Clinical Chemistry

MASS SPECTROMETRY (MS)

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A *mass spectrometry* is an analytical technique that first ionizes a target molecule and then separates and measures the mass of a molecule or its fragments. Mass analysis is the process by which a mixture of ionic species is identified according to the mass-to-charge (m/z) ratios (ions).

The analysis is qualitative, quantitative, and extremely useful for determining the elemental composition and structure of both inorganic and organic compounds.

Mass spectrometry when coupled with either gas or liquid chromatography, the resultant technique is a particularly powerful analytical technique that has found extensive use for clinical applications.

SPECTROPHOTOMETRY

Photometry is defined as the measurement of the luminous intensity of light or the amount of luminous light falling on a surface from such a source.

The absorbance of a solution is the amount of light absorbed by that solution.

According to *Beer's Law* the absorbance varies directly with the concentration of the solution in question. It is equals to the concentration of a substance in solution multiplied by the length of the path that the light must pass through multiplied by the molar absorptivity of the substance of interest.

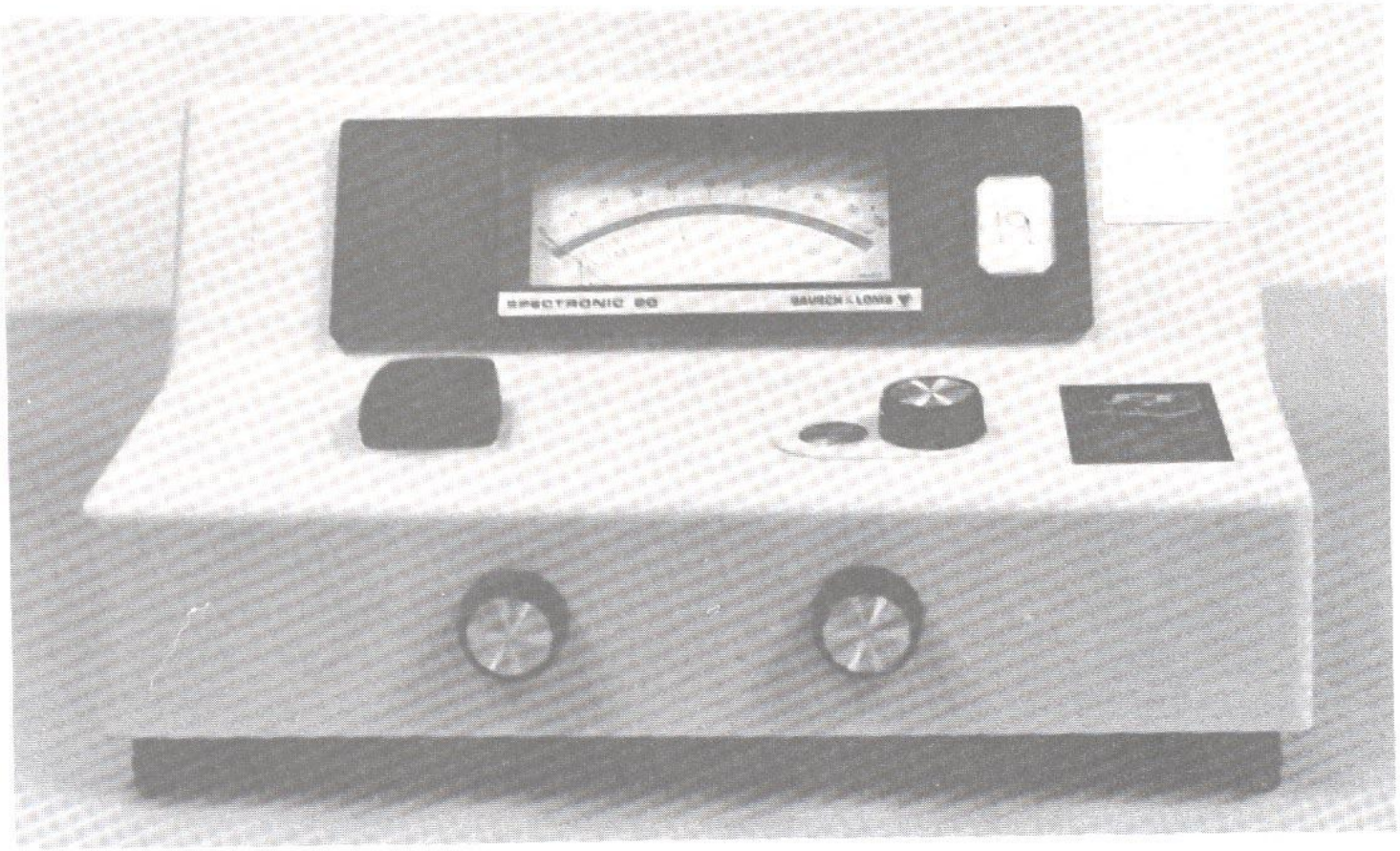


Figure 7–5. An example of a spectrophotometer *(Photo by John Estridge)*

Diagram of internal parts of a spectrophotometer

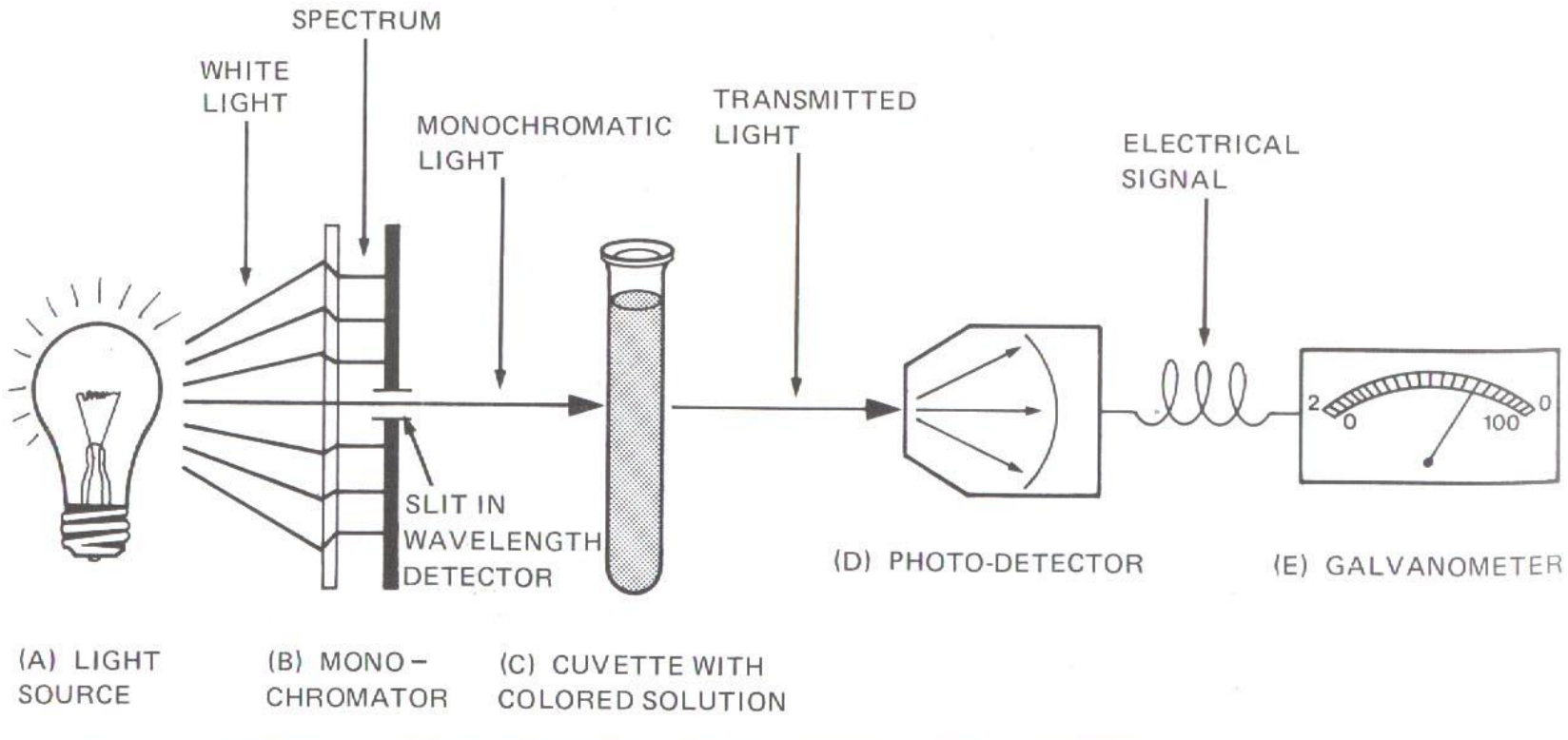


Figure 7–6. Diagram of internal parts of a spectrophotometer

Schematic diagram of Spectrophotometer

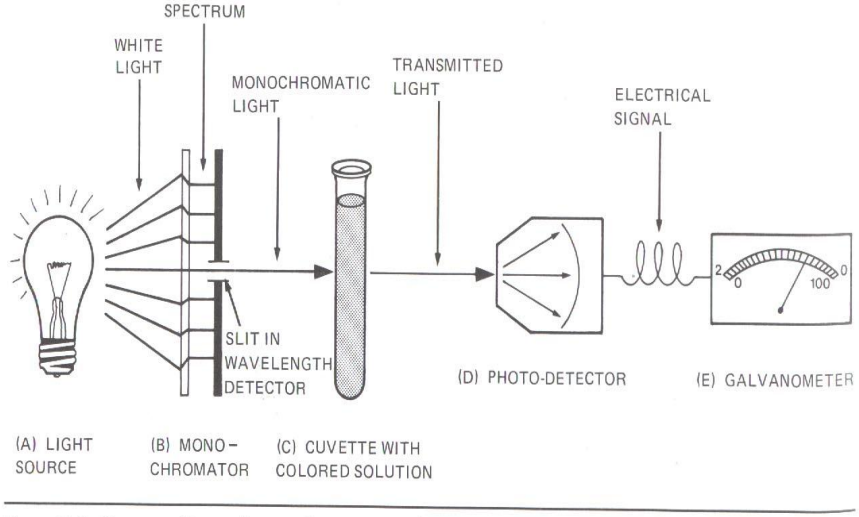
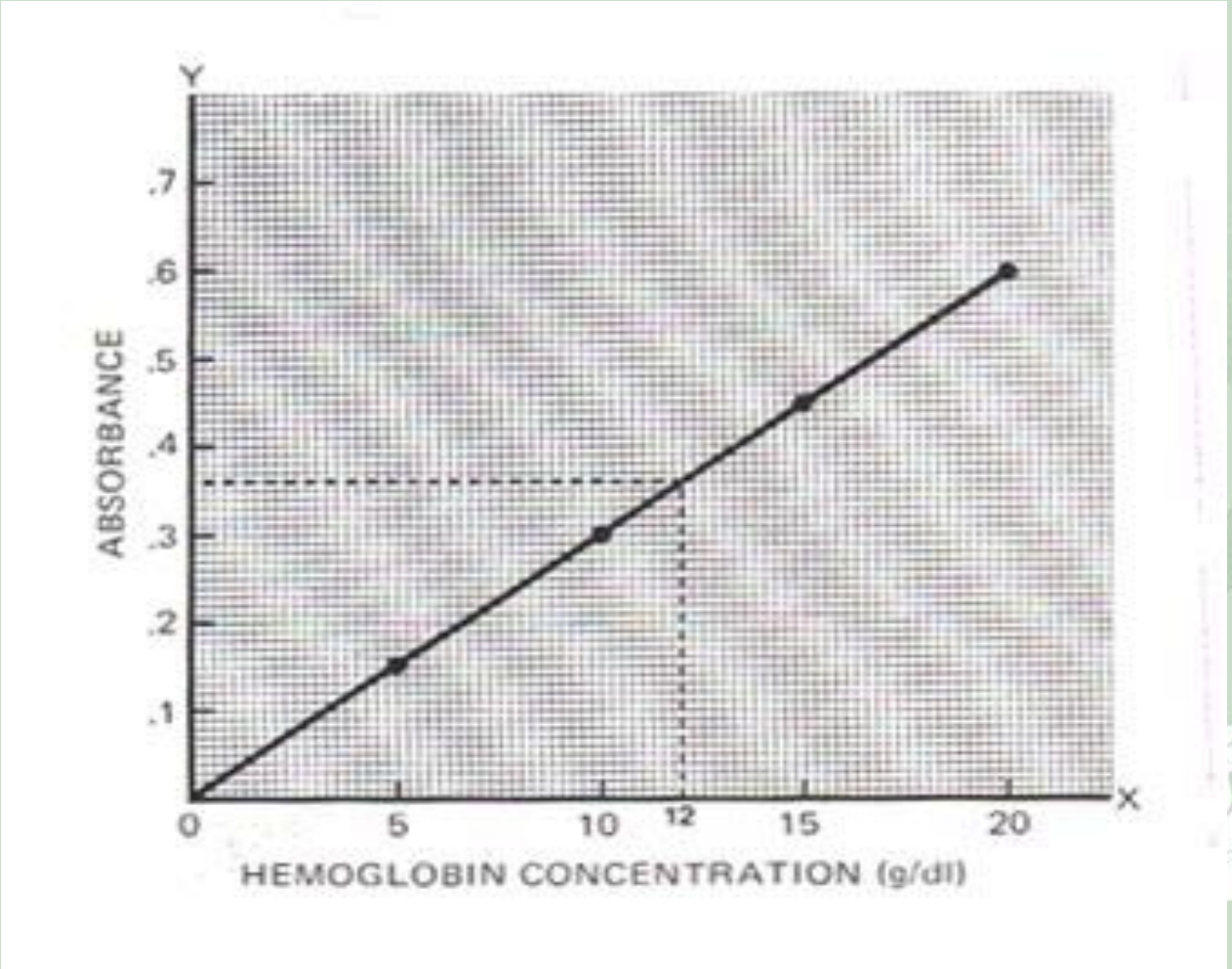


Figure 7–6. Diagram of internal parts of a spectrophotometer

In practice, a beam of light is passed through a monochromator that provides selection of the desired region of the spectrum to be used for measurements.

Determination of the concentration of the unknown using the standard curve



FLUOROMETRY

The interaction of radiant energy with molecules or particles in solution can result in either Fluorescence or light scattering .

Fluorescence occurs when a molecule absorbs light at one wavelength and remits light at a longer wavelength.

Light scattering occurs when radiant energy passing through a solution meets a molecule in an elastic collision, which results in the light being dispersed in all directions.

TURBIDIMETRY

Turbidity causes the decrease of the intensity of the incident beam of light as it passes through a solution of particles. The measurement of this decrease in intensity of the incident light beam that is caused by scattering, reflectance , and absorption of the light is called turbidimetry .