Medicinal Chemistry

Medicinal Chemistry’s Laboratories

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<td>M12-128</td>
<td>Dr. Dana Hilal</td>
<td>College of Pharmacy</td>
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<td>Pharmacognosy</td>
<td>M28-103</td>
<td>Dr. Chefa’a Al-Hourani</td>
<td>College of Pharmacy</td>
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Chemistry for Pharmacy lab

Introduction

This course covers experiments on qualitative and quantitative aspects of general chemistry and their applications in the pharmaceutical field, such as separation, identification, determination, purification, and extraction procedures.

Equipment and Instruments

- Analytical Balances
- Top Loading Balances
- Hot Plates and Stirrer
- Oven
- Ice Flaking Machine
- Water Bath
- Centrifuge
- Vacuum Pump
- Separatory Funnel
- Melting Point Apparatuses

Experiments

- Identification of Anions and Cations
- Density Determination
- The Empirical Formula of a Compound: The Law of Constant Composition
- Water Analysis
- Physical Properties of Chemicals: Melting Point, Sublimation, and Boiling Point
- Water of Hydration
- Factors Affecting Rate of Reactions
- pH, Buffer Solutions and Buffer Capacity
- Analysis of Vinegar by Titration
- Isolation of Caffeine from Tea Leaves
- Paper Chromatography; Separation of Plant Pigments
- Analysis of Ascorbic Acid by Oxidation Reduction Titration
Medicinal Chemistry IA

Introduction

This course introduces the basic concepts of medicinal chemistry, including study of the molecular and chemical structures of organic pharmaceuticals using molecular models, preparation of some active ingredients, functional groups reactions and identification of organic compounds such as amine, aldehyde, ketones, alcohols, esters and phenols.

Equipment and Instruments

• Analytical Balances
• Hot Plates and Stirrers
• Rotatory Evaporators and Vacuum Pumps
• Distillation Apparatuses
• Melting Point Apparatuses
• Water Baths
• Ultrasonic Bath
• Ovens

Experiments

• Molecular Models and Stereochemistry
• Qualitative Identification of Functional Groups (Part-I)
• Qualitative Identification of Functional Groups (Part-II)
• Factors Affecting SN1 and SN2 Reactions
• Resolution of Racemic Mixture (a-Methylbenzylamine)
**Medicinal Chemistry IB**

**Introduction**

This course is concerned with the theory and practice of the preparation of some active ingredients in pharmaceutical preparation as well as classical and instrumental methods for the separation, identification and quantitative analysis of chemical substances. Satisfactory completion of this course affords students a working knowledge of analytical instrumentation typically employed in pharmaceutical and biochemical research laboratories. It also provides students with an appreciation of the relative strengths and limitations of different instrumental-based analysis methods.

**Equipment and Instruments**

- UV-VIS Spectrophotometer
- GC-MSMS
- GC-FID and GC-ECD
- HPLC-UV
- Analytical Balances
- Hot Plates and Stirrers
- Rotatory Evaporators and Vacuum Pumps
- Water Baths
- Ultrasonic Bath
- Ovens

![Image of laboratory equipment]

**Experiments**

- Aspirin Preparation and Crystallization
- Drugs Mixture Separation Using TLC
- Determination of Paracetamol Concentration Using Spectrophotometer
- Separation of Caffeine and Paracetamol Mixture Using HPLC
- Separation and Identification of Hydrocarbon Mixture Using GC-FID and GC-MSMS

**Tests and Services**

- Development and Validation of Analytical Methods for Analysis of Active Ingredients and related substances.
- Routine Quality Control of Pharmaceutical Products
- Accelerated and Real Time Stability Study of Pharmaceuticals
- Heavy Metal Content Determination in Pharmaceutical Sample
**Medicinal Chemistry IIA**

**Introduction**

The practical part of the course covers experiments on the synthesis of organic compounds and drugs using different analysis and purification techniques and includes synthesis of chiral drugs and the techniques used in the separation of enantiomers.

**Equipment and Instruments**

- Analytical Balances
- Top loading Balances
- Hot Plates and Stirrer
- Oven
- Water Bath
- Thermometer
- Vacuum Pump
- IR- Spectrophotometer
- Polarimeter
- Ice Flaking Machine
- Reflux Apparatus
- Melting Point Apparatus
- Separator Funnel
- Rotatory Evaporator
- UV Cabinate
- Thin Layer Chromotography Tanks

**Experiments**

- Friedel-Crafts Alkylation
- Nitrating Methyl Benzoate: Electrophilic Aromatic Substitution
- Synthesis of 3-Methylpyrazole-5-One
- Synthesis of Acetanilide
- Diel’s Alder Reaction

**Tests and Services**

- To Have Preliminary Idea About the Active Ingredients and their Concentration in the Drug Dosage Forms
- Toxic Elements Detection and Measurement in Food, Water, Soil and Other Specimens (With the Help of ICP)
Medicinal Chemistry IIB

Introduction

The practical part of this course deals with experiments on the synthesis of pharmaceutical organic compounds and detection of their purity, stability and biological activity. Experiments to study the chemical and pharmaceutical properties of pharmaceutical drugs are also included in this course in addition to the application of molecular modeling to study the three-dimensional structures of drugs and their structure activity relationship (SAR).

Equipment and Instruments

- Analytical Balances
- Top loading Balances
- Hot Plates and Stirrer
- Oven
- Water Bath
- Thermometer
- Centrifuge
- Vacumm Pump
- UV-Vis Spectrophotometer
- Polarimeter
- Ice Flaking Machine
- Reflux Apparatus
- Melting Point Apparatus
- Separator Funnel
- Rotatory Evaporator
- UV Cabinet
- Thin Layer Chromotography Tanks

Experiments

- Synthesis of Sulfasalazine
- Synthesis of 5,5-Diphenylhydantoin from Benzyl
- Multicomponent Reactions: Ugi, Passerini, Benelli (Part-I)
- Multicomponent Reactions: Ugi, Passerini, Benelli (Part-II)
- Synthesis and Chemical Analysis of Penicillins
- Structural Data: The Bases for Molecular Modeling (Molecular Docking)

Tests and Services

- To Have Preliminary Idea About the Active Ingredients and their Concentration in the Drug Dosage Forms
- Toxic Elements Detection and Measurement in Food, Water, Soil and Other Specimens (With the Help of ICP)
Pharmacognosy Lab

Introduction

Plant materials are used throughout developed and developing countries as home remedies, over the counter drug products and raw materials for the pharmaceutical industry. It is therefore essential to ensure the quality of medicinal plant products by using several techniques and applying suitable standards. One of the most important techniques to authenticate a crude plant drug is the microscopical examination of the crude plant or the plant powder. The plant material is prepared for microscopical examination and the anatomical features of the powdered drugs are recorded in order to compare the structures present with those drawn and described in the relevant monographs. At the end of the lab course, students are able to interpret the morphological and anatomical descriptions of the crude plant in order to clearly identify it.

Experiments

• The Morphological and Microscopical Identification of the Herbal Leaves such as Senna Leaves; Peppermint Leaves; Thyme Leaves and Flowering Tops
• The Morphological and Microscopical Identification of the Herbal Seeds such as Black Mustard Seeds and Fenugreek Seeds
• The Morphological and Microscopical Identification of Herbal Fruits such as Anise Fruits, Caraway Fruits, Coriander Fruits, Cardamom Fruits, Fennel Fruits, Black Pepper Fruits and Capsicum Fruits
• The Morphological and Anatomical Identification of Herbal Underground Parts: Rhubarb Rhizome, Ginger Rhizome, Liquorice Root
• The Morphological and Anatomical Identification of Herbal Flowers Like Clove Flower
• The Morphological and Anatomical Identification of Herbal Stem and Root Barks such as Cinnamon Bark

Tests and Services

• This course gives the pharmacists the skills to identify herbal medicines and detect any adulteration in the herbal products in the market through microscopic examinations.