

Advanced

Inorganic Chemistry

for BSc (Hons), MSc and Research Scholars

Volume 1

Volume 1

is a classical textbook and comprises relevant current informations expanded and treated in a unique style for the benefit of brilliant students in the Indian Universities Pursuing: BSc (Hons), MSc, and Research Scholars.

Key features

- Basic fundamentals of Inorganic Chemistry duly articulated in a systematic and logical manner. The textbook contains several conceptual questions/solutions at the end of each chapter followed by Probable Questions/University Questions.
- Chemistry of elements and related compounds are expatiated based on the periodic table together with their structures and electronic configurations.
- Each chapter has been substantiated with adequate textual contents and explained in a perfect lucid manner. Typical and critical examples are dealt with appropriately.



Ashutosh Kar is a renowned Professor of Pharamaceutical Chemistry, and has to his credit 35years teaching experience in PG/UG levels both in Indian and African Universities. He has duly published more than fifty research papers both in National and International Scientific Journals. He has taught at School of Pharmacy, Addis Ababa University, Addis Ababa (Ethiopia) (2002-2005); Guru Jambheshwar University, Hisar (India) (1999-2002); Al Arab Medical University, Benghazi (Libya) (1997-1998); College of Pharmacy (University of Delhi (Delhi) (1990-1994); Faculty of Pharmaceutical Sciences, University of Nigeria, Nsukka (Nigeria) (1976-1987); RNS College of Pharmacy, Gormi (MP) (Indian) (2005-2012), and Apeejay Styra University, Gurgaon (India) (2014-2015), and Lingay's University (2015-till date). Professor Kar has been conferred with four great academic awards:

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APP Outstanding Achievement Award by the Association of Pharmacy Professionals, Bhopal (MP) at the DD University, Nadiad (Gujarat) on the 18th January, 2014.

Lifetime Achievement Award by the Association of Pharmaceutical Teachers (APTI) of India (Haryana Branch) at the 1st Conference held at the Kurukshetra University, Kurukshetra, on the 23rd August, 2014.

Scroll of Honour by the Delhi Institute of Pharmaceutical Sciences and Research (DIPSAR), University of Delhi, New Delhi (India) on the occasion of Gulden Jubilee Year on 14th November, 2014.

Professor Kar has completed 24 textbooks: *Medical Chemistry* (6th edn, 2015), *Pharmaceutical Drug Analysis* (3rd edn, 2013), *Pharmaceutical Technology Vol 1* (2013), *Pharmaceutical Technology Vol 2* (2013), *Essentials of Biopharmaceutics and Pharmacokinetics* (2010), *Chemistry of Natural Products Vol 1* (2010), *Chemistry of Natural Products Vol 2* (2012), *Chemistry of Natural Products Vol 3* (2015), *Pharmaceutical Analysis Vol 1* (2008), *Pharmaceutical Analysis Vol II* (2009), *Pharmacognosy and Pharmacobiotechnology* (2nd edn, 2009), *Advanced Practical Medicinal Chemistry* (2nd edn, 2015), *Pharmaceutical Microbiology* (2011), *Pharmaceutical Biotechnology* (2nd edn, 2015), *Pharmaceutical Pharmacology* (2011), *Pharmaceutical Industrial Management* (2011), *Pharmacology for Nurses and Allied Health Sciences* (2012), *Essentials of Pharmacognosy* (2013), *Essentials of Pharmacology* (2013), and *Pharmaceutical Calculations* (2014), *Microbiology for Nurses and Allied Health Science* (2016), and *Advances Organic Chemistry* (2016).

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New Delhi | Bengaluru | Chennai | Kochi | Kolkata | Mumbai
Hyderabad | Nagpur | Patna | Pune | Vijayawada

ISBN: 978-93-86310-84-2



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Ashutosh Kar



Volume 1

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CBS Publishers & Distributors Pvt Ltd

Advanced Inorganic Chemistry

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Volume I

Advanced Inorganic Chemistry

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Volume I

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Advanced Inorganic Chemistry

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Volume I

ISBN: 978-93-86310-84-2

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First Edition: 2017

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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.

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Printed at India Binding House, Noida, UP, India

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to

*my beloved parents, sisters and brother,
others and my wife
who helped me build-up my life,
our sons, daughters-in-law and grandchildren
who thrilled my life with joy and cheers,
my esteemed teachers and taughts
(in India, Nigeria, Libya and Ethiopia),
the august authors (home and abroad)
whomsoever the book owes,
the people who meticulously toil, to make fruitful the soil,
for ever and now,
Almighty God's eternal blessings
I respectfully bow, bow and bow*

“Those who aspire not to guess, and divine,
but to discover and know;
who propose not to devise mimic
and fabulous worlds of their own,
but to examine and dissect
the nature of this world itself,
Must go to facts themselves for everything.”

F Bacon (1620)

PREFACE

Advanced Inorganic Chemistry (Volume 1), is solely intended to fulfill the dire needs of the teachers who would like to deliver the subject to the aspiring students who really require an in-depth deliberations of the various fundamental topics. It would certainly help the students to have a better understanding related to the electronic structure of atoms and elementary valence theory. The textual matter in this compendium has been specifically elaborated in an elementary fashion, detailing the main facts, and expatiating the various reactions in an excellent manner.

The back-bone and deep-seated basics decidedly hangs around the so-called *Baconian philosophy* with respect to all chemistry but critically **Inorganic Chemistry**. For the benefit of teachers and students alike, the present textbook essentially consists of a cocktail comprising: *Theory, principles, examples* along with an intermittent mention of the underlying hard facts in a lucid style. A sincere and earnest effort has been made to encourage the learning and teaching of **Inorganic Chemistry** in the *Boconian manner* perceptively.

There are in all *six* chapters that have been included in the **Advanced Inorganic Chemistry (Volume 1)**, namely:

Chapter–1: Atomic Structure: Quantum Mechanical Approach and Wave Mechanical Approach

Chapter–2: Modern Periodic Table: Electronic Configuration of Atom and Atomic Properties

Chapter–3: Radioactivity, Isotopes, Isobars, and Isotones

Chapter–4: Chemical Bonding: Lewis Theoretical Concepts

Chapter–5: Metallurgy

Chapter–6: Solvolytic Reactions (Hydrolysis)

A comprehensive deliberation of the *quantum mechanical approach* of hydrogen atom along with an exhaustive solution of Schrödinger equation, critical ensuing expressions of angular and radial wave functions, derivation of various shapes of orbitals *vis-a-vis* their inherent spherical harmonics have acquired a much deserved emphasis. A systematic elaboration of molecular symmetry as well as group theory has been dealt exhaustively.

Each chapter concludes with *three* highly important and useful supplements, *viz. problems with solutions, probable questions, and university questions* that would strengthen the students ability, understanding, and learning aptitude to a great extent.

It is earnestly hoped and believed that **Advanced Inorganic Chemistry (Volume 1)**, may certainly help BSc (Hons), MSc, and Research Scholars to help in a big way to grasp and understand the subject in an appreciable manner.

I wish to place on record the excellent support by Shri Satish Kumar Jain, MD, CBS Publishers & Distributors Pvt. Ltd., New Delhi and his excellent editorial team for bringing out this textbook in a scheduled time-frame.

Ashutosh Kar

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