

## BOOK REVIEWS

**Felton L. Remington: *Essentials of Pharmaceutics*. Pharmaceutical Press; 2013, 772pp, \$69.00 (soft-cover), ISBN 9780857111050.**

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This new pharmaceutics book, edited by Dr. Linda Felton, is a snap shot of the previous Remington's pharmaceutical sciences textbook with many of the same chapter authors. This edition has 40 chapters and it focuses on the conventional subjects normally taught in pharmaceutics; ie, pharmaceutical calculations, physical pharmacy, and classical dosage form design. The new graphical design of data, added in the form of tables and figures, was intriguing. This book has a wealth of new information that will enhance the knowledge and learning experience of pharmacy students.

Chapter 1 shares the information resources available in pharmacy and the pharmaceutical sciences, and educates students on how to explore the literature, databases, and textbooks. Chapter 2 provides a brief discussion on the analysis of medicinals. It explains the criteria for USP monographs specifications, methods validation, and the type of analytical methods utilized to analyze different dosage forms. Chapter 3 links quality assurance and quality control. It explains the differences between quality control and quality assurance in terms of functions and responsibilities and what documentations are required by the Food and Drug Administration (FDA). Chapter 4 focuses on the stability of pharmaceutical products. It emphasizes the stability conditions (temperature and humidity) required by FDA to test pharmaceutical products and the approach to determining shelf life from an actual stability data.

Chapter 5 reviews bioavailability and bioequivalence and the factors that affect dissolution and absorption. The chapter explains what is required to conduct a bioequivalence study and the criteria for bioequivalence linked with clinical examples. Chapter 6 goes deep into dissolution science and explains the differences between dissolution rate of solid particles or tablets. It then explores the influence of excipients and dissolution media on dissolution rate of drugs in tablets. Chapter 7 focuses on modern-day drug discovery and development from the industrial perspective. The chapter discusses the evolution of pharmaceutical research organizations and the biological testing that is conducted to ensure safety

and efficacy of new drug entities. Chapter 8 goes through the new drug approval process and the FDA requirement for an IND and NDA, as well as the different development phases of new drug molecules.

Chapter 9 summarizes metrology and pharmaceutical calculations. In this chapter, the author discussed the history of pharmacy calculations and the early introduction of the metric system into modern measurements. The chapter has eye-capturing tables and graphs that show different weight and volume units and the conversions from each unit to the other. At the end of this chapter, there is a brief comparison between different balances used in pharmacy and several examples to illustrate pharmacy calculations for students' own practice.

Chapter 10 discusses the diverse applications of statistics in pharmacy. Beyond explanations of different statistical parameters and statistical significance tests, the chapter looks at the application of statistical design in modern clinical studies. Chapter 11 is molecular structure, properties, and states of matter. The authors of this chapter discuss the different types of bonds, bonds formation, and structural outlook of metallocenes, isomers, conformations, and enantiomers. In the middle of the chapter, the authors discussed intermolecular forces and their influence on the physical state of matter. The chapter also discusses the different type of solids (crystalline and amorphous) and their thermodynamic transitions. Chapter 12 provides a thermodynamics overview. The author discusses the laws of thermodynamics, defines the energetic parameters (enthalpy, entropy, and Gibbs free energy), and then explains how thermodynamics influences equilibria, solubility, heat of solution, partition coefficient, and protein binding.

Chapter 13 links solutions and solubility to phase equilibria, then discusses different solvents and methods to increase solubility of poorly soluble drugs. Chapter 14 discusses separation methods such as filtration, centrifugation, precipitation, and separation of immiscible liquids. Chapter 15 discusses ionic solutions and electrolytic equilibria. In this chapter, the author discusses conductivity, ionization, Bronsted-Lowry acid-base theory, and dissociation of acids and bases in addition to determination of pH and pKa with an overview of buffers. In chapter 16, the authors provide an overview of tonicity, osmoticity, osmolality, and osmolarity and their influence on biological fluids. At the end of the chapter, the authors list a few examples on the calculations of additives to adjust tonicity and present an extensive table about the E values of many drugs.

Chapter 17 is an overview of chemical kinetics. The author discusses the reaction rate, reaction mechanisms, and techniques to distinguish between zero, first, second,

and third order reactions. The author also includes a discussion on the influence of temperature and pH on the rate of the reaction. Chapter 18 is complex formation. The authors explain the interaction between metal-ion coordination complexes and the different types of complexation curves. A separate discussion is added on the use of cyclodextrin to enhance drug solubility through complexation.

Chapter 19 is dedicated to interfacial phenomena, interfacial forces and energies, adhesional and cohesive forces, wetting phenomena, and surface active agents. Chapter 20 talks about colloidal dispersions and includes a brief discussion of particle shape and techniques to measure particle size, adsorption of charges on solid surfaces, kinetics of aggregation, and limited descriptions of microemulsions, liposomes, micelles, and nanoparticles. Chapter 21 continues the discussion of coarse dispersions such as suspensions, caking and sedimentation, emulsions and emulsion types, emulsifying agents, and the preparation and stability of emulsions. In chapter 22, the author presents rheology fundamentals and discusses the rheology behaviors of different types of liquids such as Newtonians and non-Newtonians fluids, with a brief discussion of viscosity measurement with different viscometers.

Chapter 23 is a new addition to this book, which relates powders to its properties. The author discusses different techniques to decrease the particle sizes and powder handling during dosage form preparations. Chapter 24 is an introduction to solutions, emulsions, suspensions and extracts. The author lists the solvents used for liquid pharmaceutical preparations, including aqueous and nonaqueous solutions, in addition to the preparation of emulsions and suspensions in pharmacy. Chapter 25 is an overview of sterilization processes and sterility assurance. The authors list equipment used for sterilization, and biological and physical tests for sterility indications.

Chapter 26, dedicated to parenteral preparations, talks about the components, preparations, qualifications, and tests which are related to parenteral drug delivery. Chapter 27 is pharmaceutical compounding USP <797> sterile preparations. This chapter discusses the information listed in the USP about compounding personnel, facility qualifications, sterile preparations, and quality assurance of final products. Ophthalmic preparations are reviewed in chapter 28 along with a brief introduction to the anatomy of the eye, types of ophthalmic dosage forms and drug administration, different types of eye injections, sterilization, preparation, and antimicrobial preservatives, buffers, and other excipients. Chapter 29 is about medicated topicals. In this chapter the author

discusses the skin and its appendages and drug delivery to the skin such as ointments and creams.

Chapter 30 has an extensive discussion of oral solid dosage forms such as tablets and capsules. In this chapter, the author lists different types of tablets based on release characteristics, excipients used to prepare tablets, methods of preparation, and machines used to make tablets and capsules. Chapter 31 talks about coating of pharmaceutical dosage forms. The chapter discusses the basics of different types of coatings (sugar, film, etc) and the equipment involved in this process. Chapter 32 provides insight into oral modified-release drug delivery systems. It points out the differences between delayed and extended release systems. At the end of the chapter, new extended release technologies such as matrix based, reservoir systems, and osmotic pumps are discussed.

Chapter 33 is the aerosols chapter. In this chapter, the authors introduce the different components of an aerosol system (propellant, containers, valves, actuators, packaging) and the unique formulations that goes into newer aerosols. Chapter 34 gives an overview of biotechnology and drugs. The authors discuss briefly the process of making genetically engineered vaccine, hybridoma production, and searching for genetic defects to develop or identify treatment. In addition, there is a brief discussion in the chapter has on unique pharmaceutical challenges of biotechnology-derived therapeutics and pharmacognostical applications.

Chapter 35 is about pharmaceutical packaging. It gives an overview of container selection by dosage form and container's testing to ensure quality. Chapter 36 lists pharmaceutical excipients based on functionality and use. The chapter has listed monographs related to the most used excipients. Chapter 37 talks about basic pharmacokinetics and pharmacodynamics. The information listed are concentration versus time profile, pharmacokinetic models, rates and orders of reactions, continuous infusion, multiple dose administration, absorption, clearance, dose and time dependent pharmacokinetic and kinetics of pharmacological effect. Chapter 38 is on drug action and effect, and talks about the pharmacological effect and the theories of efficacy. Chapter 39 is on drug absorption, distribution, metabolism, and excretion. This chapter discusses the basic structure of membranes, diffusion and transport, and the physical chemical factors in penetration and absorption of drugs. It also discusses the routes of administration and the factors that affect absorption, distribution, and excretion. Chapter 40 is pharmacokinetics/pharmacodynamics in drug development. This chapter discusses the factors to create a pharmacodynamic relationship and phase II clinical trials validation of dose for use in phase II and phase III trials.

To this reviewer's knowledge, this book has more extensive and more relevant pharmaceuticals information than any other pharmaceuticals book published so far. The only concern of this reviewer is the difficulty in considering it as a required classroom textbook. This book is recommended as an important reference for pharmaceuticals faculty members who are designing new courses in this area. The book can also be used as a brief

(not extensive) graduate reference for MS and PhD graduate students in pharmaceuticals.

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