative analysis)

b.) How much is in the sample? (quantitative analysis)


Analytical methods
Classical
Qualitative
Melting point
Colour
Odor
Solubility
Quantitative
Gravimetric
Volumetric
Modern
Qualitative
Chromatography
Electrophoresis
Physical properties
Quantitative
Spectroscopy
Mass spectroscopy

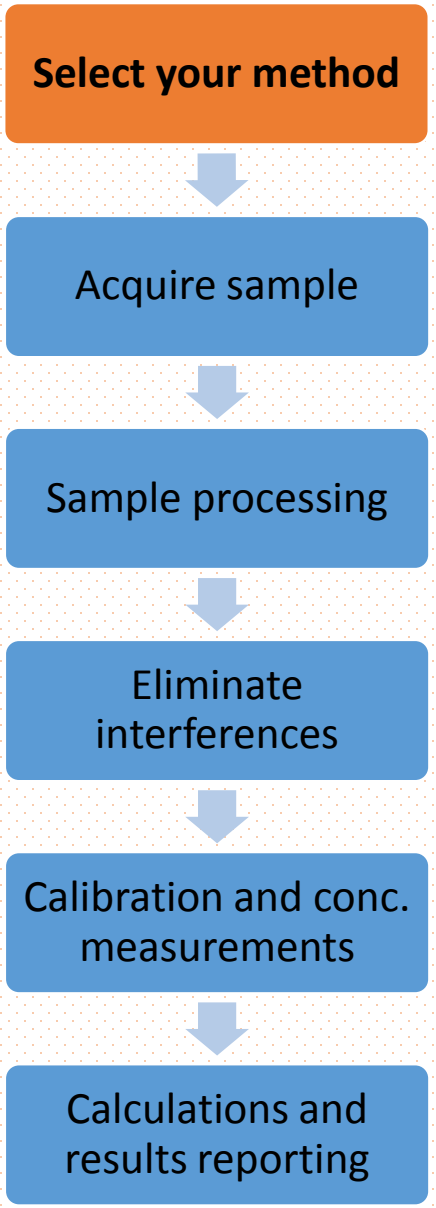
Typical quantitative analysis

Sometimes needs experience and intuition
Some points should be taken into consideration:

1. Level of accuracy required
2. Number of samples will be analysed

Choosing a method can be influenced by two factors:

1. Complexity of the sample
2. Number of components in the sample

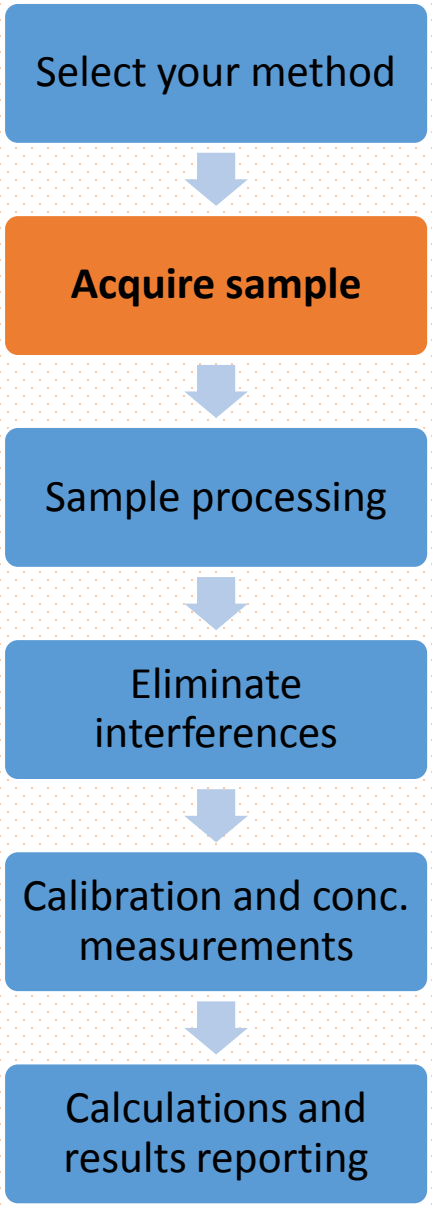


Typical quantitative analysis

Sampling is the process of collecting a small mass of material whose composition accurately represents the bulk of material being sampled.

Two main factors that affect sampling:

1. Heterogeneity
2. Collecting biological samples



Typical quantitative analysis

1. Preparing a laboratory sample

Solids:

a. Grounding
b. Mixing
c. Storing
d. Drying

Liquids:

a. Covering
b. Keeping inside evacuated container

2. Sample replications

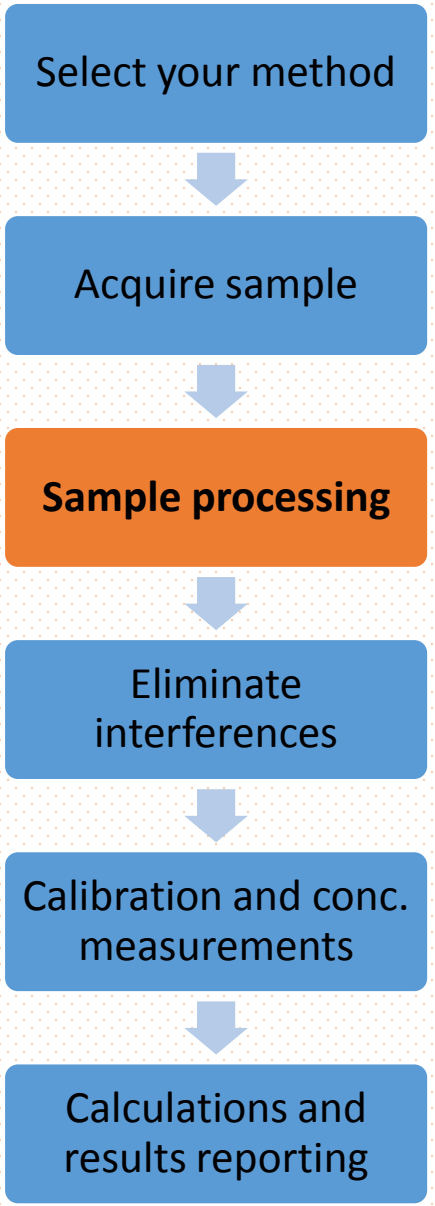
It improves the quality of the results and provides a measure of their reliability

3. Preparing liquid samples

It requires choosing a suitable solvent (√)

Materials like silicates, high molecular mass polymers, samples of animal tissues (X)

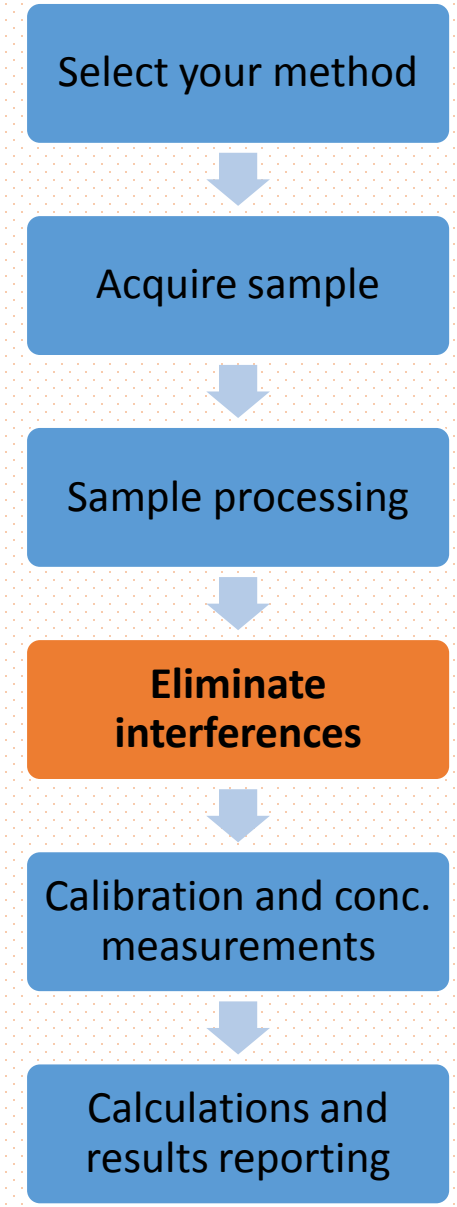
they require extraordinary conditions to prepare a suitable form for measurement (time-consuming and expensive)



Typical quantitative analysis

Interferences Other compounds in the sample matrix that interfere with the measurement of the analyte

It is advisable to remove the impurities *before* starting measurements.



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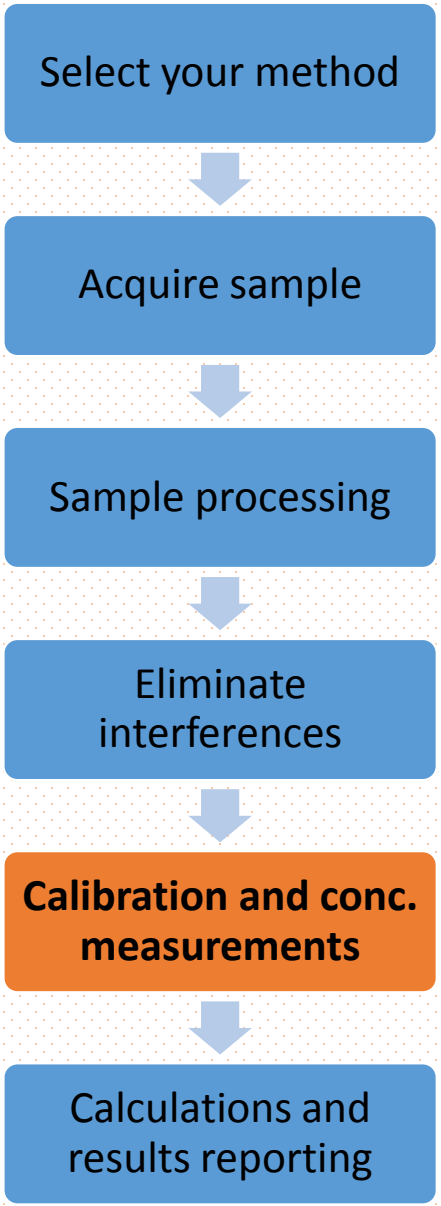
Calibration is the process of determining the proportionality between analyte conc. And a measured quantity



Typical quantitative analysis

Interferences: Other compounds in the sample matrix that interfere with the measurement of the analyte

It is advisable to remove all the impurities before starting measurements.

Calibration: The process of determining the proportionality between analyte conc. And a measured quantity

Calculations: The final event in the analytical process is to perform the calculations and present the results in an acceptable manner.