IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 3, January 2026
Impact Factor: 7.67

Design and Development of Anti-ulcer Drug Derivatives for Analytical Studies

Mr. Laxman S Wagh[1], Dr. Madhuri A. Theng[2], Dr. Ashutosh Kumar Dash[3]
Gawande College of Pharmacy, Sakharkherda, Sindakhed Raja, Buldana[1-3]

Abstract: *Ulcer is a break on the skin, in the lining of an organ, or on the surface of a tissue Ulcers are open sores or wounds caused by the erosion of tissue Ulcers are most Common on the skin of the lower extremities and in the Gastrointestinal tract, although they may be encountered at almost any site*

Keywords: *Ulcer*

I. INTRODUCTION

1. Ulcer

1. Ulcer is a break on the skin, in the lining of an organ, or on the surface of a tissue Ulcers are open sores or wounds caused by the erosion of tissue Ulcers are most Common on the skin of the lower extremities and in the Gastrointestinal tract, although they may be encountered at almost any site[16]

2. There are many types of ulcer such as mouth ulcer, esophagus ulcer, peptic ulcer, and genital ulcer Among these the peptic ulcer is seen mostly common in peoples Peptic ulcer occurs in that part of the gastrointestinal tract (g1L) which is exposed to gastric acid and pepsin, i.e. the stomach and duodenum. The etiology of peptic ulcer is not clearly known Peptic ulcer disorder arises due to imbalance between defensive factor (gastric mucus and bicarbonate secretion, prostaglandins, nitric oxide, high mucosal blood flow, inmate resistance of the mucosal cells) and the aggressive (acid, pepsin, NSAIDs, bile and H. pylon). [19]

2. Drugs for Peptic Ulcer Classification :

A. Gastric acid secretion inhibitors

1. Antihistamines: Cimetidine, Ranitidine, Famotidine, Roxatidine, Lafutidine

2. Anticholinergics: Pirenzepine, Propantheline, Oxyphenonium

3. Proton pump inhibitors

(PPIs): Omeprazole, Esomeprazole, Pantoprazole, Lansoprazole, Rabeprazole, Dexrabeprazol e, Ilaprazole

4. Prostaglandin analogue: Misoprostol

B. Gastric acid neutralizers (Antacids)

1. Systemic: Sodium bicarbonate, Sodium citrate

2. Nonsystemic: Magnesium hydroxide, Magnesium trisilicate, Aluminum hydroxide, Magaldrate, Calcium carbonate

C. Ulcer protectives: Sucralfate , Colloidal bismuth subcitrate (CBS)

D. Anti-H.pylori drugs: Amoxicillin, Clarithromycin, Metronidazole, Tinidazole, Tetracycline, CBS

3. Pathophysiology

The pathophysiology of an ulcer involves a breakdown of the defensive mucosal barrier in the gastrointestinal (GI) tract, allowing the corrosive digestive fluids to damage the underlying tissue. This imbalance between protective and destructive factors leads to the formation of an open sore, most commonly in the stomach (gastric ulcer) or the duodenum (duodenal ulcer).

4. Factors that disrupt the mucosal defense

1. Helicobacter pylori (H. pylori) infection :H. pylori is a spiral-shaped bacterium that is a major cause of peptic ulcers. It thrives in the acidic environment of the stomach by employing several mechanisms to weaken the mucosal lining:

2. Urease production: The bacteria produce the enzyme urease, which breaks down urea into ammonia and carbon dioxide. The ammonia creates a protective, alkaline cloud around the bacteria, shielding them from stomach acid.

DOI: 10.48175/568

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 3, January 2026 Impact Factor: 7.67

3. Adherence and motility: The bacterium's shape and flagella allow it to burrow through the mucus layer and attach to the epithelial cells of the stomach lining.
4. Toxin production: H. pylori releases cytotoxins, such as VacA and CagA, which directly damage epithelial cells and trigger an inflammatory response. The resulting inflammation further compromises the mucosal barrier. [11]
5. Inflammatory response
The host's immune response to the infection, including the release of cytokines like interleukin- 8 (IL-8), attracts inflammatory cells that contribute to tissue damage.
1. Nonsteroidal anti-inflammatory drugs (NSAIDs)
1. Long-term or high-dose use of NSAIDs, such as aspirin and ibuprofen, is the second leading cause of ulcers. NSAIDs disrupt the mucosal barrier through both systemic and local mechanisms:
2. Prostaglandin inhibition: NSAIDs block the cyclooxygenase (COX) enzymes, particularly COX-1, which are critical for producing prostaglandins. These prostaglandins normally stimulate mucus and bicarbonate secretion and help maintain mucosal blood flow, which are all vital protective functions.
3. Direct mucosal injury: As acidic compounds, NSAIDs can cause direct damage to the superficial epithelial cells when they are taken orally. This topical irritation further compromises the mucosal integrity.

ANALYTICAL TECHNIQUES

An analytical technique is a procedure or systematic method used to identify, separate, and quantify components within a sample, often by utilizing the physical, chemical, or biological properties of the material. These techniques are employed across various fields, from chemistry and biology to computer science, to gain insights, solve problems, and understand the composition and structure of substances.

Types Of Analytical Techniques

1. Chemical Analysis Techniques
• Titration – measuring concentration by reacting with a standard solution.
• Gravimetric Analysis – measuring mass of a substance after separation.
2. Spectroscopic Techniques
• UV-Vis Spectroscopy – studies light absorption.
• IR Spectroscopy – identifies functional groups.
• NMR (Nuclear Magnetic Resonance) – determines molecular structure.
• Mass Spectrometry (MS) – identifies compounds by mass-to-charge ratio.
3. Chromatographic Techniques
• Thin Layer Chromatography (TLC) – quick compound separation.
• High-Performance Liquid Chromatography (HPLC) – precise separation & quantification.
• Gas Chromatography (GC) – separation of volatile compounds
4. Microscopic & Imaging Techniques
• Scanning Electron Microscopy (SEM)
• Transmission Electron Microscopy (TEM)
• Atomic Force Microscopy (AFM)
5. Thermal Analysis
• Differential Scanning Calorimetry (DSC) – studies phase transitions.
• Thermogravimetric Analysis (TGA) – measures weight change with temperature.
6. Molecular Biology Techniques
• PCR (Polymerase Chain Reaction) – DNA amplification.

APPLICATION

1. Clinical and Biomedical:
a. Measuring blood glucose, cholesterol, and other biomarkers for disease diagnosis and monitoring.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 3, January 2026
Impact Factor: 7.67

b. Analyzing drug concentrations in biological samples for pharmacokinetic studies.
c. Used in PCR testing for diseases like COVID-19.
2. Environmental Monitoring:
a. Testing water, air, and soil for pollutants, heavy metals, and other toxic substances.
b. Identifying pesticides and other contaminants in various environments.
c. Assessing air and water quality.
3. Pharmaceuticals:
a. Ensuring the purity and shelf-life of drugs.
b. Identifying and quantifying impurities and active ingredients in drug formulations.
c. Studying the stability of drug molecules and evaluating therapeutic drug monitoring.
4. Forensic Science:
a. Analyzing evidence from crime scenes, such as blood, fingerprints, and other trace substances.
b. Detecting drugs and toxins in biological samples through toxicology studies.
5. Food and Agriculture:
a. Detecting contaminants, additives, and harmful chemicals in food products.
b. Assessing the nutritional content of food, including proteins, carbohydrates, and fats.
c. Monitoring mineral content in soil to ensure optimal conditions
6. Materials Science and Manufacturing:
a. Quality control of industrial products, including semiconductors and nanomaterials.
b. Research and development of new materials with specific chemical and physical properties.

UV-VISIBLE SPECTROSCOPY

Ultraviolet and visible spectroscopy deals with the recording of the absorption of radiations in the UV and visible regions of the electromagnetic spectrum. The UV region extends from 10- 400nm. It is sub -divided into the near UV (quartz) region (200-400nm) and the far or vacuum UV region (10-200nm). The visible region extends from 400-800nm. [9]

Absorption of electromagnetic radiations in the UV and visible regions induces the excitation of an electron from a lower to higher molecular orbital (electronic energy level). Since UV and visible spectroscopy involves electronic transitions, it is often called electronic spectroscopy . Organic chemists use UV and visible spectroscopy for detecting the presence and elucidating the nature of conjugated multiple bonds or aromatic ring. [17]

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 3, January 2026
Impact Factor: 7.67

PRINCIPLE

1. Spectroscopy is unique spectra that are based on the principle of ultraviolet-visible radiation. These spectra are produced when ultraviolet or visible light is absorbed by chemicals. Spectroscopy is based on the interaction of light and matter. The material will undergo phases of excitation and re-excitation when light is absorbed by it, creating a spectrum. When an electromagnetic wave hits matter, it can undergo a number of processes, including transmission, absorption, reflection, and dispersion. [25]

2. When the structure of a molecule or ion is electronically transformed by radiation, the object will exhibit absorption in the visible or ultraviolet range. When light is absorbed by the sample in the ultraviolet or visible range, the molecules of the sample will be electronically altered, Therefore; the electrons will be promoted from their ground state orbit to higher energy orbits excited by the energy of absorbed light or antibonding orbit.

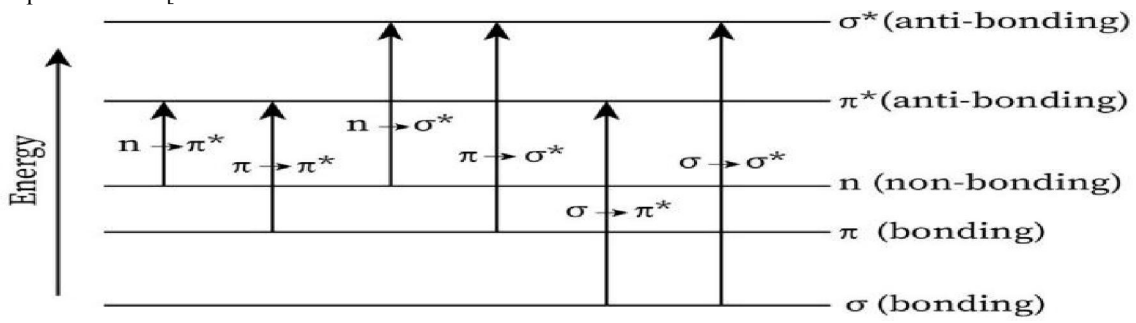
3. There are three possible types of ground state orbits involved: σ (bonding) molecular Orbital and n (bonding) atomic orbital, in addition to two types of antibonding orbitals that may participate in the transition process: Σ* (sigma star) orbital and π* (pi star) orbital. Note that there is no antibonding orbital n* because the n electrons don't form bonds, and as a result electronic transitions can occur by absorbing ultraviolet and visible light.

4. Absorption of ultraviolet and visible light leads to types of electronic transformations, the most important of which are[10]

1. σ-σ* Transitions: The electron in the bonding orbital σ is stimulated to the anti-orbit that it corresponds to, and this stimulation requires a lot of energy.

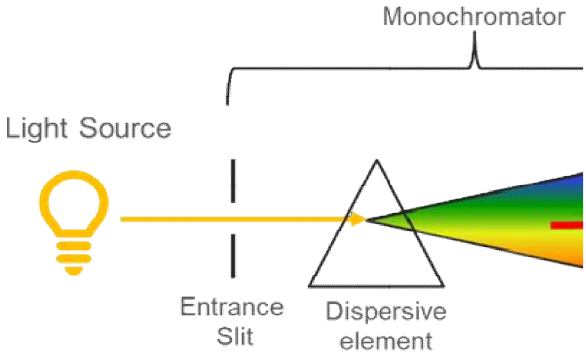
2. N-σ* Transitions: These transformations occur in saturated compounds that contain atoms with lone pairs, or unpaired electrons, and they usually require less energy than the energy needed to convert σ to σ*.

3. N-π* and π -π* Transitions: Electron transitions from n or π to the excited state π*. It is the basis for most absorption spectroscopy of organic compounds. This is because of the spectral range (between 200 and 700 nanometers) suitable for experimentation[1



Electronic Transition

INSTRUMENTATION :-



Instrumentation of UV Spectrophotometer

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 3, January 2026 Impact Factor: 7.67

A. Light Source :-

a. Hydrogen lamp: They are highly reliable and stable lamps. The radiation emitted from it is continuous and its range ranges between (160-380) nm.

b. Xenon Lamp: It is a high-energy light source. The wavelength of the light emitted from it ranges from about (250-600) nm in the ultraviolet and visible spectra. The xenon lamp flashes at a frequency of 80 Hz, making it longer lasting than other lamps. In terms of manufacturing, it is the highest cost

c. Deuterium lamp: It is the source that emits ultraviolet radiation and is symbolized by the symbol D2. The wavelength of the radiation emitted from it ranges from about (160-450) nm, and it is more expensive than a hydrogen lamp.

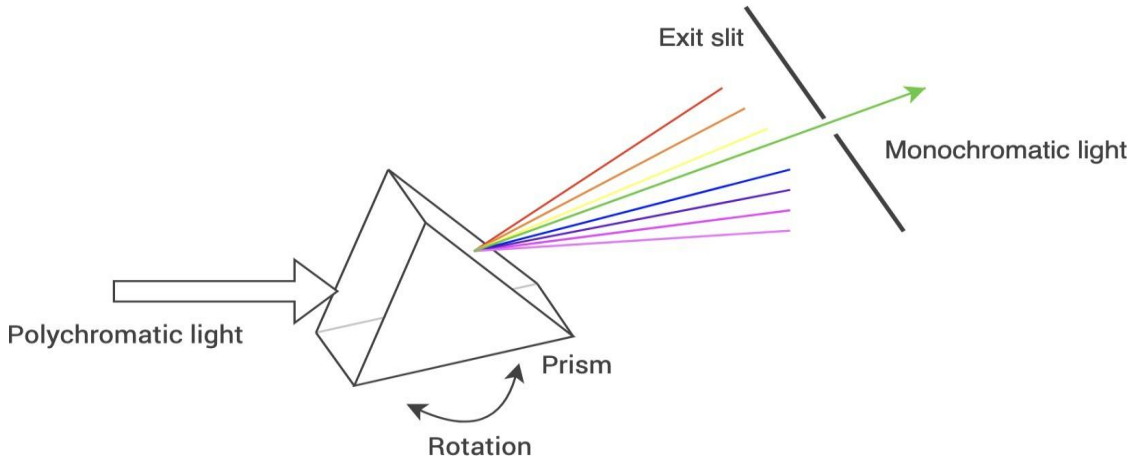
d. Tungsten lamp: It is the most common source used in spectrophotometers, as it operates in the wavelength range between 330 and 900 micrometers[11]

B. Wavelength Selector :-

1. Filters

1. Filter permits certain bands of wavelength (bandwidth of ~50nm) to pass through.
2. They are used in visible region.
3. The simplest kind of filter is absorption filters , the most common of this type of filter is colored glass filters.
4. The colored glass absorbs a broard portion of the spectrum and transmits other portion.

2. Monochromators

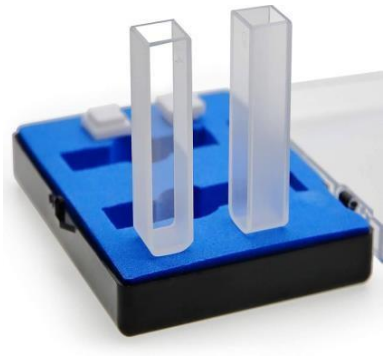


1. Monochrome devices are used to convert multicolored or heterochromatic light into monochromatic light, and are considered better and more efficient than filters.There are two types of Monochromators: prism monochromator and grating monochromator.

3. Sample Compartment (Cells) :-

1. For visible and uv spectroscopy, a liquid sample is usually contained in a cell called a
Cuvette.
2. Glass is suitable for visible but not for uv spectroscopy because it absorbs UV radiation. Quartz can be used in UV as well as in Visible spectroscopy.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 3, January 2026
Impact Factor: 7.67

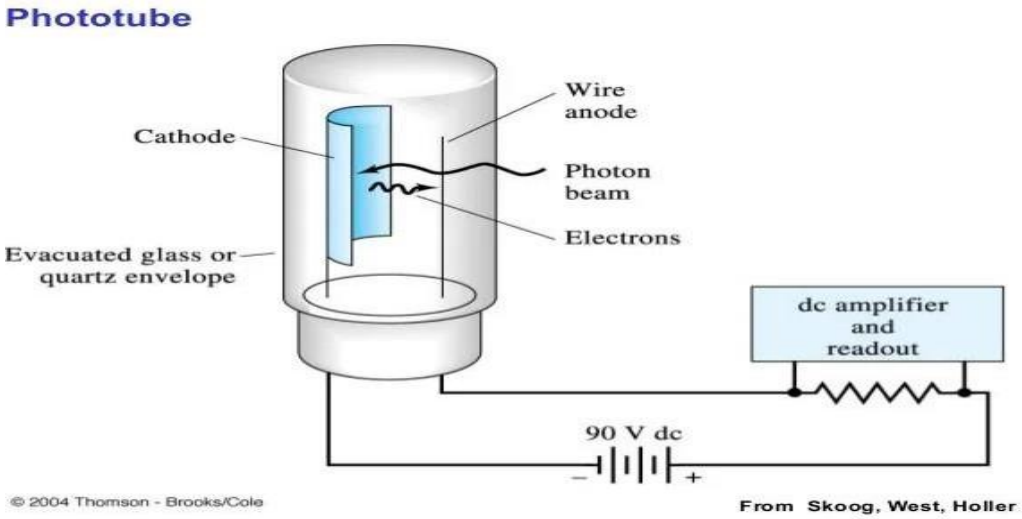


Cuvette

4. Detector :-

1. The detectors are device that convert radiant energy into electric signal
2. A detector should be sensitive, and has fast response over a considerable range of wavelenghts.
3. In addition, the electrical signal produced by the detector must be directly proportional to the transmitted intensity (linear response)

5. Phototube :-



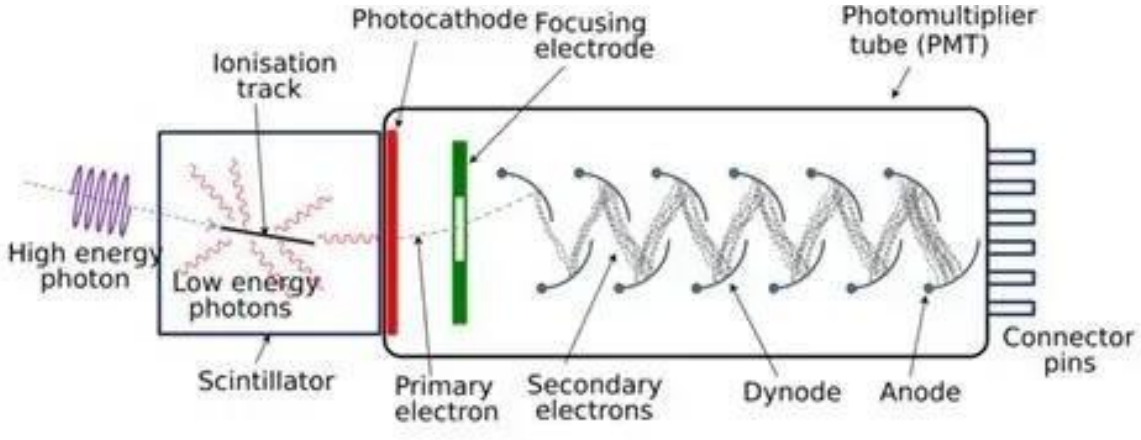
Phototube

1. Phototube emits electrons from a photosensitive, negatively charged cathode when struck by visible or UV radiation
2. The electrons flow through vacuum to an anode to produce current which is proportional to radiation intensity.

6. Photomultiplier tube :-

1. It is a very sensitive device in which electrons emitted from the photosensitive cathode strike a second surface called dynode which is positive with respect to the original cathode.
2. Electrons are thus accelerated and can knock out more than one electrons from the dynode.
3. If the above process is repeated several times, so more than 105 electrons are finally collected for each photon striking the first cathode.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 3, January 2026
Impact Factor: 7.67



Photomultiplier Tube

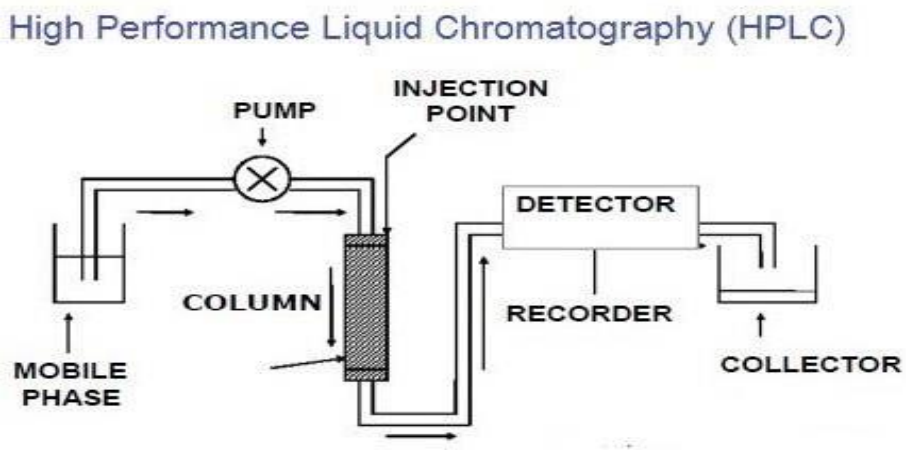
7. Application Of UV Spectroscopy :-

1. Quantitative Analysis: UV-Vis spectroscopy measures the concentration of molecules in solution by relating absorbance to concentration using Beer's Law.
2. Qualitative Analysis: It identifies compounds by comparing their unique absorption spectra to known reference spectra.
3. Purity Testing: The technique is used to assess the purity of a sample by detecting impurities that absorb at different wavelengths.
4. Pharmaceutical Analysis: Used for quality control, determining drug content, and verifying the purity and efficacy of pharmaceutical products.
5. Biochemistry: Applied to determine the concentration of proteins, nucleic acids, and to track bacterial growth by measuring optical density.
6. Food and Beverage Analysis: Utilized to measure sugar, lipid, protein content, and detect contaminants in food products.
7. Environmental Science: Helps in the identification and quantification of various pollutants and contaminants in environmental samples.
8. Forensics: Used to analyze dyes and pigments in inks, fibers, and paint chips, and in toxicology.
9. Material Science: Used for characterizing nanoparticles, determining the thickness of thin films, and analyzing the composition of materials like coal and petroleum.
10. Chemical Kinetics: Can monitor the progress and rate of chemical reactions over time.

High Performance Liquid Chromatography (HPLC) : .

1. High Performance Liquid Chromatography (HPLC) was derived from the classical column chromatography and, is one of the most important tools of analytical chemistry today. In the modern pharmaceutical industry, High-Performance Liquid Chromatography (HPLC) is the major and integral analytical tool applied in all stages of drug discovery, development and production.
2. HPLC is the method of choice for checking peak purity of new chemical entities, monitoring reaction changes is in synthetic procedures or scale up, evaluating new formulations and carrying out quality control / assurance of the final drug products. [13]

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 3, January 2026
Impact Factor: 7.67



High Performance Liquid Chromatography (HPLC)

3. High Performance Liquid Chromatography is now one of the most powerful tools in analytical chemistry. It has the ability to separate, identify and quantify the compounds that are present in any sample that can be dissolved in a liquid. HPLC is the most accurate analytical methods widely used for the quantitative as well as qualitative analysis of drug product and used for determining drug product stability.

4. HPLC principle is the solution of sample is injected into a column of porous material (stationary phase) and liquid phase (mobile phase) is pumped at higher pressure through the column. The principle of separation followed is the adsorption of solute on stationary phase based on its affinity towards stationary phase.

2.TYPES OF HPLC

Types of HPLC generally depend on phase system used in the process. Following types of HPLC generally used in analysis-

1. Normal phase chromatography:

Also known Normal Phase HPLC (NP-HPLC), this method separates analytes based on polarity. NP-HPLC uses a polar stationary phase and a non-polar mobile phase. The polar analyte interacted with and is retained by the polar stationary phase. Adsorption strengths increase with increased analyte polarity and the interaction between the polar analyte and the polar stationary phase increases the elution time.

2. Reversed phase chromatography:

Reversed phase HPLC (RP-HPLC or RPC) has a non-polar stationary phase and an aqueous, moderately polar mobile phase. RPC operates on the principle of hydrophobic interactions, which result from repulsive forces between a polar eluent, the relatively non-polar analyte, and the non-polar stationary phase.

3. Ion Exchange Chromatography:

The stationary phase contains ionic groups like NR3+, SO3- which interact with the ionic' groups of the sample molecules. This is suitable for the separation of charged molecules only. Changing the pH and salt concentration can modulate the retention time.

4. Ion Pair Chromatography:

This technique is also referred to as Reversed Phase Ion Pair Chromatography or Soap Chromatography, It may be used for the separation of Ionic compounds and this method can also substitute for Ion Exchange Chromatography. Strong acidic and basic compounds may be separated by reversed phase mode by forming ion pairs (columbic association species formed between two ions of opposite electric charge) with suitable counter ions.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 3, January 2026 Impact Factor: 7.67

5. Affinity Chromatography:
This technique uses highly specific biochemical interactions for separation. The stationary phase contains specific groups of molecules which can absorb the sample if certain steric and charge related conditions are satisfied. This technique cans be used to isolate proteins, enzymes as well as antibodies from complex mixtures.
6. Size Exclusion Chromatography:
It separates molecules according to their molecular mass. Largest molecules are eluted first and the smallest molecules last. This method is generally used when a mixture contains compounds with a molecular mass difference of at least 10%. This mode can be further subdivided into Gel Permeation Chromatography (with organic solvents) and Gel Filtration Chromatography (with aqueous solvents) [14]
3. HPLC Principle:
HPLC separates components of a mixture based on their differential interactions with a station ay phase and a mobile phase under high pressure, allowing precise analysis and purification of compounds. [15]
4. Applications of HPLC:
1. PHARMACEUTICAL APPLICATIONS:
1. Tablet dissolution study of the pharmaceutical dosage form.
2. To control drug stability, shelf-life determination.
3. Identification of active ingredient.
4. Pharmaceutical quality control. [16]
2. Food applications:
1. HPLC is widely using the food analysis of particular product research and quality control.
2. It is suited for testing of the labile compound for a complex matrix.
3. Analysis of natural compounds (sugar, fats, protein, amino acids) are determined.
4. Multiresidues testing of contaminants and pesticides. [16] 3.Forensics applications:
1. Quantification of the drug in a biological sample.
2. Identification of anabolic steroids in serum, urine, sweat, and hair.
3. Forensics analysis of textile dyes.
4. Determination of cocaine and metabolites in blood. [17]
4.Clinical Applications:
1. Clinical research and routine clinical analysis.
2. Measuring the glycated hemoglobin, it means monitoring long term plasma glucose control in diabetic patients.
3. It is also widely used to identify the cause of poisoning.
4. Identifying the drug metabolism that may be important in drug toxicity. [18]

II. REVIEW OF LITERATURE

1. Karthik Vishwanath et.al., (2010) :- quantitative UV-visible optical spectroscopy may prove to be a viable alternative to more invasive, or less practical, methods for evaluating biomarkers of cancer for a variety of applications. Recent reports in which quantitative optical cancer biomarkers are clinically validated with currently accepted methods are a welcome addition to the field, as they will set the stage for optical technologies to gain widespread clinical acceptance. It is our hope that the number of groups employing quantitative approaches to tissue optical spectroscopy will only increase, and that continued research will reduce or eliminate any barriers to widespread clinical application of these technologies. [2]
2. Desai N J et.al., (2015) :- has developed UV Spectrophotometric Method for determination of Luliconazole drug content in Marketed product. Simple, more accurate, reproducible, accurate and précised method has been developed. Analysis of Luliconazole was carried out at lambda max 296 nm in the concentration range of 5-25 ppm with mean recovery of Luliconazole 99.97%. The Limit of detection and Limit of quantification were found to be 0.38ppm and 1.06 ppm respectively. [3]
3. Gangane PS et al., (2014) :- brought out a simple, precise, and specific RP-HPLC technique for determining "Etoricoxib in bulk and tablet dosage forms. This method was found advantageous as it employs the LC-10ATVP

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 3, January 2026 Impact Factor: 7.67

Shimadzu Liquid Chromatography HPLC at Hyper ODS 2 C18 size 4.5x250 mm column as a stationary phase." The flow rate of the solvent system (Methanol: buffer) was 1 ml/min and its analysis had been done. [4]

4. Potluri H et al., (2017) :- fabricated a method that is simple, accurate and precise. It is used for the "analysis of drug nortriptyline and pregabalin simultaneously. BDS (250mm x 4.6mm, 5m) C18 was used at 210 nm of UV detection. Perchloric acid (0.1 percent) and acetonitrile were used in the ratio of 55:45. The flow rate of 1.0 ml/min." The active pharmaceutical ingredients were in the range of 100.60-101.65 percent and 100.59-
101.74 percent, for nortriptyline and pregabalin. It was recovered for pregabalin and nortriptyline. It may be called successful as it is found validated. It may be utilised to analyze the tablet dosage formulation quantitatively. [5]

5. Parameswari SA, Arunamma G et al., (2018) :- suggested and developed a method for determination of epalrestat and pregabalin in the form tablet dosage. The method was found accurate, precise, and sensitive which indicates RP-HPLC is validated. STD Discovery column (250 X 4.6 mm X 5µm) was used as a column and a mobile phase (0.1)% orthophosphoric acid buffer and acetonitrile in a 45:55 ratio) injected through with injector device "with a flow rate of 1 ml/min. The temperature was kept at 25 degrees Celsius. Using a PDA detector, the effluents were measured at 244 nm Epalrestat and pregabalin had retention times of 2.407 and 3.272 minutes, respectively. The technique was validated according to the ICH criteria for several analytical parameters. For epalrestat and pregabalin, the technique was shown to be linear in the ranges of 37.5 - 225 µg and 18.75
- 112.5 µg/ml," respectively .The assay of the commercial formulation was evaluated, and epalrestat and pregabalin were found to have 99.22 percent and 99.07 percent w/v, respectively. [7]

6. David Newport et.al., (2019) :- There are several molecules of environmental and domestic significance, which show strong deep-UV absorption. This intrinsic property can be exploited for the development of a gas sensor using absorbance measurement at a specific wavelengths range. UV absorption spectrophotometry provides a sensitive, reliable, self-referenced, and selective approach for gas sensors development. Recently, portable and efficient UV optoelectronic and optofluidic components have been developed, for example LEDs, HCWs, and photodiodes. These portable devices can be utilized to develop a portable deep-UV absorption spectrophotometer, which can rival the analytical performance of a lab-based deep-UV absorption spectrophotometer. [8]

7. Yuchen Guo et.al., (2020) :- UV-Vis spectroscopy techniques have been widely used to detect pollutants in different water environments, including organic and inorganic substances. In this paper, the detection method of water quality parameters, data analysis method, and existing problems are introduced in detail. UV-Vis spectroscopy has become a rapid analysis tool for qualitative and quantitative detection of water quality. Although these studies show the ability of UV-Vis spectroscopy to detect pollutants in water environments, the practical application of UV-Vis spectroscopy in water quality detection is still difficult. One of the main problems is the detection limit. At present, the detection limit of many studies has been below the environmental safety value; however, it is worth noting that the experimental processes have been performed in the laboratory rather than in true field environments. The field environment is complex and contains many pollutants, which have significant impacts on the detection results. [9]

8. Kumar et al., (2021) opine that the DoE is an essential technique in modern drug analysis since it balances a number of chromatographic parameters at the same time to achieve optimal separation in High Pressure Liquid Chromatography (HPLC). This publication includes a brief overview of the DoE's theoretical underpinnings as well as step-by-step instructions for implementing it in HPLC pharmaceutical practise. The reviewers of this study classified various design types and their capabilities to rationalise the various stages of the HPLC method development" workflow, such as the selection of the most influential factors, factor optimization, method robustness assessment, and the application of the DoE in the development of new HPLC method development. [11]

9. Dr. Umesh Upadhyay et.al., (2022) :- UVvisible spectroscopy is a reliable, straightforward, and affordable approach for estimating the concentration of absorbing species. One of the crucial methods for analyzing the optical characteristics of PMCs is UV-Vis spectroscopy. It clarifies the relationship between the matrix and the nanofiller and examines how the nanofillers contribute to the enhancement of the properties of the nanocomposites. To assess the intended optical properties of nanofillers in a polymer matrix, UV-Vis spectroscopy is a crucial technique. The polymer nanocomposites with some optically responsive nanofillers, such as metals, semiconductor nanocrystals, and nano oxides, are characterized using the UV-Vis spectroscopic approach in order to produce functional materials with

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 3, January 2026 Impact Factor: 7.67

significant technological applications. UV-Vis Spectroscopy (or Spectrophotometry) is a quantitative technique used to measure how much a chemical substance absorbs light. [12]

10. Sargar Komal Bharat et.al., (2023) :- spectroscopy is used for two measurements techniques; how much analyte is in the sample (quantitative analysis) and Which analyte is in the sample (qualitative analysis). An Area under curve method is "the area under two points on The mixture spectra is directly proportional to the Concentration of the compound of interest" particularly Suitable for the compounds where there are no sharp peak or Broad spectra are obtained. The pharmaceutical analysis by UV-Visible Spectroscopy comprises the procedures Necessary to determine the "identity, strength, quality and Purity" of compounds. Present review concludes various Applications of UV spectroscopy qualitatively as well as Quantitatively. [13]

11. .Harshika Jain et.al., (2023) :- Calibration of UV result was accurate and specific range. A UV spectrophotometric method was developed and validated for pure and formulated letrozole. The UV spectrophotometric method was an accurate and cost- effective method and it is a fast and accurate result. The method is accurate, selective, precise and linear in the studied concentration range. The proposed method is suitable for quality control, routine analysis and determination of letrozole in pure and pharmaceutical dosage form determination of letrozole in pure and pharmaceutical dosage form. [18]

12. Naveenarani Dharuman et.al., (2024) :-Design of experiment driven ecofriendly RP- HPLC for simultaneous determination of Cilnidipine and Metoprolol succinate The analytical community prioritizes adopting green techniques due to concerns over the environmental impact of chemical research. This study employs an integrated experimental strategy, combining the concept of design of experiment (DOE) and green analytical chemistry (GAC), to establish a robust, green RP-HPLC approach for the simultaneous estimation Cilnidipine (CIL) and Metoprolol succinate (MET). For method optimization, a central composite design (CCD) was implemented. Separation utilized Intersil ODS 3 column (250 mm x 4.6 mm, 5 µm), with gradient mobile phase (ethanol: 17.65% at 0 min, 75.5% at 3 min) and phosphate buffer, flowing at 1 ml/ min. Detection wavelength at 230 nm. Column temperature (35±1°C), and injection volume 5 µL. [16]

13. Chaudhari M et.al., (2023) :- A UV-spectrophotometric method was successfully developed for the quantitative analysis of antifungal agent in both bulk and pharmaceutical formulations. The method employed the Area Under the Curve (AUC) approach, integrating absorbance over the wavelength range of 279–305 nm. The absorption maximum (λ_{max}) of antifungal agent in methanol was determined to be 295 nm.The method demonstrated linearity over the concentration range of 3–18 µg/mL, with a correlation coefficient (R^2) of 0.997, indicating a strong linear relationship between concentration and absorbance. This confirms the suitability of the method for routine analysis of anti fungal drug in quality control laboratories. [19]

14. Dr. Hemant Kamble et.al., (2024) :- UV spectroscopy stands as a pivotal and in dispensable characterization technique, offering Profound insights into the properties of diverse samples through the analysis of their interaction with electromagnetic radiation. If used with the right standard curve and applied to pure substances, UV-visible spectroscopy is a reliable, straight forward, and analyzing affordable approach for estimating the concentration of absorbing species. One of the crucial methods for the optical characteristics of PMCs is UV-visible is spectroscopy. It clarifies the relationship between the matrix and the nanofiller and examines how the nanofillers contribute to the enhancement of the properties of the nanocomposites. To assess the intended optical properties of nanofillers in a polymer matrix, UV-Vis spectroscopy is a crucial technique. The review paper contains all information about UV visible spectroscopy, its principle, theory, instrumentation, advantages, Disadvantage's & its applications. The identification of impurities are Carried out by using UV visible spectroscopy more Accurately UV visible spectroscopy is a very crucial Spectroscopy. [22]

III. AIM & OBJECTIVE

AIM: Design and Development of Anti-ulcer Drug Derivatives for Analytical Studies

OBJEVTIVES:

1. To select suitable drug and drug formulation

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 3, January 2026 Impact Factor: 7.67

2. To apply suitable analytical techniques
3. To optimize the analytical techniques employed
4. To select drug or drug combinations and to develop analytical methodology

IV. PLAN OF WORK

1. Literature Survey :- Review of the Literature Gather pertinent literature from online databases,books, patents, and journals.
2. Preformulation Studies :-
a. Drug Characterization: Solubility, partition coefficient, stability, pKa.
b. Excipient Compatibility: Screening oils, surfactants, gelling agents, and preservatives.
c. Analytical Method Development: Validated methods (UV Spectroscopy) for drug quantification.
3. Formulation Development :-
c. Gel Phase Selection: Gelling agents optimized for viscosity and spreadability.
d. Prototype Batches: Preparation of trial formulations with varying excipient ratios.
4. Evaluation & Characterization :-
a. Physicochemical Tests: pH, viscosity, spreadability, extrudability, particle size.
5. Timeline and Milestones
6. Resources and Budget Outline
7. Result and Exchange
8. References

V. MATERIALS AND METHOD

1. Source of Data:
1. Preliminary data required for the experimental study would be obtained from:
1. Gawande College of Pharmacy, library.
2. Indian institute of science and internet browsing.
3. Scientific journals.

2. Materials
Drug : ANTI-ULCER DRUG
1. Experimental work
1. Preliminary Characterization Identification of Drug
1. Appearance, colour and odour.
Ticagrelor is evaluated for various pre-formulation parameters likes colour,odour, appearance and confirmed that they complied with official standards.
2. Determination of melting point.
Melting point of the Ticagrelor is determined by open capillary methodand compared with standards literature values.
3. Determination of solubility.
The solubility of the Ticagrelor is determined in acetonitrile and methanol.

2. Materials
1. Material Chemical and Regents : All of chemical , , reagents, and solvents used in this work will be of analytical grade and will be purchased from reputable vendors like Loba Chemie, Sigma-Aldrich, or Merck. When necessary, solvents like methanol, ethanol, acetonitrile, chloroform, and water (HPLC grade) will be used.
2. Based on the planned synthetic scheme, synthesis reagents such as carboxylic acids, heterocyclic intermediates, substituted aromatic amines, and coupling agents

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 3, January 2026 Impact Factor: 7.67

3. Reference Standards: For analytical comparison, standard anti-ulcer medications like ranitidine, omeprazole, pantoprazole, or other pertinent analogues will be acquired. Equipment and Instrumentation: Electronic balance Hot plate and magnetic stirrer Equipment for melting points Spectrophotometer with UV Visibility FTIR (Fourier Transform Infrared) Spectrophotometer , HPLC.

2. Methods

1. To identify and design potential anti-ulcer drug derivatives by predicting their binding affinity and interaction with a biological target, such as the H+/K+ ATPase enzyme.
2. ADMET (Absorption, Distribution, Metabolism, Excretion, and Toxicity) prediction: To computationally assess the pharmacokinetic properties and toxicity profile of the newly derivatives.
3. Pharmacophore modeling: To define the essential structural features required for a molecule to interact with the biologicaltarget.
4. Structural characterization : Elemental analysis: To confirm the empirical formula of the final compounds.
5. Analytical method development and validation : UV-Vis ,Chromatographic method development: Developing and optimizing a robust analytical method, such as High- Performance Liquid Chromatography (HPLC), for the separation, identification, and quantification of the drug derivatives.
6. In vitro evaluation : In vitro H+/K+ ATPase enzyme inhibition assay: Using an enzyme- linked assay to test the inhibitory activity of the synthesized derivatives against the gastric proton p.
7. The preparation of Anti ulcer antidiabetic chewable tablets will involve a series of steps, primarily utilizing the wet granulation method. Initially, the ingredients will be accurately weighed according to the formulation. These weighed ingredients will then be combined to form a damp mass, ensuring homogeneity of the mixture.
8. The damp mass will be screened through a sieve, typically with a mesh size number 14, to obtain granules of uniform size. These granules will then be dried to remove excess moisture, ensuring stability and facilitating subsequent processing steps.
9. Lubricants, such as stearic acid and magnesium stearate, will be added to the dried granules to improve flow properties and prevent sticking during tablet compression. After thorough blending, the granules will be compressed into tablets using an 8-station rotary press tablet compression machine.
10. This process will ensure uniformity in tablet weight, content, and physical characteristics, resulting in the production of high-quality chewable tablets suitable for oral administration.
11. Evaluation of Pre-compression Parameters

1. Bulk Density :

The bulk density of the compound will vary substantially based on the method of crystallization, milling, or formulation. Bulk density will be determined by pouring pre- sieved granules into a graduated cylinder via a large funnel and measuring the volume and weight.

2. Tapped Density :

Tapped density will be determined by placing a known mass of granules in a graduated cylinder and using a mechanical tapper apparatus. The apparatus will be operated for a fixed number of taps until the powder bed volume reaches its minimum. Using the weight of the drug in the cylinder and this minimum volume, the tapped density will be calculated.

3. Carr's Index (CI) :

Carr's index will be measured using the values of bulk density and tapped density,
providing insight into the flowability and compressibility of the powder.

4. Hausner's Ratio :

Hausner's ratio will be calculated to indicate the flow properties of the powder by taking
the ratio of tapped density to bulk density of the powder or granules.

5. Angle of Repose :

The angle of repose will be measured to determine the flow characteristics of the granules. This parameter reflects how stresses are transmitted through a bead and the bead's response to applied stress.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 3, January 2026 Impact Factor: 7.67

6. Evaluation of Tablets formulated tablets will be assessed for general appearance, with observations made for shape, color, texture, and odor.

7. Hardness :

The hardness of the tablets will be determined using a Monsanto hardness tester. The lower plunger will be placed in contact with the tablet, and a zero reading will be recorded. The plunger will then be forced against a spring by turning a threaded bolt until the tablet fractures. The force required to fracture the tablet will be indicated on a gauge in the barrel as the spring is compressed.

8. Weight Variation :

Twenty tablets will be selected and weighed collectively and individually. The average weight will be calculated from the collective weight. Each tablet's weight will then be compared with the average to determine if it falls within permissible limits. Not more than two individual weights will deviate from the average weight by more than 7.5% for 300 mg tablets, and none will deviate by more than double that percentage.

9. Friability Test :

Twenty previously weighed tablets will be placed in the friability apparatus, which will be operated for 100 revolutions. Afterward, the tablets will be reweighed to assess their
friability.

10. Drug Content :

Twenty tablets from each formulation will be weighed and powdered. A quantity of powder equivalent to 100 mg of drug will be transferred to a 100 ml volumetric flask, and the volume will be adjusted to 100 ml with 0.1N HCl. Subsequently, 1 ml of the above solution will be diluted to 100 ml with 0.1N HCl, and the absorbance of the resulting solution will be measured at 216 nm to determine the drug content.

VI. FUTURE OUTCOMES

1. Highly sensitive.
2. It is reproducible.
3. It is simple and accurate analytical technique can be developed for the determination in bulk and pharmaceutical dosage form.
4. Method developed can be conveniently used for quality control and routine determination of drug in pharmaceutical dosage forms in pharmaceutical industry.
5. Adoption of modern analytical tools (HPLC, U.V spectroscopy) for better characterization of Anti ulcer drug
6. Development of stability-indicating methods to ensure long-term effectiveness of anti ulcer formulations.
7. develop improved stability protocols for anti ulcer drug under different environmental conditions.
8. Ensuring consistent drug release profiles throughout the shelf life.
9. focus on meeting stringent global regulatory guidelines .
10. Establishment of standardized quality benchmarks for Anti ulcer drug formulations.
11. Focus on targeted drug delivery with minimal systemic absorption.
12. ensure skin compatibility testing, reduced irritation, and improved patient compliance.
13. Post-marketing surveillance to monitor real-world safety and efficacy.

REFERENCES

[1]. Rowe R, Sheskey P, Quinn M. Butylated Hydroxytoluene, Handbook of Pharmaceutical Excipients; Published by Pharmaceutical Press and American Pharmacist Association; Sixth Edition, 2009;06:Page no. 75-77

[2]. Gandhimathi R, Vijayaraj S, Jyothirmaie MP. Analytical process of drugs by ultraviolet (UV) spectroscopy–a review.International Journal of Pharmaceutical Research & Analysis. 2012;2: Page no. 72-8.

[3]. Antonov L, Stoyanov S. Analysis of the overlapping bands in UV-vis absorption spectroscopy. Applied spectroscopy. 1993 Jul 1;47: Page no. 1030-5.

[4]. R.Barik, R&D Bulletins, NOCIL, Thane, (1987, 1988, 1989, 1990).

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 3, January 2026
Impact Factor: 7.67

[5]. Chandrashekara KN and Srinivasa K, New analytical method development for the active Pharmaceutical ingredients using visible spectrophotometry. Int J Gen Med Pharm. 2013; 2:Page no. 55-64.
[6]. Chatwal GR and Anand SK. Instrumental Methods of Chemical Analysis. Maharashtra: Himalaya Publications. 1979:Page no.107-2.109.
[7]. Chauhan A, Mittu B and Chauhan P. Analytical method development and validation: A Concise review. J Anal Bioanal Tech. 2015; 6:Page no. 233-240.
[8]. Gadkari P. Challenges in Analytical Method Development for Drug Products. Pharma Times.2012; 44:Page no. 22-24.
[9]. Jatar T, Kachave RN and Chaudhari SR. A review on development and validation of Analytical method, World J Pharmaceut Res. 2014, 3:Page no. 298-304.
[10]. Jatto E and Okhamafe A. An overview of pharmaceutical validation and process controls in Drug development. Trop J Pharm Res. 2002; 1:Page no. 115-122.
[11]. Sharma. Y.R. Elementary Organic Spectroscopy. First edition S.Chand Publisher: 2010
[12]. Chatwal G.R. Instrumental methods of chemical analysis. First edition. Himalava Publisher: 2010
[13]. Ahuja S, Rasmussen H, editors. HPLC method development for pharmaceuticals. Elsevier; 2011.
[14]. Alzweiri M, Sallam M, Al-Zyoud W, Aiedeh K. Stability Study of Etoricoxib a Selective Cyclooxygenase-2 Inhibitor by a New Single and Rapid Reversed Phase HPLC Method. Symmetry. 2018;10(7):288.
[15]. Bacheli Giridhar RP-HPLC Method Development And Validation For The Simultaneous Determination Of Cilnidipine And Nebivolol In Pharmaceutical Dosage Form. World Journal of Pharmaceutical Sciences, 2025 ,13(02).
[16]. Beckett AH, Stenlake JB. Practical Pharmaceutical Chemistry: Quantitative Analysis. University of London, Athlone Press; 1962.
[17]. Biotech AP. Reversed Phase Chromatography: Principles and Methods. Amersham Pharmacia Biotech AB, Uppsala, Sweden.1999.
[18]. Borman P, Elder D. Q2 (R1) validation of analytical procedures. ICH Quality guidelines. 2017 Sep 29; 5:127-66.European Medicines Agency. ICH Topic Q2 (R1) Validation of Analytical Procedures: Text and Methodology.1995.
[19]. Gangane PS, Bagde SM, Mujbaile SG, Niranjane KD & Gangane PS. (2018). Development and Validation of HPLC Assay Method for Etoricoxib in Bulk Drug and Tablet Formulation. Indian Journal of Natural Sciences. 2018;4 (24):1565-72.
[20]. Gore AB, Munde MK, Rukhe NB, Kulkarni NS. A Review on HPLC Method Development and Validation for Gliptin Class: New Oral Antidiabetic Agents. Research Journal of Pharmaceutical Dosage Forms and Technology. 2022;14(1):79- 86.
[21]. Gurdeep R, Chatwal S, Anand K. Instrumental methods of chemical analysis.Hakkani A, Mostafa F. a research article a rapid developed and validated RP-HPLC method for determination of azithromycin, 2019;1:120-222.Himalaya publishing house; 2016.ICH Q2A. Validation of analytical procedure: Methodology International Conference on Harmonization, Geneva, October 1994.
[22]. Kumar SD, Kumar DH. Importance of RP-HPLC in analytical method development: a review. International Journal of Pharmaceutical Sciences and Research. 2012; 1;3(12):4626.
[23]. Sachs, G., Hunt, R., & Shin, J. M. (2010). innovative methods for preventing the production of gastric acid. Reports on Current Gastroenterology, 12(6), 437–447. https://doi.org/10.1007/s11894-010-0142-4
[24]. Sachs, G., Howden, C. W., Shin, J. M., & Chey, W. D. (2006). Proton pump inhibitors'
[25]. clinical pharmacology. 23(2), 2–8; Alimentary Pharmacology & Therapeutics. 10.1111/j.1365-2036.2006.02943.x
[26]. Kim, N., and Shin, J. M. (2013). Proton pump inhibitor pharmacokinetics and pharmacodynamics. Neurogastroenterology and Motility Journal, 19(1), 25–35. https://doi.org/10.5056/jnm.2013.19.1.25
[27]. N. Vakil (2012). Proton pump inhibitors and potassium-competitive acid blockers for acid inhibition: innovative therapeutic strategies. Advances in Therapeutics

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 3, January 2026
Impact Factor: 7.67

[28]. Keeling, D. J. (2017). Advances in the chemistry of proton pump inhibitors. Future Medicinal Chemistry, 9(8), 763–773. https://doi.org/10.4155/fmc-2017-0016
[29]. Sachs, G., & Shin, J. M. (2014). Proton pump inhibitors and acid-related diseases. Pharmacological Reviews, 66(2), 354–367. https://doi.org/10.1124/pr.113.008680
[30]. Snyder LR, Kirkland JJ, Glajch JL. Practical HPLC method development. John Wiley & Sons. 2012.
[31]. Zotou A. An overview of recent advances in HPLC instrumentation. Open Chemistry. 2012;10(3):554-69.