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Chapter 1 : The Spectroscope: its uses in general analytical chemistry

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Introduction to Analytical Chemistry advertisement Students should be able to: Define and differentiate the following terms: Define the role of analytical chemistry. Define quantitative analytical methods. Define the following terms: Heterogeneous materials, an assay, Replicate samples, Interference, Specific and Selective techniques and reactions, sample matrices and calibration. Discuss the process of quantitative analysis. To determine the concentration of oxygen and carbon dioxide in blood samples to diagnose and treat illnesses. Determination of nitrogen in foods establishes their protein content and thus their nutritional value. What are three 3 other examples? Qualitative analysis is what. Quantitative analysis is how much. Organic compounds are analysed using all or some of the following methods: The target is the centre. Which diagram s show high accuracy? Which show high precision? Construct a flow diagram to show the steps involved in a typical quantitative analysis. Include considerations for each step. Describe the steps in a well-designed sampling plan. What is the importance of a good sample? What factors must be considered when obtaining a sample? What factors must be considered when storing and transporting a sample? Fundamentals of Analytical Chemistry 8th Edition - Chapter 1: The Nature of Analytical Chemistry, pages 2 – 16, - Chapter 2: Calculations Used in Analytical Chemistry, pages 71 – 89 - Chapter 8: Sampling, Standardization and Calibration, pages – 1. James Holler Stanley R.

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Chapter 3 : Introduction to Analytical Chemistry

An Intermediate Textbook for Practical Chemists by Baker, Thomas Thorne in our library for absolutely free. Read various fiction books with us in our e-reader. Add your books to our library. Best fiction books are always available here - the largest online library.

By visually comparing the color of a sample to the colors of a series of standards, Nessler was able to determine the concentration of ammonia. Colorimetry, in which a sample absorbs visible light, is one example of a spectroscopic method of analysis. At the end of the nineteenth century, spectroscopy was limited to the absorption, emission, and scattering of visible, ultraviolet, and infrared electromagnetic radiation. Since its introduction, spectroscopy has expanded to include other forms of electromagnetic radiation—such as X-rays, microwaves, and radio waves—and other energetic particles—such as electrons and ions.

Overview of Spectroscopy

The focus of this chapter is on the interaction of ultraviolet, visible, and infrared radiation with matter. Because these techniques use optical materials to disperse and focus the radiation, they often are identified as optical spectroscopies. For convenience we will use the simpler term spectroscopy in place of optical spectroscopy; however, you should understand that we are considering only a limited part of a much broader area of analytical techniques.

Spectroscopy Based on Absorption

In absorption spectroscopy a beam of electromagnetic radiation passes through a sample. Much of the radiation passes through the sample without a loss in intensity. This process of attenuation is called absorption. As a result, modern instrumentation for absorption spectroscopy became routinely available in the 1950s—progress has been rapid ever since. Frequently an analyst must select—among several instruments of different design—the one instrument best suited for a particular analysis. In this section we examine several different instruments for mole

Atomic Absorption Spectroscopy

Modern atomic absorption spectroscopy has its beginnings in as a result of the independent work of A. Commercial instruments were in place by the early 1950s, and the importance of atomic absorption as an analytical technique was soon evident. Atomic absorption spectrophotometers use the same optics described earlier for molecular absorption spectrophotometers, but with an important additional component—we must convert the analyte into free atoms.

Emission Spectroscopy

An analyte in an excited state possesses an energy that is greater than its energy when it is in a lower energy state. When the analyte returns to its lower energy state—a process we call relaxation.

Photoluminescence Spectroscopy

Photoemission is divided into two categories: Emission of a photon from the singlet excited state to the singlet ground state—or between any two levels with the same spin—is called fluorescence. Emission between a triplet excited state and a singlet ground state—or between any two levels that differ in their respective spin states—is called phosphorescence. Both fluorescence and phosphorescence can be used for qualitative analysis and semi-quantitative analysis.

Atomic Emission Spectroscopy

The focus of this section is on the emission of ultraviolet and visible radiation following the thermal excitation of atoms. Atomic emission occurs when a valence electron in a higher energy atomic orbital returns to a lower energy atomic orbital. The emission consists of a series of discrete lines at wavelengths corresponding to the difference in energy between two atomic orbitals.

Spectroscopy Based on Scattering

Two general categories of scattering of radiation are recognized: Elastic scattering is divided into two types: Rayleigh, or small-particle scattering, and large-particle scattering. Turbidimetry and nephelometry are two techniques based on the elastic scattering of radiation by a suspension of colloidal particles.

Chapter 4 : The Spectroscope: its Uses in General Analytical Chemistry

An intermediate textbook for practical chemists.

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