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DOSAGE CALCULATIONS

A RATIO-PROPORTION APPROACH

F O U R T H E D I T I O N

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Equivalents

Metric Equivalent	Household Equivalent	Approximate Equivalent
1 g = 1,000 mg = 1,000,000 mcg	3 t = 1 T	1 t = 5 mL
0.001 g = 1 mg = 1,000 mcg	2 T = 1 fl oz	1 T = 3 t = 15 mL = $\frac{1}{2}$ fl oz
0.000001 g = 0.001 mg = 1 mcg	1 cup = 8 fl oz	1 fl oz = 30 mL = 6 t
1 kg = 1,000 g	1 pt = 16 fl oz = 2 cups	1 L = 1 qt = 32 fl oz = 2 pt = 4 cups
1 L = 1,000 mL	1 qt = 2 pt = 4 cups = 32 fl oz	1 pt = 16 fl oz = 2 cups
0.001 L = 1 mL	1 lb = 16 oz	1 cup = 8 fl oz = 240 mL
1 m = 100 cm = 1,000 mm		1 kg = 2.2 lb
0.01 m = 1 cm = 10 mm		1 in = 2.5 cm
0.001 m = 0.1 cm = 1 mm		

Common Calculations

Dosage: Ratio-Proportion Method

- Step 1.** Convert
Step 2. Think
Step 3. Calculate: $\frac{\text{Dosage on hand}}{\text{Amount on hand}} = \frac{\text{Dosage desired}}{X \text{ Amount desired}}$

Dosage: Formula Method

- Step 1.** Convert
Step 2. Think
Step 3. Calculate: $\frac{D}{H} \times Q = X$

Dosage: Dimensional Analysis Method

- Step 1.** Determine unit of measure for *amount-to-give* ratio for left side of equation
Step 2. Think
Step 3. Match unit of numerator of *supply-dosage ratio* with unit of numerator of *amount-to-give ratio*. Set up all other ratios so units cancel, leaving unit of amount to give. Calculate:

$$\begin{array}{ccccccc} \text{Amount-} & & \text{Supply-} & & \text{Conversion-} & & \text{Ordered-} \\ \text{to-Give} & = & \text{Dosage} & \times & \text{Factor} & \times & \text{Dosage} \\ \text{Ratio} & & \text{Ratio} & & \text{Ratio} & & \text{Ratio} \end{array}$$

Temperature Conversion

$$\text{Celsius: } ^\circ\text{C} = \frac{^\circ\text{F} - 32}{1.8} \quad \text{Fahrenheit: } ^\circ\text{F} = 1.8^\circ\text{C} + 32$$

IV Flow Rate

$$\frac{\text{Total mL}}{\text{Total h}} = \text{mL/h}$$

$$\frac{\text{Total mL}}{\text{Total min}} = \frac{X \text{ mL/h}}{60 \text{ min/h}}$$

$$\frac{V \text{ (mL)}}{T \text{ (min)}} \times C \text{ (gtt/mL)} = R \text{ (gtt/min)}$$

Shortcut

$$\text{IV Flow Rate: } \frac{\text{mL/h}}{\text{Drop factor constant}} = R \text{ (gtt/min)}$$

Body Surface Area

$$\text{Metric BSA: } \text{m}^2 = \sqrt{\frac{\text{ht (cm)} \times \text{wt (kg)}}{3,600}}$$

$$\text{Household BSA: } \text{m}^2 = \sqrt{\frac{\text{ht (in)} \times \text{wt (lb)}}{3,131}}$$

Common Medical Abbreviations

Abbreviation	Interpretation	Abbreviation	Interpretation
Route:		Frequency:	
IM	intramuscular	q.h	every hour
IV	intravenous	q.2h	every 2 hours
IV PB	intravenous piggyback	q.3h	every 3 hours
subcut	subcutaneous	q.4h	every 4 hours
SL	sublingual, under the tongue	q.6h	every 6 hours
ID	intra-dermal	q.8h	every 8 hours
GT	gastrostomy tube	q.12h	every 12 hours
NG	nasogastric tube	General:	
NJ	nasojejunal tube	\bar{a}	before
p.o.	by mouth, orally	\bar{p}	after
p.r.	per rectum, rectally	\bar{c}	with
Frequency:		\bar{s}	without
a.c.	before meals	q	every
p.c.	after meals	qs	quantity sufficient
ad. lib.	as desired, freely	aq	water
p.r.n.	when necessary	NPO	nothing by mouth
stat	immediately, at once	gtt	drop
b.i.d.	twice a day	tab	tablet
t.i.d.	3 times a day	cap	capsule
q.i.d.	4 times a day	et	and
min	minute	noct	night
h	hour		

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F O U R T H E D I T I O N

Gloria D. Pickar, RN, EdD

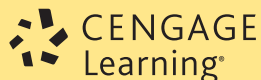
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**Dosage Calculations: A Ratio-Proportion
Approach, Fourth Edition**

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Preface

Introduction

Dosage Calculations: A Ratio-Proportion Approach, fourth edition, offers a clear and concise method of calculating drug dosages. The text is directed to students and professionals who want to increase their comfort level with mathematics and also to faculty members who prefer ratio and proportion for calculating dosages. Along with the companion text, *Dosage Calculations*, ninth edition, the content has been classroom tested and reviewed by well over 1 million faculty and students, who report that it has helped allay math anxiety and promote confidence in their ability to perform accurate calculations. As one reviewer noted, “I have looked at others [texts], and I don’t feel they can compare.”

The only math prerequisite is the ability to do basic arithmetic. For those who need a review, **Chapters 1** and **2** offer an overview of basic arithmetic calculations with extensive exercises for practice. The text teaches the learner to use a Three-Step Approach for calculating dosages.

1. Convert measurements to the same system and same size units.
2. Consider what dosage is reasonable.
3. Calculate using ratio and proportion.

Dosage Calculations: A Ratio-Proportion Approach, fourth edition, is based on feedback from users of the previous editions and users of other dosage calculations texts. The new edition also responds to changes in the health care field and includes the introduction of new drugs, replacement of outdated drugs, and discussion of new or refined methods of administering medications. The importance of avoiding medication errors is highlighted by the incorporation of applied critical thinking skills in clinical reasoning scenarios based on patient care situations, and a chapter on preventing medication errors. Clinical reasoning content has been expanded considering the Quality and Safety Education for Nurses (QSEN: www.qsen.org) competencies

that take into account the complexity of nursing work. Learners and faculty will find QSEN principles incorporated throughout: stacking, mindfulness, sensemaking, anticipating, memory aids, and work-arounds. To better prepare graduates for licensure examinations, test items patterned after NCLEX™-RN and NCLEX™-PN have been added for frequent practice.

Organization of Content

The text is organized in a natural progression of basic to more complex information. Learners gain self-confidence as they master content in small increments with ample review and reinforcement. Many learners claim that while using this text, they did not fear math for the very first time.

The seventeen chapters are divided into four sections.

Section 1 starts with a *Pretest* patterned after examinations often used by hospitals and health care agencies to evaluate the readiness of new graduates to prepare and administer medications. Learners can both evaluate their level of knowledge as they begin their study of dosage calculations and test their learning with the same examination as a posttest. This is followed by a mathematics diagnostic evaluation and a thorough mathematics review in **Chapters 1** and **2**. The *Mathematics Diagnostic Evaluation* allows learners to determine their computational strengths and weaknesses to guide them through the review of the **Section 1** chapters. **Chapters 1** and **2** provide a review of basic arithmetic skills, including fractions, decimals, ratios, percents, and simple equations, with numerous examples and practice problems to ensure that students can apply the procedures.

Section 2 includes **Chapters 3** through **9**. This section provides essential information that makes up the foundation for accurate dosage calculations and safe medication administration including medicine orders, labels, and equipment. **Chapters 3** and **4** introduce the three systems of measurement: metric, household, and

apothecary. The metric system of measurement is emphasized because of its standardization in the health care field and the household system is included because of its implications for care at home. Apothecary measure and conversions can be found in **Appendix B**, because the apothecary system is outdated and no longer recommended for use in health care. International or 24-hour time, and Fahrenheit and Celsius temperature conversions are presented in **Chapter 5**.

In **Chapter 6**, students learn to recognize and select appropriate equipment for the administration of medications based on the drug, dosage, and method of administration. Emphasis is placed on interpreting syringe calibrations to ensure that the dosage to be administered is accurate. All photos and drawings have been enhanced for improved clarity with updates from state-of-the-art technology and information systems.

Chapter 7 presents the common abbreviations used in health care so that learners can become proficient in interpreting medical orders. The content on computerized medication administration records has been updated and expanded for this edition.

It is essential that learners be able to read medication labels to calculate dosages accurately. This skill is developed by having readers interpret the medication labels provided beginning in **Chapter 8**. These labels represent current commonly prescribed medications and are presented in full color and actual size (except in a few instances where the label is enlarged to improve readability). Some labels have been substituted with generic simulated labels to demonstrate critical calculations. This ensures that the entire range of medications seen in practice is presented, and gives the learners the experience with actual generic drugs. A full list of all labels in the text can be found in the **Drug Label Index**.

Chapter 9 has been expanded and directs the learner's attention to the risks and responsibilities inherent in receiving medication prescriptions, transcribing orders, and administering medications. It provides the rationale for the patient's rights to safe medication administration and identifies the common causes of medication errors, including safe methods to prevent them. Throughout the text, care is taken to comply with standards and recommendations for medical notation available at the time of publication by The Joint Commission and The Institute for Safe Medication Practices. The *Official "Do Not Use" List* is emphasized. Learners are directed to stay abreast of these standards as they evolve to best ensure patient safety and prevent medication administration errors. More resources and tools for error prevention are presented, such as Tall Man letters to avoid mistaken identity of look-alike/sound-alike (LASA) drugs.

In **Section 3**, students learn and practice the skill of dosage calculations applied to patients across the life

span. The authors used QSEN quality and safety competencies as a guide for the development of realistic and challenging medication scenarios that simulate the complexity of various factors that challenge learners as they interpret, retrieve, prepare, calculate, and administer medications. These include obtaining pertinent drug information and making safe decisions for drug selection, preparation, dosage strength, equipment, and route for each patient. Various medication storage and retrieval systems are also demonstrated, such as unit-dose carts, automated dispensing cabinets (ADC) and ADC matrix drawers.

Safety competencies are incorporated to ensure learners carefully consider each aspect of the medication administration process for safe practice. Students learn to think through each problem logically for the right answer and then apply the ratio-proportion approach to double-check their thinking and verify their calculations. When this logical but unique system is applied every time to every problem, experience has shown that decreased math anxiety and increased accuracy result.

Chapters 10 and **11** guide the learner to apply all the skills mastered in previous chapters to achieve accurate oral and injectable drug dosage calculations. High-alert drugs, such as insulin and heparin, are thoroughly presented. Insulin types, species, and manufacturers have been updated with a description of insulin action time and the addition of U-500 insulin, including the difference between administering U-500 in the hospital and at home. The 70/30 and 50/50 insulins and the insulin pen are also thoroughly explained.

Chapter 12 introduces the concepts of solutions. Users learn the calculations associated with diluting solutions and reconstituting injectable drugs. This chapter provides a segue to intravenous calculations by fully describing the preparation of solutions. With the expanding role of the nurse and other health care workers in the home setting, clinical calculations for home care, such as nutritional feedings, are also emphasized.

Chapter 13 covers the calculation of pediatric and adult dosages and concentrates on the body weight method. Emphasis is placed on verifying safe dosages and applying concepts across the life span.

Chapter 14 introduces the formula and dimensional analysis methods of calculating dosages for faculty who may prefer these methods. Ample **Review Sets** and **Practice Problems** provide exposure to these methods, giving the learner an opportunity to sample other calculation methods and choose the one preferred.

Section 4 presents advanced clinical calculations applicable to both adults and children. Intravenous administration calculations are presented in **Chapters 15** through **17**. Coverage reflects the greater application of IVs in drug therapy. Shortcut calculation methods are

presented and explained fully. More electronic infusion devices are included. Heparin and saline locks, types of IV solutions, IV monitoring, IV administration records, and IV push drugs are included in **Chapter 15**. Pediatric IV calculations are presented in **Chapter 16**, and obstetric, heparin, insulin, and critical care IV calculations are covered in **Chapter 17**. Ample problems help students master the necessary calculations. Additional attention is directed to the clinical reasoning skills required to safely administer high-alert medications according to standard protocols, such as heparin and insulin.

Procedures in the text are introduced using **Rule** boxes and several **Examples**. Many examples use **Clinical Simulations** to guide learners through clinical reasoning and critical calculations. Examples and practice include finding and recording pertinent drug information from reputable drug resources. Key concepts are summarized and highlighted in **Quick Review** boxes before each set of **Review Problems** to give learners an opportunity to review major concepts prior to working through the problems. **Math Tips** provide memory joggers to assist learners in accurately solving problems. Learning is reinforced and evaluated by **Practice Problems** that conclude each chapter. The importance of calculation accuracy and patient safety is emphasized by patient scenarios that require careful and accurate consideration of every step of the medication administration process. **Clinical Reasoning Skills** scenarios allow learners to apply critical thinking to analyze and resolve medication administration errors at the end of each chapter beginning with **Section 2**. Additional scenarios accompany each chapter's **Practice Problems** to further emphasize accuracy and safety.

Information to be memorized is identified in **Remember** boxes, and **Caution** boxes alert learners to critical procedures and information.

Section Self-Evaluations found at the end of each section provide learners with an opportunity to test their mastery of chapter objectives prior to proceeding to the next section. Two **Posttests** at the conclusion of the text serve to evaluate the learner's overall skill in dosage calculations. The first **Posttest** refers the learner back to the new **Essential Skills Evaluation Pretest** from the beginning of the text, which covers essential skills commonly tested by employers. The second posttest, the **Comprehensive Skills Evaluation**, serves as a comprehensive examination covering all 17 chapters. Both are presented in a case study format to simulate actual clinical calculations.

An **Answer Key** at the back of the text provides all answers and solutions to selected problems in the **Pretest, Review Sets, Practice Problems, Section Self-Evaluations**, and **Posttests. Appendix A: Study Guide** is a new tool that provides essential abbreviations,

equivalents, rules, and formulas from each clinical chapter, and **Appendix B: Apothecary System** describes apothecary conversions. Both a general content **Index** and a **Drug Label Index** conclude the text.

Features of the Fourth Edition

This text provides learners with the necessary knowledge and skills to accurately calculate dosages, safely prepare to administer medications, and carefully make decisions for error-free medication administration.

- Content is divided into four main sections to help learners better organize their studies.
- Measurable objectives at the beginning of each chapter emphasize the content to be mastered.
- More than 2,700 problems are included for learners to practice their skills and reinforce their learning, reflecting current drugs and protocols.
- **Clinical Reasoning Skills** scenarios apply critical thinking to real-life patient care situations to emphasize the importance of accurate dosage calculations and the avoidance of medication errors.
- Full color is used to make the text more user friendly, enhance presentation, and improve readability. Chapter elements, such as **Rules, Math Tips, Cautions, Remember** boxes, **Quick Reviews, Examples**, and **Summaries**, are color-coded for easy recognition and use. Color also highlights **Review Sets** and **Practice Problems**.
- Color has been added to selected syringe drawings throughout the text to *simulate a specific amount of medication*, as indicated in the example or problem. Because the color used may not correspond to the actual color of the medications named, *it must not be used as a reference for identifying medications*.
- Photos and drug labels are presented in full color. Special attention is given to visual clarity with some labels enlarged to ensure legibility.
- The **Math Review** brings learners up to the required level of basic math competence.
- SI conventional metric system notation is used (apothecary and household systems of measurement are introduced; apothecary measure can be found in **Appendix B**).
- **Rule** boxes draw the learner's attention to pertinent instructions.
- **Remember** boxes highlight information to be memorized.

- **Quick Review** boxes summarize critical information throughout the chapters before **Review Sets** are solved.
- **Caution** boxes alert learners to critical information.
- **Math Tips** serve to point out math shortcuts and reminders.
- Each new topic or skill presented is followed by **Review Sets** with end-of-chapter **Practice Problems** to assess understanding and skills and to reinforce learning.
- Many problems are included involving the interpretation of syringe scales to ensure that the proper dosage is administered. Once the dosage is calculated, the learner is directed to draw an arrow on a syringe at the proper value.
- Many more labels of current and commonly prescribed medications are presented, including a few simulated labels to help users learn how to select the proper information required to determine correct dosage. There are over 375 labels included.
- Hundreds of **Examples** are included to demonstrate the ratio-proportion, formula, or dimensional analysis methods of calculating dosages.
- The addition of the formula and dimensional analysis methods gives learners and instructors a choice of which method they prefer to use.
- Abbreviations, measurements, acronyms, and symbols follow The Joint Commission *Official “Do Not Use” List* and ISMP standards.
- Clear instructions are included for calculating IV medications administered in milligram per kilogram per minute.
- Clinical situations are simulated using actual medication labels, drug resource references, syringes, physician order forms, various medication storage and retrieval systems, and medication administration records.
- As requested by faculty and clinicians, the text has an enhanced emphasis on clinical decision making. While unit-dose preparations have eased calculation error rates, clinical complexity has increased them.
- The **Pretest**, **Section Evaluations**, **Chapter Practice Problems**, and **Posttests** include scenarios that simulate substantial aspects of real-world clinical calculation situations.
- An **Essential Skills Evaluation Pretest** and **Posttest** simulate exams commonly administered by

employers for new hires, assess prior knowledge, and evaluate learning of essential calculation skills. A **Comprehensive Skills Evaluation** evaluates the learner’s overall comprehension in preparation for a level or program assessment.

- **Appendix A: Study Guide** summarizes the most frequently used abbreviations, equivalents, and formulas from each chapter. Learners can refer to this valuable study tool for solving problems that will reinforce learning essential information and calculations.
- The general **Index** facilitates learner and instructor access to content and skills, and the **Drug Index** facilitates access to all labels used in the text.

New to the Fourth Edition

For more than 30 years, this text and its companion, **Dosage Calculations**, ninth edition, have guided health care students to learn the knowledge and skills necessary for safe and accurate dosage calculations and medication administration. Regular and frequent updates keep the information current and state-of-the-art. Here is what’s new to this edition.

- **Quality and Safety in Nursing Education (QSEN)** principles and competencies have been adapted to reduce the risk of medication errors and improve patient safety.
- **Clinical simulations** provided in examples and test questions in **Chapters 10 through 13** develop clinical reasoning and calculation skills, beginning with seeking drug information from reputable resources, through the logic and safety precautions in the drug dosage calculation and administration process.
- Section Examinations include test items formatted like graduate licensure examinations, such as the **NCLEX-RN™ and NCLEX-PN™ exams**.
- A new **Pretest** and **Posttest** assess prior learning and evaluate skills commonly tested for new-hire graduates.
- Content on **high-alert drugs**, such as heparin and insulin, has been extensively augmented, including safety concerns with the increased use of **insulin pens** in hospitals. **U-500 insulin** content and calculations have been expanded, including conversions for preparation using both U-100 and 1 mL syringes.
- Administration protocols are expanded to include both insulin and heparin.

- New questions are added throughout to reflect current drugs and protocols.
- Computerized order and medication administration record systems have been updated to demonstrate a variety of drug retrieval systems, including Automated Dispensing Cabinets (ADC).
- Photographs of state-of-the-art equipment are replaced and updated, including the latest medication storage and retrieval systems.
- Practice has been added for the clinical reasoning essential to making correct choices when using different drug storage and retrieval systems.
- Apothecary calculations have been deleted within the text and evaluation items, consistent with current standards. Apothecary measure has been moved to **Appendix B**.
- Learners apply critical thinking to prevent medication errors in **Clinical Reasoning Skills** scenarios based on QSEN principles.
- Dosage calculations scenarios have been expanded to incorporate each step of safe and error-free medication administration: interpretation of order, acquisition of drug information, retrieval of drug, dosage calculation, dose measurement, preparation, and administration.
- Learners are purposely directed to be mindful of the seriousness of their clinical practice and the value of **safety alerts** to prevent errors.
- **Appendix A: Study Guide** summarizes essential rules, formulas, abbreviations, and equivalents to facilitate problem solving and reinforce learning.
- **Appendix B: Apothecary System** gives common units, abbreviations, and symbols of the original dosage measurement system, for faculty and students interested in comparing and converting between apothecary and metric measure.
- An exciting new **Premium Website** with **Practice Software** is available, offering a glossary review, chapter tutorials, interactive exercises, and hundreds of practice problems.

Learning Package for the Student

Premium Website

(ISBN 978-1-2854-2954-0)

The **Premium Website** can be accessed by users of the text at www.CengageBrain.com. Enter your passcode, found in the front of the book, and the Premium Website will be added to your bookshelf. Here you can access the engaging **Practice Software**, which includes:

- A user-friendly menu structure to immediately access the program's items.
- A bank of several hundred questions for practice and to reinforce the content presented in the text.
- A tutorial for each chapter outlining instructions and approaches to safe and accurate dosage calculation.
- **Quizzes, Pretest, and Posttest** that operate within a tutorial mode, which allows two tries before the correct answer is provided.
- Interactive exercises that ask you to fill a medicine cup or draw back a syringe to the correctly calculated dose.
- A comprehensive glossary of terms and drug names with definitions and pronunciations.
- Drop-down calculator available at a click of a button, as used on the NCLEX-RN™ and -PN examinations.

Teaching Package for the Instructor

(ISBN 978-1-2854-2955-7)

The **Instructor Companion Website to Accompany Dosage Calculations: A Ratio-Proportion Approach**, fourth edition, contains a variety of tools to help instructors successfully prepare lectures and teach within this subject area. The following components in the website are free to adopters of the text:

- A **Solutions Manual** includes answers and step-by-step solutions for every question in the **Pretest, Math Evaluation, Review Sets, Practice Problems, Section Evaluations, and Posttests** from the book.
- The **Computerized Test Bank** includes approximately 500 additional questions not found in the book for further assessment. The software also allows for the creation of test items and full tests, as well as coding for difficulty level.
- Lecture slides created in **PowerPoint®** offer a depiction of administration tools and include calculation tips helpful to classroom lecture of dosage calculations.



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From the Authors

We wish to thank our many students and colleagues who have provided inspiration and made contributions to the production of the text. We are particularly grateful to Maureen Tremel for her careful attention to researching and updating information; to Julie Pickar and Beverly Meyers for their careful attention to accuracy; to Elisabeth Williams and Kenneth McGrath for their careful attention to deadlines and details; and to Roger Pickar and Steve Abernethy for their careful attention to us and our families.

Gloria D. Pickar, RN, EdD
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Introduction to the Learner

The accurate calculation of drug dosages is an essential skill in health care. Paracelsus (1493–1591), often referred to as the father of pharmacology, recognized that the difference between a poison, narcotic, hallucinogen, and medicine is dosage. Serious harm to the patient can result from inadequate knowledge, incorrect interpretation or transcription of a medication order, retrieving the wrong drug, or error during the calculation and subsequent administration of a drug dosage. It is the responsibility of those administering drugs to precisely and efficiently carry out medical orders and to recognize unsafe dosages, prescriptions, and practices.

Learning to calculate drug dosages need not be a difficult or burdensome process. *Dosage Calculations: A Ratio-Proportion Approach*, fourth edition, provides an uncomplicated, easy-to-learn, easy-to-recall Three-Step Approach to dosage calculations. Once you master this method, you will be able to consistently compute dosages with accuracy, ease, and confidence.

The text is a self-study guide that is divided into four main sections. The only mathematical prerequisite is the basic ability to add, subtract, multiply, and divide whole numbers. A review of fractions, decimals, percents, simple equations, ratios, and proportions is included. You are encouraged to work at your own pace and seek assistance from a qualified instructor as needed.

Each procedure in the text is introduced by several *Examples*. Key concepts are summarized and highlighted throughout each chapter, to give you an

opportunity to review the concepts before working the problems. Ample *Review* and *Practice Problems* are given to reinforce your skill and confidence.

Before calculating the dosage, you are asked to consider the reasonableness of the computation. More often than not, the correct amount can be estimated in your head. Many errors can be avoided if you approach dosage calculation in this logical fashion. The mathematical computation can then be used to double-check your thinking. Answers to all problems and step-by-step solutions to select problems are included at the back of the text.

Many photos and drawings are included to demonstrate key concepts and equipment. Drug labels and measuring devices (for example, syringes) are included to give a simulated “hands-on” experience outside of the clinical setting or laboratory. *Clinical Reasoning Skills* emphasize the importance of dosage calculation accuracy, and medication administration scenarios provide opportunities to analyze pertinent information, make sound clinical decisions, calculate accurately, and prevent errors.

This text has helped hundreds of thousands of learners just like you to feel at ease about math and to master dosage calculations. I am interested in your feedback. Please write to me to share your reactions and success stories.

Gloria D. Pickar, RN, EdD
gpickar@cfl.rr.com

*Dedicated to Julie,
in recognition of the importance of preventing errors.*

Using This Book

- **Content** is presented from simple to complex, in small increments, followed by solved *Examples* and a *Quick Review*. *Review Sets* and *Practice Problems* provide opportunities for you to reinforce your learning.

- **Measurable objectives** at the beginning of each chapter define learning outcomes.

- **Syringes** are drawn to full size, providing accurate scale renderings to help you master the reading of injectable dosages.

3. Order: penicillin G potassium 1,000,000 units IV q.6h

SEE ACCOMPANYING
PRESCRIBING INFORMATION
RECOMMENDED STORAGE
IN DRY FORM.

Store below 86°F (30°C).

Sterile solution may be kept
in refrigerator for one (1)
week without significant loss
of potency.

Buffered

Pfizerpen[®]
(penicillin G potassium)

For Injection

FIVE MILLION UNITS

Pfizer **Roerig**
Division of Pfizer Inc. NY, NY 10017

NDC 0049-0520-83
Rx only

USUAL DOSAGE
Average single intramuscular injection:
200,000-400,000 units.
Intravenous. Additional information about
the use of this product intravenously can
be found in the package insert.

mL diluent added	Units per mL of solution
10 mL	200,000
5 mL	500,000
3 mL	1,000,000

Buffered with sodium citrate and citric acid
to optimum pH.

PATENT: _____

ROOM NO. _____

DATE DILUTED: _____

Describe the three concentrations, and calculate the amount to give for each of the supply dosage concentrations.

Reconstitute with _____ mL diluent for a concentration of _____ units/mL.
Give: _____ mL

Reconstitute with _____ mL diluent for a concentration of _____ units/mL.
Give: _____ mL

Reconstitute with _____ mL diluent for a concentration of _____ units/mL.
Give: _____ mL

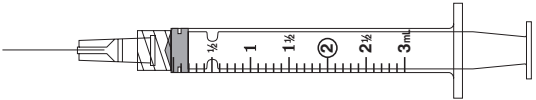
Indicate the concentration you would choose, and explain the rationale for your selection.
Select _____ units/mL and give _____ mL. Rationale: _____

OBJECTIVES

Upon mastery of Chapter 11, you will be able to apply clinical reasoning skills to prepare safe and accurate parenteral dosages of drugs. To accomplish this, you will also be able to:

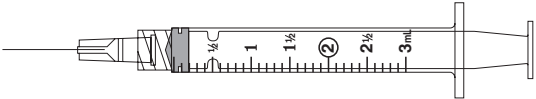
- Gather current information about the drug.
- Retrieve the right drug in the correct supply dosage strength.
- Apply the Three-Step Approach to dosage calculation: convert, think, and calculate using ratio-proportion.
- Verify drug and dosage with a second nurse for high-alert medications and for wasting of controlled substances.
- Measure correct dose amounts.
- Collaborate with patients and families regarding their medications, including safe administration at home.

19. Administer 2.4 mL.



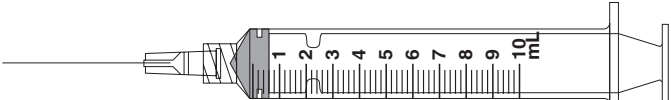
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20. Administer 1.1 mL.



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21. Administer 6.2 mL.



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Used with permission from Bedford Laboratories.

FAMOTIDINE INJECTION

NDC 55390-028-10
FOR INTRAVENOUS USE ONLY AFTER DILUTION.
USUAL DOSAGE: See package insert.
*Each mL contains 10 mg of famotidine and the following inactive ingredients: L-aspartic acid 4 mg, mannitol 20 mg, and Water for Injection, q.s., 1 mL Benzyl alcohol 0.9% added as preservative.
Store at 2° to 8°C (36° to 46°F).
Manufactured for: Bedford Laboratories™
Bedford, OH 44146 FAMPV04

40 mg/4 mL*

20 mg/2 mL
4 mL TWO-DOSE VIAL
Rx ONLY



- **Drug labels** and photos are presented in full color; actual size labels help prepare you to read and interpret content in its true-life format.

**MATH TIP**

Notice that to multiply 2 by 1,000, you are moving the decimal three places to the right. This is a shortcut. Sometimes to complete this operation, you add zeros to hold the places equal to the number of zeros in the equivalent. In this case, $1\text{ g} = 1,000\text{ mg}$, so you add three zeros: $2 \times 1,000 = 2,000 = 2,000$

- **Math Tip** boxes provide you with clues to essential computations.

**CAUTION**

If any of the seven parts is missing or unclear, the order is considered incomplete and is therefore not a legal drug order.

- **Caution** boxes alert you to critical information and safety concerns.

**RULE**

In a proportion, the ratio for a known equivalent equals the ratio for an unknown equivalent. To use ratio-proportion to convert from one unit to another, you need to follow these three steps.

1. Recall the equivalents.
2. Set up a proportion of two equivalent ratios.
3. Cross-multiply to solve for an unknown quantity, X.

- **Rule** boxes highlight and draw your attention to important formulas and pertinent instructions.

**REMEMBER**

The Six Rights of safe and accurate medication administration are as follows:

The *right patient* must receive the *right drug* in the *right amount* by the *right route* at the *right time*, followed by the *right documentation*.

- **Remember** boxes highlight information that you should memorize.

**QUICK REVIEW**

Look again at Steps 1 through 3 as a valuable dosage calculation checklist.

- Step 1 Convert** Be sure that all measurements are in the same system and all units are the same size.
- Step 2 Think** Carefully estimate the reasonable amount of the drug that you should administer.
- Step 3 Calculate** $\frac{\text{Dosage on hand}}{\text{Amount on hand}} = \frac{\text{Dosage desired}}{X \text{ Amount desired}}$

- **Quick Review** boxes summarize critical information that you will need to know and understand to safely prepare and administer medications.

**SUMMARY**

At this point, you should be quite familiar with the equivalents for converting within the metric and household systems and from one system to another. From memory, you should be able to recall quickly and accurately the equivalents for conversions. If you are having difficulty understanding the concept of converting from one unit of measurement to another, review this chapter and seek additional help from your instructor.

Consider the two Clinical Reasoning Skills scenarios, and work the Practice Problems for Chapter 4. Concentrate on accuracy. One error can be a serious mistake when calculating the dosages of medicines or performing critical measurements of health status.

- **Summary** boxes draw out key information from the chapter as a self-check and review tool.

EXAMPLE 4

Convert: 0.15 kg to g

Equivalent: 1 kg = 1,000 g

$$\frac{1\text{ kg}}{1,000\text{ g}} = \frac{0.15\text{ kg}}{X\text{ g}}$$

$$\frac{1\text{ kg}}{1,000\text{ g}} \times \frac{0.15\text{ kg}}{X\text{ g}}$$

$$X = 1,000 \times 0.15$$

$$X = 150\text{ g}$$

Cross-multiply

0.150. Move the decimal 3 places to the right to multiply by 1,000. Add a zero to complete the operation.

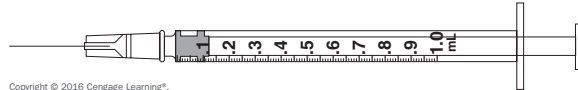
Label the units to match the unknown X.

- **Examples** walk you step-by-step through each calculation process, using different conversions, medications, and methods, to ensure that your mastery of the process is complete.

- **Problems** illustrate questions that students will encounter in actual lab and clinical situations.

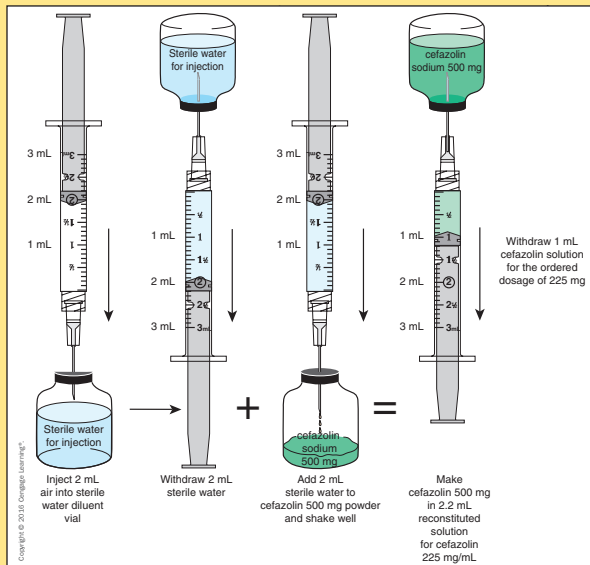
13. Order: **terbutaline 250 mcg subcut stat and repeat q. 15 to 30 min if no significant improvement**

- For what condition(s) is terbutaline indicated? _____
- What dosage strengths of terbutaline may be supplied in solution for injection? _____
- By what parenteral routes may terbutaline be administered? _____
- What is the usual recommended adult dosage range? _____
- Identify the letter of the label showing the supplied dosage strength that you will use to calculate one dose. _____
- Give: _____ mL
- Mark correct amount on the syringe:



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- **Illustrations** simulate critical dosage calculation and dose preparation skills.



- **Clinical Reasoning Skills** apply critical thinking to real-life patient care situations emphasizing the importance of accurate dosage calculations and the avoidance of medication errors. As an added benefit, clinical reasoning scenarios present prevention strategies so that you can learn how to avoid these errors in practice.

CLINICAL REASONING SKILLS

Medication errors can be caused by setting up problems incorrectly. Let's look at an example to identify the nurse's error.

ERROR

Incorrectly using the ratio-proportion method of dosage calculation

Possible Scenario

Suppose the physician ordered Keflex 80 mg p.o. q.i.d. for a child with an upper respiratory infection, and the Keflex is supplied in an oral suspension with 250 mg per 5 mL. The nurse decided to calculate the dosage using the ratio-proportion method and set up the problem this way:

$$\frac{80 \text{ mg}}{5 \text{ mL}} = \frac{250 \text{ mg}}{X \text{ mL}}$$

$$80X = 1,250$$

$$\frac{80X}{80} = \frac{1,250}{80}$$

$$X = 15.6 \text{ mL}$$

INCORRECT

The nurse gave the child 15 mL of Keflex for 2 doses. The next day, as the nurse prepared the medication in the medication room, another nurse observed the nurse pouring 15 mL into a medicine cup and asked about the dosage. At that point, the nurse preparing the medication realized the error.

Potential Outcome

The child could develop complications from the overdosage of Keflex, such as renal impairment and liver damage. When the physician was notified of the error, the physician would likely order the medication discontinued and the child's blood urea nitrogen (BUN) and liver enzymes monitored. An incident report would be filed and the family would be notified of the error.

Prevention

This type of calculation error occurred because the nurse set up the ratio-proportion problem incorrectly. The dosage on hand and amount on hand were not both set up on the left (or same) side of the proportion. The problem should have been calculated this way:

$$\frac{250 \text{ mg}}{5 \text{ mL}} \times \frac{80 \text{ mg}}{X \text{ mL}}$$

$$250X = 400$$

$$\frac{250X}{250} = \frac{400}{250}$$

$$X = 1.6 \text{ mL}$$

CORRECT

In addition, had the nurse used **Step 2: Think** of the Three-Step Approach, the nurse would have estimated that the dose required was less than 5 mL, not more. You should **think first, and then calculate**. In calculating ratio-proportion problems, remember to keep the weight of the medication and the amount of the *known* together on the left side of the proportion, and the weight and the amount of the *unknown* together on the right side. In this scenario, the patient would have received almost 10 times the amount of medication ordered by the physician each time the nurse committed the error. You can use ratio-proportion to determine how many mg of Keflex the child received in the scenario.

$$\frac{250 \text{ mg}}{5 \text{ mL}} \times \frac{X \text{ mg}}{15 \text{ mL}}$$

$$5X = 3,750$$

$$X = 750 \text{ mg, not } 80 \text{ mg as ordered}$$

Obviously, the nurse did not think through for the reasonable amount and either miscalculated the dosage three times or did not bother to calculate the dosage again, preventing identification of the error.

Review Set 13

Convert each of the following to the equivalent unit indicated.

- | | |
|------------------------|------------------------|
| 1. 500 mL = _____ L | 16. 0.75 L = _____ mL |
| 2. 0.015 g = _____ mg | 17. 5,000 mL = _____ L |
| 3. 8 mg = _____ g | 18. 1 L = _____ mL |
| 4. 10 mg = _____ g | 19. 1 g = _____ mg |
| 5. 60 mg = _____ g | 20. 3,000 mL = _____ L |
| 6. 300 mg = _____ g | 21. 23 mcg = _____ mg |
| 7. 0.2 g = _____ mg | 22. 1.05 g = _____ kg |
| 8. 1.2 g = _____ mg | 23. 18 mcg = _____ mg |
| 9. 0.0025 kg = _____ g | 24. 0.4 mg = _____ mcg |
| 10. 0.065 g = _____ mg | 25. 2,625 g = _____ kg |
| 11. 0.005 L = _____ mL | 26. 50 cm = _____ m |
| 12. 1.5 L = _____ mL | 27. 10 L = _____ mL |
| 13. 100 mcg = _____ mg | 28. 450 mL = _____ L |
| 14. 250 mL = _____ L | 29. 5 mL = _____ L |
| 15. 2 kg = _____ g | 30. 30 mg = _____ mcg |

After completing these problems, see page 642 to check your answers.

- **Practice Problems** round out each chapter. This is your opportunity to put your skills to the test, to identify your areas of strength, and also to acknowledge those areas in which you need additional study.

Mr. Smith is on restricted fluids. His IV order is: NS 1,500 mL IV q 24h \bar{c} 300,000 units penicillin G potassium IV PB in 100 mL NS q 4h over 30 min. The infusion set is calibrated at 60 gtt/mL.

38. Set Mr. Smith's regular IV at _____ gtt/min.

39. Set Mr. Smith's IV PB at _____ gtt/min.

Later during your shift, an electronic infusion pump becomes available. You decide to use it to regulate Mr. Smith's IVs.

40. Regulate Mr. Smith's regular IV at _____ mL/h.

41. Regulate Mr. Smith's IV PB at _____ mL/h.

- **Clinical Simulations** provide opportunities to practice your clinical reasoning combined with dosage calculation skills for safe and accurate medication administration.

- **Review Sets** are inserted after each new topic, to encourage you to stop and check your understanding of the material just presented.

PRACTICE PROBLEMS—CHAPTER 11

Calculate the amount you will prepare for 1 dose. Indicate the syringe you will select to measure the medication.

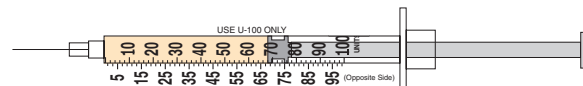
- Order: hydromorphone (Dilaudid) 4 mg slow IV push (over 10 min) q 4h p.r.n., severe pain
Supply: hydromorphone 10 mg/mL
Give: _____ mL Select: _____ syringe
- Order: morphine sulfate 15 mg slow IV push (over 5 min) stat
Supply: morphine sulfate 10 mg/mL
Give: _____ mL Select: _____ syringe

- **Essential Skills Pretest, Section Self-Evaluations, Posttest, and Comprehensive Skills Evaluation** test your mastery of concepts and critical calculation skills.

Questions 19 through 22: You are asked to provide independent verification for high-alert drug dosages. As shown, your nurse colleague provides you with the drug order, labeled vial used to prepare the dosage, and the syringe filled with the dose amount. Determine if the drug drawn up is the correct dosage.

19. Order: Lantus U-100 insulin 67 units subcut daily at 0900

Correct dosage? Yes _____ No _____



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- **NCLEX-RN™ and NCLEX-PN™** alternate test items give you an opportunity to practice answering questions formatted like these licensure examinations.

54. NCLEX Drag-and-Drop / Ordered-Response Item

Copy the tasks from the box onto the list in the proper sequence to administer high-alert intravenous heparin by a standard weight-based protocol.

- Check aPTT test results.
- Start continuous infusion, if required.
- Record weight in kilograms.
- Administer bolus, if required.
- Adjust infusion rate, if required.
- Check aPTT test results.
- Administer rebolus, if required.

Answer:

Dosage Calculations: Ratio-Proportion Method

$$\frac{\text{Dosage on hand}}{\text{Amount on hand}} = \frac{\text{Dosage desired}}{X \text{ Amount desired}}$$

- **Appendix B: Apothecary System** describes the common units, symbols, and equivalent conversions of this measurement system.

Apothecary-Metric Approximate Equivalents

Volume			Weight				
oz	mL	min	mL	gr	mg	gr	mg
1	= 30	45	= 3	15	= 1,000	$\frac{1}{4}$	= 15
$\frac{1}{2}$	= 15	30	= 2	10	= 600	$\frac{1}{6}$	= 10
		15	= 1	$7\frac{1}{2}$	= 500	$\frac{1}{8}$	= 7.5
dr	mL	12	= 0.75	5	= 300	$\frac{1}{10}$	= 6
$2\frac{1}{2}$	= 10	10	= 0.6	4	= 250	$\frac{1}{15}$	= 4
2	= 8	8	= 0.5	3	= 200	$\frac{1}{20}$	= 3
$1\frac{1}{4}$	= 5	5	= 0.3	$2\frac{1}{2}$	= 150	$\frac{1}{30}$	= 2
1	= 5	4	= 0.25	2	= 120	$\frac{1}{40}$	= 1.5
		3	= 0.2	$1\frac{1}{2}$	= 100	$\frac{1}{60}$	= 1
1 minim	= 1 gtt	$1\frac{1}{2}$	= 0.1	1	= 60	$\frac{1}{100}$	= 0.6
		1	= 0.06	$\frac{3}{4}$	= 45	$\frac{1}{120}$	= 0.5
		$\frac{3}{4}$	= 0.05	$\frac{1}{2}$	= 30	$\frac{1}{150}$	= 0.4
		$\frac{1}{2}$	= 0.03	$\frac{1}{3}$	= 20	$\frac{1}{200}$	= 0.3
						$\frac{1}{250}$	= 0.25

- **Drug Label Index** identifies each label in the text as a quick reference.

Drug Label Index

Boldface indicates generic drug name

<p>A</p> <p>acetaminophen, 250</p> <p>acetaminophen (Tylenol), 610</p> <p>acetaminophen and hydrocodone bitartrate (Lortab), 5, 168, 177, 234</p> <p>acetaminophen and oxycodone (Percocet), 168, 234, 262</p> <p>acyclovir, 342, 361</p> <p>albuterol sulfate, 244, 432, 459</p> <p>Aldactone (spironolactone), 98, 167, 262</p>	<p>B</p> <p>Biaxin (clarithromycin), 170, 217, 431</p> <p>bumetanide injection, 176, 286</p> <p>butorphanol tartrate injection, 7</p> <p>C</p> <p>Calan (verapamil), 4, 230</p> <p>Carafate (sucralfate), 15, 160, 216, 260</p> <p>carbamazepine (Tegretol), 166, 169, 231, 260, 424</p>	<p>codeine sulfate tablets, 459</p> <p>Continu-Flo solution set, 494</p> <p>Continu-Flo solution set with Duo-Vent spike, 18, 482, 495</p> <p>Co-Trimoxazole (trimethoprim and sulfamethoxazole), 407, 412</p> <p>cytarabine injection, 369</p> <p>D</p> <p>Depakene (valproic acid), 244, 424, 457</p>
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- **Online Practice Software** is offered as your built-in learning tutor. As you study each chapter, be sure to also work with the online study tool. This valuable resource will help you verify your understanding of key rules and calculations.



SECTION

1

Pretest and Mathematics Review

Essential Skills Evaluation: Pretest

Essential Skills Evaluation: Pretest Answer Sheet

Mathematics Diagnostic Evaluation

1 Fractions and Decimals

2 Ratios, Percents, Simple Equations, and Ratio-Proportion

Section 1 Self-Evaluation



Essential Skills Evaluation: Pretest

Record your answers on the Essential Skills Evaluation: Pretest Answer Sheet on page 21. Do not record your answers on the test itself. You will refer back to this Essential Skills Evaluation as an essential skills posttest when you conclude your studies.

As you begin the study of safe dosage calculation, consider that you bring previous knowledge from life experiences. Perhaps you have worked or volunteered in a health care setting or administered medication to a family member or friend. This essential skills pretest will help you identify dosage calculation skills you already possess and highlight skills that you will learn and master as you work through the text. Take this pretest now, but do not be concerned if there are many questions you are unable to answer. That is to be expected. Use scrap paper to work the problems rather than writing on the test pages so that you can take this test again once you have completed this course of study. Separate answer sheets are provided following the pretest and again following Section 4 (as a posttest) for you to record your answers. Comparing your answers from the pretest with those of the posttest will allow you to measure your improvement and see what material you may need to revisit with your instructor.

The Essential Skills Evaluation is designed to be similar to the type of entry-level test given by hospitals and health care agencies during orientation for new graduates and new employees. It excludes the advanced calculation skills presented in Chapters 16 and 17. A more comprehensive skills evaluation will be available at the end of the text, to measure mastery of the full range of dosage calculation skills presented in all 17 chapters of the text.

Locate the Essential Skills Evaluation: Pretest Answer Sheet, gather some scratch paper, and let's get started!

Instructions for questions 1 through 19:

Throughout your assigned shift on a busy adult medical unit, you will give medications to a group of patients. The following labels represent the medications available on the medical unit to fill the orders given. Calculate the amount you will administer for one dose, and identify the frequency of administration of each dose. For solutions, mark an arrow on the syringe to indicate the correct volume. When multiple syringes are provided, choose the most appropriate one to mark.

1. Order: verapamil 40 mg p.o. t.i.d.

Give: _____ tablet(s) Frequency: _____

Copyright Pfizer Inc. Reproduced with permission.

Store at 15° to 25°C (59° to 77°F).
Protect from light.
Dispense in tight, light-resistant, child-resistant containers (USP).
DOSAGE AND USE: See accompanying prescribing information.
Each tablet contains 80 mg verapamil hydrochloride.

100 Tablets
Calan®
verapamil hydrochloride tablets
80 mg
Distributed by
Pfizer G.D. Searle LLC
Division of Pfizer Inc, NY, NY 10017

NDC 0025-1851-31 Rx only

2286

05-7021-32-0

2. Order: clonazepam 1.5 mg p.o. b.i.d.

Give: _____ tablet(s) Frequency: _____

NDC 0555-0096-96

CLONAZEPAM
ORALLY DISINTEGRATING
Tablets USP
0.5 mg

Each tablet contains 0.5 mg clonazepam, USP.
Phenylketouric: Contains phenylalanine 2.4 mg per tablet.
Pharmacist: Dispense the enclosed Medication Guide to each patient. Dispense one "Instruction to the Patient Sheet" with each prescription.

Rx only

60 TABLETS (10 blister cards of 6 tablets each)

TEVA

Used with permission from Teva Pharmaceuticals USA.

3. Order: atomoxetine 20 mg p.o. daily

Choose: _____ mg capsules Give: _____ capsule(s) Frequency: _____

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30 Capsules NDC 0002-3227-30 PU 3227

strattera®
atomoxetine HCl
Rx only 10 mg

Each capsule equivalent to 10 mg atomoxetine

Do not use if Lilly inner seal is missing or broken.

www.strattera.com Lilly

Medication Guide is to be dispensed to patients. Keep tightly closed. Keep out of the reach of children. See accompanying literature for dosage information.

0 0002-3227-30 3

A

© Copyright Eli Lilly and Company. All Rights Reserved. Used with permission. Strattera is a trademark of Eli Lilly and Company.

30 Capsules NDC 0002-3229-30 PU 3229

strattera®
atomoxetine HCl
Rx only 40 mg

Each capsule equivalent to 40 mg atomoxetine

Do not use if Lilly inner seal is missing or broken.

www.strattera.com Lilly

Medication Guide is to be dispensed to patients. Keep tightly closed. Keep out of the reach of children. See accompanying literature for dosage information.

0 0002-3229-30 4

B

4. Order: *Lortab 2.5 mg p.o. q.3h, p.r.n., moderate pain* (ordered according to dose of hydrocodone)

Give: _____ tablet(s)

Frequency: _____

Used with permission from UCB Pharma, Inc.



5. Order: *levothyroxine 0.3 mg p.o. q.AM*

Give: _____ tablet(s)

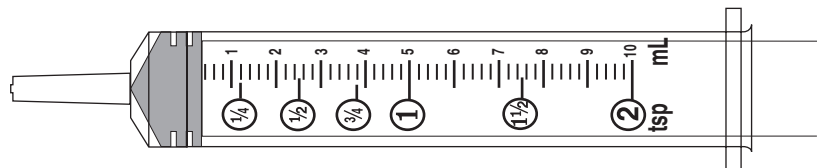
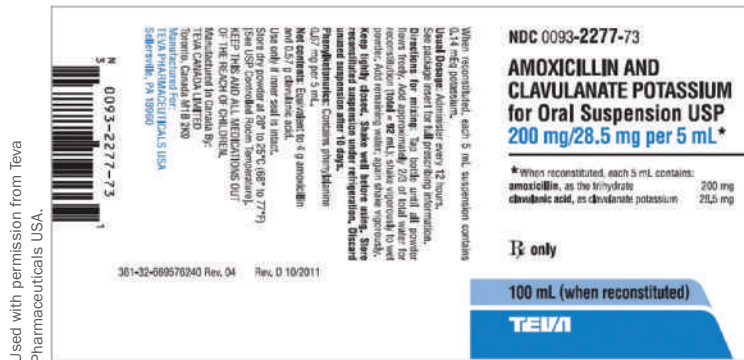
Frequency: _____

Used with permission from Abbott Laboratories.



6. Order: *amoxicillin and clavulanate potassium 100 mg p.o. q.8h* (ordered according to dose of amoxicillin)

Give: _____ mL Frequency: _____



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7. Order: promethazine 12.5 mg IV q.4h p.r.n., nausea

Give: _____ mL (Use label A.)

Frequency: _____



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Used with permission from Teva Pharmaceuticals USA.

<p>NDC 0703-2191-04 Rx only</p> <p>Promethazine Hydrochloride Injection, USP</p> <p>25 mg/mL</p> <p>FOR DEEP INTRAMUSCULAR OR INTRAVENOUS USE</p> <p>1 mL Single Dose Vials 25 Vials</p> <p>TEVA</p>	<p>Each mL contains: Promethazine hydrochloride 25 mg, edetate disodium 0.1 mg, calcium chloride 0.04 mg, sodium metabisulfite 0.25 mg and phenol 5 mg in water for injection. pH 4.0–5.5; buffered with acetic acid-sodium acetate. Sealed under nitrogen.</p> <p>Usual Dosage: See Package Insert.</p> <p>PROTECT FROM LIGHT: Keep covered in carton until time of use.</p> <p>Store at room temperature 20°–25°C (68°–77°F) [See USP Controlled Room Temperature].</p> <p>Teva Pharmaceuticals USA Sellersville, PA 18960 Rev. A 11/2011</p>  <p>Y10765</p>
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A

Used with permission from Teva Pharmaceuticals USA.

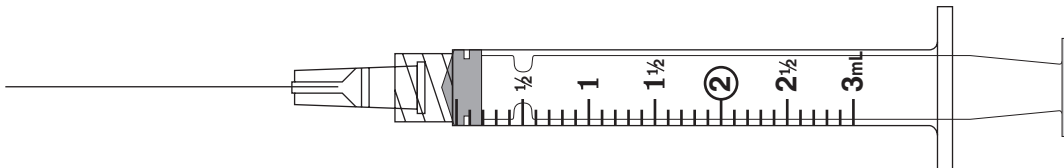
<p>NDC 0703-2201-04 Rx only</p> <p>Promethazine Hydrochloride Injection, USP</p> <p>50 mg/mL</p> <p>FOR DEEP INTRAMUSCULAR USE ONLY</p> <p>1 mL Single Dose Vials 25 Vials</p>	<p>Each mL contains: Promethazine hydrochloride 50 mg, edetate disodium 0.1 mg, calcium chloride 0.04 mg, sodium metabisulfite 0.25 mg and phenol 5 mg in water for injection. pH 4.0–5.5; buffered with acetic acid-sodium acetate. Sealed under nitrogen.</p> <p>Usual Dosage: See Package Insert.</p> <p>PROTECT FROM LIGHT: Keep covered in carton until time of use.</p> <p>Store at room temperature 20°–25°C (68°–77°F) [See USP Controlled Room Temperature].</p> <p>Teva Pharmaceuticals USA Sellersville, PA 18960 Rev. A 11/2011</p>  <p>Y10766</p>
--	---

B

8. Order: promethazine 40 mg IM stat

Give: _____ mL (Use label B.)

Frequency: _____



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9. Order: morphine sulfate 4 mg slow IV push q.4h p.r.n., severe pain

Give: _____ mL Frequency: _____



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NDC 10019-178-68

Morphine
Sulfate Inj., USP

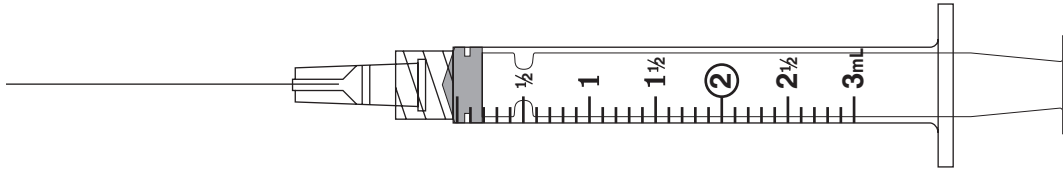
10 mg/mL
(1/8 gr per mL)

FOR SC, IM OR SLOW IV USE
1 mL DOSETTE® Ampul
PROTECT FROM LIGHT

Mfd. for an affiliate of
Baxter Healthcare Corporation
by: Elkins-Sinn, Cherry Hill, NJ 08003
400-831-01

Lot: _____

Exp.: _____



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10. Order: butorphanol 3 mg IM stat

Give: _____ mL

Frequency: _____

Used with permission from
Bedford Laboratories.

BUTORPHANOL
TARTRATE INJECTION, USP

2 mg/mL

SINGLE DOSE VIAL
FOR IM OR IV USE
Rx ONLY

NDC 55390-184-01
1 mL vial

USUAL DOSAGE: See
package insert.

Store at room temperature,
15° to 30°C (59° to 86°F).

Manufactured for:
Bedford Laboratories™
Bedford, OH 44146

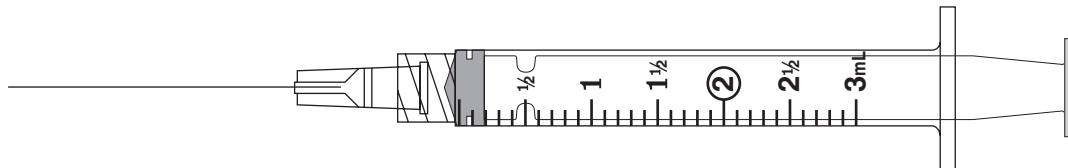
BTP-VB05

Lot: _____

Exp. Date: _____



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11. Order: kanamycin 350 mg IV PB q.8h

Give: _____ mL

Frequency: _____

Used with permission from
Bristol-Myers Squibb Company.

NDC 0015-3502-20

Kantrex®
(KANAMYCIN SULFATE
INJECTION, USP)
For I.M. or I.V. Use
EQUIVALENT TO

500 mg KANAMYCIN per 2 mL

CAUTION: Federal law prohibits
dispensing without prescription

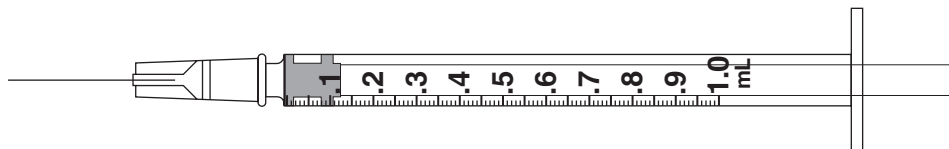
0.66% sodium blifite added as
an antioxidant, buffered with 2.2%
sodium H.S.D. • Kanamycin
should not be physically mixed with
other antibacterial agents.

READ ACCOMPANYING CIRCULAR

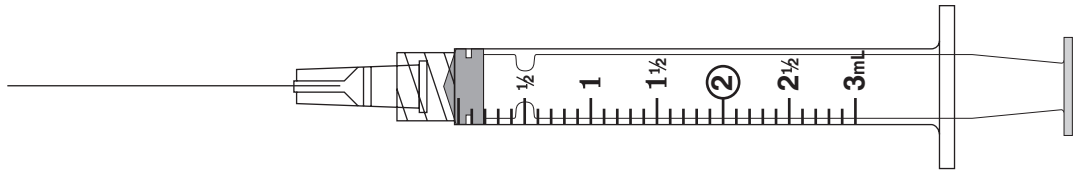
350220RL-44

Lot: _____

Exp. Date: _____



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12. Order: *gentamicin* 35 mg IM stat

Give: _____ mL

Frequency: _____

Used with permission from Fresenius Kabi USA, LLC, whose products are available only in the United States.

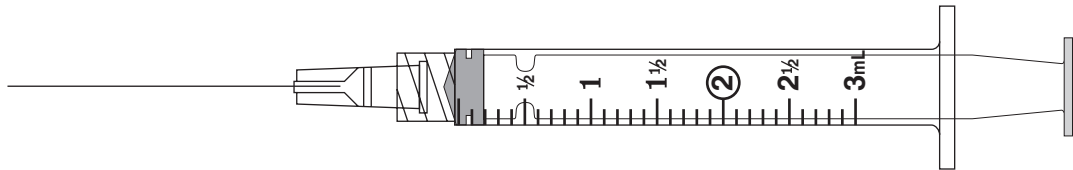
<p>NDC 63323-010-02 1002 GENTAMICIN INJECTION, USP equivalent to 40 mg/mL Gentamicin 80 mg/2 mL For IM or IV Use. Must be diluted for IV use. 2 mL Multiple Dose Vial Sterile Rx only</p>	<p>APP Pharmaceuticals, LLC Schaumburg, IL 60173 401896D LOT/EXP</p>
--	--

3 63323-010-02 7

SAMPLE. NOT FOR HUMAN USE.



Copyright © 2016 Cengage Learning®.



Copyright © 2016 Cengage Learning®.

13. Order: *glycopyrrolate* 200 mcg IV stat

Give: _____ mL

Frequency: _____



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NDC 10019-016-81

Robinul[®]

Injectable

(glycopyrrolate injection, USP)

0.2 mg/mL

FOR IM OR IV USE

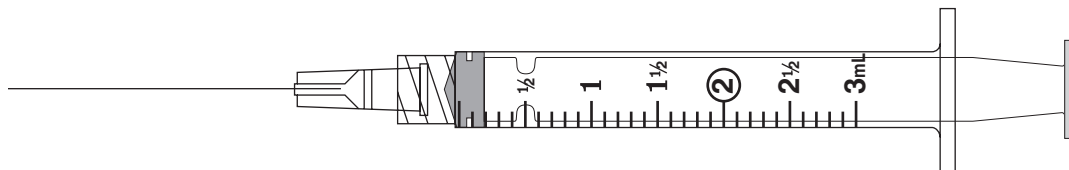
1 mL

Single Dose Vial

M14, for an affiliate of
Baxter Healthcare Corp.
 by: A.H. Robins Co.
 Richmond, VA 23220
 400-938-01

Lot: _____
 Exp.: _____

Image courtesy of Baxter Healthcare Corporation.
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14. Order: *digoxin* 0.125 mg IV q.AM

Give: _____ mL

Frequency: _____

Image courtesy of Baxter Healthcare Corporation.
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NDC 0641-1410-35

Digoxin
Injection, USP
500 mcg/2 mL

Store at 20°-25°C (68°-77°F).

Baxter Healthcare Corporation
Deerfield, IL 60015 USA

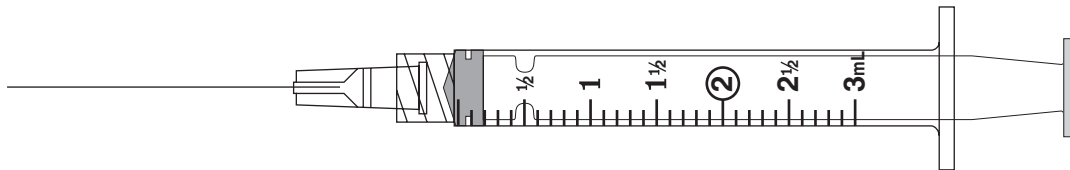
40 packs each containing
25 x 2 mL DOSETTE Ampuls
475-523-00

LOT/EXP

(01) 5 03 10019 12345 0 (30) 0100



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15. Order: *doxycycline* 80 mg IV PB q.12h

Give: _____ mL

Frequency: _____

Used with permission from Bedford Laboratories.

DOXYCYCLINE
FOR INJECTION USP

FOR IV INFUSION ONLY

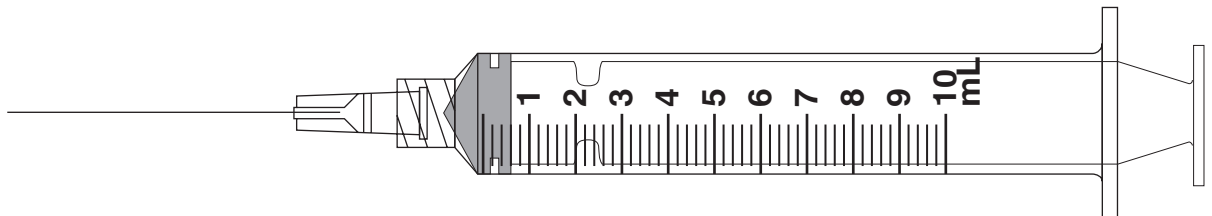
Equivalent to
100 mg
Doxycycline
Rx ONLY

NDC 55390-110-10 LYOPHILIZED
Usual Dosage: See package insert.
MUST DILUTE RECONSTITUTED SOLUTION.
Each 10 mL (when mixed) contains doxycycline
hydrate equivalent to 100 mg doxycycline
(10 mg/mL) and 480 mg ascorbic acid.
Store lyophilized product at or below 25°C
(77°F). **Protect from light.** Retain in carton
until time of use.

Patient: _____
Date: _____ Time: _____
Manufactured for:
Bedford Laboratories™
Bedford, OH 44146 **DCY-V02**



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