



Analytical Chemistry

SELECT METHODS

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First Stage

جامعة ساوة الأهلية

كلية الصيدلة

المرحلة الاولى

المحاضرة الثانية: الجانب النظري

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What is Analytical Chemistry?

- **Analytical chemistry is the field of chemistry that study the composition of matter, both qualitatively (what is present) and quantitatively (how much is present).**

The role of analytical chemistry

Analytical chemistry has been applied throughout industry, medicine, and all sciences. To illustrate this, consider some examples.

1. Determine of oxygen and carbon dioxide in blood samples.
2. Determine ionized calcium in blood serum.
3. Determine nitrogen in protein.

Q/ Define the analytical chemistry?

Q/ What the roles of the analytical chemistry?

Some of the terms used

1. **Analysis** is the process of determining the level of any or all components by a physical and chemical processes.
2. **Analyte**. is substances that is determined like nitrates in water, and ozone in the air.
3. **Matrix**. It is the material in which Analyte is found.

Q/Define Analysis, Analyte, Matrix?

Analytics Classifications

Analytical chemistry methods can be classified in terms of the goal of the analysis, the classification can be based on whether the analysis is 'qualitative' or 'quantitative'.

□ **Qualitative analysis: is an analysis in which we determine the identity of the constituent species in a sample.**

Q/ Define qualitative analysis?

Q/ What is the type of determination if the result which is reported the presence of mercury in the sample?

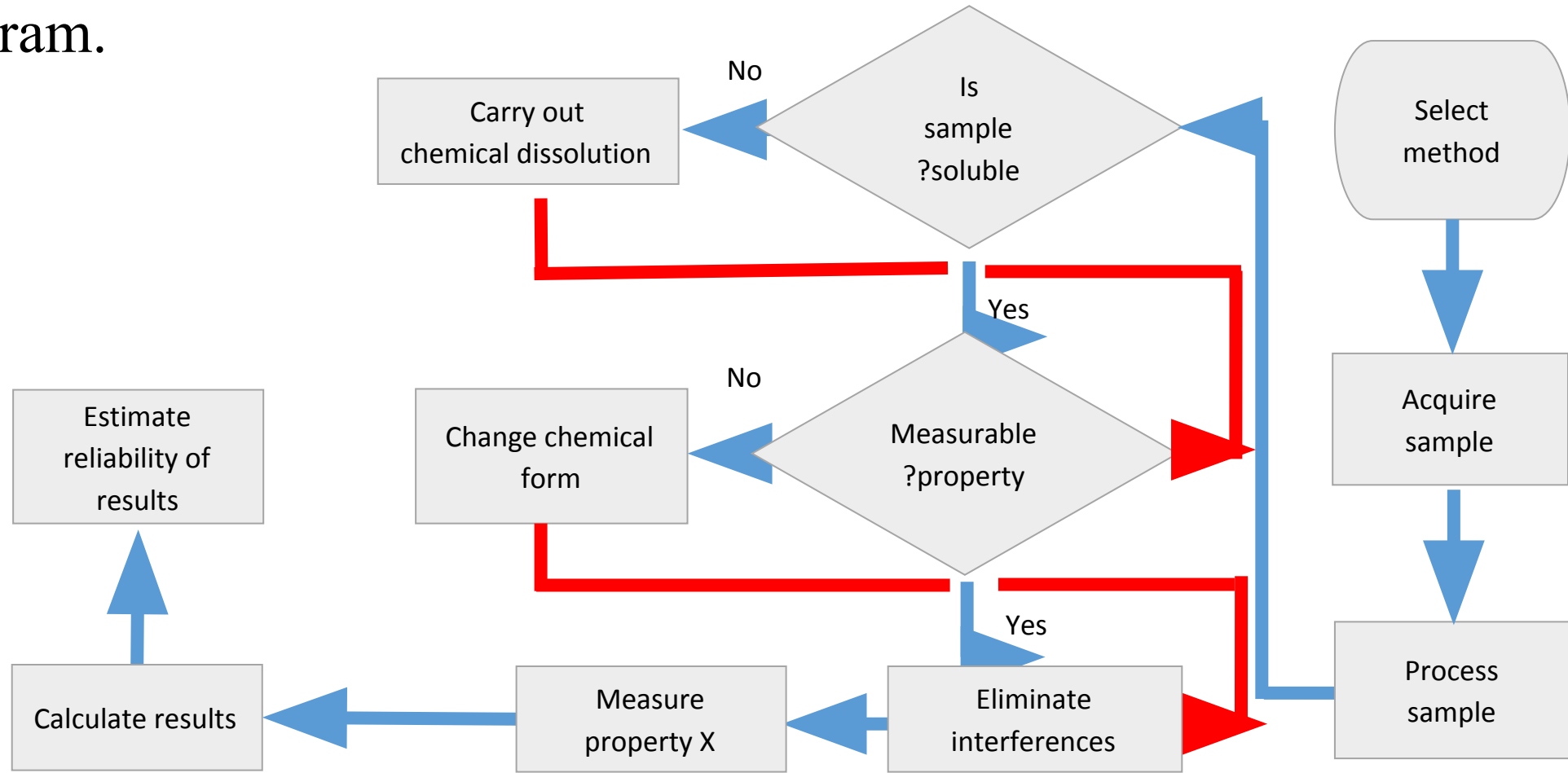
□ **Quantitative analysis: is an analysis in which we determine how much of a constituent species is present in a sample.**

Q/ What is quantitative analysis?

Q/ What is the type of analysis if the result is to report the amount of calcium in the soil.

Typical quantitative analysis

A typical quantitative analysis includes the sequence of steps shown in the flow diagram.



Q/ By the scheme, explain the typical quantitative analysis?

Select method

There are some considerations in selecting the method such as:

1. Level of **accuracy** required. (**Accuracy**)
2. **Economic** factors. (**Economy**)
3. Available **sample size** and analyte concentration. (**Sample size**)
4. **Time** available for analysis. (**Time**)
5. The nature of the **interferences**. (**Interferences**)

Q/ What are the considerations to be followed in selecting the method?

Acquire sample

To produce meaningful information, an analysis must be performed on a sample that has the same composition as the bulk of material from which it was taken.

The sample must be.

Representative sample

Q/ The consideration to be followed in acquire sample is that the sample should be?

Process sample

Laboratory sample preparation

Solid sample. A solid laboratory sample is :

- **Ground to reduce particle size. (Grinding)**
- **Mix to ensure homogeneity, and (Mixing)**
- **Store for various periods of time before analysis begins. (Storing)**
- **Dry the samples to remove water absorbed or adsorbed. (Drying)**
- **Dissolve to make a liquid solution. (Dissolving)**

Q/ What the treatment must be followed with solid sample?

Q/ Why should the solid sample be ground before use?

Q/ Why should the solid sample be dried before use?

Q/ Why should the solid sample be mixed before use?

Process sample

Laboratory sample preparation

Liquid samples

- **Liquid samples** present a slightly different problems during the preparation step.
- If such samples are allowed to stand in **open containers**, **the solvent may evaporate and change the concentration of the analyte.**

Q/ Why is the liquid sample must not stored in open containers?

Eliminating Interferences

□ **Interference** or interferent is a species that **causes an error in an analysis.**

Q/ Define interference?

Q/ Why the interference must be removed?

Calibrating and Measuring Concentration

- All analytical results depend on a final measurement X of a physical or chemical property of the analyte
- This property must vary in a known and reproducible way with the concentration c of the analyte.
- Ideally, the measurement of the property is directly proportional to the concentration, that is,

Calibrating and Measuring Concentration

$$C_A = KX$$

where k is a proportionality constant.

- Analytical methods require the empirical determination of k with chemical standards.

Calculating Results

- Using K value used to known the unknown concentration of analyte.

Q/ In step one, The physical property was measured to standard colored solution (0.01 mol/L) and was found it 0.9, calculate the preoperational constant (K)?

In step two, The physical property was measured to the same colored solution (unknown concentration) and was found it 0.5, calculate the concentration of the colored solution?

Solution/

1. From the first step can calculate K

$$C_A = KX$$

$$K = \frac{C_A}{X}$$

$$K = \frac{0.01(\frac{Mol}{L})}{0.9} = 0.0111(\frac{Mol}{L})$$

2. From the step two can calculate the unknown concentration of the analyte.

$$C_A = KX$$

$$C_A = 0.0111(\frac{Mol}{L}) * 0.5 = 0.0055(\frac{Mol}{L})$$