



## A BRIEF REVIEW ON: RECENT ADVANCES PHARMACEUTICAL ANALYSIS

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ABSTRACT:-

Advancements in pharmaceutical products have led to a revolutionary improvement in human health. This is only possible if the ingredients and purity of these products are guaranteed. As a result, numerous analytical methods were created to achieve this goal. In the same context, pharmaceutical items may become contaminated throughout various production phases, increasing the likelihood that consuming these products could be dangerous. As a result, these medicinal items need to be classified and measured. As a result, the analytical methods are crucial in the identification of pharmaceutical drugs. This review emphasizes how analytical methods and equipment play a crucial part in determining the medications' quality. The authors of this paper highlight many technical drug studies, including chromatography, electrophoresis, titrimetry, spectroscopy, and electrochemical analyses utilized in the analysis of pharmaceutical products.

**KEYWORD:** Pharmaceutical Analysis; Titrimetry; Chromatography; Spectroscopy; Analytic

### INTRODUCTION:-

The assurance of pharmaceutical product quality is vital due to its direct impact on patient health and well-being. Consequently, quality control serves as a fundamental element in various processes, including but not limited to the analysis of raw materials, purification, drug manufacturing, patch assays, and numerous research and development activities. For example, the pharmaceutical research field is rapidly evolving, and the design, synthesis, and development of new or existing drugs create additional pressure to improve current methods or innovate new ones.

This encompasses a wide range of drug molecules and dosage forms, from basic inorganic salts such as potassium chloride to sophisticated monoclonal antibodies and even more advanced pharmacogenomic therapies. Consequently, there is a demand for analytical techniques that are both highly sensitive and selective. In this review, the authors highlight the analytical methods frequently used in the examination of pharmaceutical drugs.

Analytical techniques for pharmaceutical analysis. The analytical techniques used in pharmaceutical analysis are listed below:-

#### 1. First Technique :- Titrimetric

The titration technique was first used as a volumetric method in the early 19th century. The term "titration" has been further developed. Although titration is quite old compared to other analytical techniques, it has gained particular interest in applications to rheology and reaction kinetics, as it exploits the functional groups of drug molecules

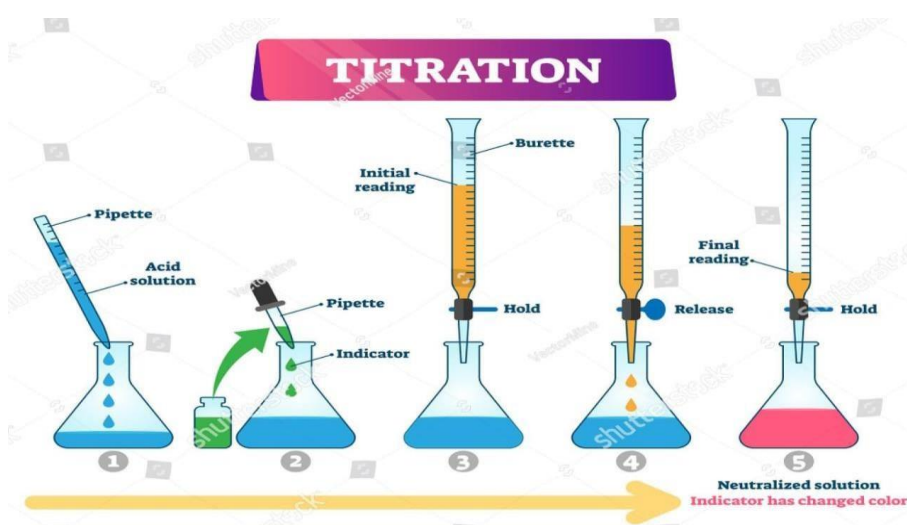


Fig No.1 Titrimetric Titration

## 2. Electroanalytical Technique :-

Electrochemical analytical techniques are one of the cheap, simple and sensitive tools, with the advantage of low detection limits.

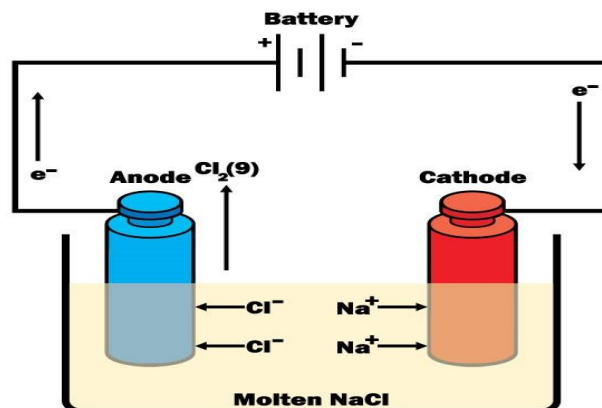


Fig No.2 :- Electroanalytical Technique

## 3. Third technique: Chromatographic

The chromatographic techniques utilized in drug analyses can be enclosed by three major techniques. These are:

### a) Thin Layer Chromatography :-

Thin Layer Chromatography Thin layer chromatography (TLC) is considered an older technique but is still used in routine laboratories, especially in analytical drug testing.

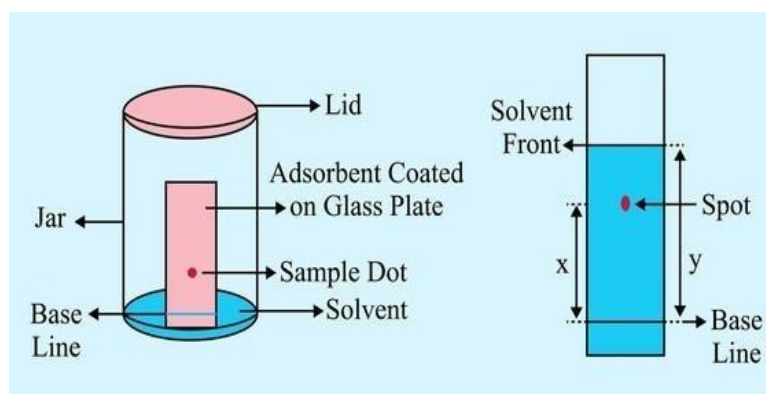


Fig No. 3 TLC Technique

### b) High Performance Liquid Chromatography :-

No one can write about pharmaceutical analytical techniques without mentioning high performance liquid chromatography (HPLC). This technique was first introduced in the United States Pharmacopeia (USP) in 1980 to test pharmaceutical ingredients.

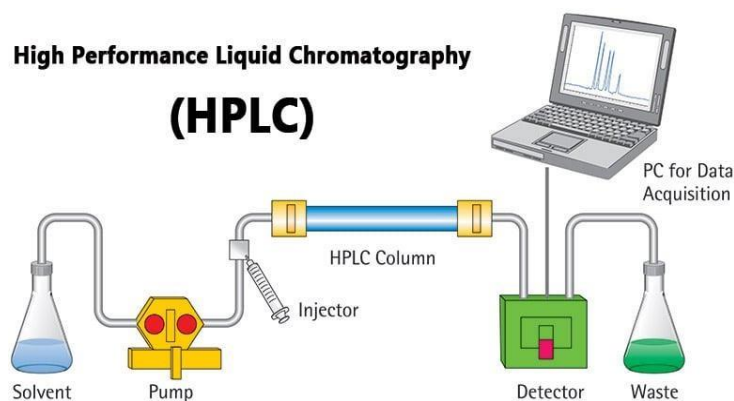


Fig No. 4 HPLC Technique

### c) Gas Chromatography:-

Although gas chromatography (GC) is limited to volatile drug molecules, the technique is undoubtedly very sensitive and considered to have powerful separation capabilities.

This has led to the widespread use of this powerful analytical technique for detecting minute amounts of drugs, such as picograms, after separation.

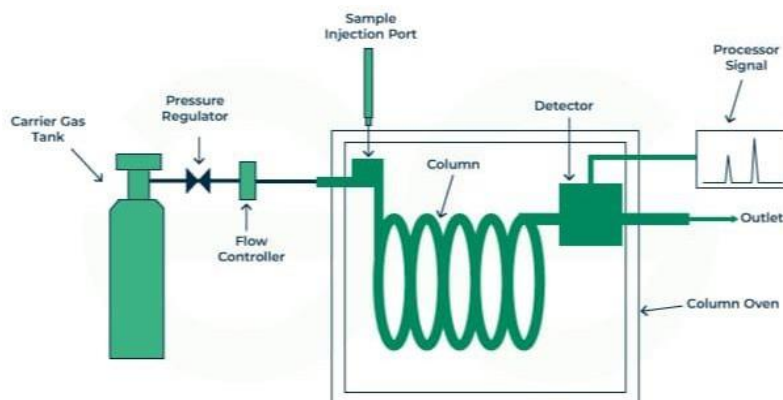


Fig No. 5 GC Technique

### 1. Fourth technique:- Capillary Electrophoresis.

If you are looking for an efficient, fast and robust separation method that can be used to quantify both small and large molecules, don't rule out capillary electrophoresis

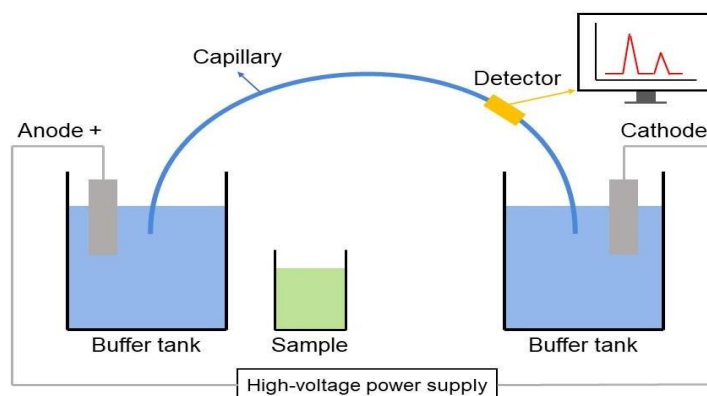


Fig No :- 6 Cappillary Electrophoresis

### 2. Fifth technique:- Spectroscopic Technique

Spectroscopic techniques used for the analysis of pharmaceutical products are commonly divided into three main techniques:-

#### a) Spectrophotometry Ultraviolet-Visible (UV-Vis)

Spectroscopy is a globally used technique that is very simple, reliable, rapid and relatively inexpensive to both quantify and qualify pharmaceutical ingredients containing chromophores, allowing routine laboratory work by groups.

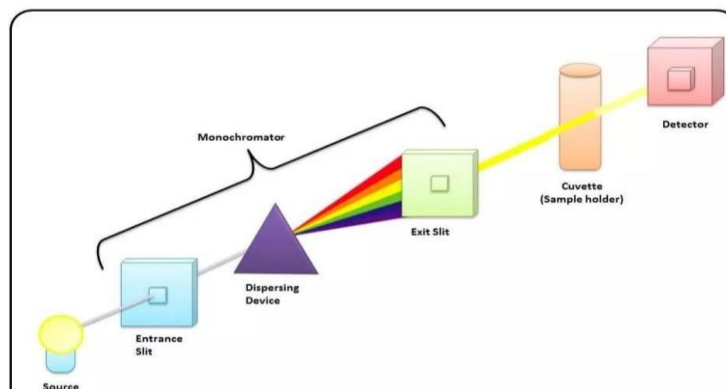


Fig No :- 7 Spectroscopic Technique (UV)

**b) Nuclear Magnetic Resonance Spectroscopy:-**

Since its invention in 1996, nuclear magnetic resonance spectroscopy (NMR) has been widely used to elucidate and confirm the structure of target drug molecules.

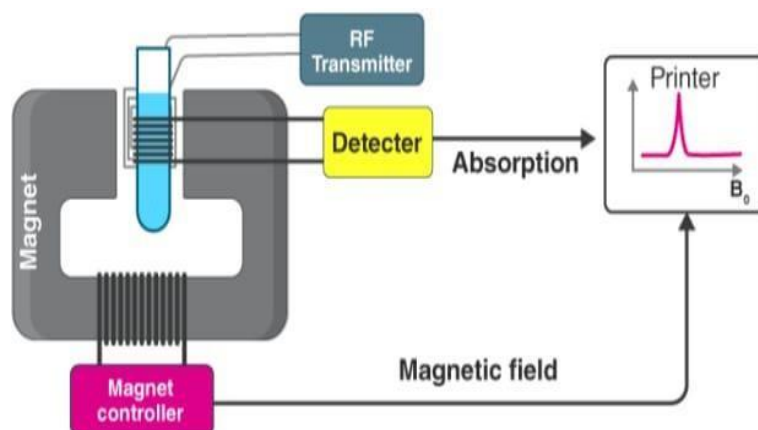


Fig No.8 NMR Technique

**c) Phosphorimetry and Fluorometry:**

Fluorescence spectroscopy is a powerful technique with the following characteristics: It is characterized by precision, sensitivity and specificity and is used in the analysis of pharmaceuticals.

**CONCLUSION :**

Many of the most commonly used analytical techniques are covered in this review. These techniques are used to ensure the quality and quantity of medicines taken daily by millions of healthy and sick people and animals, to prevent or treat existing diseases, or for research purposes. In this study, the authors conclude that the aforementioned analytical techniques are essential to ensure the safe and effective treatment of a significant number of drugs distributed worldwide.

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