Types of analytical chemistry & their uses

- Analytical chemistry :- is concerned with the separation, identification, and determination of the relative amounts of the components making up a sample.
- Analytical chemistry is concerned with the chemical characterization of matter and the answer to two important questions
  - what is it…….. …….(qualitative) and
  - how much is it …….(quantitative).
  - Analytical chemistry therefor answering the basic questions about a material sample: · What? · How much? · What arrangement, structure or form.

- 1-Qualitative analysis:

  An analysis in which we determine the identity of the constituent species (the elements and compounds) in a sample.

- 2-Quantitative analysis:

  An analysis in which we determine how much of a constituent species is present in a sample.

Classifying Analytical Techniques

- A- Classical techniques

- 1- Gravimetric techniques.
- 2- Volumetric techniques.
- 3- Coulometeric techniques.

- B- Instrumental techniques

- 1- Spectroscopic methods - measuring the interaction between the analyte and electromagnetic radiation (or the production of radiation by an analyte).
- 2- Electroanalytic methods - measure an electrical property (i.e., potential, current, resistance, amperes, etc.) chemically related to the amount of analyte.

Quantitative Analytical Methods

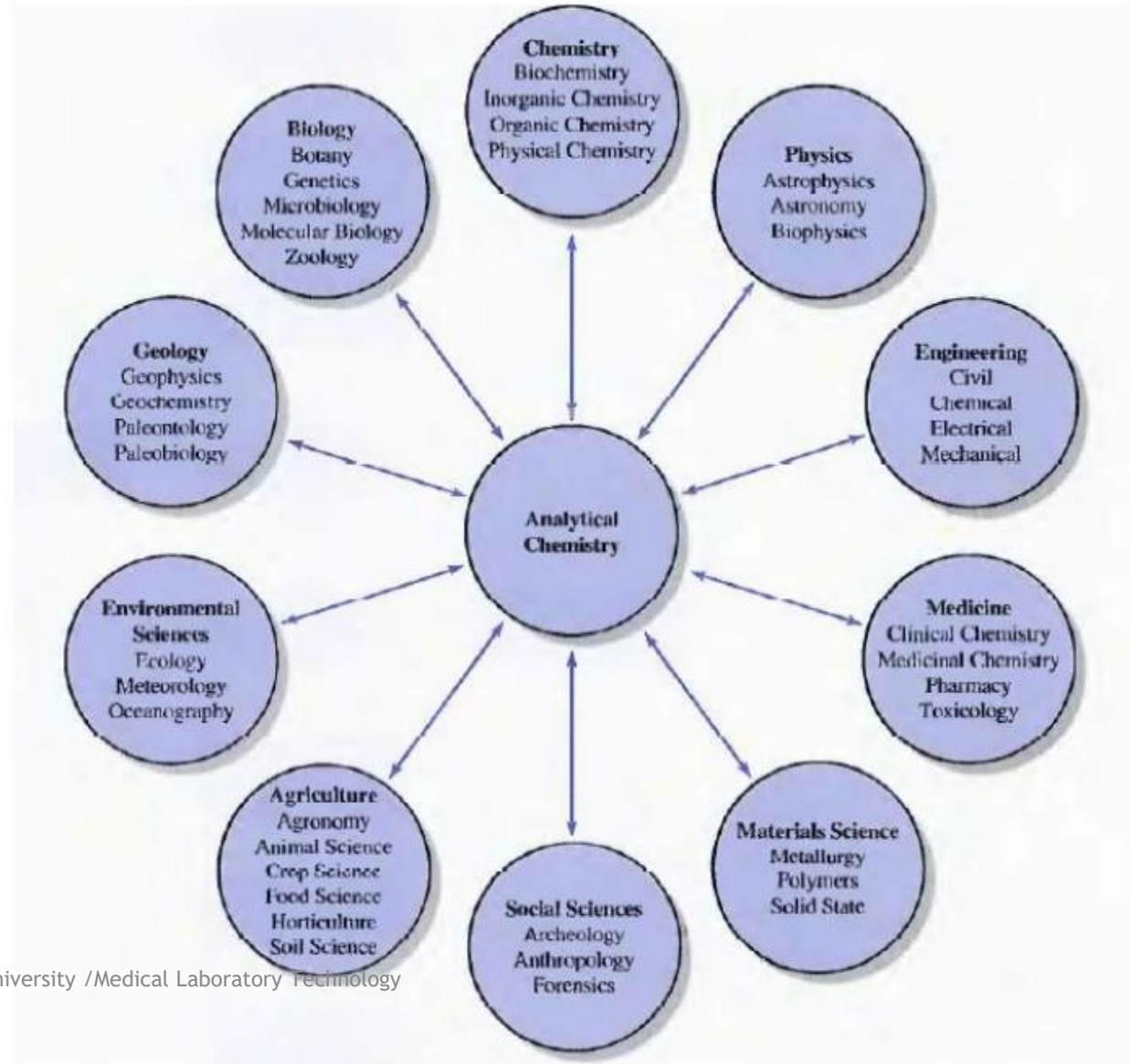
Classification of analytical methods.

1. Gravimetric methods determine the mass of analyte or some compound chemically related to it.
2. volumetric method, the volume of a solution containing sufficient reagent to react completely with the analyte is measured.
3. Electrochemical methods involve the measurement of such electrical properties as potential, current, resistance, and quantity of electrical charge.
4. Spectroscopic methods are based on measurement of the interaction between electromagnetic radiation and analyte atoms or molecules or on the production of such radiation by analytes.
5. Finally, a group of miscellaneous methods includes the measurement of such quantities as mass – to -charge ratio of molecules by mass spectrometry , rate of radioactive decay, heat of reaction, rate of reaction , simple thermal conductivity, optical activity and refractive index.

Applications of Analytical Chemistry Analytical chemistry used in many fields

1. In medicine, help physicians diagnosis disease and chart progress in recovery.
2. In industry, testing raw materials and the quality of finished products, such as household products, fuels, paints, Pharmaceutical, etc.
3. Environmental quality is often evaluated by testing for suspected contaminants using
4. The nutritional value of food such as protein and carbohydrates and trace components such as vitamins and minerals.
5. Forensic analysis - analysis related to criminology; DNA finger printing, finger print detection; blood analysis.
6. Bioanalytical chemistry and analysis - detection and/or analysis of biological components (i.e., proteins, DNA, RNA, carbohydrates, metabolites, etc.).
7. Pharmacy sciences: · Pharmaceutical chemistry. · Pharmaceutical industry (quality control). · Analytical toxicology , identification and measurement of drugs and other foreign compounds (and their metabolites in biological and related specimens. · Natural products detection, isolation, and structural determination.

Introduction to Analytical Chemistry.pdf - Profile 1 - Microsoft Edge
File | F:/ASHUR/تقنيات%20المختبرات%20الطبية/Introduction%20to%20Analytical%20Chemistry.pdf
Draw | Read aloud | Ask Copilot | 4 of 7



Analytical Solutions

- Standard Solution :-

- A solution of accurately known concentration, prepared by dissolving a known amount of solute in a known volume of solvent.
- Examples: 0.1M Na_2CO_3 , 0.1N - HCl , 2%$NaCl$, 100mg/ml glucose, 50 ppm Na^+…..etc

1-Primary standard solution:- A solution of accurately known concentration prepared from primary standard material which has the following properties:

- 1- High purity (99.99%) "Analar"
- 2- Stable toward air (not absorb H_2O or CO_2 from atmosphere).
- 3- Available in reasonable price.
- 4- Soluble in titration medium.
- 5- Has a large molecular weight (M.wt.) so that the relative error associated with weighing would be low.

Ex: Na_2CO_3 , $AgNO_3$, $K_2Cr_2O_7$, $H_2C_2O_4$, $EDTA$, $Na_2S_2O_3$, KIO_3

2- Secondary standard solution:-

This is usually prepared from non-primary standard substance and prepared in approximate concentration ≈ 0.1M,and its concentration Is then determined accurately by titration with a solution of primary standard material

- Ex/ 0.1 M HCl , 0.1N NaOH , 0.1N $H2SO4$, 0.1N $KMnO4$

Preparation of standard solution

1. Weight the substance in watch glass.
2. Dissolve the substance in little water in a beaker supplied with glass rod.
3. Transfer the dissolve substance into 100ml volumetric flask supplied with a funnel and diluted to the mark with distilled water. .
4. Shake the volumetric flask with the solution for homogeneity