Pharmaceutical Chemistry Laboratory Manual

for First Year Diploma in Pharmacy

Course Code: ER20-12P

Second Edition

The *Manual* covers all the practical aspects of pharmaceutical chemistry as per the new syllabus prescribed by Pharmacy Council of India under ER 2020 for First Year Diploma in Pharmacy students.

The experiments are divided into eight sections as per the new regulation. They cover limit tests, identification of anions and cations, volumetric analysis, assays, boiling and melting point determinations, synthesis, identification tests and qualitative analysis.

This laboratory manual would serve as ready reckoner for teachers. It would save teachers' time of instructions and dictation. The students can directly write their observations and do calculations in the space provided on the left page. Thus, the students' time saved in writing the record can be utilized fruitfully for performing and understanding the practical as well as theoretical aspects of each experiment.

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Ms Parle is recipient of IDMA Gold Medal and has worked as JRF under UGC. She is invited speaker in various institutes and training wing of Delhi Govt. She has presented research papers, delivered talks at conferences and coordinated quality improvement programs of AICTE. She has published about 50 research papers in reputed national and international journals.

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Amrita Parle

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Name of the Student .....

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Roll No. .....

Subject .....

Institution .....

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Certificate

Student's Name Mr/Ms _____

Class: Diploma in Pharmacy 1st year Roll No. _____

Subject: Pharmaceutical Chemistry Practical

This is to certify that expriements, written in the index, have been performed by the student, are satisfactory.

_____

Grade _____ Name and signature of teacher

College stamp Date _____

Preface to the Second Edition

Pharmacy Council of India has revised diploma in pharmacy syllabus under Education Regulations 2020. It is my pleasure to bring out the second edition of *Pharmaceutical Chemistry Laboratory Manual* for first year diploma students of pharmacy. This edition, under are cover is designed and updated as per the new syllabus.

The experiments are divided into eight categories as given in the new regulation. They cover limits tests, identification of anions and cations, volumetric analysis, assays, boiling and melting point determinations, synthesis, identifcation tests and qualitative analysis. In the qualitative organic analysis section, the initial part covers theory with chemistry involved. It describes the tests and expected obsevations for positive inference in the detection functional groups. The initial part of fundamentals of volumetric analysis covers the theory behind the acid–base, redox, precipitation and complexometric titrations. The basics, chemistry involved and theory part covered in each section will help the students in developing the sound knowledge of chemistry practicals.

This laboratory manual would serve as ready reckoner for teachers. It would save teachers' time of instructions and dictation. The students can directly write their observations and do calculations in the space provided on the left page. Thus, the students' time saved in writing the record can be utilized fruitfully for performing and understanding the practical as well as theoretical aspects of each experiment. A few pages are left blank at the end for students to make their own notes.

My efforts would be worthwhile only when the book is found to be useful by the students and faculty. Constructive comments/suggestions on the content and approach of the book will be highly appreciated. My E-mail address is amrita.parle@gmail.com.

Amrita Parle

Preface to the First Edition

I am happy to bring out the *Pharmaceutical Chemistry Laboratory Manual* for first year diploma students of pharmacy. This manual covers the practical aspects of pharmaceutical chemistry in detail as per the ER 1991 of PCI. I expect that the undergraduate students studying practical pharmaceutical inorganic chemistry would be highly benefited from this laboratory manual.

The experiments are divided into three parts. The first part covers the identification tests for official inorganic pharmaceuticals. The second part covers the limit test for chlorides, sulphates, arsenic, iron and heavy metals. The third part deals with standardization and assays of inorganic pharmaceuticals. The assay of an inorganic compound is preceded by experiments covering standardization of the solutions that would be used in the assay. The standardization and assays include acid-base titrations, redox titrations, precipitation titrations and complexometric titrations. Most of the experiments are as per IP 1996 while some are as per IP 1985. I have chosen the most common and easily available inorganic substances as samples.

This laboratory manual would serve as ready reckoner for teachers. It would save teachers' time of instructions and dictation. Two experiments covering identification tests can be performed in single practical class. The limit tests for one group (e.g. chlorides), for two or three samples covering two or three experiments can be performed during single practical class. Similarly, during single practical class two experiments, one related to standardization and another related to assay can be performed. The students can directly write their observations and do calculations in the space provided on the left page. Thus, the students' time saved in writing the record can be utilized fruitfully for performing and understanding the practical as well as theoretical aspects of each experiment. A few pages are left blank at the end for students to make their own notes.

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Amrita Parle

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I would like to express my deep sense of gratitude to my family members Dr Milind Parle, Pradnesh Parle, Devyani Parle and Apoorv Parle for their silent support. I am indebted to my sister Bharti Kulkarni for boosting my morale from time-to-time.

I would like to acknowledge all the people who are involved in the preparation of this book, especially Mr SK Jain (Chairman and Managing Director), Mr Varun Jain (Director), Mr YN Arjuna (Sr. Vice President—Publishing, Editorial and Publicity), Ms Ritu Chawla (GM Production), all of CBSPD, for their all-time support and bringing out this book in record short time.

Above all, I am grateful to God almighty for giving me brain and brawn to complete this project.

Amrita Parle

PHARMACEUTICAL CHEMISTRY—PRACTICAL

Course Code: ER20-12P **75 Hours (3 Hours/week)**

Scope: This course is designed to impart basic training and hands-on experiences to synthesis chemical substances used as drugs and pharmaceuticals. Also, to perform the quality control tests, impurity testing, test for purity and systematic qualitative analysis of chemical substances used as drugs and pharmaceuticals.

Course Objectives: This course will provide the hands-on experience on the following aspects of chemical substances used as drugs and pharmaceuticals

1. Limit tests and assays of selected chemical substances as per the monograph
2. Volumetric analysis of the chemical substances
3. Basics of preparatory chemistry and their analysis
4. Systematic qualitative analysis for the identification of the chemical drugs

Course Outcomes: Upon successful completion of this course, the students will be able to

1. Perform the limit tests for various inorganic elements and report
2. Prepare standard solutions using the principles of volumetric analysis
3. Test the purity of the selected inorganic and organic compounds against the monograph standards
4. Synthesize the selected chemical substances as per the standard synthetic scheme
5. Perform qualitative tests to systematically identify the unknown chemical substances

Practicals

S. No.	*Experiment*
1	**Limit test for** • Chlorides; sulphate; iron; heavy metals
2	Identification tests for anions and cations as per Indian Pharmacopoeia
3	**Fundamentals of volumetric analysis** Preparation of standard solution and standardization of sodium hydroxide, potassium permanganate
4	**Assay of the following compounds** • Ferrous sulphate by redox titration • Calcium gluconate by complexometric • Sodium chloride by modified Volhard's method • Ascorbic acid by iodometry • Ibuprofen by alkalimetry
5	**Fundamentals of preparative organic chemistry** Determination of melting point and boiling point of organic compounds
6	Preparation of organic compounds • Benzoic acid from benzamide • Picric acid from phenol
7	**Identification and test for purity of pharmaceuticals** Aspirin, caffeine, paracetamol, sulfanilamide
8.	Systematic qualitative analysis experiments (4 substances)

Assignments

The students shall be asked to submit the written assignments on the following topics (one assignment per student per sessional period, i.e. a minimum of THREE assignments per student)

1. Different monographs and formularies available and their major contents
2. Significance of quality control and quality assurance in pharmaceutical industries
3. Overview on green chemistry
4. Various software programs available for computer aided drug discovery
5. Various instrumentations used for characterization and quantification of drug

Contents