

1.5. Basic Elements of Practical Spectroscopy:

Introduction to Spectroscopy :-

Basic Elements of Practical Spectroscopy —

For various regions of spectrum, the Spectrometers ^{used} are usually different in construction. The study of such differences will be helpful to indicate the basic features which are common to all types of Spectrometer. Thus we may consider absorption and emission Spectrometers separately.

1. Absorption Instruments :-

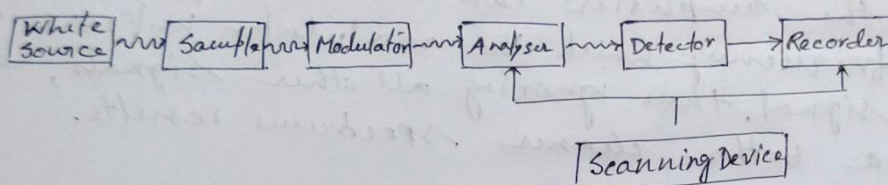


Figure: 1(a) - Used in IR, Visible and UV regions.

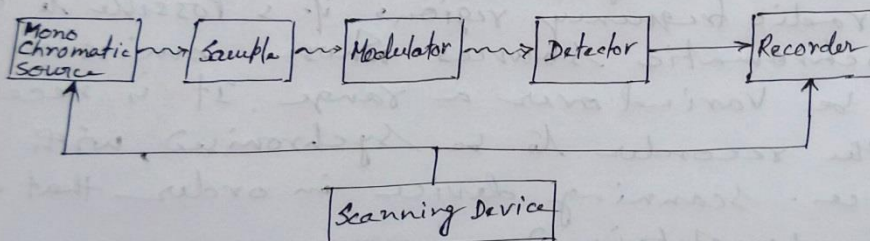


Figure: 1(b) - Used in Microwave and Radiofrequency regions.

In the fig. 1(a), the radiation from a white source is directed by some lens or mirrors ~~which~~ on to the sample from which it passes through an analyser (Prism), which selects the frequency reaching the detector at any given time. The signal from the analyser to recorder which is synchronised with the analyser so as to produce a trace of the absorbance as the frequency varies.

The modulator is a mechanical or electronic device which interrupts the radiation beam a certain number of times per second (usually 10-1000 times) and its effect caused the detector to send an AC signal to the recorder with a fixed frequency of 10-1000 Hz rather than DC signal.

This has two main advantages —

- i) the amplifier in the recorder can be of AC type which is simpler to construct and more reliable in operation than a DC amplifier
- ii) the amplifier can be tuned to select only the frequency which the modulator imposes on the signal, thus ignoring all other signals, hence a better, cleaner spectrum results.

On the other hand in fig. 1(b) no analysis is necessary the source being its own analyser. In the microwave and radio frequency regions it is possible to construct monochromatic sources whose emission frequency can be varied over a range. It is necessary for the recorder to be synchronised with the source-scanning device in order that a spectrum be obtained.

2. Emission Instruments :—

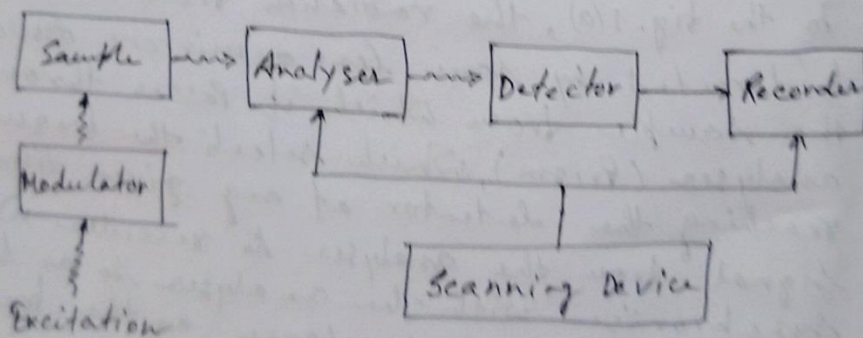


Figure: 1(c) Block Diagram of a typical emission Spectrometer.

In the sample, after excitation in its own source, it is necessary only to collect the emitted radiation, analyse and record in the usual way.

The excitation often takes place from the EMR (thermal and electrical method may also take place). In the EMR excitation it is essential that the detector does not collect radiation directly from the exciting beam.

In this typical arrangement, a modulator placed bet.ⁿ the source of excitation and the sample, together with a tuned detector - amplifier ensures that the only emission recorded from the sample arises directly from excitation, any other spontaneous emission is ignored.

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