

Textbook of Pharmaceutical Inorganic Chemistry

for First Semester Bachelor in Pharmacy

Course Code: BP104T

covers the basic inorganic chemistry essentials required by the undergraduate pharmacy students, though students of chemistry, biology and related courses will also find this is an interesting and valuable book.

Salient features of the book

- gives an overview of general aspects and their importance, with emphasis on pharmaceutical applications.
- is a classic common textbook for an undergraduate course in inorganic chemistry providing a comprehensive pedagogical framework to support students with key points.
- provides good introduction of the subject; describes various inorganic compounds, minimum chemical facts and concepts that are necessary to understand modern inorganic chemistry.
- gives advanced and comprehensive descriptive coverage of all the official compounds included with a strong focus on preparation, properties, assay and pharmaceutical applications.
- is written in a comprehensive manner with updated details of the topics covered in the syllabus.
- includes examples and exercises, revision exercises at the end of the every unit in the form of multiple choice questions, fill in the blanks, short answer questions and long answer questions to help the students prepare better for their examinations.

Arun Kumar Gupta MPharm PhD is Professor and Principal, Chameli Devi Institute of Pharmacy, Indore. He completed his postdoctorate research from Astra Zeneca India Pvt Ltd, Bangalore, in collaboration with University of Leeds, London. He is a renowned academician and has immensely contributed in the field of pharmaceutical sciences and research. He has to his credit more than 130 research/review articles published in leading national and international journals, three published books and three patents. He has guided more than 50 postgraduate and 10 PhD students. His present research interest is focused on molecular modelling, drug discovery and design, with special attention towards computational chemistry and bioinformatics. He is recipient of Pharma Recognition Award, Astra Zeneca Recognition Award, APP Young Achiever Award and IDMA Research Award, etc.



Revathi A Gupta MPharm PhD is Professor and Principal, Institute of Pharmacy, and Dean, Faculty of Pharmacy, Dr APJ Abdul Kalam University, Indore. She has more than 18 years of experience from both academia and research. She has to her credit about 65 research papers published in national and international journals of repute. She has supervised more than 35 postgraduate and 4 PhD students, and organized many national and international conferences/seminar in various capacities. She has authored two books and published two patents, and is a reviewer for various national and international journals.



Textbook of Pharmaceutical Inorganic Chemistry

Textbook of Pharmaceutical Inorganic Chemistry

Course Code: BP104T

for First Semester Bachelor in Pharmacy

As per the latest syllabus prescribed by the Pharmacy Council of India

Arun Kumar Gupta
Revathi A Gupta



CBS Publishers & Distributors Pvt Ltd

4819/XI, Prahlad Street, 24 Ansari Road, Daryaganj, New Delhi 110 002, India
E-mail: delhi@cbspd.com, cbspubs@airtelmail.in; Website: www.cbspd.com
New Delhi | Bengaluru | Chennai | Kochi | Kolkata | Lucknow | Mumbai
Hyderabad | Jharkhand | Nagpur | Patna | Pune | Uttarakhand



QR code to
access online
CBS Catalogue

ISBN: 978-93-5466-036-8



Gupta | Gupta



Dedicated to Education

CBS Publishers & Distributors Pvt Ltd

Textbook of
**Pharmaceutical
Inorganic Chemistry**

for Bachelor of Pharmacy (BPharm) Course
As per PCI Syllabus
BPharm (Semester I)
Subject Code: BP 104T

Textbook of
**Pharmaceutical
Inorganic Chemistry**

**for Bachelor of Pharmacy (BPharm) Course
As per PCI Syllabus
BPharm (Semester I)
Subject Code: BP 104T**

Arun Kumar Gupta

MPharm PhD
Principal and Professor
Chameli Devi Institute of Pharmacy
Indore (MP)

Revathi A Gupta

MPharm PhD
Principal and Professor
Institute of Pharmacy
Dr. A. P.J. Abdul Kalam University
Indore (MP)



CBS Publishers & Distributors Pvt Ltd

New Delhi • Bengaluru • Chennai • Kochi • Kolkata • Lucknow • Mumbai
Hyderabad • Jharkhand • Nagpur • Patna • Pune • Uttarakhand

Disclaimer

Science and technology are constantly changing fields. New research and experience broaden the scope of information and knowledge. The authors have tried their best in giving information available to them while preparing the material for this book. Although all efforts have been made to ensure optimum accuracy of the material, yet it is quite possible some errors might have been left uncorrected. The publisher, the printer and the authors will not be held responsible for any inadvertent errors or inaccuracies.

Textbook of
**Pharmaceutical
Inorganic Chemistry**

ISBN: 978-93-5466-036-8

Copyright © Authors and Publisher

First Edition: 2023

All rights reserved. No part of this book may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage and retrieval system without permission in writing, from the authors and the publisher.

Published by Satish Kumar Jain and produced by Varun Jain for

CBS Publishers & Distributors Pvt Ltd

4819/XI Prahlad Street, 24 Ansari Road, Daryaganj, New Delhi 110 002, India.

Ph: 23289259, 23266861, 23266867 Fax: 011-23243014 Website: www.cbspd.com
e-mail: delhi@cbspd.com; cbspubs@airtelmail.in

Corporate Office: 204 FIE, Industrial Area, Patparganj, Delhi 110 092
Ph: 4934 4934 Fax: 4934 4935 e-mail: publishing@cbspd.com;
publicity@cbspd.com

Branches

- **Bengaluru:** Seema House 2975, 17th Cross, K.R. Road, Banasankari 2nd Stage, Bengaluru 560 070, Karnataka
Ph: +91-80-26771678/79 Fax: +91-80-26771680 e-mail: bangalore@cbspd.com
- **Chennai:** 7, Subbaraya Street, Shenoy Nagar, Chennai 600 030, Tamil Nadu
Ph: +91-44-26680620, 26681266 Fax: +91-44-42032115 e-mail: chennai@cbspd.com
- **Kochi:** 42/1325, 1326, Power House Road, Opp KSEB Power House, Ernakulam 682 018, Kochi, Kerala
Ph: +91-484-4059061-65 Fax: +91-484-4059065 e-mail: kochi@cbspd.com
- **Kolkata:** 147, Hind Ceramics Compound, 1st Floor, Nilgunj Road, Belghoria, Kolkata 700 056, West Bengal, India
Ph: +91-033-25633055, 033-25633056 e-mail: kolkata@cbspd.com
- **Lucknow:** Basement, Khushnuma Complex, 7-Meerabai Marg (behind Jawahar Bhawan), Lucknow 226 001, UP
Ph: +91-522-400043, 9919002738 e-mail: tiwari.lucknow@cbspd.com
- **Mumbai:** PWD Shed, Gala no. 25/26, Ramchandra Bhatt Marg, Next to JJ Hospital Gate no. 2 Opp. Union Bank of India, Noorbaug, Mumbai-400009, Maharashtra, India
Ph: 022-60061880/89 e-mail: mumbai@cbspd.com

Representatives

- | | | | | | |
|--------------------|--------------|--------------------|--------------|----------------------|--------------|
| • Hyderabad | 0-9885175004 | • Jharkhand | 0-9811541605 | • Nagpur | 0-9421945513 |
| • Patna | 0-9334159340 | • Pune | 0-9623451994 | • Uttarakhand | 0-9716462459 |

Printed at: Glorious Printers, Delhi, India

Preface

We feel great honor and an immense pleasure in bringing out this book entitled *Textbook of Pharmaceutical Inorganic Chemistry* is written according to the syllabus for Bachelor of Pharmacy (BPharmacy) approved and implemented by the **Pharmacy Council of India**. The major thrust to make the book is, students need a textbook in a comprehensive descriptive manner with updated details of the topic covered in their syllabus. They also expect good quality readable books include basic principles with relevant examples rather than standalone concepts, allowing students to see the relevance of the subject in future professions. The main purpose of writing this book is to provide a qualitative book to pharmacy students and allied health professionals those who are dealing with this subject.

This book covers all the theoretical aspects of the subject BP 104T for BPharmacy first year students. It is a classic common textbook for an undergraduate course in inorganic chemistry. This book is divided into five units. Each unit in the book is self-contained and serves as dual teaching function to highlight the basic concepts. This book not only good introduction of the subject but also tried to describe various inorganic compounds, minimum chemical facts and concepts that are necessary to understand modern inorganic chemistry. Unique very advanced and comprehensive descriptive coverage of all the official compounds included, with a strong focus on preparation, properties, assay and pharmaceutical applications. The book will lay the foundation for students in BPharm first semester regarding the subject knowledge. This book presented in a very systematic way. All the topics in each chapter have been provided with reasonable account, covering the information in easy to understand manner.

In this book we cover basic concepts with respective topic have been discussed which will help to understand the students in a better manner. We also includes revision exercises at the end of the every chapter in the form of multiple choice questions, fill in blanks, short questions and long questions which will help them to prepare better for their exams and self-assess himself/herself. In this book, we also highlights the medical and pharmaceutical terms along with explanation for easy understanding of students. This book will give valuable source of information and appropriate subject knowledge to students, teachers as well as other allied persons.

We are indeed delighted to present the work which will be very fruitful for pharmacy professionals working in different areas of pharmaceutical sector and as well as students at undergraduate and postgraduate levels. We heartily welcome comments along with valuable suggestions from all corners of the profession which will help us in improving the content of the book in ensuing editions of this book and also in other books that are on the anvil. We are gratified to CBS Publishers and his editorial team for their kind assistance in bringing out this book.

Arun Kumar Gupta
Revathi A Gupta

Syllabus

Course: BPharm (As per PCI Syllabus)

Semester I

Subject code: BP 104T

UNIT I

10 Hours

- **Impurities in pharmaceutical substances:** History of pharmacopoeia, sources and types of impurities, principle involved in the limit test for chloride, sulphate, iron, arsenic, lead and heavy metals, modified limit test for chloride and sulphate.
- **General methods of preparation,** assay for the compounds superscripted with **asterisk (*)**, properties and medicinal uses of inorganic compounds belonging to the following classes

UNIT II

10 Hours

- **Acids, bases and buffers:** Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic, solutions, measurements of tonicity, calculations and methods of adjusting, isotonicity.
- **Major extra and intracellular electrolytes:** Functions of major, physiological ions, electrolytes used in the replacement therapy: sodium, chloride*, potassium chloride, calcium gluconate* and oral rehydration salt (ORS), physiological acid base balance.
- **Dental products:** Dentifrices, role of fluoride in the treatment of dental, caries, desensitizing agents, calcium carbonate, sodium fluoride, and zinc, eugenol cement.

UNIT III

10 Hours

- **Gastrointestinal agents:**

Acidifiers: Ammonium chloride* and Dil. HCl

Antacid: Ideal properties of antacids, combinations of antacids, sodium bicarbonate*, aluminum hydroxide gel, magnesium hydroxide mixture

Cathartics: Magnesium sulphate, sodium orthophosphate, kaolin and bentonite

Antimicrobials: Mechanism, classification, potassium permanganate, boric acid, hydrogen peroxide*, chlorinated lime*, iodine and its preparations

UNIT IV

08 Hours

- **Miscellaneous compounds:**

Expectorants: Potassium iodide, ammonium chloride*.

Emetics: Copper sulphate*, sodium potassium tartarate

Haematinics: Ferrous sulphate*, ferrous gluconate

Poison and Antidote: Sodium thiosulphate*, activated charcoal, sodium nitrite

Astringents: Zinc sulphate, potash alum

UNIT V

07 Hours

Radiopharmaceuticals: Radio activity, measurement of radioactivity, properties of α , β , γ radiations, half-life, radioisotopes and study of radioisotopes: Sodium iodide ^{131}I , storage conditions, precautions and pharmaceutical application of radioactive substances.

Contents

<i>Preface</i>	<i>v</i>
Unit 1 Impurities in Pharmaceutical Substances	1
Unit 2 Acids, Bases and Buffers	29
Unit 2.1 Major Extracellular and Intracellular Electrolytes	46
Unit 2.2 Dental Products	63
Unit 3 Gastrointestinal Agents	74
Unit 3.1 Acidifiers	76
Unit 3.2 Antacid	80
Unit 3.3 Cathartics	87
Unit 3.4 Antimicrobials	98
Unit 4.1 Expectorants	111
Unit 4.2 Emetics	118
Unit 4.3 Hematinics	123
Unit 4.4 Poison and Antidote	134
Unit 4.5 Astringents	145
Unit 5 Radiopharmaceuticals	150

