

**NURSPT 020**  
**PHARMACOLOGY I**

**WEEK #1**

**Module 1:** Fundamentals of Pharmacology

1. Describe the role and responsibilities of the Psychiatric Technician in medication administration.
2. Identify and discuss the six rights of medication administration.
3. Explain the terms commonly used to describe the basic principles of drug actions.
4. Identify routes of medication administration.
5. Define common terminology associated with medication administration.
6. Identify and utilize a variety of sources of drug information.
7. State the purpose of federal regulations and standards related to medications and medical products.
8. Discuss cultural and life span considerations related to medication administration.
9. Identify important concepts related to medication administration and patient education.

**WEEK #2**

**Module 2:** Drug Classification

1. Explain how drugs are classified.
2. Identify the major therapeutic drug classifications.
3. Describe the teaching responsibilities related to the administration of medications.

**WEEK #3**

**Module 3:** Calculation of Medication Dosages

1. Define common abbreviation symbols used to communicate medication orders.
2. Review basic math skills
3. Review the metric system
4. Review the apothecary system
5. Review household system
6. Demonstrate conversion between systems,
7. Calculate medication dosages using Dimensional Analysis.

## WEEK #4

### **Module 4:** Analgesics, Anti-inflammatory and Anti-Rheumatoid Agent Medications

1. Describe the physiology of pain and different types of pain.
2. Describe the use of opioid analgesics.
3. Identify opioid analgesics according to dosages and strengths.
4. Describe the most common opioid antagonists and how they are used.
5. Describe indications, uses and precautions for non-steroidal anti-inflammatory agents (NSAIDs).
6. Identify various chemical classes of non-opioid, non-steroidal anti-inflammatory agents (NSAIDs).
7. Identify and discuss selected medications included in the classification of NSAIDs and how they are used.

## WEEK #5

### **Module 5:** Individualizing Drug Therapy and Over-the-Counter Medications-Part I

1. Identify factors contributing to variability in drug response, including biological factors, cultural factors, environmental factors and polypharmacy.
2. Review physiological changes that occur during the aging process that impact pharmacokinetic and pharmacodynamics processes in the elderly.
3. Discuss the variability in drug response and the implications for drug therapy.

## WEEK #6

### **Module 5:** Individualizing Drug Therapy and Over-the-Counter Medications-Part II

1. Review common OTC drugs and discuss important concepts related to medication administration for patient/family education.
2. Review alternative medication therapies, including herbal medications.

**NURSPT 020 / PHARMACOLOGY I**  
**Curriculum Content Week 1**

**Fundamentals of Pharmacology**

**Goal Statement**

The goal of this module is to provide the learner with basic information regarding pharmacology.

**Module Description**

Fundamental of Pharmacology module provides an overview of basic pharmacological principles, terminology associated with medication administration, drug terminology, sources of drug information, federal legislation, cultural, ethical, and lifespan considerations.

**Objectives**

At the completion of this module, the learner will be able to:

1. Describe the role and responsibilities of the Psychiatric Technician in medication administration.
2. Identify and discuss the six rights of medication administration.
3. Explain terms commonly used to describe the basic principles of drug actions.
4. Identify routes of medication administration.
5. Define common terminology associated with medication administration.
6. Identify and utilize a variety of sources of drug information.
7. State the purpose of federal legislation and standards related to medications and medical products.
8. Discuss cultural and lifespan considerations related to medication therapy.
9. Identify important concepts related to medication administration and patient education.

# Psychiatric Technician Program Curriculum Content

Instructional Plan: Term 1 \_\_\_\_\_ Week 1 \_\_\_\_\_

Unit Title: Nurspt 020 Pharmacology 1  
Theory Hours this week: 3

Skills Lab / Clinical Hours this week: 0

Curriculum Content/Hrs	Theory Objectives	Content Outline	Methods of Instruction	Assignments	Clinical Hours	Skills Lab/Clinical Objectives
<p>Fundamentals of Pharmacology PHARM/0.5</p>	<p><b>Objective 1</b> Describe the role and responsibilities of the Psychiatric Technician in medication administration.</p>	<p>A. Psychiatric Technician's scope of practice as it relates to medication administration (as described by the Psychiatric Technician Licensure Examination Test Plan [2007] Operational Definitions of Content Area).</p> <ol style="list-style-type: none"> <li>1. The psychiatric technician administers medications and documents their administration as ordered by the physician or designee.               <ol style="list-style-type: none"> <li>a. All routes of administration utilized except IV.</li> <li>b. All classifications of medications are included.</li> </ol> </li> <li>2. The psychiatric technician is expected to have a good understanding of:               <ol style="list-style-type: none"> <li>a. Commonly used drugs including indications for use, dosage, expected actions, contraindications, precautions, adverse reactions and warnings.</li> <li>b. Medication allergies.</li> <li>c. Preparation of</li> </ol> </li> </ol>	<p>Lecture Discussion Reading Transparencies Study guide Audiovisual aids</p> <p><b>Lecture/Discussion</b></p> <ul style="list-style-type: none"> <li>• <a href="http://www.bvnpt.ca.gov/pdf/ptregs.pdf">http://www.bvnpt.ca.gov/pdf/ptregs.pdf</a> Psychiatric Technicians California Code of Regulations</li> <li>• <a href="http://www.bvnpt.ca.gov/enforcement/psychiatric_technicians_law.shtml">http://www.bvnpt.ca.gov/enforcement/psychiatric_technicians_law.shtml</a> Psychiatric Technician's Law</li> </ul> <p>Methods of Evaluation: Testing Discussion Questions Case Studies Observation</p>	<p>The following learning activities apply for Content Outline Objectives 1-9.</p> <p><b>Required Reading</b></p> <ul style="list-style-type: none"> <li>• BVNPT Scope of Practice for the Psychiatric Technician</li> <li>• BVNPT Rights and Responsibilities of the Psychiatric Technician</li> <li>• In required pharmacology textbook, read chapters and information on topics listed in Column I.</li> <li>1. Terminology</li> <li>2. Drug nomenclature</li> <li>3. Drug information</li> <li>4. Federal legislation and standards regarding medication</li> </ul>	<p>N/A</p>	<p>N/A</p>

Curriculum Content/Hrs	Theory Objectives	Content Outline	Methods of Instruction	Assignments	Clinical Hours	Skills Lab/Clinical Objectives
		<p>prescribed medications.</p> <p>d. Calculations of medication dosages.</p> <p>e. Principles of medication administration.</p> <p>f. Controlled drugs.</p> <p>3. The psychiatric technician performs associated tasks that include (but are not limited to):</p> <p>a. Assessment of client history.</p> <p>b. Calculation of drug dosages.</p> <p>c. Preparation and administration of oral medications</p> <p>d. Preparation/administration of parenteral medications.</p> <p>e. Preparation/administration of topical medications</p> <p>f. Preparation/administration of inhaled medications</p> <p>g. Preparation/administration of controlled medications</p> <p>h. Evaluation of client response to administered medications.</p>		<p>testing</p> <p>5. Cultural and lifespan considerations</p> <p>6. Patient education</p>		
<p>Fundamentals of Pharmacology PHARM/0.25</p>	<p><b>Objective 2</b>  <b>Identify and discuss the six rights of medication administration.</b></p>	<p>A. Medication</p> <p>B. Route</p> <p>C. Time</p> <p>D. Client</p> <p>E. Dosage</p> <p>F. Documentation</p>				<p>NA</p>

Curriculum Content/Hrs	Theory Objectives	Content Outline	Methods of Instruction	Assignments	Clinical Hours	Skills Lab/Clinical Objectives
Fundamentals of Pharmacology PHARM/0.25	<b>Objective 3</b> Explain terms commonly used to describe the basic principles of drug actions.	<p>A Pharmacokinetics</p> <ol style="list-style-type: none"> <li>1. Absorption</li> <li>2. Distribution</li> <li>3. Metabolism</li> <li>4. Excretion</li> </ol> <p>B Pharmacodynamics</p> <p>C Pharmacotherapeutics</p>				NA
Fundamentals of Pharmacology PHARM/0.25	<b>Objective 4</b> Identify routes of medication administration.	<p>A. Enteral (administration into GI tract by oral, rectal or nasogastric means).</p> <ol style="list-style-type: none"> <li>1. Oral               <ol style="list-style-type: none"> <li>a. Tablets                   <ol style="list-style-type: none"> <li>i. Enteric coated tablets</li> <li>ii. Sustained release tablets</li> </ol> </li> <li>b. Sublingual or buccal</li> <li>c. Capsules                   <ol style="list-style-type: none"> <li>i. immediate release (IR)</li> <li>ii. sustained release (SR)</li> </ol> </li> <li>d. Syrups</li> <li>e. Elixirs</li> </ol> </li> <li>2. Rectal               <ol style="list-style-type: none"> <li>a. suppository</li> <li>b. gel</li> </ol> </li> <li>3. Nasogastric (for patients who cannot swallow or have had oral surgery).</li> </ol> <p>B. Parenteral (any route other than enteral)</p> <ol style="list-style-type: none"> <li>1. Injections               <ol style="list-style-type: none"> <li>a. Intramuscular</li> <li>b. Subcutaneous</li> <li>c. Intradermal</li> <li>d. Z-track</li> </ol> </li> <li>2. Percutaneous (application of medication to the skin or</li> </ol>				NA

Curriculum Content/Hrs	Theory Objectives	Content Outline	Methods of Instruction	Assignments	Clinical Hours	Skills Lab/Clinical Objectives
Fundamentals of Pharmacology PHARM/0.5	<b>Objective 5</b> <b>Define common terminology associated with medication administration.</b>	<p>mucous membranes for absorption).</p> <p>a. Otic (application to the mucous membrane of the eye)</p> <p>b. Otic (application to the mucous membrane of the ear)</p> <p>c. Intranasal (application to the mucous membrane of the nose)</p> <p>i. spray</p> <p>ii. drops</p> <p>d. Inhalant (application to the bronchial muscle of the lung)</p> <p>i. metered dose inhaler (MDI)</p> <p>ii. dry powder inhaler (DPI)</p> <p>e. Topical (application to the skin)</p> <p>i. creams</p> <p>ii. lotions</p> <p>iii. ointments</p> <p>iv. powders</p>				
		<p>A. Action</p> <p>B. Adverse Drug Reaction</p> <p>C. Allergy</p> <p>D. Agonist</p> <p>E. Antagonist</p> <p>F. Bioavailability</p> <p>G. Chemical Name</p> <p>H. Contraindications</p> <p>I. Interactions</p> <p>J. Indication</p> <p>K. Drug solubility</p> <p>L. Generic Name</p> <p>M. Half-Life</p> <p>N. Hypersensitivity</p>	<p><b>Internet Resource -</b></p> <p>practice</p> <ul style="list-style-type: none"> <li><a href="http://www.wisc-online.com/Objects/ViewObject.aspx?ID=NUR7407">http://www.wisc-online.com/Objects/ViewObject.aspx?ID=NUR7407</a> Basic Pharmacology Terms Matching Game</li> <li><a href="http://www.studystack.com/flashcard-14552">http://www.studystack.com/flashcard-14552</a></li> </ul>	<p><b>Assignment</b></p> <ul style="list-style-type: none"> <li>Write definitions for each item.</li> <li>Utilize internet resources for practice.</li> </ul>		NA

Curriculum Content/Hrs	Theory Objectives	Content Outline	Methods of Instruction	Assignments	Clinical Hours	Skills Lab/Clinical Objectives
		<p>O. Iatrogenic Response  P. Idiosyncratic response  Q. Incompatibility  R. Peak  S. Placebo  T. Precautions  U. Side effects  V. Steady state  W. Synergistic effect  X. Therapeutic effect  Y. Therapeutic margin  Z. Titrant  AA. Therapeutic margin  BB. Titrant  CC. Toxicity  DD. Trough</p>	<p>Studying flashcards about pharmacology terms.</p>			
<p>Fundamentals of Pharmacology  <b>PHARM/0.25</b></p>	<p><b>Objective 6</b>  Identify and utilize a variety of sources of drug information.</p>	<p>A. Internet Resources  B. Journals  C. The United States Pharmacopeia–National Formulary (USP–NF)  1. a book of public pharmacopeial standards.  2. contains standards for medicines, dosage forms, drug substances, excipients, medical devices, and dietary supplements.  D. Textbooks/Drug Reference Books  E. Physicians Desk Reference  1. Contains full label information 2,400 prescription drugs with warnings and drug interactions.  2. Hundreds of full-size, color photographs.</p>	<p><b>Internet Resources</b></p> <ul style="list-style-type: none"> <li>• <a href="http://www.webmd.com/drugs/index-drugs.aspx">http://www.webmd.com/drugs/index-drugs.aspx</a> WEB MD</li> <li>• <a href="http://www.usp.org/USPNF/">http://www.usp.org/USPNF/</a> The United States Pharmacopeia–National Formulary</li> </ul>	<p><b>Group Activity</b></p> <ul style="list-style-type: none"> <li>• Divide students into group and assign each to a different source for drug information.</li> <li>• Have each group identify various examples or resources from each source and demonstrate for the class how it is best utilized.</li> </ul>		



Curriculum Content/Hrs	Theory Objectives	Content Outline	Methods of Instruction	Assignments	Clinical Hours	Skills Lab/Clinical Objectives
Fundamentals of Pharmacology PHARM/0.5	<b>Objective 7</b> State the purpose of federal legislation and standards related to medications and medical products.	<p>A. Pure Food and Drug Act of 1906</p> <p>B. Federal Food, Drug and Cosmetics Act 1938</p> <ol style="list-style-type: none"> <li>Amended 1952</li> <li>Amended 1962</li> </ol> <p>C. Controlled Substances Act 1970</p> <ol style="list-style-type: none"> <li>Schedule I</li> <li>Schedule II</li> <li>Schedule III</li> <li>Schedule IV</li> <li>Schedule V</li> </ol> <p>D. Pregnancy categories</p>	<p><b>Internet Resource:</b>  <a href="http://www.fda.gov/regulatoryinformation/legislation/federalfooddrugandcosmetictactfdca/default.htm">http://www.fda.gov/regulatoryinformation/legislation/federalfooddrugandcosmetictactfdca/default.htm</a>            FDA Website</p>			NA
Fundamentals of Pharmacology PHARM/0.25	<b>Objective 8</b> Discuss cultural and lifespan considerations related to medication therapy.	<p>A. Cultural issues</p> <p>B. Lifespan considerations</p>				NA
Fundamentals of Pharmacology PHARM/0.25	<b>Objective 9</b> Identify important concepts related to medication administration and patient education.	<p>A. Responsibility for patient teaching</p> <p>B. Cultural Considerations</p> <p>C. Barriers to learning</p>				NA

Key:

<b>For All Programs:</b>	NP	Nursing Process	CCC	Culturally Congruent Care	M/S	Medical/Surgical Nursing
A/P Anatomy and Physiology	PE	Patient Education	EOL	End-of-Life Care	REH	Rehabilitation Nursing
CDIS Communicable Diseases	PHARM	Pharmacology	<b>For VN Programs only:</b>	<b>For VN Programs only:</b>	<b>For PT Programs only:</b>	<b>For PT Programs only:</b>
COM Communication	LDR	Leadership	FUN	Nursing Fundamentals	NS	Nursing Science Fundamentals
NUT Nutrition	SUP	Supervision	MAT	Maternity Nursing	MD	Mental Disorders
PSY Psychology	ETH	Ethics and Unethical Conduct	PED	Pediatric Nursing	DD	Dev. Disabilities
G/D Normal Growth and Development	CT	Critical Thinking	GER	Gerontological Nursing		



**NURSPT 020 / PHARMACOLOGY I**  
**Curriculum Content Week 2**

**Calculating Medication Dosages**

**Goal Statement**

The goal of this module is to review basic mathematical systems necessary in medication administration and to introduce the psychiatric technician student to those systems conversions necessary for medication administration.

**Module Description**

Calculating Medication Dosages module introduces the beginning nursing student to concepts necessary to prepare to be successful in the Pharmacology Course. These concepts include a math review, conversions from household measurements, to metric measurements, and to the apothecary system. Students will also be taught to calculate drug dosages by use of ratio and proportion, and dimensional analysis. Abbreviations and symbols used in pharmacology will also be emphasized.

**Objectives**

At the completion of this module, the learner will be able to:

1. Define common abbreviations and symbols used to communicate medication orders.
2. Review basic math skills.
3. Review the metric system.
4. Review the apothecary system.
5. Review the household system.
6. Demonstrate conversion between systems.
7. Calculate medication dosages.

# Psychiatric Technician Program Curriculum Content

Instructional Plan: Term 1 Week 2

Unit Title: Nurspt 020 Pharmacology 1  
Theory Hours this week: 3

Skills Lab / Clinical Hours this week:

Curriculum Content/Hrs	Theory Objectives	Content Outline	Methods of Instruction	Assignments	Clinical Hours	Skills Lab/Clinical Objectives
Calculating medication dosages  PHARM/.5	<b>Objective 1</b> Define common abbreviation symbols used to communicate medication orders.	<p>A. Abbreviations</p> <ol style="list-style-type: none"> <li>1. Utilize Study Guide 2.1 and demonstrate understanding of abbreviations used in medicine and nursing.</li> </ol> <p>B. Symbols</p> <ol style="list-style-type: none"> <li>1. Utilize Study Guide 2.1 and demonstrate understanding of symbols used in medicine and nursing.</li> </ol>	<p>Lecture Discussion Reading Transparencies Study guide Audiovisual aids</p> <p><u>Methods of Evaluation:</u> Testing Discussion Questions Case Studies Observation</p>	<p><b>Required Reading</b></p> <ul style="list-style-type: none"> <li>• In required Pharmacology Textbook, read chapters and information as listed in Column I.</li> </ul> <p><b>Study Guide 2.1</b> Abbreviations &amp; Symbols</p> <p><b>Study Guide 2.2</b> Pharmacology Vocabulary</p>	N/A	N/A
Calculating medication dosages  PHARM/.5	<b>Objective 2</b> Review basic math skills.	<p>A. Perform basic arithmetic operations on the following types of problems:</p> <ol style="list-style-type: none"> <li>1. Addition</li> <li>2. Subtraction</li> <li>3. Multiplication</li> <li>4. Division</li> <li>5. Decimal fractions</li> <li>6. Common fractions</li> <li>7. Percent</li> <li>8. Round dosage problems</li> </ol> <p>B. Match Roman numeral with the equivalent Arabic notations.</p> <p>C. Identify the numbers located to the right of the decimal point as tenths, hundredths, and thousandths.</p> <ol style="list-style-type: none"> <li>1. Multiply number by 10, 100,</li> </ol>		<p><b>Required Reading</b></p> <ul style="list-style-type: none"> <li>• In required Pharmacology Textbook, read chapters and information as listed in Column I.</li> </ul> <p><b>Study Guide 2.3</b> Rounding Policy</p> <p><b>Study Guide 2.4</b> Military Time</p> <p><b>Study Guide 2.5</b> Review of Essential Mathematics</p> <p><b>Study Guide 2.6</b> Roman Numerals</p>	N/A	N/A

Curriculum Content/Hrs	Theory Objectives	Content Outline	Methods of Instruction	Assignments	Clinical Hours	Skills Lab/Clinical Objectives
Calculating medication dosages PHARM/ 0.25	<b>Objective 3</b> <b>Review the metric system.</b>	<p>1000</p> <p>2. Divide numbers by 10, 100, 1000</p> <p>D. Rank a given list of decimal or common fractions from the highest values to the lowest values.</p> <p>E. Perform conversion between Standard Time and Military Time.</p> <p>A. Differentiate types of metric measures commonly used in health care settings by weight, volume, and length.</p> <p>B. Match the metric measures with the appropriate usage.</p> <p>C. Match the metric measures with the appropriate abbreviations or symbols.</p> <p>D. Select from a given list the correct metric conversation equivalents.</p> <p>E. Match the given metric units of measurements with the equivalent converted units of measurements.</p>		<p><b>Required Reading</b></p> <ul style="list-style-type: none"> <li>In required Pharmacology Textbook, read chapters and information as listed in Column I.</li> </ul> <p><b>Study Guide 2.7</b> Table of Approximate Equivalents</p> <p><b>Study Guide 2.8</b> Introduction to Dimensional Analysis</p> <p><b>Study Guide 2.9</b> Equivalents</p>		
Calculating medication dosages PHARM/ 0.25	<b>Objective 4</b> <b>Review the apothecary system.</b>	<p>A. Grains and Minims</p> <ol style="list-style-type: none"> <li>Match the apothecary measures with the appropriate usage.</li> <li>Calculate dosages using apothecary system.</li> </ol>		<p><b>Required Reading</b></p> <ul style="list-style-type: none"> <li>In required Pharmacology Textbook, read chapters and information as listed in Column I.</li> </ul> <p><b>Study Guide 2.10</b> Calculating Medication Dosages</p> <p><b>Required Reading</b></p>	NA	

Curriculum Content/Hrs	Theory Objectives	Content Outline	Methods of Instruction	Assignments	Clinical Hours	Skills Lab/Clinical Objectives
Calculating medication dosages PHARM/.5	<b>Objective 5</b> <b>Review the household system.</b>	A. Differentiate types of household measures commonly used in health care settings. B. Match the household measures with the appropriate abbreviations or symbols. C. Select from a given list the correct household conversion equivalents. D. Match the given household units of measurement with the equivalent converted units of measurements.		<ul style="list-style-type: none"> <li>In required Pharmacology Textbook, read chapters and information as listed in Column I.</li> </ul>		NA
Calculating medication dosages PHARM/.5	<b>Objective 6</b> <b>Demonstrate conversion between systems.</b>	A. Differentiate given metric, apothecary or house measurements from equivalent measurements in another system. B. Match given metric, apothecary or household measurements with equivalent converted measurements in another system.		<p><b>Required Reading</b></p> <ul style="list-style-type: none"> <li>In required Pharmacology Textbook, read chapters and information as listed in Column I.</li> </ul> <p><b>Study Guide 2.1</b> Abbreviations &amp; Symbols</p> <p><b>Study Guide 2.10</b> Calculating Medication Dosages</p>		NA
Calculating medication dosages PHARM/.5	<b>Objective 7</b> <b>Calculate medication dosages.</b>	A. Discuss definition of Dimensional Analysis. B. Identify the steps in Dimensional Analysis. C. Calculate the correct answer of medication dosages problems using dimensional analysis.		<p><b>Required Reading</b></p> <ul style="list-style-type: none"> <li>In required Pharmacology Textbook, read chapters and information as listed in Column I.</li> </ul> <p><b>Study Guide 2.10</b></p> <ul style="list-style-type: none"> <li>Calculating Medication Dosages</li> </ul>		NA

Key:

<b>For All Programs:</b>		NP	Nursing Process	CCC	Culturally Congruent Care	M/S
A/P	Anatomy and Physiology	PE	Patient Education	EOL	End-of-Life Care	REH
CDIS	Communicable Diseases	PHARM	Pharmacology	<b>For VN Programs only:</b>		
COM	Communication	LDR	Leadership	FUN	Nursing Fundamentals	NS
NUT	Nutrition	SUP	Supervision	MAT	Maternity Nursing	MD
PSY	Psychology	ETH	Ethics and Unethical Conduct	PED	Pediatric Nursing	DD
G/D	Normal Growth and Development	CT	Critical Thinking	GER	Gerontological Nursing	
						Medical/Surgical Nursing
						Rehabilitation Nursing
						<b>For PT Programs only:</b>
						NS
						Nursing Science Fundamentals
						Mental Disorders
						Dev. Disabilities

**Week 2 – Calculating Medication Dosages**  
**Study Guide 2.1**  
**Abbreviations & Symbols**  
**(Common to medical orders and prescriptions)**

a	before	<b>OD, o.d.</b>	<b>right eye</b>
A,AP	apical pulse	ophth.	Ophthalmic
a.c.	before meals	<b>o.s.</b>	<b>left eye</b>
<b>a.d.</b>	<b>right ear</b>	<b>os</b>	<b>mouth</b>
ad lib	freely as desired	<b>OU</b>	<b>both eyes</b>
	as much as needed	oz	ounce
amp	ampule	P.	pulse
<b>a.s.</b>	<b>left ear</b>	p.c.	after meals
<b>AU</b>	<b>both ears</b>	p.o.	by mouth
b.i.d.	two times a day	p.r.n.	when required;
B.M. or BM	bowel movement		as needed
B.P. or BP	blood pressure	q.	every
c, c	with	<b>q.d.</b>	<b>every day</b>
cc	cubic centimeter	q.h.	every hour
cap.	Capsule	q2h	every 2 hours
comp.	compound; compounded of	q3h	every 3 hours
D.C.	discontinue	q4h	every 4 hours
dr	dram	<b>q.o.d.</b>	<b>every other day</b>
elix.	elixir	q.i.d.	four times a day
gr.	Grain	R, ®	rectal
Gm,gm.,g	gram	Rx	take
Gtt	drop	s,s	without
h.	an hour	sol.	A solution
(H)	hypodermic, also subQ	ss, ss.	A half
h.s.	hour of sleep; bedtime	stat	immediately; at once
I.M.	intramuscular	subl., S.L., sl	sublingual
Inj.	Injection	subQ, <b>sc, s.c.</b>	subcutaneous
I.V.	intravenous	suppose.	Suppository
L.	liter	syr.	Syrup
m.	minim	T.	temperature
med.	A medicine	tab.	A tablet
mcg.	microgram	tbsp, T	tablespoon
mEq.	Milliequivalent	tsp, t	teaspoon
mg.	milligram	t.i.d.	three times a day
ml.	milliliter	tinc.,tr.	A tincture
noc	night	ung.,ungt.	An ointment
NKA	no known allergy	Vag.	Vaginal
NPO	nothing by mouth	W.A.	while awake

\* **bold items** (see JACHO ‘do not use’ list next page)



**Abbreviations and Symbols**  
(Found on client charts, not on computer programs)

CO <sup>2</sup>	carbon dioxide
↓	decrease
>	greater than
/	per
↑	increase
K	potassium
Na	sodium
Cl	chloride
Ca	calcium
<	less than
O <sup>2</sup>	oxygen
® or PR	rectal
H <sup>2</sup> O	water
c	with
s	without
p      pc	after      after meals
a      ac	before      before meals
Ψ	Psych or psychiatric
Δ	change

**National Patient Safety Goals**

The NPSG's are based on national statistics related to high risk issues in healthcare settings.  
All facilities accredited by the JACHO must fully meet these goals.

<b><u>DO NOT USE</u></b>	<b><u>USE THIS INSTEAD</u></b>
<b>'u' or 'U'</b>	Write the word "Unit"
<b>q.d. or Q.D.</b>	Write the words "daily" or "every day"
<b>q.o.d. or Q.O.D.</b>	Write the words "every other day"
<b>S.C. or S.Q</b>	Write "Sub Q" or "Subcutaneous"
<b>c.c. or cc</b>	Use "ml" for milliliter instead
<b>A.S., A.D., A.U.</b>	Write the words "right, left, or both ears"
<b>O.S., O.D., O.U.</b>	Write the words "right, left, or both eyes"
<b>µg</b>	Use "mcg" or write the word "microgram"
<b>IU</b>	Write the words "International Unit"

## Practice Application of Abbreviations 1

Write abbreviations for terms:

1. under the tongue \_\_\_\_\_ or \_\_\_\_\_
2. without \_\_\_\_\_
3. every three hours \_\_\_\_\_
4. both ears \_\_\_\_\_
5. hour of sleep \_\_\_\_\_
6. suppository \_\_\_\_\_
7. ounce \_\_\_\_\_ or \_\_\_\_\_
8. after meals \_\_\_\_\_
9. nothing by mouth \_\_\_\_\_
10. milliequivalent
11. intravenous \_\_\_\_\_
12. with \_\_\_\_\_
13. left eye \_\_\_\_\_

Briefly define the abbreviations

14. p.r.n. \_\_\_\_\_
15. q.o.d. \_\_\_\_\_
16. ml. \_\_\_\_\_
17. DC \_\_\_\_\_
18. q.d. \_\_\_\_\_
19. p.o. \_\_\_\_\_
20. t.i.d. \_\_\_\_\_
21. s.s. \_\_\_\_\_
22. a.c. \_\_\_\_\_
23. O.D. \_\_\_\_\_
24. ungt. \_\_\_\_\_
25. gr. \_\_\_\_\_

See answer key at the end of the exercises

## Practice Application of Abbreviations 2

Briefly define abbreviations:

Write abbreviations for terms:

1. N.P.O. \_\_\_\_\_

2. q4h \_\_\_\_\_

3. p.c. \_\_\_\_\_

4. mEq \_\_\_\_\_

5. c \_\_\_\_\_

6. S.L. \_\_\_\_\_

7. s \_\_\_\_\_

8. I.V. \_\_\_\_\_

9. os. \_\_\_\_\_

10. h.s. \_\_\_\_\_

11. mcg. \_\_\_\_\_

12. suppos. \_\_\_\_\_

13. one-half \_\_\_\_\_

14. less than \_\_\_\_\_

15. four times a day \_\_\_\_\_

16. right eye \_\_\_\_\_

17. kilogram \_\_\_\_\_

18. discontinue \_\_\_\_\_

19. as needed \_\_\_\_\_

20. every day \_\_\_\_\_

21. before meals \_\_\_\_\_

22. ointment \_\_\_\_\_

23. every other day \_\_\_\_\_

24. drop \_\_\_\_\_

25. by mouth \_\_\_\_\_

See answer key at the end of the exercises

### Application of Abbreviations 3

Directions: Circle the correct answer

1. The abbreviation gm. is accepted for:
  - a. grain
  - b. gram
  - c. dram
  - d. drop
2. The abbreviation p.c. is accepted for:
  - a. as desired
  - b. after meals
  - c. before meals
  - d. of each
3. The abbreviation O.U. is accepted for:
  - a. left eye
  - b. right eye
  - c. both eyes
  - d. no eyes
4. The abbreviation p.o. is accepted for:
  - a. by mouth
  - b. after meals
  - c. before meals
  - d. intramuscular injection
5. The abbreviation dr. is accepted for:
  - a. grain
  - b. gram
  - c. dram
  - d. drop
6. The abbreviation bid is accepted for:
  - a. once a day
  - b. twice a day
  - c. three times a day
  - d. four times a day
7. The abbreviation PRN. is accepted for:
  - a. at bedtime
  - b. every morning
  - c. immediately
  - d. when needed
8. The abbreviation gr. is accepted for:
  - a. grain
  - b. gram
  - c. dram
  - d. drop
9. The abbreviation a.c. is accepted for:
  - a. as desired
  - b. after meals
  - c. before meals
  - d. of each
10. The abbreviation O.D. is accepted for:
  - a. left eye
  - b. right eye
  - c. both eyes
  - d. no eyes.
11. The abbreviation I.M. is accepted for:
  - a. by mouth
  - b. sublingual
  - c. intramuscularly
  - d. subcutaneously
12. The abbreviation oz. is accepted for:
  - a. grain
  - b. gram
  - c. dram
  - d. ounce
13. The abbreviation qid is accepted for:
  - a. once a day
  - b. twice a day
  - c. three times a day
  - d. four times a day
14. The abbreviation H.S. is accepted for:
  - a. at bedtime
  - b. every morning
  - c. immediately
  - d. when needed
15. The abbreviation mg. is accepted for:
  - a. milligram
  - b. microgram
  - c. dram
  - d. drop
22. The doctor's order reads paraldehyde 4 ml. tid prn. The drug should be given:
  - a. three times a day if necessary
  - b. four times a day
  - c. twice a day
  - d. immediately and four times a day

16. The abbreviation ad lib is accepted for:
- as desired
  - after meals
  - before meals
  - of each
17. The abbreviation O.S. is accepted for:
- left eye
  - right eye
  - both eyes
  - no eyes
18. The abbreviation S.L. is accepted for:
- by mouth
  - sublingual
  - slowly
  - subcutaneously
19. The abbreviation gtt. is accepted for:
- grain
  - gram
  - dram
  - drop
20. The abbreviation tid is accepted for:
- once a day
  - twice a day
  - three times a day
  - four times a day
21. The abbreviation stat is accepted for:
- at bedtime
  - every morning
  - immediately
  - when needed
23. Aspirin 0.3 Gm. stat and tid prn. was ordered  
The aspirin should be given:
- once, if necessary
  - every three hours if necessary
  - immediately and three times a day if necessary
  - every two hours and at once
24. Chlortetracycline 250 mg. I.M., q. 4h. was ordered. Chlortetracycline should be given:
- intramuscularly every four hours
  - by hypodermic injection at once and repeated in 4 hours
  - by mouth every 4 hours
  - intravenously in 4 doses
25. Meperidine hydrochloride (Demerol) 50 mg. stat and q. 4 hrs prn. for 24 hrs was ordered.  
The drug should be given:
- immediately and every 4 hours if necessary for the next 24 hours
  - twenty-four times
  - four times
  - intravenously in 4 doses
26. Procaine penicillin 400,000 units I.M., bid was ordered. The nurse should give the procaine penicillin:
- once a day – by injection
  - four times a day – intramuscularly
  - every 12 hours – intramuscularly
  - four times in 24 hours – intramuscularly

## Application of Abbreviations – Answer Key

### Application of Abbreviations I

1. subl. or s.l. or sl
2. s
3. q3h
4. au or AU
5. H.S.
6. supp. or suppose.
7. 3 or oz
8. p.c.
9. N.P.O.
10. MEq
11. I.V.
12. c
13. O.S.
14. as needed, when required
15. every other day
16. milliliter
17. discontinue
18. every day
19. by mouth
20. 3 times a day
21. one-half
22. before meals
23. right eye
24. ointment
25. grain

### Applications of Abbreviations 2

1. nothing by mouth
2. every four hours
3. after meals
4. millequivalent
5. with
6. sublingual
7. without
8. intravenous
9. mouth
10. bedtime, hour of sleep
11. microgram
12. suppository

13. ss
14. <
15. qid
16. OD
17. Kg
18. D.C.
19. prn
20. q.d.
21. a.c.
22. ung. or ungt.
23. q.o.d.
24. gtt
25. p.o.

### Applications of Abbreviations 3

1. b
2. b
3. c
4. a
5. c
6. b
7. d
8. a
9. c
10. b
11. c
12. d
13. d
14. a
15. a
16. a
17. a
18. b
19. d
20. c
21. c
22. a
23. c
24. a
25. a
26. c

**Week 2 – Calculating Medication Dosages**  
**Study Guide 2.2**  
**Pharmacology Vocabulary**

Absorption	Excretion	Optic
Allergic reaction	“Five (5) Rights”	Oral
Ampule	Fowler’s position	Oropharyngeal
Anaphylactic reaction	Fraction	Optic
Anti-	Gastrointestinal (G.I.)	Parenteral
Anticoagulant	Generic name	Patrial Thromboplasm Time (PTT)
Antidote	Glucometer	Pharmacokinet
Apothecaries System	Half-life	Prophylactic
Aspiration	Idiosyncratic effect (of drug)	Prothrombin Time (PT)
Auricle	Inhalation	Rectal
Bioavailability	Instillation	Serum concentration
Biotransformation (detoxification)	Insulin	Serum half-life
Buccal	Intramuscular	Side effects
Calibration	Inunction	“Sliding Scale”
Canthus	Kardex	Sphincter muscle
Common fraction	Lacrimal duct	Subcutaneous
Contraindications	Lateral Sims’ position	Sublingual
Controlled substances	Local action	Suppository
Cumulative effect	Medical asepsis	Synergistic effect (of drugs)
Decimal fraction	Medical record	Systemic action
Denominator	Meniscus	Therapeutic effect (of drugs)
Distribution	Metric system	Thrombosis
Dorsal recumbent position	Minum	Topical
Drug abuse	Mucous membrane	Toxicity (toxic effect)
Drug allergy	Narcotics	Trade name
Drug dependence	Numerator	Unit-dose system
Drug interaction	Official name	Unit of insulin
Drug tolerance	Opiate	Untoward
Embolus	OTC (over the counter)	Vaginal
Emetic	Ophthalmic	Vial
	Opiate	

**Week 2 – Calculating Medication Dosages**  
**Study Guide 2.3**  
**Rounding Policy**

**General Rule-** 5 or more round up.  
Less than 5 round down.

**Tablets-** If scored, the tablet may be broken in half or fourths, depending on how it is scored, to give the correct dose. In practice, we sometimes divide unscored tablets. In Nursing 100, round all tablets in test questions to the nearest half ( $1/2$  or 0.5) tablet whether or not it is scored.

**Capsules to nearest whole-** Great care must be taken in rounding these forms of drugs. Whether you will round or not depends on the amount of medication you need, the amount of drug in the tablet or capsule, and the type of medication. The pharmacy may be able to send you a tablet or capsule of the correct dosage. Know the medications.

**Drops-** to the nearest whole.

**Parenteral drugs for intramuscular and subcutaneous injections-** These are usually rounded to the nearest tenth. (Work the problem out to at least two decimal places before rounding.) The syringes used for administration of intramuscular drugs are commonly calibrated in tenths. Certain very potent medications are given in syringes marked in hundredths. (To make the calculations work the problem to 3 decimal places before rounding.) Know the medications.

This policy for rounding applies to first and second semester dosage problems. Later, when you calculate pediatric doses and medications used in intensive care units, you will need to work the problems to 3 decimal places before rounding.

In Nursing 100, round everything to the nearest tenth except tablets, capsules, and drops for all exams. Note: this includes tsp., cc, ml, pounds, kg., etc. In the hospital you change 0.7 tsp to cc and use a syringe to measure.

**Note: The exceptions:**

1. When changing  $1/6$  to a decimal, use 0.17 for your calculations.
2. When changing  $1/150$  to a decimal, use 0.007 for your calculations
3. When changing  $1/200$  to a decimal, use 0.005 for your calculations

This gives you a more accurate answer.



## Rounding Policy Application

Following the rounding policy, correctly round each of the following.

1. 0.72 tabs = \_\_\_\_\_ tabs

2. 0.83 cc = \_\_\_\_\_ cc

3. 0.9 caps = \_\_\_\_\_ caps

4. 0.75 ml = \_\_\_\_\_ ml

5. 0.43 tabs = \_\_\_\_\_ tabs

6. 1.23 tabs = \_\_\_\_\_ tabs

7. 1.15 caps = \_\_\_\_\_ caps

8. 2.05 tabs = \_\_\_\_\_ tabs

9. 0.98 cc = \_\_\_\_\_ cc

10. 0.33 ml = \_\_\_\_\_ ml

## Answer Key

1. 0.5 tabs

2. 0.8 cc

3. 1 cap

4. 0.8 ml

5. 0.5 tabs

6. 1 tab

7. 1 cap

8. 2 tabs

9. 1 cc

10. 0.3 ml

**Week 2 – Calculating Medication Dosages**  
**Study Guide 2.4**  
**Military Time**

Known also as the 24-hour clock. Used in almost all hospitals at this time. Four digits are used to write military time: 0000. The first 2 digits represent hours, the last 2 represent minutes. Starts at 1 minute after midnight: 0001. Hours that are not 2 digits are preceded by “0”: 0400 is 4 A.M., 0830 is 8:30 A.M.

Calculate the hours after 12 noon (1200) by adding 12 to the actual time:

$$1:30 \text{ P.M.} = 1:30 + 12 = 1330$$

$$9:15 \text{ P.M.} = 9:15 + 12 = 2115$$

Reverse the rules to change military time to standard time.

<u>Change to standard time</u>	<u>Change to military time</u>
A. 005	E. 11:45 P.M.
B. 0930	F. 4:30 A.M.
C. 1415	G. 8:30 P.M.
D. 2200	H. 12 Noon

- I. The military time notation 1015 is written as \_\_\_\_\_ in standard time.
- 10:15 A.M.
  - 10:15 P.M.
  - Could be used for either
  - None of the above are correct
- J. The time notation 12:30 A.M. is written as \_\_\_\_\_ in military time.
- 2430
  - 0030
  - Neither of the above is correct
- K. The time notation 4 P.M. is written as \_\_\_\_\_ in military time.
- 0400
  - 1400
  - 1600
  - 1800
- L. The physician orders the lab to draw blood for a blood sugar test at 0630, 1130, 1700, and 2230. This means blood will be drawn at:
- 6:30 A.M., 11:30 A.M., 5:30 P.M., 9:00 P.M.
  - 6:00 A.M., 11:30 A.M., 5:30 P.M., 10:30 P.M.
  - 6:30 A.M., 11:30 A.M., 5:30 P.M., 10:00 P.M.
  - 6:30 A.M., 11:30 A.M., 5:00 P.M., 10:30 P.M.

## Answers

A. 12:05 A.M.

B. 9:30 A.M.

C. 2:15 P.M.

D. 10:00 P.M.

E. 2345

F. 0430

G. 2030

H. 1200

I. a

J. b

K. c

L. d

**Week 2 – Calculating Medication Dosages**  
**Study Guide 2.5**  
**Review of Essential Mathematics**

**A. Introduction**

Knowledge of certain mathematical skills is necessary for health care workers, especially in situations where the worker is expected to calculate accurate medication dosages for individual clients.

This study guide is designed to help you identify the areas of mathematical operations in which you need improvement.

In order to evaluate your mathematical skills, work the following problems and check your answers with the answer key at the end of the exercise.

If you have difficulty in any of the areas included in this review, please see your instructor. If you feel confident in these review skill areas, continue your studies in this module.

**B. Skills self-examination**

<u>Skill areas</u>	<u>Your answers</u>
1. Express in Roman numerals a. 4 _____ b. 47 _____	a. _____ b. _____
2. Express in Arabic numerals a. XVI _____ b. LIX _____	a. _____ b. _____
3. a. Add: 2.5, 0.18, 3.725 b. Subtract: 12.352 from 19.5	a. _____ b. _____
4. Multiply: a. 0.13 by 1000 b. 1.25 by 0.5 c. 0.12 by 0.003	a. _____ b. _____ c. _____
5. Divide: a. 0.12 by 0.4 b. 15 by 1.5 c. 0.6 by 0.15	a. _____ b. _____ c. _____
6. Rank the following numbers from the highest value to the lowest value: 0.13, 1.28, 0.1, 0.239 _____	
7. Perform the indicated operations: a. $1/5 + 1/2 + 7/8$ b. $2/9 - 1/6$ c. $3/8 \times 2/7 \times 5/6$ d. $4 \times 3/5 \times 2 \frac{1}{2}$ e. $2/7 \div 2/14$ f. $3 \div 9.10$	a. _____ b. _____ c. _____ d. _____ e. _____ f. _____
8. Rank the following fractions from highest value to the lowest value: $1/2, 3/4, 5/6, 2/3$ _____	

### C. Answer key

1. a. IV  
b. XLVII
2. a. 16  
b. 59
3. a. 6.405  
b. 7.148
4. a. 130  
b. 0.625  
c. 0.00036
5. a. 0.3  
b. 10  
c. 4.0
6. 1.28; 0.239; 0.13; 0.1
7. a.  $1 \frac{23}{40}$   
b.  $\frac{1}{18}$   
c.  $\frac{5}{56}$   
d. 6  
e. 2  
f.  $3 \frac{1}{3}$
8.  $\frac{5}{6}$ ;  $\frac{3}{4}$ ;  $\frac{2}{3}$ ;  $\frac{1}{2}$

**Week 2 – Calculating Medication Dosages**  
**Study Guide 2.6**  
**Roman Numerals**

1. Letters are used to indicate numbers.
2. Repeating a number 2 times doubles its value.
3. Repeating a number 3 times triples its value.
4. Roman numerals are never repeated more than 3 times.
5. When a Roman numeral is followed by a smaller one, add.
6. When a Roman numeral is preceded by a smaller one, subtract.
7. When a smaller Roman numeral comes between two larger ones, subtract, then add.

**Roman numerals**

ss = $\frac{1}{2}$	IX = 9
I = 1	X = 10
II = 2	L = 50
III = 3	C = 100
IV = 4	CL = 150
V = 5	D = 500
VI = 6	M = 1000

May be written either in lower or upper case letters.

VI = 6
CL = 150

Change to Arabic numbers

Change to Roman numerals

- |          |         |
|----------|---------|
| A. VIII  | E. 1000 |
| B. XIX   | F. 24   |
| C. XISS  | G. 35   |
| D. CXLVI | H. 174  |

**Answers**

- |                    |           |
|--------------------|-----------|
| A. 8               | E. M      |
| B. 19              | F. XXIV   |
| C. $12\frac{1}{2}$ | G. XXXV   |
| D. 146             | H. CLXXIV |



**Week 2 – Calculating Medication Dosages**  
**Study Guide 2.7**

**Table of Approximate Equivalents**

1 Kg. = 2.2 lb.	1000 mcg = 1 mg
1 Gm. = gr. xv (15) or xvi (16)	1000 mg = 1 gm
1000 Gm. = 1 Kg	1000 mg = 15 gr
60-65 mg. = gr. i	15 cc. = 1 tablespoon
1000 cc. = 1 qt. = 1 L.	5 cc. = 1 tsp.
30 cc. = 1 ounce	1 cc = 60 microdrop ( for I.V. problems)
1 cc. = 1 ml.	

**These are the approximate equivalents you are to memorize.**

Quiz 1

1. \_\_\_\_\_ cc = 1 tsp.
2. 1 Gm. = gr. \_\_\_\_\_ or \_\_\_\_\_
3. \_\_\_\_\_ mg. = 1 Gm.
4. 60-65 mg. = gr. \_\_\_\_\_
5. \_\_\_\_\_ cc. = 1 tbsp.
6. \_\_\_\_\_ cc. = 1 tsp.
7. \_\_\_\_\_ kg. = 2.2 lb.
8. 30 cc. = \_\_\_\_\_ oz.
9. 1000 mcg. = 1 qt. = 1 L.
10. \_\_\_\_\_ cc. = 1 qt. = 1 L.

Quiz 2

1. \_\_\_\_\_ kg. = 2.2 lb.
2. gr. xv-xvi = \_\_\_\_\_ Gm.
3. 60-65 mg. = gr. \_\_\_\_\_
4. 1000 cc. = \_\_\_\_\_ qt. = \_\_\_\_\_ L.
5. 30 cc. = \_\_\_\_\_ oz.
6. 1000 mg. = \_\_\_\_\_ Gm.
7. 1000 mcg. = \_\_\_\_\_ mg.
8. \_\_\_\_\_ cc. = 1 tbsp.
9. 5 cc. = \_\_\_\_\_ tsp.
10. 1 tbsp. = \_\_\_\_\_ tsp.

## Application of Approximate Equivalents. ANSWER KEY

### QUIZ 1

1. 5 cc. = 1 tsp.
2. 1 Gm. = gr. 15 or 16
3. 1000 mg. = 1 Gm.
4. 60-65 mg. = gr. 1
5. 15 cc. = 1 tbsp.
6. 5 cc. = 1 tsp.
7. 1 kg. = 2.2 lb.
8. 30 cc. = 1 oz.
9. 1000 mcg. = 1 mg.
10. 1000 cc. = 1 qt. = 1 L.

### QUIZ 2

1. 1 kg. = 2.2 lb.
2. gr. xv-xvi = 1 Gm.
3. 60-65 mg. = gr. 1
4. 1000 cc. = 1 qt. = 1 L.
5. 30 cc. = 1 oz.
6. 1000 mg. = 1 Gm.
7. 1000 mcg. = 1 mg.
8. 15 cc. = 1 tbsp. (3 household tsp.)
9. 5 cc. = 1 tsp.
10. 1 tbsp. = 3 tsp.

**Week 2 – Calculating Medication Dosages**  
**Study Guide 2.8**  
**Introduction to Dimensional Analysis**

Calculating medication dosage problems by Dimensional Analysis is the easiest and most accurate way for nursing students to learn medication dosage calculation. Once you learn this method of dosage calculation, you will do all dosage problems this way. You will not need to memorize formula to calculate dosage problems. This study guide was written to help you learn the steps and to be successful in calculation dosage problems.

**Definition of Dimensional Analysis**

The calculation of problems by changing a given quantity from one unit of measurement to another unit of measurement based on known relationships between units.

**OR**

\*Dimensional Analysis is defined as a problem-solving method that changes units of measurement to another by multiplying a particular unit of measurement by a conversion factor.

**Steps in using Dimensional Analysis**

- A. Determine what units have been ORDERED (Starting Factor).
- B. Determine what units you SEEK to solve the problem (Answer Label).
- C. Multiply by appropriate CONVERSION FACTORS.

Examples:  $\frac{3 \text{ ft.}}{1 \text{ yd.}}$  or  $\frac{1 \text{ yd.}}{3 \text{ ft.}}$        $\frac{12 \text{ in.}}{1 \text{ ft.}}$  or  $\frac{1 \text{ ft.}}{12 \text{ in.}}$

**Note\*:** A conversion factor produces a change in the form of a quantity or expression without changing its value.

$\frac{8 \text{ ounces}}{1 \text{ cup}}$        $\frac{3 \text{ tsb.}}{1 \text{ tbsp.}}$

- D. Use computation to do ARITHMETIC

**A** ORDER or BEGINNING      *times*      **C** CONVERSION FACTORS      *equals*      **B** SEEK or the ANSWER

The amount that **A** (ORDERED) is multiplied by **C** (a known CONVERSION FACTOR or FACTORS) to equal **B** *the* answer (what you SEEK)

\*Wilson, p. 35

Another way of stating this is:

Starting Factor *times* Conversion factor(s) *equal* Answer label.

E. Calculations. Use the tips and methods identified for you during your basic math review. Often, after reducing large numbers by canceling, the answer is obvious without much more mathematical work. Remember, if the labels are in their correct positions, the numbers will ‘fall’ into their proper place.

**Example:**

How many yards are there in 54 inches?

**A**      *times*   **C**      *equals*      **B**

54 inches    *times*     $\frac{1 \text{ ft.}}{12 \text{ in.}}$     *times*     $\frac{1 \text{ yd.}}{3 \text{ ft.}}$     *equals*    3    *equals*     $\frac{1 \frac{1}{2} \text{ yards}}{\text{or } 1.5 \text{ yds.}}$

**Defining and Practicing the Steps**

**A. DETERMINE WHAT UNITS HAVE BEEN ORDERED.**

The following are some of the forms that your order may take in different problems:

- CHANGE
- THE GIVEN QUANTITY
- THIS IS WHAT YOU ARE GOING TO CHANGE
- “...ARE IN...”
- “YOU ARE REQUIRED TO GIVE...”
- “THE PHYSICIAN ORDERS...”
- “THE GIVEN QUANTITY...”

Listed below are some examples of dosage problems. Do not attempt to solve the problems. First, we are going to identify **A**, the order, or what you are going to change. In the answer column on your right, enter what you determine to be **A** (order). Be sure to label your answer.

- |   |              |
|---|--------------|
| 1. How many inches are in 4 feet?   | 1.    4 feet |
| 2. _____ Minutes = 3 ¼ Hours  | 2. _____     |
| 3. The client is to be given 1 gm. of medication stat. You have on hand 5 grain tablets. How many tablet(s) will you give?          | 3. _____     |
| 4. You have a bottle labeled ‘Elixir of Phenobarbital’ gr. xv/cc. You are to administer 0.5 gm. orally. How many cc do you prepare? | 4. _____     |
| 5. A 1 ml. ampule of caffeine with sodium benzoate contains gr. viiss. How many cc would be necessary to give gr. xxx?              | 5. _____     |

## B. DETERMINE WHAT UNITS YOU SEEK.

This may also be asked in many different ways.

AN UNKNOWN ANSWER

WHAT THE GIVEN QUANTITY NEEDS TO BE CHANGED TO

“HOW MANY...?”

“HOW MUCH...?”

“WHAT NUMBER OF TABLETS (CC’s, CAPS, etc.)...?”

Listed below are some more examples of dosage problems. Do not attempt to solve the problems. We are now going to determine **B** (the answer label we seek).

Identify **B**, the answer label you are looking for (tablets, cc., gr., tsp., etc.) in each of the following problems. In the answer column on the right, enter what you determine to be **B** (the answer label you are seeking).

- |   |          |
|---|----------|
| 1. 1 ½ cups = _____ tbsp.?  | 1. Tbsp. |
| 2. The physician ordered aspirin Grains 7 ½ .<br>You have on hand 2 ½ grain tablets. How<br>Many tablets will you give?                 | 2. _____ |
| 3. There are 2 grains of medication in 10 cc.<br>How many cc’s are needed to give 240 mg.?  | 3. _____ |
| 4. You are to give Codeine 45 mg. SC (subcutaneous)<br>from a vial of codeine labeled gr. I = 2 ml.<br>How much should you administer?  | 4. _____ |
| 5. The bottle of “Elixir of Donnato!” is labeled<br>tsp. 1 = gr. x. The physician ordered 600 mg.<br>How many tsp. will you administer? | 5. _____ |

## C. DETERMINE THE CONVERSION FACTORS YOU WILL USE.

These are determined by a relationship between the given quantity and the units in the answer. A Conversion Factor is “the statement of a known relationship between two entities.”

Examples:      $\frac{12 \text{ inches}}{1 \text{ foot}}$       $\frac{2 \text{ pints}}{1 \text{ quart}}$

### Where you will find Conversion Factors:

1. Equivalents are listed in Study Guide 2.7. These are the ones you are to memorize.
2. Some Conversion Factors are in the dosage problem indicating how labels on bottles and vials are prepared and labeled by the manufacturer.

THERE ARE GR. V. IN ONE TABLET  
 1 CC. OF MEDICATION = 100 MG.  
 1 CAP/1 GRAM  
 5 ML = GR. 10

3. Others are known (common knowledge) relationships, such as:

$\frac{12 \text{ Inches}}{1 \text{ foot}}$	$\frac{2 \text{ pints}}{1 \text{ quart}}$	$\frac{60 \text{ minutes}}{1 \text{ hour}}$	$\frac{24 \text{ hours}}{1 \text{ day}}$	$\frac{4 \text{ cups}}{1 \text{ quart}}$
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**Examples:**

1. The physician ordered 10 cc. of cough medication. How many teaspoons will you give?

A Order *times* C Conversion Factor(s) *equals* B Answer Label

$$\frac{10 \text{ cc}}{1} \times \frac{1 \text{ tsp.}}{5 \text{ cc.}} = \underline{\hspace{2cm}} \text{ tsp.}$$

Note the relationship. Any label (for example: cc., gm., gr., etc.) in the top position (the numerator) will cancel with its counterpart found in a bottom position (the denominator). The 5 cc. is on the bottom, so we can cancel the cc. The tsp. must be on the top so that after all the labels are cancelled we will have a tsp. on each side of the equal sign. The conversion factor came from the Table of Equivalents.

Rule 1: One side of an equation can be multiplied by a conversion factor without changing the value of the equation.

Rule 2: The problem is correctly set up when all labels cancel, from both the numerator and the denominator, except the label that is desired in the answer.

2. The client is to be given 2 gm. of medication stat. You have on hand 10 grain tablets. How many tablets will you give? Apply Rules 1 & 2 from previous example.

A Order *times* C Conversion Factor(s) *equals* B Answer Label

$$\frac{2 \text{ gm.}}{1} \times \frac{\text{gr.15}}{1 \text{ gm.}} \times \frac{1 \text{ tab}}{\text{gr.10}} = \underline{\hspace{2cm}} \text{ tab}$$

Note the relationship. The 1 gm. is on the bottom, so we can cancel gm. on top. The tab must be on top so that after all the labels are cancelled we will have a tab on each side of the equal sign. The first conversion factor came from the Table of Equivalents. The second was found in the problem.

When we multiply by appropriate Conversion Factors, we solve the problem.

In the following dosage problems, identify the conversion factors you would use to set up the dimensional analysis statement. Check off where you found the C.F. (Conversion Factor).

Here are some household equivalents to help you with these problems.

- 3 teaspoons (tsp.) = 1 tablespoon (tbsp.)
- 2 tablespoons = 1 ounce (oz.)
- 8 ounces = 1 cup (c.)
- 2 cups = 1 pint (pt.)
- 2 pints = 1 quart (qt.)
- 4 quarts = 1 gallon (gal.)

In the answer column on the right, enter what you determine to be C, the conversion factor(s).

1. Jim is to drink 2 quarts of water in 24 hours.      1.  $\frac{2 \text{ pt.}}{1 \text{ qt.}}$        $\frac{2 \text{ cups}}{1 \text{ pt.}}$       How many cups is this?      Conversion  
If you know that 4 cups = 1 qt., only one conversion factor is needed.  
Factor came from Table of Equivalent \_\_\_\_\_

The Problem \_\_\_\_\_  
Known Relationship  $\frac{X}{X}$  \_\_\_\_\_

If you use more than one Conversion Factor that does not come from the same source, write *first, second, third, etc.*

**Example:**

Conversion Factor came from Table of Equivalent first  
The Problem third  
Known Relationship second

2. How many tsp. in one oz.      2. \_\_\_\_\_  
Conversion Factor came from Table of Equivalent \_\_\_\_\_  
The Problem \_\_\_\_\_  
Known Relationship \_\_\_\_\_

3. \_\_\_\_\_ Minutes = 3-1/4 Hours      3. \_\_\_\_\_  
Conversion Factor came from Table of Equivalent \_\_\_\_\_  
The Problem \_\_\_\_\_  
Known Relationship \_\_\_\_\_

4. 1-1/2 cups = \_\_\_\_\_ tbsp.      4. \_\_\_\_\_  
Conversion Factor came from Table of Equivalent \_\_\_\_\_  
The Problem \_\_\_\_\_  
Known Relationship \_\_\_\_\_

5. A 1 ml. ampule of caffeine with sodium benzoate contains gr. viiss.      5. \_\_\_\_\_  
How many cc. would be necessary to give gr. xxx?  
Conversion Factor came from Table of Equivalent \_\_\_\_\_  
The Problem \_\_\_\_\_  
Known Relationship \_\_\_\_\_

**D. CALCULATE THE ANSWER.**

1. **Cancel wherever possible.**
2. **Reduce to lowest terms.**
3. **Multiply the numerators together.**
4. **Multiply the denominators together.**
5. **Divide the numerator by the denominator.**

Set up each of the following problems and solve them by dimensional analysis. To be correct you must have the set-up correct and the correct answer labeled. Remember, **A x C = B.**

**D** is your calculation.

1. 6 oz. = \_\_\_\_\_ tbsp.
  
2. The physician ordered aspirin Grains 7-1/2. You have on hand 1000 mg. tablets. How many tablet(s) will you give?
  
3. There are 10 grains of medication in 5 cc. How many tsp(s) will you need to give 25 grains?
  
4. You are to give Codeine 45 mg. SC (subcutaneous) from a vial of codeine labeled 30 mg. – 1 ml. How many cc(s) should you administer?
  
5. The bottle of “Elixir of Donnatol” is labeled 5 cc. = gr. x. You are to give gr. v. How many tsp(s) will you administer?
  
6. How many grains are in 90 mg?



7. \_\_\_\_\_ hours =  $\frac{1}{4}$  of a day.

8. The client is to be given 0.5 gm. of medication stat. You have on hand 15 grain tablets. How many tablet(s) will you give?

9. You have a bottle labeled "Elixir of Phenobarbital" 120 mg./10cc. You are to administer gr. ii orally. How many cc(s) do you prepare?

10. A 1 ml. ampule of caffeine with sodium benzoate contains gr. viiss. How many cc(s) would be necessary to give gr. xxiiss?

