

PHARMACY TECHNICIAN CERTIFICATION EXAMINATION CONTENT OUTLINE.....

I. Assisting the Pharmacist in Serving Patients: 66% of Examination

Includes activities related to traditional pharmacy prescription dispensing and medication distribution.

1. Receive prescription/medication order from patient/patient's representative, prescriber, or other healthcare professionals.
2. At the direction of the pharmacist, assist in obtaining from the patient/patient's representative such information as diagnosis or desired therapeutic outcome, medication use, allergies, adverse reactions, medical history, psychosocial history, visual impairment, physical disability, and reimbursement mechanisms.
3. Assess prescription/medication order for completeness, correctness, authenticity, and legality.
4. At the direction of the pharmacist, assist in obtaining from prescriber and/or other health care professionals important information
5. Update the medical record/patient profile with such information as medication history, allergies, medication duplication, and/or drug-disease, drug-drug, drug-laboratory interactions.
6. Process the prescription/medication order
7. Storing and delivering medication to patient/patient's representative
8. Determine charges and obtain compensation for services.
9. Provide supplemental information, as indicated (e.g. patient package inserts, computer information and videos)

II. Medication Distribution and Inventory Control Systems: 22% of Examination

Includes activities related to medication and supply purchasing, inventory control, and preparation and distribution of medications according to approved policies and procedures.

1. Place orders for pharmaceuticals, durable medical equipment, devices, and supplies
2. Receive goods and verify specifications on original purchase orders
3. Place pharmaceuticals, durable medical equipment, devices, and supplies in inventory under proper storage conditions
4. Remove from inventory expired/discontinued/slow-moving pharmaceuticals, durable medical equipment, devices, and supplies, and document actions taken
5. Recalls and document actions taken
6. Identify supplies to be ordered (i.e. "want book")
7. Communicate changes in product availability (i.e. formulary changes, recalls)
8. Maintain policies and procedures to deter theft and/or drug diversion
9. Maintain a record of controlled substances received, stored, and removed from inventory
10. Maintain recordkeeping systems for repackaging, recalls, and returns of supplies
11. Compound medications in anticipation of prescriptions/medication orders (i.e. bulk compounding)
12. Prepackage finished dosage forms for dispensing
13. Collect and analyze data on the quality of pharmacy products and services

III. Operations: 12% of Examination

Includes activities related to the administrative processes for the pharmacy practice.

1. Coordinate communications throughout the practice center and/or service area
2. Participate in meetings to obtain feedback regarding the performance in the practice center
3. Monitor for compliance with federal, state, and local laws, regulations, and professional standards
4. Implement and monitor policies and procedures for sanitation, hazardous waste handling, and infection control
5. Perform and record routine sanitation, maintenance, and calibration of equipment
6. Maintain a manual or computer based information system

Are You Ready? Checklist



To Do

- Complete registration with PTCB and pick a test date.
- Purchase Study Material
 - Study Manual
 - Math Workbook
 - Advanced Math Problems
 - Practice Exams
- What are the differences between a Prescription and a Medication Order
- Why is a Patient Profile important to complete
- When do you know when to refer a patient to a pharmacist
- Latin Abbreviations
- Absorption, Distribution, Metabolism, Elimination definitions
- Dosage forms
- NDCs
- Expiration Dates
- Unit doses
- Fractions, Decimals, and Roman Numerals
- Conversions
- Alligations
- Celsius and Fahrenheit
- Flow Rates
- Weights that Class A,B and Analytical balances can weigh accurately
- Types of Mortars and what each is for
- Definitions of Levigation, Trituration, Punch Method
- Differences between Conical and graduated Cylinders and how to measure
- Antibiotics
- Cardiovasculars
- GI Meds
- Respiratory Meds
- Diabetes
- Analgesics
- Blood Disorder Meds
- Psychotherapeutic Meds
- Hormones
- HIV/AIDS
- Topicals
- Auxiliary Labels
- Aseptic Technique's dos and don'ts
 - How to clean
 - How to correctly operate
- Differences between Horizontal and Vertical Flowhoods
 - Where the filter is located
 - Direction of airflow
 - Which one to use with hazardous materials
- Syringes/Needles – Names and critical sites
- Differences between vials and ampoules
- IVs and Injections

- TPNs
- Antineoplastics
- Distribution and Inventory
 - Identify Robotic names
 - Formulary System
 - Inventory Systems
 - Purchasing Choices
 - Returns
 - Drug Recalls
- Computer Terminology
- Law
 - FDA Regulates who
 - Durham-Humphrey
 - Kefauver-Harris
 - PPIs
 - Poison Prevention Packaging Act
 - Occupational and Safety Act
 - Poison Log Requirements
 - Controlled Substance Act
 - DEA Identification
 - Amount of Refills allowed
 - Limitations of Pharmacy Technician
 - Repackaging Requirements
 - OBRA
 - DEA Forms
- Classroom Quiz 1 and 2
- Review Past Exam Questions
- Q&As
- Math Workbook
- Advanced Math Problems
- Practice Exams 1,2,3,and 4
- Get a good nights sleep
- Bring pencils and a non-programmable calculator
- Also use the syllabus as a checklist

- _____
- _____
- _____

- _____
- _____

“What is the definition of a prescription?”

A prescription is an order for a medication issued by a licensed medical practitioner.

For example: Physician, dentist, veterinarian, podiatrist, physician assistant, and nurse practitioner.

A prescription is required if the medicine requires medical supervision. The drug is unsafe without medical supervision.

A prescription medication is required by the manufacturer to print on the stock bottle:

“Caution, Federal Law prohibits dispensing without a prescription.”

A prescription may come in different forms:

- Written form from the office*
 - The office may telephone in the prescription (Only RPhs and Interns are allowed to take) No CII's*
 - The office is allowed to fax in the prescription (with an exception: CII's)*
 - The office may transmit through the computer (electronic prescriptions) NO CII's*
-

A prescription is different from a medication order in that: A prescription is an order given to the patient to have filled and a medication order is medications written by the physician in an institution (hospital) and kept on one sheet of paper in the patients file for the whole hospital staff to use. See example on page 8.

Technicians may do refill requests. They must provide the following information to the doctor's office:

- 1. Pharmacy name and Phone Number*
- 2. Patient name and Date of Birth*
- 3. Drug Name, Strength, and Quantity*
- 4. Directions to confirm no change*
- 5. Date of the last refill*

ASSESSING ORDER COMPLETENESS

Elements of a Prescription

Every medication order and prescription should contain the following elements:

- Patients name
- Name of drug (generic or brand)
- Route of Administration
- Dosage form - **Only required if the medicine comes in more than one form**
- Dose
- Strength - **Only required if the medicine has more than one strength available**
- Quantity and frequency of administration
- Prescriber's name and signature
- Prescriber's Drug Enforcement Agency (DEA) number – for controlled substances only
- Date written
- Refill information

Additional information that is included on inpatient orders (hospital) includes:

- Rate or time of administration
- Allergy information
- Account number
- Admission number
- Room and bed location
- Time of day written
- Diagnosis
- Patients diet
- Indication for use of the medication

Labeling Medications

Prescription Label Requirements

Under the Food, Drug, and Cosmetic Act (FDCA), the prescription label must have the following information:

- Name and address of the pharmacy
- Serial number of the prescription (Rx number)
- Date of the prescription or its date of filling or refilling
- Name of the prescriber
- Name of the patient
- Directions for use

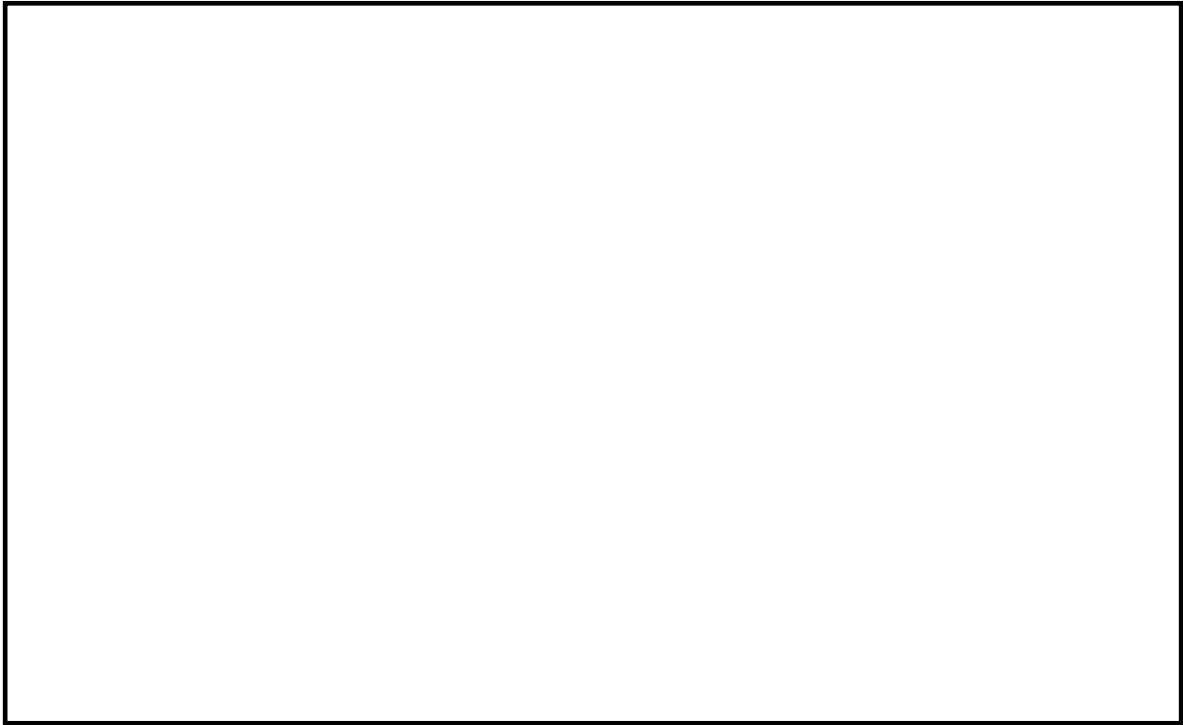
State law may further require the following:

- Address of the patient
- Initials or name of the dispensing pharmacist
- Telephone number of the pharmacy
- Drug name, strength, and manufacturer's lot or control number
- Expiration date of the drug
- Name of the manufacturer
- Amount of the drug dispensed
- Refill information

Elements of a Label

Place all the requirements of a prescription label from memory.

If the medication is a controlled substance, the label must state, "Caution, Federal Law prohibits the transfer of this drug to any person other than the patient for whom it was prescribed." **DO NOT COVER THIS UP WITH AN AUXILARY LABEL.**



"Who regulates what goes on a prescription label?" Answer: FDA

FDA Requirements:

- 1. Name of Pharmacy*
- 2. Address of the Pharmacy*
- 3. Rx Number*
- 4. Date of filling*
- 5. Name of the Patient*
- 6. Directions of Use*
- 7. Address of the Patient*
- 8. Initials of dispensing Pharmacist*
- 9. Phone number of Pharmacy*
- 10. Drug Name, Strength, Form, and Quantity*
- 11. Expiration Date*
- 12. Manufacturer*
- 13. Refill Information*

Elements of a Prescription

Label all the requirements of a prescription.

Draw your own prescription with the following information.



1. Patients name
2. Name of Drug
3. Route of Administration – *If the route is missing, the patient might not take it as you assume.*
4. Dosage Form- *only needed if the drug comes in more than one form.*
5. Dose
6. Strength – *Only needed if the drug comes in more than one strength.*
7. Quantity
8. Prescriber's name printed on the prescription
9. Prescriber's signature
10. Date written
11. Refill information – *if the refill spot is blank then a zero must be placed on the label.*
12. DEA number of the prescriber – *only needed if the medication is a controlled substance.*

Patient Profiles

A patient profile includes a list of all the prescriptions received by a patient and all of the corresponding prescription information (e.g. original date, refill dates, doctor information). Active medications should be listed first, and they should be separated from the discontinued medications. Also, O-T-C medications should also be listed for the pharmacist to monitor interactions.

The following information is usually found in a patient profile:

- Patient name and identification number
- Date of birth or age
- Sex
- Height and weight - **hospital use**
- Diagnosis or health conditions
- Name of parent or guardian
- Patient address and phone number
- Names of practitioners (e.g. physicians, dentists, podiatrists)
- Medication allergies
- Third-party payer information
- Medication history (current, old, and OTC)
- Special considerations (foreign language)
- Clinical comments (e.g. therapeutic monitoring, counseling notes)
- Desired therapeutic outcome – what does the doctor hope to accomplish?

Referring Patients to a Pharmacist

It is very important for technicians to know when to answer a patient's question and when to refer the patient to the pharmacist. Technicians SHOULD NOT interpret a patient-specific question or provide information that may require professional judgment.

The technician is not the one to tell the patient that they need to see a doctor.....that is the pharmacist's job.

There are three reasons why technicians should always refer patients with drug (even OTCs) or health-related questions to a pharmacist:

1. Drug-Drug Interactions

The patient may be taking prescription or other nonprescription drugs that may interact with OTC medication. For example, drugs used for heartburn and acid indigestion interact with heart disease, blood pressure, and seizure disorders.

Aspirin and Coumadin (warfarin) interact and could cause internal bleeding.

2. Drug-Disease State Interactions

Some nonprescription drugs may worsen the patient's existing disease state.

Sudafed (pseudoephedrine) worsens high blood pressure and diabetes therefore should not be taken.

3. Drug-Food Interactions

The absorption of ketoconazole and nitrofurantion increases when taken with fatty foods.

The absorption of Tetracycline, Cipro, Phenytoin decreases when taken with any food.

Grapefruit interacts with Calcium Channel Blockers and estrogens.

Warfarin interacts with food high in Vitamin K (spinach and romaine)

4. Need for Physician Referral

Pharmacists have their limits. The pharmacists are the ones with the knowledge of knowing when the condition requires medical attention.

PATIENT PROFILE

Patient Name

Last

First

Middle Initial

Street or PO Box

City

State

Zip

Phone

Date of Birth

Social Security No.

()

Month Day Year

Male Female

- Yes, I would like medication dispensed in a child-resistant container.
 No, I do not want medication dispensed in a child-resistant container.

Medication Insurance

Card Holder Name

Yes No

Card Holder

Child

Disabled Dependent

Spouse

Dependent Parent

Full Time Student

MEDICAL HISTORY

HEALTH

- Angina
 Anemia
 Arthritis
 Asthma
 Blood Clotting Disorders
 High Blood Pressure
 Breast Feeding
 Cancer
 Diabetes
- Epilepsy
 Glaucoma
 Heart Condition
 Kidney Disease
 Liver Disease
 Lung Disease
 Parkinson's Disease
 Pregnancy
 Ulcers

Other Conditions _____

ALLERGIES AND DRUG REACTIONS

- No known drug allergies or reactions
 Aspirin
 Cephalosporins
 Codeine
 Erythromycin
 Penicillin
 Sulfa Drugs
 Tetracyclines
 Xanthines

Other Allergies/Reactions _____

Prescription Medication Being Taken

OTC Medication Currently Being Taken

Would You Like Generic Medication Where Possible? Yes No

Comments

Health information changes periodically. Please notify the pharmacy of any new medications, allergies, drug reactions, or health conditions.

Signature _____

Date I do not wish to provide this information.

Common Latin Abbreviations

You only need to memorize these to pass the exam. Make flashcards.

<u>Abbreviation</u>	<u>Meaning</u>
a	before
aa	of each
ac	before meals
ad	up to
ad lib	as much as desired
ad	right ear
as	left ear
am	before noon
au	both ears
bid	twice daily
c	with
d	give
dtd	give such doses
f,ft.	make
gtt	drop
gtts	drops
h	hour
hs	at bedtime
M	mix
Mft.	mix and make
no	number
noct	night
non rep, NIR	no refills
od	right eye
os	left eye
ou	both eyes
p	after
PC	after meals
po	by mouth
pm	after noon
pr	rectally
prn	as needed
q	every
qd	every day
qod	every other day
q2h	every 2 hours
q4h	every 4 hours
qid	four times daily
qs	quantity sufficient
sl	sublingual (under the tongue)
ss	1/2
sig	directions
stat	now
tid	3 times daily
Ut dict , ud, utd	as directed

Write out the following directions in a complete sentence.

i gtt ou bid x 7 d

i appl vag qhs

i tab po qid pc

iss tsp po tid prn cough

iv gtts ad q 4 h prn pain

i cap po tid ac + hs

i tab sl prn chest pain

ii tab po qod

ii stat, i tab qid x 10 d

i supp pr q 6 h prn nausea

i – ii caps po q 4-6 h prn p

How many tablets should be dispensed for a 30 day supply? i tab qid x 1 day, i tab tid x 2 days, i tab bid x 3 days, then i tab qd thereafter.

Answers: Insert one drop into both eyes twice daily for 7 days. , Insert one applicatorful vaginally every night at bedtime. , Take one tablet by mouth four times a day after a meal. , Take one and one-half teaspoonful by mouth 3 times a day as needed for cough. , Insert 4 drops into right ear evry 4 hours as needed for pain. , Take one capsule by mouth three times a day before a meal and again at bedtime. , Dissolve one tablet under the tongue as needed for chest pain. , Take two tablets by mouth every other day. , Take two tablets immediately then one tablet four times a day for 10 days. , Insert one suppository rectally every 6 hours as needed for nausea. , Take one or two capsules by mouth every 4 to 6 hours as needed for pain. , $(1 \times 4 \times 1) + (1 \times 3 \times 2) + (1 \times 2 \times 3) = 16$ tablets in 6 days, that leaves 24 days left in the month at taking one tablet once a day to be an additional 24 tablets added to 16 tablets = 40 tablets in 30 days.

Memorize the following Definitions

Absorption- Drug gets absorbed into the bloodstream

Distribution- Drug goes to where it is needed

Metabolism- Drug is broken down by the liver

Elimination- Excretion from the body

Dosage Forms

Solid Dosage Forms

A. Tablets

- 1) Most popular dosage form
- 2) Prepared by mechanical compression
- 3) Dissolution= must be dissolved in the stomach before it can elicit its pharmacological effect

B. Chewable tablets

- 1) chewed and dissolved in the mouth prior to swallowing
- 2) they also can be swallowed whole

C. Enteric-coated tablets - Will be on the test

- 1) special coating over tablet to prevent the dissolution within the stomach.
- 2) these tablets are meant to dissolve in the intestines only.
- 3) should NEVER be chewed, broken or crushed prior to ingestion.
- 4) not to be taken with antacids which cause dissolution in the stomach

D. Sublingual tablets - Will be on the test

- 1) placed "under the tongue" where the active ingredient is quickly absorbed into the bloodstream
---absorption is not in the GI tract
- 2) only small amounts of drug are needed
- 3) avoids the "first pass" effect - this is where the drug circulates throughout the body before it is broken down in the liver (metabolized)

E. Buccal tablets

- 1) "between cheek and gum"
- 2) drug is dissolved slowly over a period of time

F. Film-coated tablets - Will be on the test Biaxin and Depakote are examples.

- 1) special coating that masks the objectionable odor or taste
- 2) prevents deterioration due to light and air

G. Sustained, timed-release tablets

- 1) active ingredient is released at a constant rate for a prolonged period of time
- 2) "long-acting", "delayed-release", "prolonged-action"

H. Lozenges

- 1) "troches or pastilles"
- 2) meant to dissolve slowly in the mouth to keep the drug in contact with the mouth or throat longer

I. Pellets

- 1) cylinder shaped tablets for implantation just under the skin for continuous drug absorption

J. Capsules - Will be on the test

- 1) drug is enclosed within a gelatin shell.
- 2) after 10 to 30 minutes with the stomach, the gelatin capsule dissolves and the drug is released
- 3) eliminates bad tastes and odors of drugs

K. Effervescent tablets

- 1) active ingredient + sodium bicarbonate +citric acid (or tartaric acid) acid/base reaction causes a release of carbon dioxide gas = effervescence
- 2) masks the taste of unpleasant, salty, or bitterness of medication

Syrups- = **Think SUGAR**

High concentrations of sugar hinders bacteria growth.

Examples: antibiotics, cough preparations

Solutions (Soln) – drug is uniformly dispersed throughout the liquid. (it doesn't settle to the bottom)

Therefore there is no need for a shake well sticker. If you hold the liquid up to the light you will not see any drug floating around. Example: Albuterol Solution

Suspensions (Susp)- The medication is insoluble in the liquid. (does not dissolve)

If you hold this liquid up to the light you will see little particles floating around and then settle.

These medications require a shake well sticker because the medication settles at the bottom and the patient will not get the correct dose if not shaken. Example: Bactrim Suspension

Elixer- sweetened water with alcohol. If the medication is an elixir, it contains alcohol. Not for babies.

Tinctures- highest concentration of alcohol. **This will be on the test.**

National Drug Code (NDC)- Every prescription medication has this. It is devised of 3 sets of numbers.

1. The first set of numbers refers to - the **manufacturer and is usually 5 numbers**

2. The second set of numbers refers to – **the drug name and strength and is usually 4 numbers**

3. The last set of numbers refers to what – **the package size and is usually 2 numbers.**

For example: **00535-0934-05** **This will be on the test.**

Expiration Dates- All medication has an expiration date. If the medication expires on 11-09 then the exact time it will expire is the last day of the month at midnight. So, in this case this medication expires on November 30th, 2009 at midnight.

50% Rule: The repackaged vial or unit dose must have an expiration date placed on it; but it is not the same expiration date as what is on the stock bottle. You must take the date on the stock bottle and write the half way date between today's date and the expiration date. But if the expiration date on the stock bottle is years and years, there is a max of one year that you write on the repackaged item.

Unit dose: Medication is dispensed in single unit packages in sealed, sanitary, ready-to-administer doses.

Only a 24 hour supply is dispensed in the hospital. "Why?"

Because of these Advantages:

1. Medication errors reduced
2. Control over medication is increased
3. Drug waste is minimized. Drug can be returned to stock if not used.
4. Less preparation time.
5. Billing is more accurate for the patient. The patient only pays for what was used.

Labeling requirements for Unit Dose:

1. Drug name, strength, dosage form
2. Lot number (in case of recalls)
3. Expiration date
4. Directions
5. Auxiliary labels
6. Storage and cautions
7. Manufacturer
8. Repackaging date

Fractions to Decimals

Reducing fractions to lowest terms

Find the largest number that can be divided evenly into both the numerator and denominator. Large fractions may need to be reduced several times.

Example 1: Reduce $\frac{15}{24}$ Divide both top and bottom by 3 which would equal $\frac{5}{8}$

Example 2: Reduce $\frac{189}{216}$ Divide both top and bottom by 3 to equal $\frac{63}{72}$ which can be reduced again by dividing by 9 to equal $\frac{7}{8}$

Example 3: Reduce $\frac{3}{15}$ Divide both top and bottom by 3 to equal $\frac{1}{5}$

Convert a mixed fraction to an improper fraction

Multiply the whole number by the denominator and then add the numerator. This number becomes the numerator and is placed over the stated denominator.

example: $2 \frac{3}{5} = \frac{2 \times 5 + 3}{5} = \frac{13}{5}$ Now you are able to convert to a decimal form.

Changing fractions to decimals

Divide the numerator by the denominator.

example: $\frac{1}{4} = 0.25$ or $\frac{13}{5} = 2.6$

Changing decimals to fractions

The denominator will be either 10 or a multiple of 10.

example: "tenths" = one digit to the right of the decimal point $0.7 = \frac{7}{10}$

"hundredths" = $.27 = \frac{27}{100}$

x digits to the right of the decimal point = $0.008 = \frac{8}{1000}$, $0.0365 = \frac{365}{10,000}$

Practice Problems

A patient receives the following doses of a certain drug: $\frac{1}{4}$ gr., $\frac{1}{12}$ gr., $\frac{1}{8}$ gr. and $\frac{1}{6}$ gr. Calculate the total amount of the drug received by the patient.

How much active ingredient is in 24 tablets each containing $\frac{1}{320}$ grain of the ingredient?

The dose of a drug is $\frac{1}{60}$ gr. How many doses can be made from $\frac{1}{5}$ gr.?

Answers: $\frac{5}{8}$, $\frac{3}{40}$, 12

Roman Numerals

Prescribers still sometimes use Roman numerals when writing prescriptions in the:

- 1) Strength of medication
- 2) Quantity of drug
- 3) Amount of drug to take in the sig

ss	½
I	1
V	5
X	10
L	50
C	100
D	500
M	1000

When a smaller number is before a larger number, then the smaller number is subtracted from the larger.

Example 1: CM = 900

M is the larger number and C is the smaller number therefore it is 1000-100= 900.

Example 2: XL = 40

X is the smaller number and it is left of L, therefore it is 50 – 10 = 40.

Never subtract more than one numeral.

When a smaller number is after a larger number, the smaller number is added to the larger number.

Example 1: VIII = 8

V = 5 and III = 3 therefore 5+3=8

This is not portrayed as IIX because you cannot subtract more than one numeral.

Example 2: LX = 60 which is 50 + 10

When a numeral is repeated, its value is repeated and added together.

Example 1: XX = 10+10

Example 2: XXX = 10 + 10 + 10 = 30

Numerals may never be repeated more than three times in a row. So you will never see XXXX = 40 because 40 is XL.

When the roman numeral is quite long, you will be adding and subtracting from beginning to end.

Example 1: 1998 = MCMXCVIII

M = 1000 CM = 1000-100 = 900 XC= 100-10=90 VIII = 8

CDXII = _____

669 = _____

CCCXXX=_____

2345=_____

MMVII=_____

874 = _____

CMLXXIII=_____

399 = _____

Answers: 412, 330, 2007, 973

Answers: DCLXIX, MMCCCXLV, DCCCLXXIV, CCCXCIX

I stop here and move to the Math Workbook for Pharmacy Technicians to do more problems above and learn cross-multiplication problems. Then I come back to this page to introduce Conversions but let the students not get into conversions until next class time to give them a break and not get overloaded. So, review slightly the next 2 pages and then break.

Conversions

$$4\text{ml} = 1 \text{ dram} = 60 \text{ grains}$$

$$5\text{ml} = 1 \text{ teaspoon}$$

$$15\text{ml} = 3 \text{ teaspoons} = 1 \text{ Tablespoon} = 4 \text{ drams}$$

$$30 \text{ ml} = 1 \text{ ounce} = 8 \text{ drams}$$

$$30 \text{ gm} = 1 \text{ ounce} = 8 \text{ drams}$$

$$1 \text{ cup} = 8 \text{ ounces}$$

$$1 \text{ pint} = 2 \text{ cups} = 16 \text{ ounces} = 480 \text{ ml}$$

$$1 \text{ quart} = 2 \text{ pints} = 32 \text{ ounces}$$

$$1 \text{ gallon} = 4 \text{ quarts} = 3840 \text{ ml}$$

$$1 \text{ kg} = 2.2 \text{ pounds (lbs)}$$

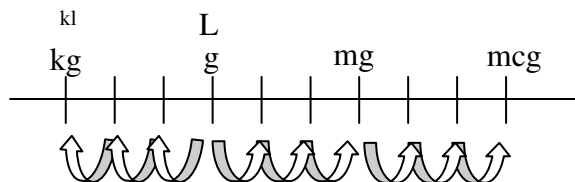
$$30 \text{ mg} = 0.5 \text{ grains}$$

Commit these conversions to memory. It is a good idea to make flash cards of these to help.

If you know just these conversions, you will be able to do any conversion on the test.

Do not try and remember every conversion you come in counter with. Just memorize the bare minimum and you will retain more.

Metric Conversions



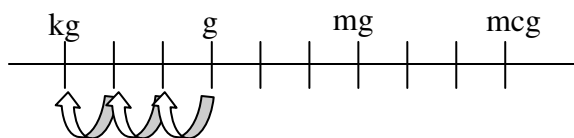
Moving right: The number gets larger

$$1 \text{ L} = 1.000 \text{ ml} \quad \text{Place decimal at the end of making loops} = 1000 \text{ ml}$$

$$1 \text{ g} = 1000 \text{ mg}$$

$$1 \text{ mg} = 1000 \text{ mcg}$$

Moving left: The number gets smaller



$$1 \text{ g} = 0.001 \text{ kg}$$

$$1 \text{ mg} = 0.001 \text{ g}$$

Let's start easy: Moving the decimal to the right

1) $3 \text{ L} = \underline{\hspace{2cm}} \text{ ml}$

2) $5.5 \text{ L} = \underline{\hspace{2cm}} \text{ ml}$

$3 \text{ g} = \underline{\hspace{2cm}} \text{ mg}$

$5.5 \text{ g} = \underline{\hspace{2cm}} \text{ mg}$

$3 \text{ mg} = \underline{\hspace{2cm}} \text{ mcg}$

$5.5 \text{ mg} = \underline{\hspace{2cm}} \text{ mcg}$

$3 \text{ kg} = \underline{\hspace{2cm}} \text{ g}$

$5.5 \text{ kg} = \underline{\hspace{2cm}} \text{ g}$

Going the other way:

3) $6000 \text{ ml} = \underline{\hspace{2cm}} \text{ L}$

$6500 \text{ ml} = \underline{\hspace{2cm}} \text{ L}$

$8730 \text{ mg} = \underline{\hspace{2cm}} \text{ g}$

$8730 \text{ mg} = \underline{\hspace{2cm}} \text{ kg}$

$4385 \text{ mcg} = \underline{\hspace{2cm}} \text{ mg}$

$4385 \text{ mcg} = \underline{\hspace{2cm}} \text{ g}$

Conversion is made simple by placing your decimal point at the end of the number and then makes loops to where you need to go. Place your decimal point here and fill in the loops with zeros.

If you go from one slash mark to one slash mark it is one loop.

If you go from g to mg, it is three loops to the **right** so the original number is **larger**.

If you go from mcg to g, it is 6 loops to the **left** so the original number is **smaller**.

If you think that was easy, try these:

$52 \text{ ml} = \underline{\hspace{2cm}} \text{ L}$

$15 \text{ kg} = \underline{\hspace{2cm}} \text{ g}$

$2.06 \text{ g} = \underline{\hspace{2cm}} \text{ mg}$

$2,785,000 \text{ mcg} = \underline{\hspace{2cm}} \text{ kg}$

$16 \text{ mcg} = \underline{\hspace{2cm}} \text{ mg}$

$2 \text{ kg} = \underline{\hspace{2cm}} \text{ mcg}$

$256 \text{ mg} = \underline{\hspace{2cm}} \text{ g}$

$21 \text{ L} = \underline{\hspace{2cm}} \text{ ml}$

$2,703,000 \text{ mcg} = \underline{\hspace{2cm}} \text{ g}$

$576 \text{ ml} = \underline{\hspace{2cm}} \text{ L}$

$6.8 \text{ L} = \underline{\hspace{2cm}} \text{ ml}$

$823 \text{ kg} = \underline{\hspace{2cm}} \text{ mg}$

$62.5 \text{ mg} = \underline{\hspace{2cm}} \text{ g}$

$27 \text{ mcg} = \underline{\hspace{2cm}} \text{ mg}$

a) A total regimen of therapy calls for 10 mg of a medication to be given to a patient over several days. In the pharmacy a solution is available that has 40 mcg/ml. How many ml must be dispensed?

b) A dose of medication that is 0.63 ml is given. The pharmacy stock solution contains 80 mg/15 ml. How many micrograms are in the dose?

c) A drug has a concentration of 25 mg/ml. How many grams of the drug are in 1 liter?

d) A capsule of medication contains 35 mg of active ingredient. How many capsules would you need to accumulate 1.05 kg of the active ingredient?

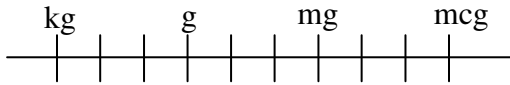
e) If there are 56 mg/ml, how many grams are in a liter?

f) There are 6 g in a liter, how many micrograms are in 3 ml?

g) You have 560 ml of a solution that contains 1,600 mg. How many mcg are in 4 ml?

h) If the dose is 0.9 g / day and the drug is given in three equally divided doses each day, what is the amount of each dose in milligrams?

Answers



Write down the number line and label the slash marks in grams or liters when you do any problem to help you visualize which way to go.

Count how many spaces you need to go and in which direction. This is how you will be moving the decimal point.

- 1) 3000 on all
- 2) 5.500 on all
- 3) 6, 6.5, 8.730, 0.00873, 4.385, 0.004385

0.052 5 2. You are moving left so the number will be smaller. Place decimal point and add a zero to the empty loop.

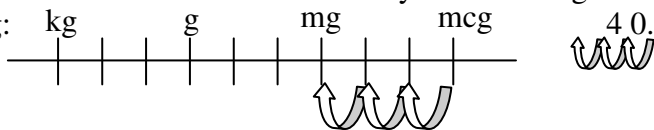
2060 2,0 6 You are moving to the right and the number will be larger. Add a zero to the empty loop.

- 0.016
- 0.256
- 2.703
- 6800
- 0.0625
- 15000
- 0.002785
- 2,000,000,000
- 21000
- 0.576
- 823,000,000
- 0.027

A) The medication strength is 40mcg per ml. So, for every 1 ml there is 40 mcg of medicine.
 This can be written as: $\frac{40 \text{ mcg}}{1 \text{ ml}}$ which means 40 mcg per ml.

It looks like the patient only needs 10mg total of medication. Mg and Mcg are not in the same units so we need to convert to the same units first so we can calculate how many ml has 10mg.

The first step is to convert 40mcg to mg: $\frac{40}{1000} = .040 \text{ mg}$
 Three spaces to the left.



Now that we converted 40mcg to 0.040 mg we can also say instead of 40mcg per 1 ml we can say 0.04mg per 1 ml. If 0.04mg are in 1 ml, how many ml has 10mg? We need to set up in cross multiplication:

$$\frac{0.040 \text{ mg}}{1 \text{ ml}} = \frac{10 \text{ mg}}{X \text{ ml}}$$

To read this out loud you would say: 0.04 mg per ml is the same as 10mg per how many ml?

To cross multiply and solve for X:

First step is to take the two numbers diagonally from each other (no X involved) which is 10 and 1.

Multiply them together to get 10.

Second step is to take that answer and divide it by the number diagonal from the X which in this case is 0.04.

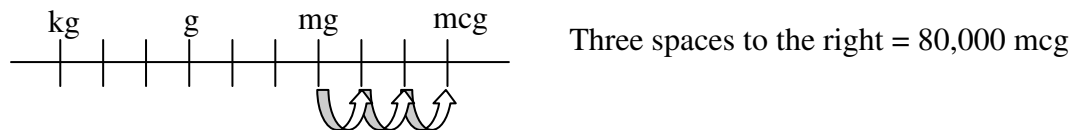
So, on your calculator you do 10 x 1 divided by 0.04 to get your answer of 250 ml.

B) Get set up for cross multiplication by writing down what you know first. We know 80mg of medication is in 15 ml written as $\frac{80\text{mg}}{15\text{ml}}$.

Next, we know 0.63ml of liquid needs to be given so write down as: $\frac{80\text{mg}}{15\text{ml}} = \frac{\quad}{0.63\text{ml}}$.

The empty top space refers to how much medicine is going to be in 0.63ml but it is asking for it in mcg. If we write in Xmcg the units will not match with the mg: $\frac{80\text{mg}}{15\text{ml}} = \frac{X\text{mcg}}{0.63\text{ml}}$

The units must match north of the equal sign and the units south of the equal sign must match each other. The 80mg must be converted over to mcg before we continue.



Now re-write: $\frac{80,000\text{mcg}}{15\text{ml}} = \frac{X\text{mcg}}{0.63\text{ml}}$

Cross Multiply: Multiply the two numbers without the X
 $80,000 \times 0.63$ and divide by the number
 diagonal from the X which it is 15.
 So, $80,000 \times 0.63$ divide by 15 = 3360mcg ANSWER

C) Set up what you know in cross multiplication. You know 25mg/ml and it's asking for X g/L.
 Write it as: $\frac{25\text{mg}}{1\text{ml}} = \frac{X\text{g}}{1\text{L}}$ The Units must match each other north of the equal sign and the
 units on the south of the equal sign must match each other.

Convert and re-write:

$\frac{0.025\text{g}}{0.001\text{L}} = \frac{X\text{g}}{1\text{L}}$ Now, cross multiply: 0.025×1 divide by 0.001 = 25 grams

D) One capsule has 35mg of medication. How many capsules equals 1.05kg(1.050000 mg)?

Set it up: $\frac{1\text{ capsule}}{35\text{ mg}} = \frac{X\text{ capsules}}{1,050,000\text{mg}}$

Cross multiply: $1 \times 1,050,000$ divide by 35 = 30,000 capsules

E) Set up as $\frac{0.056\text{g}}{0.001\text{L}} = \frac{X\text{g}}{1\text{L}}$ Cross multiply: 0.056×1 divide by 0.001 = 56 g

F) Set up as $\frac{6,000,000\text{ mcg}}{1000\text{ ml}} = \frac{X\text{ mcg}}{3\text{ ml}}$ Cross multiply: $6,000,000 \times 3$ divide by 1000ml = 18,000 mcg

G) Set up as $\frac{560\text{ ml}}{1,600,000\text{mcg}} = \frac{4\text{ ml}}{X\text{ mcg}}$ Cross multiply: $1,600,000 \times 4$ divide by 560 = 11,428 mcg

H) The total amount of drug per day is 0.9g but the person is to take medicine 3 times a day. So take 0.9g divide by three times a day(tid) = 0.3g of drug given tid. The answer is to be in mg.

$\frac{0.3\text{ g}}{1} = 300\text{mg}$ per dose ANSWER

Household and Metric Conversions

- 1 teaspoon = 5 ml
- 1 tablespoon = 15 ml
- 3 teaspoons (tsp.) = 1 tablespoon
- 2 tablespoons = 1 fluid ounce
- 1 fluid ounce = 30 ml
- 8 fluid ounces = 1 cup
- 1 cup = 240 ml
- 1 pint = 480 ml = 16 oz
- 2 pints = 1 quart
- 4 quarts = 1 gallon
- 2.2 pounds = 1 kg

These conversions must be committed to memory.

Conversions are easy when set up as a cross multiplication equation.

Example: $\frac{8 \text{ ounces}}{1 \text{ cup}} = \frac{X \text{ ounces}}{2.6 \text{ cups}}$

Units are on the same side of the equal sign.
8 x 2.6 divide by 1 = 20.8

80 ml = _____ tbsp.

80 kg = _____ lbs

Look on page 24 for explanations

1 tbsp. = _____ tsp.

185 lbs = _____ kg

1 gal = _____ pts

2 pts = _____ ml

90 tbsp. = _____ ml

7 pts = _____ cups

2 oz = _____ ml

35 ml = _____ tsp.

3 oz = _____ ml

8 ml = _____ tsp.

6 oz = _____ ml

480 ml = _____ pint(s)

53 ml = _____ tsp.

35 kg = _____ lbs

On story problems, convert units into similar units. For example, if there are mg and grams in the same story, convert to what is needed in the answer. If there are liquids in the problem convert all liquids to milliliters then re-read the question.

1) If there are ~~125~~ mg in a ~~teaspoon~~, how many grams are in a ~~cup~~?
 0.125 g 5 ml 240 ml **Now, re-read the question.**

2) How many ~~tablespoons~~ are in ~~4~~ cups?
 15ml 1 cup is 240ml so 4 cups is 960ml

Now re-read: How many 15 ml are in 960ml? A lot easier isn't it?

3) If there are 80 mg in a tablespoon and 1 tsp. is a dose, how many doses will there be in 3 cups?

4) How many 1-teaspoonful doses would there be in 1 pint of medication?

5) If there are 24 mg in a teaspoonful, how many grams are in 8 fluid ounces?

6) A physician prescribes a 1-tablespoon dose tid. How many days will a 12 fluid-ounce bottle last?

- 7) A patient weighs 75 kg. What is the weight in pounds?
- 8) A patient weighs 60 kg. What is the weight in pounds?
- 9) A patient weighs 150 lbs. What is the weight in kg?
- 10) A patient weighs 200 lbs. What is the weight in kg?
- 11) There are 62.5 mg/ tsp. in a certain antibiotic preparation. How many mg would there be in a 1 tablespoonful dose?
- 12) If there are 50 mg /tsp., how many grams will be in a fluid ounce?
- 13) You are to give 1 tea tid from a medication that has 10 g/200 ml. How many mg will the patient get daily?
- 14) If there are 25 mg in a tablespoon, how many grams are in 20 oz?
- 15) An 8 oz bottle of decongestant is given at 1 tsp. tid. How many doses are in the bottle?
- 16) There are 75 mg/tsp. in a medication. How many mg are in a tablespoon?
- 17) There are 60 mg/tbsp. How many grams are in a fluid ounce?
- 18) You have 4 g of medication in 600 ml. How many mg are in 1 tbsp.?
- 19) A dose of medication at 1 1/2 oz tid will give the patient how many ml per day?
- 20) A patient weighs 175 lbs. What is the weight in kg?

Explanation

I am going to explain as if the conversions are already committed in your memory. Make flashcards.

If I asked you how many minutes are in a week, could you calculate that? Sure you could. You probably will need a calculator but you know the conversions to get from 1 week to minutes.

You know 7 days are in a week and there are 24 hours in 1 day and 60 minutes are in 1 hour.

You would take 60 minutes x 24 hours x 7 days.

This is the way you need to think when converting Metric and Household measurements.

For example, if you know 2 cups equals 1 pint and 2 pints equals a quart and 4 quarts equals a gallon, how many cups are in a gallon? Same way of thinking.

To set it up mathematically, you would write it as: (you know 4 quarts equals one gallon. So if we can find how many cups are in 4 quarts that would be the same amount as in one gallon.)

$\frac{2 \text{ pints}}{1 \text{ quart}} = \frac{X \text{ pints}}{4 \text{ quarts}}$ X= 8 pints in 4 quarts Next, we know 1 pint = 2cups So, $\frac{1 \text{ pint}}{2 \text{ cups}} = \frac{8 \text{ pints}}{X \text{ cups}}$ (which is 4qt) X= 16 cups in 1 gallon

The units must match on the north of the equal sign and the units south of the equal sign must match each other.

Answers

1. 80 ml = X Tbsp? This is asking, $\frac{X \text{ Tbsp}}{80 \text{ ml}}$

First, that the 2 units given: ml and Tbsp. The answer needs to be in Tbsp. What conversion do we know of Tbsp and ml?

We have committed to memory 3:

We know 5 ml = 1 teaspoon and 3 teaspoons = 1 Tbsp and 1 Tbsp = 15 ml. Use the latter.

Write down what you know first which is: $\frac{1 \text{ Tbsp}}{15 \text{ ml}}$ If you would say this fraction out loud, "1 Tbsp = 15 ml"

It looks like the units match on top and on bottom so put them together in cross multiplication:

$\frac{1 \text{ Tbsp}}{15 \text{ ml}} = \frac{X \text{ Tbsp}}{80 \text{ ml}}$ Say this out loud, "If 1 Tbsp = 15 ml, how many tbsp is in 80 ml?"

Cross multiply: 1 x 80 divide by 15 = 5.3 Tbsp are in 80 ml.

2. 1 Tbsp = how many tsp? You have committed to memory that 3 tsp = 1 Tbsp

3. 1 gal = X pts You know 2 pts = 1 qt and 4 qt = 1 gal. So, how many pts in 4 qts is the same as asking how many pts are in 1 gallon. Set it up. $\frac{2 \text{ pints}}{1 \text{ quart}} = \frac{X \text{ pints}}{4 \text{ qts}}$ Cross multiply: 4x2 divide by 1 = 8 pints

4. 90 Tbsp = X ml? We know 1 Tbsp = 15 ml so how many ml in 90 Tbsp?

$\frac{1 \text{ Tbsp}}{15 \text{ ml}} = \frac{90 \text{ Tbsp}}{X \text{ ml}}$ Cross Multiply: 90 x 15 divide by 1 = 1350 ml

5. 2 oz = X ml? We know 1 oz = 30 ml so write that down first then your unknown next to it.

$\frac{1 \text{ oz}}{30 \text{ ml}} = \frac{2 \text{ oz}}{X \text{ ml}}$ Cross multiply: 2x30 divide by 1 = 60ml are in 2 ounces

6. 3 oz = X ml? $\frac{1 \text{ oz}}{30 \text{ ml}} = \frac{3 \text{ oz}}{X \text{ ml}}$ Cross multiply: 3 x 30 divide by 1 = 90 ml
7. 6 oz = X ml? $\frac{1 \text{ oz}}{30 \text{ ml}} = \frac{6 \text{ oz}}{X \text{ ml}}$ Cross multiply: 6 x 30 divide by 1 = 180 ml
8. 53 ml = X tsp? We know 1 tsp = 5 ml so $\frac{1 \text{ tea}}{5 \text{ ml}} = \frac{X \text{ tea}}{53 \text{ ml}}$ Cross multiply: 53 x 1 divide by 5 = 10.6 tsp
9. 80 kg = X lbs We know 2.2 lbs = 1 kg so $\frac{2.2 \text{ lbs}}{1 \text{ kg}} = \frac{X \text{ lbs}}{80 \text{ kg}}$ Cross multiply: 80 x 2.2 divide by 1 = 176 lbs
To double check yourself on kg/lbs, the kg should always be about half of whatever the pounds are. So here, 80kg about half of 176 lbs. Kilograms should never be more than the pounds.
10. 185 lbs = X kg $\frac{2.2 \text{ lbs}}{1 \text{ kg}} = \frac{185 \text{ lbs}}{X \text{ kg}}$ Cross multiply: 185 x 1 divide by 2.2 = 84.1 kg
11. 2 pints = X ml? We know 1 pint = 480ml so 2 pints would equal how many ml?
 $\frac{1 \text{ pint}}{480 \text{ ml}} = \frac{2 \text{ pints}}{X \text{ ml}}$ Cross multiply: 2 x 480 divide by 1 = 960 ml
12. 7 pints = X cups? $\frac{2 \text{ cups}}{1 \text{ pint}} = \frac{X \text{ cups}}{7 \text{ pints}}$ Cross multiply: 7 x 2 divide by 1 = 14 cups
13. 35 ml = X tsp? We know 1 tea = 5 ml so $\frac{1 \text{ tea}}{5 \text{ ml}} = \frac{X \text{ tea}}{35 \text{ ml}}$ Cross multiply: 35x1 divide by 5 = 7 teaspoons
14. 8 ml = X tsp? $\frac{1 \text{ tea}}{5 \text{ ml}} = \frac{X \text{ tea}}{8 \text{ ml}}$ Cross multiply: 8 x 1 divide by 5 = 1.6 tsp
15. 480ml = X pts? You should have this one committed to memory. 1 pint = 480ml
16. 35 kg = X lbs? $\frac{2.2 \text{ lbs}}{1 \text{ kg}} = \frac{X \text{ lbs}}{35 \text{ kg}}$ Cross multiply: 35x 2.2 divide by 1 = 77 lbs

Story Problem Answers

Story problems are so much easier if you can convert all measurements to matching units. Preferably the units in which the answer needs to be in. So, if there are grams and mg in the same problem and the answer is to be in mg then convert the grams to mg. If there are any liquid units (ie cups, pints, quarts) convert all liquid measurements over to mls. Now, re-read the question again. It will sound a lot less confusing.

- Convert mg to grams since the answer wants to be in grams. Convert teaspoon to 5 ml and cup to 240 ml. Re-read. If there are 0.125 g in 5 ml, how many g are in 240ml? Set up into cross multiplication.
 $\frac{0.125 \text{ g}}{5 \text{ ml}} = \frac{X \text{ g}}{240 \text{ ml}}$ Cross multiply: 240 x 0.125 divide by 5 = 6 g
- Convert 1 Tbsp to 15 ml and 4 cups to 960ml. Re-read. How many 15 ml are in 960ml? A lot easier to understand? 960 divided by 15 = 64 Tbsp
- Convert and re-read as: If there are 80mg in 15 ml and 5 ml is a dose, how many 5 ml are in 720ml? After re-reading this, you can see that the first 3 numbers are unnecessary in this problem. We are to find how many 5 ml are in 720ml. Easy: 720 divide by 5 = 144 now label it with doses as in the original question.
- Convert and re-read as: How many 5 ml would there be in 480ml? 480 divided by 5 = 96 doses

5. Convert and re-read as: If there are 0.024 g in 5 ml, how many g are in 240 ml?
 $\frac{0.024 \text{ g}}{5 \text{ ml}} = \frac{X}{240 \text{ ml}}$ Cross multiply: 240×0.024 divided by $5 = 1.152 \text{ g}$
6. The patient is taking 15 ml tid which is 45 ml per day. How many days will 360ml last?
 $\frac{45 \text{ ml}}{1 \text{ day}} = \frac{360 \text{ ml}}{X \text{ days}}$ Cross multiply: 360×1 divided by $45 = 8$ days
7. Write down the conversion you know first: $\frac{2.2 \text{ lb}}{1 \text{ kg}} = \frac{X \text{ lbs}}{75 \text{ kg}}$ Cross multiply: 75×2.2 divided by $1 = 165 \text{ lbs}$
8. $\frac{2.2 \text{ lb}}{1 \text{ kg}} = \frac{X \text{ lbs}}{60 \text{ kg}}$ Cross multiply: 60×2.2 divided by $1 = 132$
9. $\frac{2.2 \text{ lb}}{1 \text{ kg}} = \frac{150 \text{ lbs}}{X \text{ kg}}$ Cross multiply: 150×1 divided by $2.2 = 68.2 \text{ kg}$
10. $\frac{2.2 \text{ lb}}{1 \text{ kg}} = \frac{200 \text{ lbs}}{X \text{ kg}}$ Cross multiply: 200×1 divided by $2.2 = 91 \text{ kg}$
11. Convert to similar units and re-read as: There are 62.5 mg in 5 ml. How many mg in 15 ml?
 $\frac{62.5 \text{ mg}}{5 \text{ ml}} = \frac{X \text{ mg}}{15 \text{ ml}}$ Cross multiply: 15×62.5 divided by $5 = 187.5 \text{ mg}$
12. Convert the mg to g and the liquids to ml and re-read as: If there are 0.050 g in 5 ml, how many g in 30ml?
 $\frac{0.050 \text{ g}}{5 \text{ ml}} = \frac{X \text{ g}}{30 \text{ ml}}$ Cross multiply: 0.050×30 divided by $5 = 0.3 \text{ g}$
13. Convert and re-read as: You are to give 5 ml tid (or in other words 15 ml per day) of a medication of 10,000 mg per 200ml. How many mg per day? $\frac{10,000 \text{ mg}}{200 \text{ ml}} = \frac{X \text{ mg}}{15 \text{ ml}}$ Cross multiply: $15 \times 10,000$ divide by $200 = 750 \text{ mg}$
14. Convert mg to g and liquids to ml and re-read as: If there are 0.025 g in 15 ml, how many g in 600ml?
 $\frac{0.025 \text{ g}}{15 \text{ ml}} = \frac{X \text{ g}}{600 \text{ ml}}$ Cross multiply: 600×0.025 divide by $15 = 1 \text{ g}$
15. Convert and re-read as: A 240ml bottle is given in 5 ml doses. How many 5 ml are in 240ml? The first two numbers are unnecessary for converting. 240 divided by $5 = 48$ doses
16. Convert and re-read as: There are 75mg in 5 ml. How many mg are in 15 ml?
 $\frac{75 \text{ mg}}{5 \text{ ml}} = \frac{X \text{ mg}}{15 \text{ ml}}$ Cross multiply: 15×75 divide by $5 = 225 \text{ mg}$
17. Convert and re-read as: There are 0.060 grams in 15 ml. How many g are in 30 ml?
 $\frac{0.060 \text{ g}}{15 \text{ ml}} = \frac{X \text{ g}}{30 \text{ ml}}$ Cross multiply: 30×0.060 divide by $15 = 0.12 \text{ g}$
18. Convert and re-read as: You have 4000mg in 600ml. How many mg are in 15 ml?
 $\frac{4000 \text{ mg}}{600 \text{ ml}} = \frac{X \text{ mg}}{15 \text{ ml}}$ Cross multiply: 15×4000 divide by $600 = 100 \text{ mg}$
19. Convert and re-read: A dose of medication is 45 ml tid. How many ml per day? $45 \text{ ml} \times \text{tid} = 135 \text{ ml}$
Remember, tid is three times per day.
20. $\frac{2.2 \text{ lb}}{1 \text{ kg}} = \frac{175 \text{ lb}}{X \text{ kg}}$ Cross multiply: 175×1 divide by $2.2 = 79.5 \text{ kg}$

Apothecary and Metric Conversions

1 gallon = 3785 ml
1 gram = 15.4 grains(gr)
1 grain = 65 mg
1 pound = 454 g
1 ounce = 30 g

Commit these to memory

1) 6 gallons = _____ fluid ounces.

2) 300 ml = _____ fluid ounces.

3) 4 gallons = _____ ml

4) A drug is available as 1/2 gr per fluid ounce. If you are to administer 1/4 gr, how many ml will that be?

5) A medication is available as 10 gr/15 ml and you are to give 30 g. How many fluid ounces will you give?

6) A drug is available as 0.45 g/fluid ounce. You are to administer 15 mg. How many ml will that be?

7) A drug is packaged as 36 mg/ml and you are to give 1.62 g. What volume will that be in fluid ounces?

8) How many 0.325 g tablets would you dispense for an order requesting 20 gr?

You may notice that the same conversions differ between Apothecary and Household.
i.e.

- 1 pint can equal either 473ml or 480ml.

- gallon may equal 3785ml or 3840ml

- 1 pound equals 454g in apothecary but not in household.

Which one to use? Both should get you close to the answer but I prefer Apothecary. Household measurements to me are more for cooking.

- 9) A medication is packaged as 20 gr per fluid ounce. How many mg are in a teaspoonful?
- 10) Three ounces contain how many grains?
- 11) Convert 15 lbs, 8 oz to ounces.
- 12) An order is for 10 gr. How many 325 mg tablets would you dispense?
- 13) Three grains of medication is ordered. You have tablets of 5 mg. How many tablets would be dispensed?
- 14) Convert 3 lbs to grams.
- 15) Convert 60 ml to ounces.
- 16) You are to measure out 50 grains of medication from a stock that has 0.75 grams per tablespoonful. How many ml do you measure out?
- 17) You are to make $\frac{1}{2}$ gallon of medication that will have 2 g of active ingredient per teaspoonful. How many mg of active ingredient will you need?

Apothecary and Metric Conversion Answers

1. Sometimes you may need to do a couple of conversions to get to the answer you need. In this case, if we can change gallons over to mls we could plug that answer in a cross multiplication with what we know of 1oz = 30ml.
 $\frac{1 \text{ gallon}}{3785 \text{ ml}} = \frac{6 \text{ gallons}}{X \text{ ml}}$ Cross multiply: 6×3785 divide by 1 = 22,710 ml now plug that into another set up.

$$\frac{1 \text{ oz}}{30 \text{ ml}} = \frac{X \text{ oz}}{22710 \text{ ml}} \quad \text{Cross multiply: } 22,710 \times 1 \text{ divide by } 30 = 757 \text{ oz}$$

2. $\frac{1 \text{ oz}}{30 \text{ ml}} = \frac{X \text{ oz}}{300 \text{ ml}}$ Cross multiply: 300×1 divide by 30 = 10 oz

3. $\frac{1 \text{ gallon}}{3785 \text{ ml}} = \frac{4 \text{ gallons}}{X \text{ ml}}$ Cross multiply: 4×3785 divide by 1 = 15,140ml

4. $\frac{0.5 \text{ grain}}{30 \text{ ml}} = \frac{0.25 \text{ grain}}{X \text{ ml}}$ Cross multiply: 0.25×30 divide by 0.5 = 15 ml

5. Grains are so confusing when trying to match the answer needed. This is due to 1 grain(gr) being equal to a range of mg which the range is 60-65mg. Depending on what number you pick 1mg to equal will make a slight difference in the answer. If the answer that you get does not exactly match the 4 multiple choice questions on the test then pick the nearest one to your answer. To commit to memory, just remember 1 grain = 65mg and 1 gram(g) = 15.4 grains and you will be fine.

In this problem, convert grains to grams and ml to ounces then re-read.

$$\frac{1 \text{ gram}}{15.4 \text{ gr}} = \frac{X \text{ gram}}{10 \text{ gr}} \quad X = 0.65 \text{ g} \quad \text{and the other conversion is } \frac{1 \text{ oz}}{30 \text{ ml}} = \frac{X \text{ oz}}{15 \text{ ml}} \quad X = 0.5 \text{ ounces}$$

Now re-read as: A medication is available as 0.65g per 0.5 ounces and you are to give 30 g. How many ounces will you give?

$$\frac{0.65 \text{ g}}{0.5 \text{ oz}} = \frac{30 \text{ g}}{X \text{ oz}} \quad \text{Cross multiply: } 30 \times 0.5 \text{ divide by } 0.65 = 23.1 \text{ oz}$$

6. Convert g to mg and fluid ounces to ml and re-read: A drug is available as 450mg per 30ml. You are to administer 15 mg. How many ml has 15mg?
 $\frac{450 \text{ mg}}{30 \text{ ml}} = \frac{15 \text{ mg}}{X \text{ ml}}$ Cross multiply: 15×30 divide by 450 = 1 ml

7. $\frac{36 \text{ mg}}{1 \text{ ml}} = \frac{1620 \text{ mg}}{X \text{ ml}}$ X = 45ml plug this into next formula: $\frac{1 \text{ ounce}}{30 \text{ ml}} = \frac{X \text{ ounces}}{45 \text{ ml}}$ X = 1.5 ounces

8. $\frac{1 \text{ gram}}{15.4 \text{ gr}} = \frac{0.325 \text{ gram}}{X \text{ gr}}$ X= 5 grain per tablet and we need to fill an order for 20 grains. $\frac{1 \text{ tab}}{5 \text{ gr}} = \frac{X \text{ tab}}{20 \text{ gr}}$ X= 4 tabs

9. The medication is $\frac{20 \text{ grain}}{30 \text{ ml}}$ but its asking for $\frac{X \text{ mg}}{5 \text{ ml}}$

Convert 20 grains to mg: $\frac{1 \text{ grain}}{60-65 \text{ mg}} = \frac{20 \text{ grains}}{X \text{ mg}}$ Cross multiply: 20×65 divide by 1 = 1300 mg in 30 ml
 (an answer between 1200mg and 1300mg is acceptable)

Now that we have mg we can figure out how many mg are in 5 ml:

$$\frac{1300 \text{ mg}}{30 \text{ ml}} = \frac{X \text{ mg}}{5 \text{ ml}} \quad X = 217 \text{ mg} \quad \text{but an answer between } 200 \text{ and } 217 \text{ is acceptable.}$$

10. We know 1 oz = 30 grams. And once we convert to grams we know 1 gram = 15.4 grains to get our answer.

$$\frac{1 \text{ ounces}}{30 \text{ grams}} = \frac{3 \text{ ounces}}{X \text{ grams}} \quad X = 90 \text{ grams} \quad \text{plug into here: } \frac{1 \text{ gram}}{15.4 \text{ gr}} = \frac{90 \text{ grams}}{X \text{ gr}} \quad X = 1386 \text{ grains}$$

11. We need to convert 15 lbs to grams and then grams to ounces and then add up all the ounces.

$$\frac{1 \text{ lb}}{454 \text{ g}} = \frac{15 \text{ lbs}}{X \text{ g}} \quad X = 6810 \text{ grams} \quad \text{Now plug into: } \frac{1 \text{ ounce}}{30 \text{ g}} = \frac{X \text{ ounces}}{6810 \text{ g}} \quad X = 227 \text{ ounces is the same as 15 lbs.}$$

But, the question said convert 15 lbs **and 8 ounces** all over to just ounces. So, if 15 lbs = 227 ounces then we need to add 8 ounces to that for the answer. So, 227 + 8 = 235 ounces total. Do not use household on this one.

12. Convert 10 grain to mg. $\frac{1 \text{ grain}}{60-65 \text{mg}} = \frac{10 \text{ grains}}{X \text{ mg}} \quad X = 650 \text{mg}$ $\frac{1 \text{ tablet}}{325 \text{mg}} = \frac{X \text{ tablets}}{650 \text{mg}} \quad X = 2 \text{ tablets}$

13. $\frac{1 \text{ grain}}{65 \text{ mg}} = \frac{3 \text{ grains}}{X \text{ mg}} \quad X = 195 \text{ mg}$ $\frac{1 \text{ tablet}}{5 \text{mg}} = \frac{X \text{ tablets}}{195 \text{mg}} \quad X = 39 \text{ tablets}$

14. $\frac{1 \text{ pound}}{454 \text{ g}} = \frac{3 \text{ pounds}}{X \text{ g}} \quad X = 1362 \text{ g}$

15. $\frac{1 \text{ ounce}}{30 \text{ml}} = \frac{X \text{ ounces}}{60 \text{ ml}} \quad X = 2 \text{ ounces}$

16. Convert 50 grains to grams first. $\frac{1 \text{ gram}}{15.4 \text{ gr}} = \frac{X \text{ grams}}{50 \text{ grains}} \quad X = 3.25 \text{ g}$ Now, $\frac{0.75 \text{ grams}}{15 \text{ ml}} = \frac{3.25 \text{ g}}{X \text{ ml}} \quad X = 65 \text{ml}$

17. We need 2000mg/5ml to make ½ gallon. So, how many ml are in ½ gallon?

$$\frac{1 \text{ gallon}}{3785 \text{ ml}} = \frac{0.5 \text{ gallon}}{X \text{ ml}} \quad X = 1892.5 \text{ ml} \quad \text{plug that into... } \frac{2000 \text{mg}}{5 \text{ ml}} = \frac{X \text{ mg}}{1892.5 \text{ ml}} \quad X = 757,000 \text{ mg}$$

Celsius and Fahrenheit

Celsius to Fahrenheit: $F = (9/5) \times C + 32$ or $F = (1.8 \times C) + 32$ Commit to memory

Convert the following to Fahrenheit:

- a) 15 C Plug 15 into formula: $(1.8 \times 15) + 32 = 59$ F (low number of room temp to store drugs)
- b) 38 C
- c) 106 C
- d) 46 C
- e) 25 C
- f) 30 C (highest number of room temp to store drugs)
- g) 88 C
- h) 55 C

Answers:

59 F (room temp)
100.4 F
222.8 F
114.8 F
77 F
86 F (room temp)
190.4 F
131 F

Fahrenheit to Celsius: $C = \frac{(F - 32)}{1.8}$ Commit to memory

Convert the following to Celsius:

- a) 0 F
- b) 72 F Plug 72 in: $(72 - 32)$ divide by 1.8 = 22.2 C
- c) 98.6 F
- d) 80 F
- e) 100 F
- f) 15 F
- g) 25 F
- h) 200 F

Answers:

-17.7 C
22.2 C
37 C
26.7 C
37.8 C
-9.44 C
-3.89 C
93.3 C

Alligations

Usually the story problem has two strengths on the pharmacy shelf (sometimes it is water which is zero) and a third strength the doctor wants you to make. You are to combine the two strengths that you have on the shelf to make the strength the doctor wants and find the proportion or the amounts of each one to make any amount the doctor writes for.

For example: The doctor writes a script for 450 ml 60% isopropyl alcohol. You have in stock 70% and 30%. How much of each ingredient will you need?

Step 1: Always put the largest strength in the upper left hand corner of the tic-tac-toe board.

70		

Step 2: Always put the smallest strength in the lower left hand corner.
Sometimes this is water or plain cream which the number you input would be zero.
In this case, the number is 30.

70		
30		

Step 3: The strength the doctor **wants** you to make always goes in the middle.
Think of the tic-tac-toe game.....you always **want** the middle square.

70		
	60	
30		

Step 4: Now subtract diagonally down and diagonally up. (there are never negative numbers)

70		30
	60	
30		10

Step 5: After you subtract, you have two numbers. One in the upper right hand corner and one in the lower right hand corner. These numbers become NUMERATORS in the fraction we about to form. The DENOMINATOR is the sum of the two numerators. Make your fraction.

70		$\frac{30}{30+10}$
	60	
30		$\frac{10}{40}$

Step 6: Remember, you will be able to take your calculator to the test. You will need your calculator now. Divide the numerator by the denominator to get a decimal. (Do this on both the upper and lower fractions)

<table border="1" style="border-collapse: collapse; width: 100%; height: 100%;"> <tr><td style="text-align: center;">70</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">60</td><td></td></tr> <tr><td style="text-align: center;">30</td><td></td><td></td></tr> </table>	70				60		30			<p>30 divided by 40 is 0.75</p> <p>10 divided by 40 is 0.25</p>	<p>This step here can be a double check system. These two numbers should = 1</p>
70											
	60										
30											

Step 7: Take your decimal and multiply it by the amount the doctor wants you to make.

<table border="1" style="border-collapse: collapse; width: 100%; height: 100%;"> <tr><td style="text-align: center;">70</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">60</td><td></td></tr> <tr><td style="text-align: center;">30</td><td></td><td></td></tr> </table>	70				60		30			<p>30 divided by 40 is 0.75 x 450ml = 337.5 ml of 70% alcohol</p> <p>10 divided by 40 is 0.25 x 450ml = 112.5ml of 30% alcohol</p>
70										
	60									
30										

Summary of Steps:

- 1) Highest number in upper left square, lowest number in lower left square, what you want in the middle
- 2) Subtract diagonally - there is no negative numbers
- 3) Form a fraction: what you subtracted is the numerator. The denominator is the sum of the two numerators.
- 4) Convert the fraction into a decimal (numerator divided by the denominator)
You are done if you are just looking for the RATIO of each ingredient to make any amount you want.
- 5) If you need specific amounts of each ingredient: Take that decimal and multiply it by the amount that you need to make of the final product.

1) Prepare 25 ml of 9.0% dextrose in water (D9W). Use D5W and D50W. How much of each fluid is used?

(The number in between the D and W is a %)

2) Prepare 150 ml of 7.5% dextrose from D5W and D10W. How much of each is needed?

3) Prepare 300 ml of 7.5 % dextrose using sterile water for injection and D20W. How much of each is needed?

4) Prepare 500 ml of 12.5 % dextrose using D10W and D20W. How much of each is needed?

5) The doctor writes a prescription for 45 g of Hydrocortisone cream 1.75 %. You have two strengths of Hydrocortisone cream (2.5 % and 1%).

How much of each ingredient will be used?

6) You need to prepare 1 oz of 1/8 % nasal decongestant for a newborn. You have 1/4 % nasal decongestant and ocean spray. How much of each is needed?

7) If the doctor writes a prescription for 2 L of 10% sludge and you have 50% sludge and Vaseline, how much of each would you need?

8) A person brings in a prescription for 45 grams of 0.3% triamcinolone cream and you have .5% and .025% cream on the shelf, how much of the .025% cream is needed?

9) In the hospital, a patient requires 1 L of D25W. You discover that you are out of that strength Dextrose in Water. You do, however, have D5W and D50W. How much of each would you need?

Answers:

1) 2.2 ml of D50W and 22.8 ml of D5W

50		4/45	4 divided by 45= 0.08 x 25ml = 2.2
	9		
5		41/45	41 divided by 45=0.91 x 25 ml = 22.8

2) 75 ml of each

10		2.5/5	$2.5/5 = 0.5 \times 150 \text{ ml} = 75$
	7.5		
5		2.5/5	$2.5/5 = 0.5 \times 150 \text{ ml} = 75$

3) 112.5 ml of D20W and 187.5 ml of water

20		7.5/20	$7.5/20 = 0.375 \times 300\text{ml} = 112.5$
	7.5		
0		12.5/20	$12.5/20 = 0.625 \times 300\text{ml} = 187.5$

4) 125 ml of D20W and 375 ml of D10W

20		2.5/10	$2.5/10 = .25 \times 500\text{ml} = 125$
	12.5		
10		7.5/10	$7.5/10 = .75 \times 500\text{ml} = 375$

5) 22.5 g of each

2.5		.75/1.5	$.75/1.5 = 0.5 \times 45\text{g} = 22.5$
	1.75		
1		.75/1.5	$.75/1.5 = 0.5 \times 45\text{g} = 22.5$

6) 15 ml of each

.25		.125/.25	$.125/.25 = 0.5 \times 30\text{ml} = 15$
	.125		
0		.125/.25	$.125/.25 = 0.5 \times 30\text{ml} = 15$

7) 400 ml of 50% sludge and 1600 ml of Vaseline

50		10/50	$10/50 = 0.2 \times 2000\text{ml} = 400$
	10		
0		40/50	$40/50 = 0.8 \times 2000\text{ml} = 1600$

8) 26 g of 0.5% and 19 g of 0.025%

0.5		.275/.475	$0.275/0.475 = 0.579 \times 45\text{g} = 26$
	0.3		
.025		0.2/.475	$0.2/0.475 = 0.421 \times 45\text{g} = 19$

9) 444 ml of D50W and 556 ml of D5W

50		20/45	$20/45 = 0.444 \times 1000\text{ml} = 444$
	25		
5		25/45	$25/45 = 0.556 \times 1000\text{ml} = 556$

FLOW RATE EXPLANATION

Flow Rates are going to be very hard to comprehend in one sitting. Try to introduce Flow Rates at the end of one of your study sessions so your brain is allowed to think about it when you're not. The trick here is repeat, repeat, repeat. It will take time but it will finally click all of a sudden. You must be consistent. Practice, practice, practice. Print the practice sheets off again and again.

Problem :

What would the flow rate be in drops/min (gtts/min) if a 1000ml bag is to run 30 hours? The calibration set is at 15 gtts/ml. **If the question is asking for drops per minute(only) then the following set up is always used the same way again and again.**

Step 1: Set up a half of a tic-tac-toe board and label with the units. The units are always put in the same spot.

ML	DROPS	HOUR	If the units are both on top and bottom they negate each other.
HOUR	ML	MINUTES	

Step 2: Filling in all the numbers. The first set on the left hand side is the flow rate of the bag. In other words, the size of the bag goes on top and the time to run the bag (in hours, convert if in minutes) in the lower left hand corner.

1000	ML	DROPS	HOUR
30	HOUR	ML	MINUTES

Step 3: The middle boxes are for the calibration set. This will always, always, always be told to you on the exam and this is where it always goes. The number of drops goes on top and always 1 ml goes on the bottom.

1000	ML	15	DROPS	HOUR
30	HOUR	1	ML	MINUTES

Step 4: There is only two spaces left and the same two numbers go in the same exact spots each time. 1 hour will always equal 60 minutes. 1 hour goes on top and 60 minutes will always go on the bottom.

1000	ML	15	DROPS	1	HOUR
30	HOUR	1	ML	60	MINUTES

Step 5: All the numbers are filled in. The hard part is over. Now get your calculator and multiply the numbers across the top only.

$$1000 \times 15 \times 1 = 15,000$$

Next, multiply the numbers across the bottom only. $30 \times 1 \times 60 = 1800$

Now you have a fraction: $\frac{15,000}{1800}$ Reduce it and that is your answer in gtts/min. = 8.3 gtts/min

The above procedure is ONLY for the problems asking for the answer in DROPS PER MINUTE. Otherwise, the problems you are able to use your common sense to figure out.

Stop here and do a couple of Flow Rate problems from the Math Workbook for Dummies. Take a break if needed.

Now do a couple of problems on the next page of Flow Rate Homework.

Practice, practice, practice.

FLOW RATE HOMEWORK

1. A liter IV bag is running at 50 ml/hour. How long will it last?
2. A liter bag of IV fluids is hung at 7 p.m. and runs at 100 ml/hr. What time will the next bag be due?
3. A 500 ml IV fluid volume is running at 30 ml/hr. How long will it last? (Round down)
4. An IV rate is 100 ml/hr. If a 10 drop/ml set is used, how many drops/min will the rate be?
5. How many drops/min would an IV flow rate be for a child who is receiving 35 ml/hr. using a 60 drops/ml set?
6. A rate is set at 45 gtt/min. Using a 15 gtt/ml set, how many milliliters per min is the flow rate?
7. Deliver 1 g of medication in 100ml over 1 hour using a 10 drop/ml set. What is the flow rate in gtt/min?
8. Administer 500 mg in 50 ml over 30 minutes using 60 gtt/ml. What is the flow rate in drops/min?
9. Administer 60 mg in 75 ml over 45 minutes. What is the rate in ml/hr?
10. Administer 20,000 units of heparin in 100 ml over 45 minutes. What is the flow rate in ml/hr? 25 gtt/ml set.

11. In problem 10, how many units of heparin would be delivered every 30 minutes?
12. Administer 2 g in 150 ml over 90 minutes. How many mg/ml?
13. Administer 500 ml at 30 drops/min using a 10 drop set. What is ml/hr?
14. If you have a flow rate of 24 drops/min. using a 15 drop set, how many liters would you deliver in 24 hrs?
15. The physician wants the patient to receive 2,800 ml every 24 hours. What would the pump be set at on ml/hr?
16. A patient is to get 250 ml over 30 minutes using a 15 drop set. What is the rate to set the pump in ml/hr?
17. An IV fluid bag is running at 125 ml/hr. How long will a liter last?
18. A 100 ml bag is set to run at 200 ml/hr. and is hung at 3 p.m. When will it run out?
19. Medication: Keflex 2 g
 Fluid volume: 250 ml
 Time of infusion: 1 hour, 30 minutes
- a) ml/hr _____
 b) mg/hr _____
20. Medication: Aminophylline 1 g
 Fluid volume: 500 ml
 Time of infusion: 8 hours
- a) ml/hr _____
 b) mg/hr _____
21. Patient Weight: 75 kg
 Fluid volume: 1 liter
 Dose: 1.5 mg/kg/hr
 Medication: 900 mg
- a) ml/hr _____
 b) mg/hr _____

Flow Rate Answers:

1. It is asking for ml per hour so the liter bag needs to be converted over to mls (=1000ml)

$$\frac{50 \text{ ml}}{1 \text{ hr}} = \frac{1000 \text{ ml}}{X \text{ hr}} \quad X = 20 \text{ hours}$$

2. Change the liter bag over to 1000ml.

$$\frac{100 \text{ ml}}{1 \text{ hr}} = \frac{1000 \text{ ml}}{X \text{ hr}} \quad X = 10 \text{ hours} \quad \text{So, } 7\text{pm} + 10 \text{ hours} = 5 \text{ am}$$

3. $\frac{30 \text{ ml}}{1 \text{ hr}} = \frac{500 \text{ ml}}{X \text{ hr}} \quad X = 16 \text{ hours}$

4. Drops per minute so use your set up.

$$\frac{100 \text{ ML}}{1 \text{ HOUR}} \times \frac{10 \text{ DROPS}}{1 \text{ ML}} \times \frac{1 \text{ HOUR}}{60 \text{ MINUTES}} = \frac{1000}{60} = 17 \text{ drops/minute}$$

5.

$$\frac{35 \text{ ML}}{1 \text{ HR}} \times \frac{60 \text{ DROPS}}{1 \text{ ML}} \times \frac{1 \text{ HOUR}}{60 \text{ MINUTES}} = \frac{2100}{60} = 35 \text{ drops/minute}$$

6.

$$\frac{15 \text{ gtts}}{1 \text{ ml}} = \frac{45 \text{ gtts}}{X \text{ ml}} \quad X = 3 \text{ ml/min}$$

7.

$$\frac{100 \text{ ML}}{1 \text{ HOUR}} \times \frac{10 \text{ DROPS}}{1 \text{ ML}} \times \frac{1 \text{ HOUR}}{60 \text{ MINUTES}} = \frac{1000}{60} = 17 \text{ drops/minute}$$

8.

$$\frac{50 \text{ ML}}{0.5 \text{ HOUR}} \times \frac{60 \text{ DROPS}}{1 \text{ ML}} \times \frac{1 \text{ HOUR}}{60 \text{ MINUTES}} = \frac{3000}{30} = 100 \text{ drops/minute}$$

9. $\frac{75 \text{ ml}}{45 \text{ min}} = \frac{X \text{ ml}}{60 \text{ min}} \quad X = 100 \text{ ml/hour}$

10. $\frac{100 \text{ ml}}{45 \text{ min}} = \frac{X \text{ ml}}{60 \text{ min}} \quad X = 133.33 \text{ ml/hour}$

11. $\frac{20,000 \text{ units}}{45 \text{ min}} = \frac{X \text{ units}}{30 \text{ min}} \quad X = 13,333 \text{ units}$

12. Convert 2 g to 2000mg. $\frac{2000 \text{ mg}}{150 \text{ ml}} = \frac{X \text{ mg}}{1 \text{ ml}} \quad X = 13.3 \text{ mg/ml}$

13. $\frac{30 \text{ drops}}{X \text{ ml}} = \frac{10 \text{ gtts}}{1 \text{ ml}} \quad X = 3 \text{ ml}$ So, now in the story problem cross off 30 drops and re-write 3ml above it. Now it reads 3ml/min. Now we can set up the next cross multiplication: $\frac{3 \text{ ml}}{1 \text{ min}} = \frac{X \text{ ml}}{60 \text{ min}} \quad X = 180 \text{ ml/hr}$

14. Convert 24 drops to ml so it will read ml/min. $\frac{15 \text{ gtts}}{1 \text{ ml}} = \frac{24 \text{ gtts}}{X \text{ ml}}$ X=1.6 ml

Convert 24 hours to minutes = 1440 minutes

Now set up next: $\frac{1.6 \text{ ml}}{1 \text{ min}} = \frac{X \text{ ml}}{1440 \text{ min}}$ X = 2304 ml = 2.304 L

15. $\frac{2800 \text{ ml}}{24 \text{ hr}} = 2800 \text{ divided by } 24 = 116.7 \text{ ml/hr}$

16. $\frac{250 \text{ ml}}{0.5 \text{ ml}} = \frac{X \text{ ml}}{1 \text{ hr}}$ X = 500ml

17. $\frac{125 \text{ ml}}{1 \text{ hr}} = \frac{1000 \text{ ml}}{X \text{ hr}}$ X = 8 hr

18. $\frac{200 \text{ ml}}{1 \text{ hr}} = \frac{100 \text{ ml}}{X \text{ hr}}$ X= 0.5 hr So, 3:30pm

19. a) 250 ml divided by 1.5 hours = 166.7 ml/hr
b) 2000mg divided by 1.5 hours = 1333 mg/hr

20. a) 500 divided by 8 = 62.5 ml/hr
b) 1000mg divided by 8 = 125 mg/hr

21. Need to do B first to get the answer for A
b) 1.5 mg x 75 kg = 112.5 mg/hr
a) $\frac{1000 \text{ ml}}{900 \text{ mg}} = \frac{X \text{ ml}}{112.5 \text{ mg}}$ X = 125 ml/hr

Commercial Calculations

Cost is the term which refers to the amount of money that the pharmacy spent to obtain an item. The pharmacy could not sell their merchandise at cost. They must show a profit in order to stay in business. Therefore, some kind of markup is needed.

Markup is defined as the difference between the cost of an item and the price the item is sold for. The money difference pays for the **overhead** or in other words things like the heat, electricity, and salaries.

Selling Price is the actual dollar amount sold to the customer.

$$\text{Selling Price} = \text{Cost} + \text{Markup}$$

Markup may also be referred to as a percent. **Percent Markup** is a percentage based on the cost of the product.

$$\text{Percentage Markup} = \frac{\text{Markup (actual dollar amount)}}{\text{Cost}}$$

The percentage can also be used to come up with the selling price or the cost:

$$\text{Selling price} = \text{cost} + [\text{cost} \times \text{percentage markup}]$$

$$\text{Cost} = \frac{\text{Selling Price}}{1 + \text{Percentage Markup (expressed as a decimal)}}$$

Net Profit is the amount of money leftover from the selling price after the cost and overhead have been deducted.

$$\text{Net Profit} = \text{Selling Price} - [\text{Cost} + \text{Overhead}]$$

The pharmacist asks you to price the following items that have just arrived from the warehouse. For each of the items, calculate the final selling price for the item.

1. Band-aids- cost \$2.25 and add a 5% markup
2. Cough syrup- cost \$2.90 and add a 20% markup
3. Vitamin E Capsules- cost \$5.00 and add a 15% markup
4. Ginseng tablets- cost \$12.60 and add a 11% markup
5. Blood pressure cuff- cost \$22.56 and add an 18% markup

Calculate the amount of the markup and the percentage markup on the following items:

1. Panty Hose – cost \$3.45 and selling price \$5.29
2. Diet Pills- cost \$5.35 and selling price \$8.39
3. Sitz Bath – cost \$35.65 and selling price \$56.89
4. Walking Cane- cost \$16.22 and selling price \$26.99

1. The store is selling cough drops for \$1.49. You know that the net profit is \$0.31 and the overhead is \$0.20. What is the cost?

2. The cost of an item is \$22.89 and the selling price is \$50.39 with a net profit of \$10.53. What is the store's overhead?

3. The cost of blood sugar strips for a bottle of #100 is \$78.50. The overhead for the store is \$3.50 and the store wants to make a net profit of \$23.68. What should be the selling price?

4. The cost of notebook paper is \$0.59 and the store sells the product for \$2.69 with \$0.95 of that for overhead. What is the net profit?

5. The overhead for the store is \$6.78 and the store wants to make \$5.23 on some new merchandise. If it costs the store \$23.57, what will be the selling price?

6. The price of a box of ostomy supplies is \$44.79. You know the store has an overhead cost of \$4.67 and is making \$12.61 on the item. What was the original cost?

7. The store orders a case of toilet paper for a customer at a cost of \$15.34 and will be selling the case for \$32.89. If the store is making a net profit of \$9.72 on the sale, what is the overhead for the store?

8. The cost of an item is \$37.58 and the selling price is \$69.69. IF the store is making \$20.12 on the item, what is the store's overhead?

Answers for Commercial Calculations

1. $2.25 \times 0.05 = 0.1125 + 2.25 = \2.36
 2. $2.90 \times 0.20 = 0.58 + 2.90 = \3.48
 3. $5.00 \times 0.15 = 0.75 + 5.00 = \5.75
 4. $12.60 \times 0.11 = 1.386 + 12.60 = \13.99
 5. $22.56 \times 0.18 = 4.0608 + 22.56 = \26.62
-

Selling Price = Cost + Markup

Step 1: Place the Selling Price and Cost into the equation with X as Markup. Solve for X which is needed to be placed in the next equation to figure out %Markup.

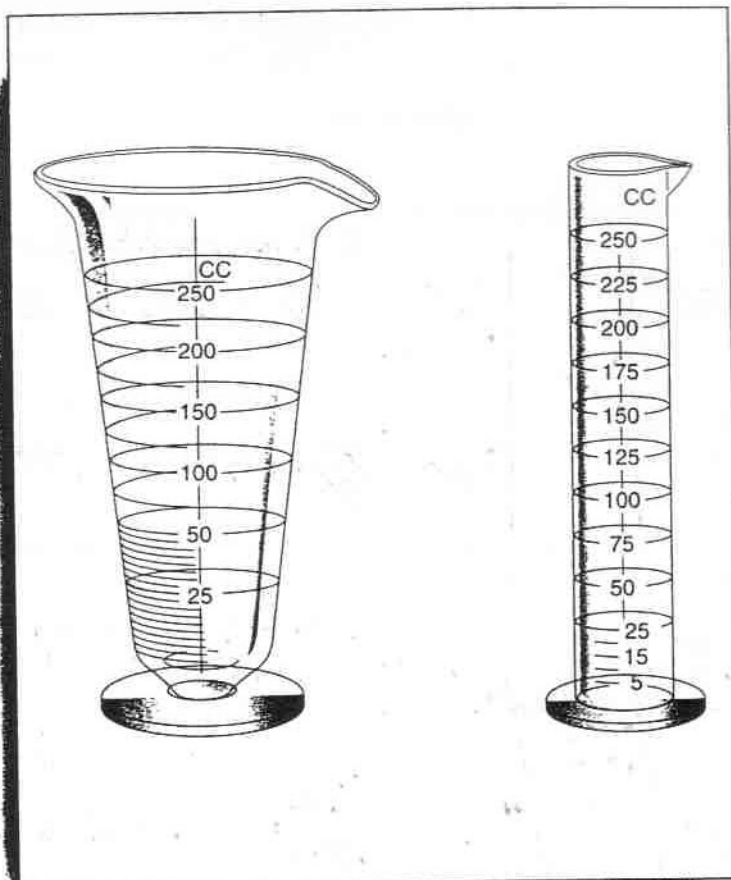
%Markup = Markup/Cost

Step 2: Place the answer from step one into the above equation and divide by the Cost.

1. Markup = 1.84
%Markup = 53%
 2. Markup = 3.04
%Markup = 57%
 3. Markup = 21.24
%Markup = 60%
 4. Markup = 10.77
%Markup = 66%
-

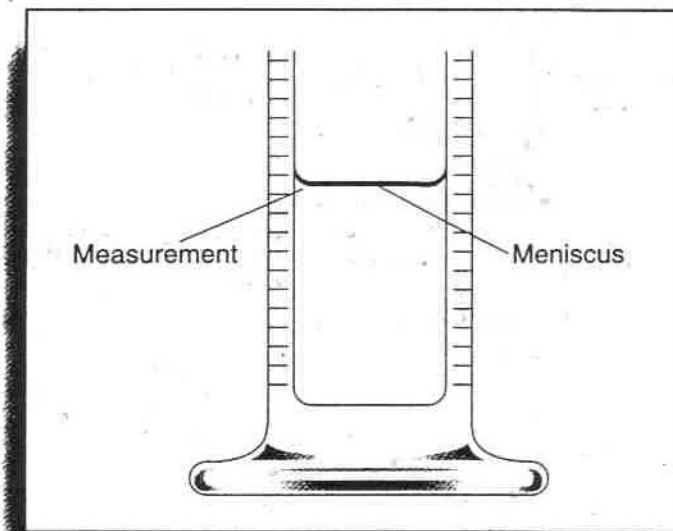
Net Profit = Selling Price – (Cost + Overhead) Solve for X

1. $0.31 = 1.49 - (X + 0.20)$ X= 0.98
2. $10.53 = 50.39 - (22.89 + X)$ X= 36.97
3. $23.68 = X - (78.50 + 3.50)$ X= 105.68
4. $X = 2.69 - (0.59 + 0.95)$ X= 1.15
5. $5.23 = X - (23.57 + 6.78)$ X= 35.58
6. $12.61 = 44.79 - (X + 4.67)$ X= 27.51
7. $9.72 = 32.89 - (15.34 + X)$ X= 7.83
8. $20.12 = 69.69 - (37.58 + X)$ X= 11.99



Conical (left) and cylindrical (right) graduates.

The graduated cylinder is the more accurate of the two.



Liquid in a narrow column usually forms a concave meniscus.

Measurements must be taken at the **bottom of the meniscus**.

Compounding of Non-Sterile Products

Balances - used to measure solids

3 types:

- 1) **Class A prescription balance** - can accurately weigh between **120 mg** to 15 grams (15,000 mg)
-this one is used at Retail pharmacies **Remember the weights they weigh**
- 2) Class B prescription balance - (bulk balance)
- used in weighing large quantities between 650mg to 120 grams (120,000 mg)
- 3) Analytical balance - mostly used in laboratories
- very sensitive even to people walking by

Balances must be placed on a level, stable surface away from traffic and zeroed out first

Weights - usually made from brass. Must be handled properly to ensure accuracy.

- should never be touched by hand
- stored clean (free from powder)
- never dropped or dented
- calibrated or checked once a year to see if they are accurate

Mortars - key words are comminution and trituration

- 1) Wedgewood mortar - very rough surface which is good to grind hard crystals into fine powder
- stains easily

Levigation- reduction of particle size combined with a liquid

- 2) Glass mortars - good for mixing liquids and solids
- not good for hard solids
- nonporous so it will not stain

Trituration- grinding to a fine particle size

- 3) Porcelain mortars - glazed, less porous than a wedgewood
- good for blending of powders

Punch Method- the technique to fill capsules

Graduated Cylinders - used to measure liquids – **This will be on the test**

- **more accurate than a conical graduate – this will be on the exam**
- come in many sizes - choose the one closest to the amount you need
- **must read from the bottom of the meniscus at eye level**

Good Manufacturing Practices (GMP)

- operates under the FDA
- regulations found in a book titled, “U.S. Pharmacopoeia National Formulary (USP-NF)
- expected at each pharmacy practice site
- preparations must include the amount of each ingredient added, lot # of each ingredient, exp. Date

Reconstitution - adding the proper amount of liquid (usually water) to a powder

Antibiotics are prepared and stored as powders because they are more stable. After adding the water to the powder, the stability now changes which might need refrigeration to prolong the stability. A new expiration date must be indicated on the bottle (auxiliary label) and a “shake well” sticker.

Examples:

Amoxil (amoxicillin), Augmentin, Erythromycins (EryPed, Pediazole), Keflex (cephalexin), and Cefzil

Room Temperature Reconstitutable Antibiotics: Biaxin, Omnicef, Zithromax

- if put in the refrigerator the cold will cause them to crystallize
- just remember these are room temp and all other recons will be refrigerated.

Antibiotics

Penicillins (PCN) anything ending in ---cillin is a penicillin. For example, say somebody's name and end it in -cillin.

Generic Name	Brand Name	Days Good After Mixing	Auxiliary Labels
amoxicillin	Amoxil , Polymox	10 Room Temp/ 14 Fridge	Shake well Refrigerate Discard after....
ampicillin	Principen	7 Room Temp/ 14 Fridge	
amoxicillin-clavulanate	Augmentin	10 Fridge	
dicloxacillin	Dynapen	14 Fridge	
penicillin	Veetids	14 Fridge	

5-10% of people who are allergic to penicillins will also be allergic to cephalosporins. This is called **cross-sensitivity**. Dr's will usually write for erythromycins.

Cephalosporins

Generic Name	Brand Name	Days Good After Mixing	Auxiliary Labels
cefactor	Ceclor	14 Fridge	Shake Well How to store Discard after...
cefadroxil	Duricef	14 Fridge	
ceftibuten	Cedax	14 Fridge	
cefuroxime	Ceftin	10 Room Temp/Fridge	
cephalexin	Keflex or Keftab	14 Fridge	
cephradine	Velosef	14 Fridge	
cefprozil	Cefzil	14 Fridge	

Erythromycins (also called Macrolides) anything ending in -mycin is grouped as an erythromycin.

Generic Name	Brand Name	Days Good After Mixing	Auxiliary Labels
azithromycin	Zithromax	10 days room or fridge	Eat Discard after... Shake well
clarithromycin	Biaxin	14 Room Temp	
dirithromycin	Dynabac	Tablet only	
erythromycin	Eryc, E-mycin, Ery-tab Ilosone, EES, Erythrocin, Pediazole	14 Fridge	

Tetracyclines (TCN) Usually ends in -cycline

Generic Name	Brand Name	Auxiliary Labels
doxycycline	Vibramycin	Photosensitivity No antacids, iron, calcium Take on empty stomach
minocycline	Minocin	
tetracycline	Achromycin, Sumycin	
Special Considerations:		
TCN is fatal if expired- this is on test TCN will discolor teeth in <8 yr olds and in a fetus if the pregnant mommy takes TCN		

Sulfonamides (sulfa drugs)

Generic Name	Brand Name	Days Good After Mixing	Auxiliary Labels
sulfamethoxazole-trimethoprim	Bactrim or Septra	No mixing	Shake Well Store room temp
sulfasalazine	Azulfidine		
sulfisoxazole	Gantrisin	No mixing	

Quinolones

Generic Name	Brand Name	Auxiliary Labels
ciprofloxacin	Cipro	No dairy No antacids which will hinder the effectiveness of the antibiotic
levofloxacin	Levaquin	
moxifloxacin	Avelox, Vigamox	
norfloxacin	Noroxin	
ofloxacin	Floxin, Ocuflax	
Special Considerations: See auxiliary labels		

Misc.

Generic Name	Brand Name	Auxiliary Labels
metronidazole	Flagyl	No alcohol
Special Considerations: Alcohol will make them throw up. Alcohol is in cough syr., mouth washes, and marinated food.		Take with Food

Antifungals

Generic Name	Brand Name	Auxiliary Labels/Concerns
amphotericin B	Amphotec, Fungizone	Max dose is 40-50g in one week and these cannot be used more than a two week period due to absorption and thinning of the skin.
ciclopirox	Loprox	
clotrimazole	Lotrimin	
clotrimazole/betamethasone	Lotrisone	
fluconazole	Diflucan	
griseofulvin	Grisactin, Gris-peg	
itraconazole	Sporonox	
ketoconazole	Nizoral	
miconazole	Monistat	
nystatin	Nystatin	
terbinafine	Lamisil	
terconazole	Terazol	

Topical Corticosteroids

Generic Name	Brand Name	Auxiliary Labels/ Concerns
betamethasone	Diprolene, Valisone	Max dose is 40-50g in one week and these cannot be used more than a two week period due to absorption and thinning of the skin.
dexamethasone	Topicort	
hydrocortisone	Hytone	
clobetasol	Temovate	
fluocinolone	Synalar	
fluocinonide	Lidex	
momethasone	Elocon	
triamcinolone	Aristocort, Kenalog	
Just be able to recall the name to what category all creams/lotions go to and the max dose.		

Cardiovascular Drugs

ANTI-ANGINALS

Angina is characterized by insufficient oxygen to the heart muscle causing sudden, severe substernal pain radiating to the left arm.

Generic Name	Brand Name	Auxiliary Labels
nitroglycerin	Nitrostat, Nitrobid, Nitro-Dur	Not child resistant lid
Special Considerations: 3 doses is the max. Tolerance buildup.	Store in original glass amber bottle. Flushing Light headedness	Do not take with Viagra/Cialis

Generic Name	Brand Name	Auxiliary Labels
isosorbide dinitrate	Isordil	Check with pharmacist before any OTC items.
isosorbide mononitrate	Imdur	
Special Considerations:	Do not take with Viagra/Cialis	

Calcium Channel Blockers
See List Below

Beta Blockers
See List Below

ANTI-ARRHYTHMICS

There are rhythmic impulses that cause the heart to beat. Dysfunction of the impulse generator (pacemaker) can cause the heart to slow down (**bradycardia**) or speed up (**tachycardia**). Anti-arrhythmic medications are divided up into different classes:

Class I	Sodium Channel Blockers
Generic Name	Brand Name
disopyramide	Norpace
lidocaine	Xylocaine
procainamide	Pronestyl
quinidine	Quinaglute
propafenone	Rythmol
flecainide	Tambocor

Class II	Beta Blockers
Generic Name	Brand Name
acebutolol	Sectral
atenolol	Tenormin
betaxolol	Kerlone
carvedilol	Coreg
metoprolol	Lopressor
nadolol	Corgard
propranolol	Inderal
sotalol	Betapace
labetolol	Normadyne

All end in -olol

Don't worry about learning Class I drugs.

Class III	Calcium Channel Blockers
Generic Name	Brand Name
amlodipine	Norvasc
diltiazem*	Cardizem, Dilacor
felodipine	Plendil
isradipine	Dynacirc
nicardipine	Cardene
nifedipine	Procardia, Adalat
verapamil*	Calan, Isoptin, Verelan

* = on test every time

Class IV	Cardiac Glycoside
Generic Name	Brand Name
digoxin*	Lanoxin
Drug to give in case of overdose:	Digibind

ANTIHYPERTENSIVE AGENTS

Hypertension - diastolic blood pressure (pressure during relaxation of heart) is greater than 90 and systolic blood pressure (pressure during contraction of the heart) is greater than 140mm Hg if left untreated, can lead to congestive heart failure(CHF), myocardial infarction, renal damage and stroke.

Diuretics

Generic Name	Brand Name	Auxiliary Labels
bumetanide	Bumex	
furosemide	Lasix	
hydrochlorothiazide	Hydrodiuril	
indapamide	Lozol	
torsemide	Demadex	
metolazone	Zaroxolyn	
Special Considerations: Flushes out Potassium		Will need a potassium Supplement

Potassium-Sparing Diuretics

Generic Name	Brand Name	Auxiliary Labels
amiloride	Midamore	
spironolactone	Aldactone	
triamterene	Dyrenium	
bisoprolol-HCTZ	Ziac	
triamterene-HCTZ	Dyazide, Maxzide	
spiranolactone- HCTZ	Aldactazide	
Special Considerations: Do not take with potassium Suppl.		

ACE Inhibitors

Generic Name	Brand Name	Auxiliary Labels
benazepril	Lotensin	
captopril	Capoten	
enalapril	Vasotec	
fosinopril	Monopril	
lisinopril	Prinivil, Zestril	
quinapril	Accupril	
ramipril	Altace	
Special Considerations: all end in -pril		

Angiotensin II – receptor Antagonists

Generic Name	Brand Name	Auxiliary Labels
losartan	Cozaar	
losartan-HCTZ	Hyzaar	
valsartan	Diovan	
Special Considerations:		

Calcium Channel Blockers

See List

Beta Blockers

See List

Gastrointestinal Agents

GAS

Generic Name	Brand Name	OTC or Rx
simethicone	Mylicon drops	OTC
	Gas X, Phazyme	OTC
Special Considerations: treats flatulence by collapsing gas bubbles in the GI tract		

ANTI-DIARRHEALS

Generic Name	Brand Name	OTC or Rx
bismuth subgallate	Pepto-Bismol	OTC
loperamide	Imodium	OTC
kaolin/attapulgate	Kaopectate	OTC
opium tincture	Paregoric	Rx CIII
diphenoxylate	Lomotil	Rx CV
Special Considerations:		

LAXATIVES

Stool Softeners/Lubricants/Saline		
Generic Name	Brand Name	OTC or Rx
docusate sodium	Colace	OTC
lactulose	Enulose, Cephulac, Generlac	Rx
mineral oil	Kondremul	OTC
magnesium hydroxide	Milk of Magnesia (MOM)	OTC
sodium phosphate	Phospho-soda	OTC
glycerin suppositories	Fleet suppositories	OTC

Stimulants		
Generic Name	Brand Name	OTC or Rx
bisacodyl	Dulcolax	OTC
castor oil	castor oil	OTC
senna	Senokot	OTC
casanthrol/docusate	Peri-Colace	OTC

Bulk-Forming		
Generic Name	Brand Name	OTC or Rx
polycarbophil	FiberCon	OTC
methylcellulose	Citrucel	OTC
psyllium	Metamucil	OTC

Bowel Evacuants		
Generic Name	Brand Name	OTC or Rx
polyethylene-glycol (PEG)	GoLYTEly, NuLYTEly, TriLyte, HalfLYTEly	Rx

ANTIEMETIC AGENTS

Generic Name	Brand Name	OTC or Rx	Auxiliary Labels or Concerns
chlorpromazine	Thorazine	Rx	
dimenhydrinate	Dramamine	OTC	
granisetron	Kytril	Rx	
hydroxyzine	Atarax	Rx	Will cause dry mouth and dizziness
meclizine	Antivert, Bonine	OTC	Will cause dry mouth and dizziness
metoclopramide	Reglan	Rx	
ondansetron	Zofran	Rx	Will cause drowsiness
prochlorperazine	Compazine	Rx	
promethazine	Phenergan	Rx	Will cause drowsiness
trimethobenzamide	Tigan	Rx	
diphenhydramine	Benadryl	OTC	Will cause drowsiness
scopolamine	Transderm Scop	Rx	1 patch behind ear every 72 hours

ANTI-ULCER AGENTS

GI ulcers (esophagus, stomach, intestine) occur due to the loss of tissue lining those parts of the digestive tract exposed to gastric acids. The drugs used to treat ulcers work by either reducing the secretion of gastric acids (H2 antagonists) or by coating the lining of the stomach and small intestine to protect it from the adverse effects of stomach acid.

Causes of ulcers: excess stomach acid, cigarette smoking, bacteria H. pylori, aspirin, NSAIDS, and stress

ANTACIDS

Given one hour after a meal to neutralize the stomach acid for two hours. The active ingredients usually are magnesium, aluminum or calcium carbonate or any combination.

Magnesium causes diarrhea and aluminum causes constipation.

Concern: Antacids absorb other drugs which reduce their effect in the body so it is necessary to space drugs far apart as possible.

Generic Name	Brand Name	OTC or Rx
aluminum hydroxide	Amphojel, Alternagel	OTC
aluminum – magnesium	Maalox, Mylanta	OTC
magnesium hydroxide	Milk of Magnesia (MOM)	OTC
magnesium trisulfate	Gelusil	OTC

HISTAMINE-2 BLOCKERS

By blocking the histamine receptors in the GI tract, this reduces the production of acid from other cells.

OTC versions are of a lower dose compared to prescription strength. **These are all on the exam.**

Generic Name	Brand Name	OTC or Rx
cimetidine	Tagamet	OTC and Rx
nizatidine	Axid	OTC and Rx
ranitidine	Zantac	OTC and Rx
famotidine	Pepcid	OTC and Rx

PROTON PUMP INHIBITORS

Stronger than the histamine-2 blockers in reducing acid. Rx Only.

Generic Name	Brand Name	OTC or Rx
lansoprazole	Prevacid	Rx
omeprazole	Prilosec	OTC and Rx
pantoprazole	Protonix	Rx
esomeprazole	Nexium	Rx
rabeprazole	Aciphex	Rx

MISCELLANEOUS DRUGS TO TREAT ULCERS:

Generic Name	Brand Name	OTC or Rx
misoprostol	Cytotec	Rx
bismuth subsalicylate	Pepto-Bismol	OTC
sucralfate	Carafate	Rx
alginic acid	Gaviscon	OTC
mesalamine	Rowasa, Asacol, Pentasa	Rx
sulfasalazine	Azulfidine	Rx

ANTIBIOTICS

tetracycline (TCN)
amoxicillin (Amoxil)
metronidazole (Flagyl)
erythromycin
clarithromycin (Biaxin)

Synergy-

the combination of more than one drug together produce a result greater than each individual drug could. So, pepto-bismol + Prilosec + Amoxil treat the more stubborn (serious) heartburn or ulcers than they could by given just one medication.

Respiratory Function

BRONCHODILATORS

These drugs act on the respiratory tree by relaxing bronchial muscle and are most commonly used to treat mild asthma. They can prevent an attack or stop an attack already started.

Generic Name	Brand Name	Auxiliary Labels
albuterol	Proventil, Ventolin	Shake Well
formoterol fumarate	Foradil	Refrigerate this one
ipratropium	Atrovent	Shake Well- Rinse mouth
ipratropium-albuterol	Combivent	
pirbuterol	Maxair	
salmeterol	Serevent	
Special Considerations: Requires a PPI by law		

CORTICOSTEROIDS

These reduce inflammation in the bronchial airways. These will not stop an attack already started.

Generic Name	Brand Name	Considerations
budesonide	Rhinocort	Nose
flunisolide	Aerobid	Rinse mouth afterwards
dexamethsone	Decadron	Tabs
fluticasone	Flovent, Flonase	Nose
fluticasone/salmeterol	Advair	Rinse mouth afterwards
methylprednisolone	Medrol	Tabs
triamcinolone	Azmacort(po), Nasacort(nose)	Rinse mouth afterwards

MISC.

Generic Name	Brand Name	Auxiliary Labels
montelukast	Singulair	
zafirlukast	Accolate	
theophylline	Theo-Dur, Slo-Phyllin	

TUBERCULOSIS AGENTS

Generic Name	Brand Name	Auxiliary Labels
ethambutol	Myambutol	
isoniazid (INH)	Laniazid	
rifampin	Rifadin	

MEDICATIONS TO TREAT THE COMMON COLD

Expectorants - thins out mucus and helps remove it

Generic Name	Brand Name	OTC or Rx
guaifenesin	Robitussin	OTC
	Humibid LA	Rx
	Entex LA	Rx
Special Considerations:	Bid dosing on Rx's	

Antitussives - reduces dry hacking coughs

Know the scheduling of the drugs for the exam.

Generic Name	Brand Name	OTC or Rx
benzonatate	Tessalon Perles	Rx
Codeine	Robitussin AC and DAC	CIII
dextromethorphan	Delsym, Robitussin DM	OTC
diphenhydramine	Benedryl	OTC
hydrocodone-homatropine	Hycodan	CIII

Decongestants - reduce nasal stuffiness. Do not use more than 3 days in a row due to rebound congestion.

Rebound congestion is severe swelling of the nasal sinuses that will not go away now.

Side effects: increased blood pressure, heart arrhythmias, and increased blood glucose. Use caution in hypertension, hyperthyroid, diabetes, and heart disease.

Generic Name	Brand Name	OTC or Rx
pseudoephedrine	Sudafed	OTC
phenylephrine	Dristan	OTC
oxymetazoline	Afrin	OTC

Antihistamines - dries up a person, good for watery eyes, runny nose (hay fever symptoms)

Generic Name	Brand Name	OTC or Rx
brompheniramine	Dimetapp	OTC
cetirizine	Zyrtec	Rx
chlorpheniramine	Chlor-Trimeton	OTC
clemastine	Tavist	OTC
diphenhydramine	Benedryl	OTC
fexofenadine	Allegra	Rx
loratadine	Claritin, Alavert	OTC
meclizine	Bonine, Antivert	OTC

Antihistamines cause drowsiness with exception to Claritin.

Diabetes

The pancreas produces insulin to decrease blood glucose and glucagon which increases blood glucose. A lack of insulin causes hyperglycemia referred to as diabetes mellitus.

Two types of diabetes:

Type I: People born with the disease and do not produce any insulin. They require insulin injections. Insulin is available from pork, beef, and human. Storage is not required but will prolong its shelf-life therefore an auxiliary label "Store in Refrigerator". Also, insulin injections need an auxiliary label of "no alcohol".

Examples of Insulin	
Lispro	
Regular	←
NPH	
Lente	
Ultralente	
Humalog	
Lantus	

Regular insulin is the only one allowed in an IV bag

100 Units/ml. Each vial is 10ml.
Therefore: One vial has _____ U?

Type II: (non-insulin dependent) People do produce insulin but is very little and usually occurs later in ones life. These people do not take insulin injections but need oral hypoglycemic agents (tablets) which cause increased production of insulin from the pancreas. Auxiliary label of "No Alcohol" and "Photosensitivity".

Generic Name	Brand Name
acarbose	Precose
glimepiride	Amaryl
glipizide	Glucotrol, Glucotrol XL
glyburide	Diabeta, Micronase
metformin	Glucophage
nateglinide	Starlix
repaglinide	Prandin
pioglitazone	Actos
rosiglitazone	Avandia
Combination Products:	
glipizide-metformin	Metaglip
glyburide-metformin	Glucovance
rosiglitazone-metformin	Avandamet

Thyroid Replacements

Hypothyroidism= Iodine deficiency. Symptoms slowed speech, swelling, puffy face, anemia, and weight gain.

Generic Name	Brand Name
thyroid	Armour Thyroid
liotrix	Thyrolar
liothyronine	Cytomel
levothyroxine	Synthroid,Levothroid,Levoxyl

Analgesics

NARCOTIC ANALGESICS

Action- used for the relief of pain (analgesia) by binding to opiate receptors in the CNS (brain and spinal cord), altering both the **perception of** and emotional response to pain.

Concerns-

Dependence- *altered state where continued administration is needed to prevent withdrawal*

Addiction – *compulsive use*

Tolerance – *larger doses needed to get the desired response. (Chronic use)*

Side effects – *GI distress, constipating, drowsiness*

Overdose - *Too much narcotics in the body (toxicity) can cause respiratory depression (breathing slows, maybe stops)*

Narcotic antagonist (blocker) = **Naloxone which is used in case of an overdose. This drug blocks the absorption of the narcotic.**

Auxiliary labels-

Take with Food/Milk

May Cause Drowsiness

Do Not Drink Alcohol

SCHEDULE II

Generic Name	Brand Name
oxycodone + APAP (Endocet)	Percocet, Tylox
oxycodone + ASA	Percodan
codeine	Codeine
fentanyl	Duragesic
hydromorphone	Dilaudid
meperidine	Demerol
methadone	Dolophine
morphine	MS Contin
oxycodone	Oxycontin

SCHEDULE III

Generic Name	Brand Name
APAP + codeine	Tylenol #2, #3, #4
hydrocodone	Hycodan
hydrocodone + APAP	Vicodin, Lortab

SCHEDULE IV

Generic Name	Brand Name
butorphanol	Stadol
propoxyphene	Darvon
propoxyphene + APAP	Darvocet N
pentazocine + naloxone	Talwin NX
pentazocine	Talwin

NON-NARCOTIC ANALGESICS AND ANTIPYRETICS

Aspirin (acetyl salicylic acid)

Uses: Analgesic, Antipyretic, Anti-inflammatory, Antirheumatic

Concerns- Reye's Syndrome in children if given during exposure of chicken pox

Thins the blood and prevents clots (stroke, heart attack) **INTERACTS WITH**

COUMADIN

Long term use causes GI distress (ulcers), hearing loss

Acetaminophen

Uses: Analgesic, Antipyretic

NO ANTI-FLAMMATORY EFFECTS

Therefore, not an NSAID

Nonsteroidal Anti-Inflammatories (NSAIDs)

Actions - anti-inflammatory, anti-pyretic (fever), analgesic (pain)

MUST HAVE ALL 3 PROPERTIES TO BE AN NSAID

Concerns - Take with Food/Milk
Contraindicated in patients with ulcers (peptic ulcer disease)
Cannot take with warfarin (Coumadin)
May cause drowsiness

Generic Name	Brand Name
diclofenac	Voltaren, Cataflam
diflunisal	Dolobid
etodolac	Lodine
fluribiprofen	Ansaid
ibuprofen	Motrin, Advil, Nuprin
indomethacin	Indocin
ketorolac	Toradol
nabumetone	Relafen
naproxen	Anaprox, Naprosyn, (Aleve – OTC)
oxaprozin	Daypro
piroxicam	Feldene

Selective 5-HT Receptor Agonist (Migraine Medicine)

Generic Name	Brand Name
almotriptan	Axert
eletriptan	Relpax
frovatriptan	Frova
naratriptan	Amerge
rizatriptan	Maxalt
sumatriptan	Imitrex
zolmitriptan	Zomig

Blood Disorders

Anticoagulant- stops or slows the clotting process

Heparin
Injection only
Monitored by PTT
Antidote is protamine Sulfate
Safe for Pregnancy

Warfarin (Coumadin)
Tablet only
Monitored by PT
Interacts with antibiotics,NSAIDS
Not safe for pregnancy

Generic Name	Brand Name
dalteparin	Fragmin
enoxaparin	Lovenox

Thrombolytics- dissolves clots quickly

examples: 1) Streptokinase 2) Urokinase

concerns: interacts with anticoagulants, anti-platelet drugs, and NSAIDS = increase bleeding

Anemia- Red blood cells are depleted of either iron, vitamin B-12 ,or folic acid

Iron- travels on hemoglobin in the RBC (hemoglobin carries oxygen)

Most common anemia is from lack of iron

examples:

ferrous sulfate (FeSO₄) - Feosol
 ferrous gluconate - Fergon
 ferrous fumarate - Feostat iron

concerns:

stay away from antacids, coffee, tea, and milk

interferes with TCN

take on empty stomach

stains teeth - *so the liquid iron for children should be dissolved in juice before administered.*

Vitamin B-12 (cyanocobalamin) and Folic Acid (folate)-

- if deficient in one of these will cause impaired DNA synthesis and the RBC does not mature

Psychotherapeutic Agents

ANTI-ANXIETY AGENTS

These agents reduce anxiety due to stress. These drugs are also used as sedatives (ability to calm) and hypnotics (causing sleep) depending on the dose administered. May cause dependence so discontinuation must be tapered.

“May Cause Drowsiness” and “Do Not Drink Alcoholic Beverages” for auxiliary labels.

Generic Name	Brand Name	Rx
alprazolam	Xanax	IV
bupirone	Buspar	Rx
chlordiazepoxide	Librium	IV
clorazepate	Tranxene	IV
diazepam	Valium	IV
hydroxyzine	Atarax, Vistaril	Rx
lorazepam	Ativan	IV
oxazepam	Serax	IV

ANTIDEPRESSANTS

Depression is an affective disorder characterized by a change in mood. **Feelings:** sadness, pessimism, worry, loss of concentration, hopelessness, despair and the inability to experience pleasure in usual activities.

Signs and symptoms: poor appetite, sleep disturbance, agitation, fatigue, thoughts of death.

Effects of these drugs are not immediate. Each class varies from 21 days to 8 weeks to be effective.

Tricyclic Anti-Depressants (TCAs)		
Generic Name	Brand Name	Notes
amitriptyline	Elavil	Do not mix with MAOI inhibitor Drugs.
clomipramine	Anafranil	
desipramine	Norpramin	
doxepin	Sinequan, Zonalon	
imipramine	Tofranil	
nortriptyline	Pamelor	

Serotonin Reuptake Inhibitors (SSRIs)		
Generic Name	Brand Name	Notes
fluoxetine	Prozac	Do not mix with MAOI inhibitor Drugs.
paroxetine	Paxil	
sertraline	Zoloft	
fluvoxamine	Luvox	
bupropion	Wellbutrin	Most causes insomnia at night and drowsiness in the day.
citalopram	Celexa	
duloxetine	Cymbalta	
escitalopram	Lexapro	
venlafaxine	Effexor	

Monoamine Oxidase Inhibitors (MAOIs)		
Generic Name	Brand Name	Notes
phenelzine	Nardil	These need what is called a "Wash Out" period. (2 weeks of no drugs)
selegiline	Eldepryl	
tranylcypromine	Parnate	
These interact with everything.		Interacts with cheeses, wine, and other anti-depressants.

ANTIPSYCHOTICS

Generic Name	Brand Name
clozapine	Clozaril
fluphenzaine	Prolixin
haloperidol	Haldol
loxapine	Loxitane
olanzapine	Zyprexa
risperidone	Risperadal
thiothixene	Navane
ziprasidone	Geodon
thioridazine	Mellaril

These are to treat psychosis and schizophrenia. Behaviors include delusions, hallucinations, and agitation. Must be tapered slowly if stopping to take medication.

Side effects: Extrapyramidal side effects (EPS) and tardive dyskinesia (TD) both effect motor coordination.

"Will Cause Drowsiness" and "No Alcoholic Beverages".

Nervous System Disorders

ANTIPARKINSON'S MEDICATIONS

Generic Name	Brand Name
amantadine	Symmetrel
benztropine	Cogentin
bromocriptine	Parlodel
levodopa-carbidopa	Sinemet
ropinirole	Requip
selegiline	Eldepryl
trihexyphenidyl	Artane

Parkinson's disease is a disorder caused by the death of a group of brain cells that use dopamine (chemical transmitter). It is a muscle movement disorder involving tremors, muscular rigidity, and gait abnormalities.

ANTICONVULSANTS

Epilepsy (seizure disorder) is abnormal discharge of signals in the brain. This results in abnormal movements that are short in duration but reoccur frequently.

Generic Name	Brand Name
carbamazepine	Tegretol
clonazepam	Klonopin
valproic acid	Depakote
lamotrigine	Lamictal
oxcarbazepine	Trileptal
phenobarbital	Luminal
valproate	Depakene
phenytoin	Dilantin
zonisamide	Zonegran

Hormone Replacement Therapy

Estrogen - responsible for the monthly build up of the endometrium of the uterus during each reproductive cycle.
Also good for the skin, heart, bones and menopause, insomnia, irritability, and mood changes.

Generic Name	Brand Name
conjugated estrogen	Premarin
conjugated estrogen + diethylstilbestrol (DES)	Prempro, Premphase
estradiol	Estrace, Estraderm, Vivelle, Climara
estradiol + norethindrone	Activella, Combipatch
estradiol + norgestimate	Ortho-Prefest
estropipate	Ogen

Progestin - prepares the body for pregnancy and breasts for milk production.
-also used in menopause to counteract the side effect of estrogen of chance of cancer also for amenorrhea & endometriosis.

Generic Name	Brand Name
medroxyprogesterone	Cycrin, Provera
norethindrone	Aygestin

Oral Contraceptives: Combo of progestin and estrogen.

-used to prevent pregnancy, regulate menses

Generic Name	Brand Name
Biphasic	
ethinyl estradiol(EE) + desogestrel	Cyclessa, Desogen, Kariva, Mircette, Ortho-Cept
EE + drospirenone	Yasmin
EE + ethynodiol diacetate	Demulen
EE + etonogestrel	NuvaRing
EE + levonorgestrel	Levlen, Tri-Levlen, TriPhasil
EE + norelgestromin	Ortho Evra
EE + norethindrone	Estrostep Fe, Femhrt, Loestrin Fe, Ovcon
EE + norgestimate	Ortho Tri-Cyclen, Ortho Tri-Cyclen Lo,
EE + norgestrel	Lo Ovral, Low-Orgestrel, Ovral
Emergency Contraceptives	
levonorgestrel	Plan B
norgestrel	Ovrette
Progestin	
norgestrel	Ovrette
Parenteral	
estradiol cypionate + medroxyprogesterone	Lunelle
medroxyprogesterone	Depo-Provera
Implant	
levonorgestrel	Norplant

Oral Contraceptive Interactions: Erythromycin, penicillin, rifampin, tetracycline, Tegretol, Dilantin, Phenobarbital, Diflucan, Nizoral, and Sporonox.

HIV/AIDS

HIV = human immunodeficiency virus - this is an RNA virus which is the causative agent in AIDS

You can have HIV and not have AIDS, but HIV is contagious and capable of passing the virus to others.

AIDS = acquired immune deficiency syndrome - severe suppression of the immune system.

People with AIDS have increased chance of infection (because their immune system cannot fight off infections).

Transmission

- sexual contact (semen, vaginal secretions, breast milk)
- exposure to infected blood
- in pregnancy - mother to neonate

Measurements

CD4 count and p24 antigen

Medications

Although not curative, these agents can interfere in the multiplication of the virus and slow progression of the disease to prolong survival rate. They decrease the chance of infection, improves performance status, person gains weight back.

Side effects: nausea, fatigue, headache, fever, and rash

Auxiliary labels: Take on an empty stomach

No alcohol

Do not take with ketoconazole, itraconazole, Cipro

- zidovudine (Retrovir) - known as AZT - first developed – *Pregnant HIV women take this one to prevent the passage of the virus to the fetus*
- didansine (Videx)
- stavudine (Zerit)
- lamivudine (EpiVir)
- zalcitabine (Hivid) - side effect of extreme neuropathy (pain, weakness, numbness, tingling, burning of hands and feet)
- nevirapine (Viramune) – rash
- delavirdine (Rescriptor) - dissolves in water to drink
- abacavir (ABC) (Ziagen)
- zidovudine + lamivudine (Combivir)
- zidovudine + lamivudine + abacavir (Trizivir)
- efavirenz (Sustiva)
- nevirapine (Viramune)

A PPI must be included with the following medications:

- saquinavir (Invirase) - photosensitivity
- indinavir (Crixivan) -kidney stones so auxiliary label - Drink plenty of water while on this medication
- ritonavir (Norvir) - most side effects and drug interactions (weakness, n & v, diarrhea, anorexia, abdominal pain)
Auxiliary labels - Keep refrigerated
Take with food
Do not take with antacids
Protect from light
- nelfinavir (Viracept)

Combination use: AZT + EpiVir + Videx or Zerit + EpiVir + Videx

Vitamins

Vitamin	Name	Use
A	Retinol, beta-carotene	retinal function, bone growth, healthy skin
B1	thiamine	energy, deficiency is called beri-beri
B2	riboflavin	energy, synthesis of fat and protein
B3	niacin	lipid metabolism, fights cholesterol
B6	pyridoxine	RBC synthesis, immune system
B9	folic acid	RBC formation
B12	cyanocobalamine	RBC formation
C	ascorbic acid	collagen formation, tissue repair
D	ergocalciferol or chloecalciferol	absorption of calcium and phosphorus in bone/teeth
E	tocopherols	antioxidant
K	phytonadione	blood clotting

Gout

Gout - Occurs when the uric acid levels in the body increase and crystallize in the joints. This causes pain in the joints like arthritis.

Generic Name	Brand Name	Use
allopurinol	Zyloprim	decrease uric acid in the body
indomethacin	Indocin	A safe NSAID for the pain

Local Anesthetics

Local Anesthetics numb the area where applied. These drugs usually end in -caine.

Name	Found in
lidocaine	gel, viscous liquid, spray
xylocaine	gel, viscous liquid
benzocaine	oragel/ambesol for mouth sores and Dermoplast spray
cocaine	liquid eye drop for eye surgery

Cholesterol Drugs

HYPERLIPIDEMIA

Generic Name	Brand Name
atorvastatin	Lipitor
fluvastatin	Lescol
lovastatin	Mevacor
pravastatin	Pravachol
rosuvastatin	Crestor
simvastatin	Zocor
fenofibrate	Tricor
gemfibrozil	Lopid
cholestyramine	Questran
colesevelam	Welchol
colestipol	Colestid

Anti-Neoplastic Drugs

The majority of antineoplastic drugs are toxic. They cause carcinogenic, mutagenic, or teratogenic effects. Aseptic technique is important in minimizing exposure to these agents.

- Potential routes of exposure: inhalation of aerosolized drug and by direct skin contact.
- Antineoplastic work should be done in a Class II laminar flow hood (vertical).
- The work surface should be covered with plastic-backed absorbent paper.
- Staff gowns (open side to the back) with knit cuffs, gloves
- Vials should be vented to reduce internal pressure that causes spraying
- Must label or place a sticker that says, "Caution - Cancer Chemotherapy, Dispose of Properly."
- Wipe down work area with 70% alcohol when finished
- Needles and syringes should be disposed of intact, to prevent aerosol generation. Place in a leak proof and puncture resistant container
- The above container, as well as bottles, vials, gloves, absorbent paper, disposable gowns should be placed in a plastic lined box, sealed and incinerated.

Know every step here.

Generic Name	Brand Name
bleomycin	Blenoxane
busulfan	Myleran
chlorambucil	Leukeran
cisplatin	Platinol
cyclophosphamide	Cytoxan
daunorubicin	Cerubidine
doxorubicin	Adriamycin
fluorouracil (5-FU)	Efudex
hydroxyurea	Hydrea
lomustine (CCNU)	CEENU
melphalan	Alkeran
mercaptopurine	Purinethol
methotrexate	Rheumatrex
temozolomide	Temodar
valrubicin	Valstar
vinblastine	Velban
vincristine	Oncovin

You don't have to worry about knowing the brand to generic name. Concentrate on that recognizing these names belong in this category.

Chemicals

Al	Aluminum	AgNO ₃	Silver Nitrate
Ag	Silver	CO ₂	Carbon Dioxide
C	Carbon	FeSO ₄	Ferrous Sulfate
Ca	Calcium	H ₂ O ₂	Hydrogen Peroxide
Cl	Chloride	KCl	Potassium Chloride
Fe	Iron	KI	Potassium Iodide
H	Hydrogen	MgO	Magnesium Oxide
I	Iodine	NaCl	Sodium Chloride
K	Potassium	NaHCO ₃	Sodium bicarbonate
Mg	Magnesium	O ₂	Oxygen
Mn	Manganese		
N	Nitrogen		
Na	Sodium		
O	Oxygen		
P	Phosphorous		
S	Sulfur		
Zn	Zinc		

Drug Information Sources

American Drug Index- generic, brand and chemical names of drugs, the manufacturer, use of drug, dosage, dosage forms available, size and strength.

Red Book- gives the wholesale and retail prices of medication. Drug re-imburement information from third party.

Goodman and Gilman's: The Pharmacological Basis of Therapeutics: pharmacokinetics of medicines.

Orange Book : FDA Approved Drug Products with Therapeutic Equivalence Evaluations: Approved drug listing for the United States and which drugs can be substituted for one another.

Hansten's Drug Interactions -guide to drug-drug interactions

Facts and Comparisons - monthly updated (most current information) guide on actions, indications, warnings, interactions, precautions, adverse reactions and dosage calculations.. Includes orphan drugs, investigational drugs, drug monographs, drug identification

Handbook on Injectable Drugs- References the compatibility of various parenteral drugs.

Handbook of Non-Prescription Drugs- OTC reference book

Merck Index - encyclopedia of chemical substance data

Merck Manual - general disease categories and their treatments

Remington's Pharmaceutical Sciences: Detailed book of the practice of pharmacy.

Physican's Desk Reference (PDR) - annual publication of all product inserts from manufacturers into a book. Indexes of manufacturers, generic and trade names; product identification guide (pictures of the product).

Aseptic Technique and Sterile Products

Sterile products should be prepared in a “Class 100” environment, which is defined as an area containing no more than 100 particles, 0.5 microns or larger in size per cubic foot of air.

Horizontal laminar flow hood

Air is taken into the unit and passed through a pre-filter to remove dust and lint. The air then passes through a HEPA filter which is bacteria retentive and removes 99.9% of particles 0.3 microns or larger from the work surface. The filter is in the back of the unit and the air is blown toward the operator. With air moving out of the unit it prevents contaminated room air coming into the work area.

Vertical laminar flow hood (“safety biological cabinets”)

Air enters at the top of the unit and is blown down toward the work surface. This type will protect the technician from exposure to cytotoxic or hazardous drugs (ie methotrexate). The filter is at the top of the unit. There is a glass shield to protect the technician.

- Flow hoods must be inspected every 6 MONTHS or when the hood is moved or if HEPA filter becomes wet.
- HEPA filters remove 99.97% of particles that are .3microns or larger.
- Nothing must interrupt the flow of air between the HEPA filter and the sterile object.
- Objects placed between the HEPA filter and the sterile product may cause contamination of the sterile product. *Space between the filter and sterile object is CRITICAL AREA.*
- All work must be performed at least 6 inches within the hood.
- Only the forearms and hands are allowed in the work area.
- The hood should never be turned off. *If it is turned off – it must run 30-60 minutes before using it.*
- Before working in, all interior work surfaces should be cleaned with isopropyl alcohol--work side to side and from back of the unit to the front
- Operator must scrub from elbow to fingernails with anti-microbial skin cleanser and dry with air blower or disposable paper towels.
- Operator must be gowned from the head to feet. *Hair cover, gloves, gown tied in back, shoe covers.....think of a surgeon.*
- No jewelry allowed.
- Talking and coughing should be directed away from the laminar flow hood.
- Only bring what is needed to prepare the sterile product
- Avoid touching any portion of the sterile product. “Critical sites” of contamination are the needle shaft and syringe plunger.
- *Filter pore size must be .2 micron to sterilize*
- *Pyrogens that are not removed by the filter produce a fever in the patient*

All of the above bullets will be on the exam. Memorize

SYRINGES All are critical sites meaning that if you touch them with your hands you will contaminate. Do not touch critical sites.

- Barrel
- Tips – two types: Luer lok (twist) or Slip tip (friction)
- Plunger

NEEDLES Critical Site

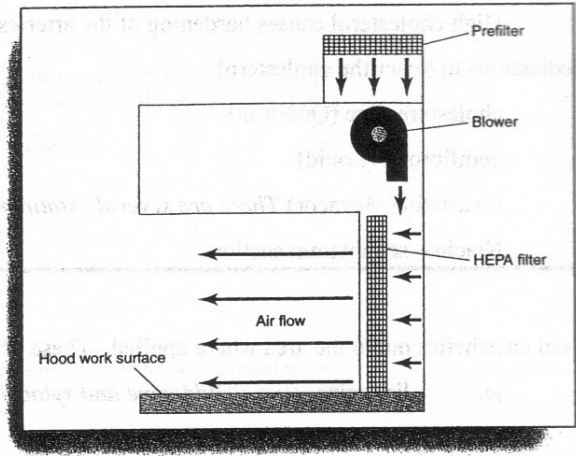
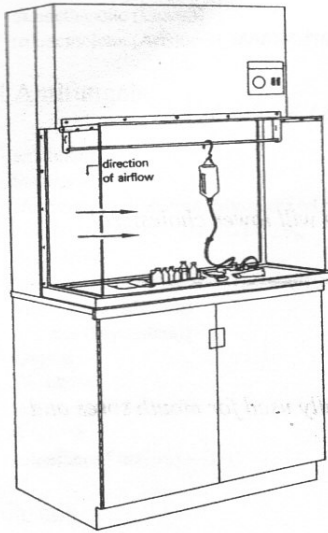
- Hub: attaches needle to syringe
- Shaft: never swabbed with alcohol, coated with silicone for ease of insertion – *alcohol will destroy the coating of the needle*
- Tip: beveled to form a point
- Size: designated by 2 numbers Example: 10cc 21G 1 gauge--the larger the gauge # the smaller the diameter of the needle – *therefore 27 is the smallest and 13 is the largest length--in inches – depends on how deep you want to inject*

VIALS

- Glass or plastic with rubber stoppers
- Caps are not sterile therefore the rubber must be swabbed with alcohol before the needle is inserted,
- “Positive pressure” - pressure inside the vial is greater than the outside
- “Negative pressure” - pressure outside the vial is greater than the inside
- For non-hazardous drugs – inject a quantity of air into the vial equal to the volume of fluid to be removed from the vial
- For hazardous drugs - important to maintain a slight negative pressure inside the vial. If there was positive pressure inside the vial, hazardous drug may spray out and cause harm to the technician.
- If a needle is inserted improperly through the rubber of the vial—pieces of rubber may be carved out as the needle is inserted and cause contamination. *This is called CORING. The pieces of rubber could also be injected into patient*

AMPULES

- Consists entirely of glass
- To open—swab neck with an alcohol pad and snap away from you and not toward the HEPA filter
- Withdraw medication with a syringe then must switch to a filter needle before injecting medication. *Filter needles have a tiny .5 micron filter in the hub*



In a **Horizontal Flowhood**, room air is pulled into the back of the hood, through the HEPA filter located **in the back**. The air passes through the **High Efficiency Particulate Air (HEPA)** filter where 99.97% of all particles 0.3 microns or larger are removed. The air flows horizontally, from the back of the hood, across the work surface and then out into the room. It is necessary to work at least six inches into the hood due to the mixing of room air and the filtered air.

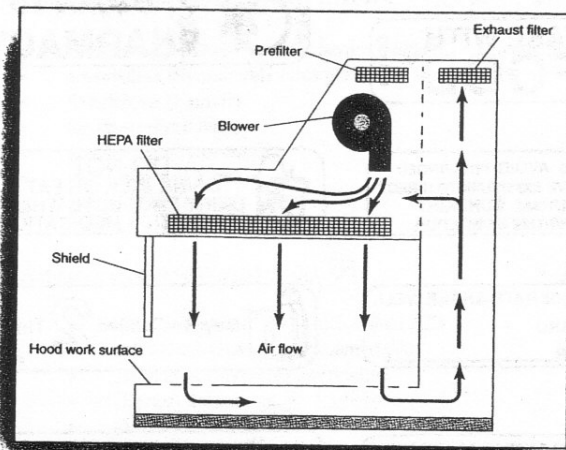
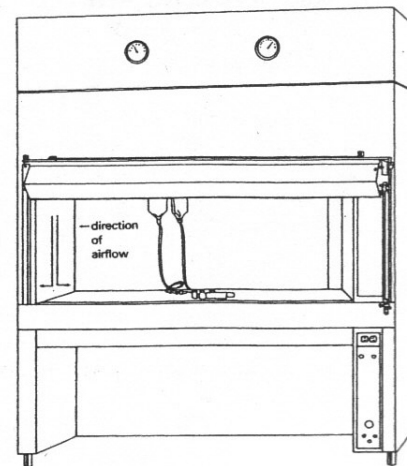


Figure 11.3 Vertical flow hood.



In a **Vertical Flowhood**, the HEPA filter is located in the **top of the hood**. The air flow moves from the top of the hood straight down onto the work surface. There is a glass shield that pulls down to help prevent splashes from hazardous material onto the worker. This is the hood of choice to work with hazardous materials like chemotherapy agents.

Parental products - drugs administered via injection
must be sterile (free from pyrogens that could cause fever)

3 REASONS WHY DRUGS ARE ADMINISTERED PARENTERALLY:

- If patient is unable to take the drug orally (comatose, unconscious, vomiting)
- Drug is not available in oral form because it gets destroyed in the stomach and injections bypass the stomach
- Emergency situations where immediate results are needed.

ADVANTAGES OF PARENTERAL ADMINISTRATION:

- Onset is more rapid than oral
- Absorption is more predictable than oral forms. Oral forms must get dissolved first.

DISADVANTAGES OF PARENTERAL ADMINISTRATION:

- Risk of infection when puncturing skin with contaminated needle
- Difficult to stop once administered and absorbed too rapidly to remove.
- Usually painful
- Must be sterile

ROUTES OF PARENTERAL ADMINISTRATION

Intravenous route IV - directly into the vein

- 1) IV injection – IV Push/Bolus - small amount of medication injected into the vein over a short period of time.
- 2) IV infusion - large volumes of fluid over longer periods of time

continuous infusion - large volumes of fluid administered at a constant rate over several hours (rehydration)

intermittent infusion - small volumes of fluid administered over a short period of time at intervals

example: Antibiotic over 15-30 minutes every 6 hours

usually piggybacked (connected to the main line via a **Y-site** to minimize injecting the patient so many times.)

Intramuscular (IM) - into the muscle

- upper arm, thigh, buttocks
- usually more irritating drugs are administered this way
- longer needle needed *to reach the muscle*

Subcutaneous (SC, SQ) - under the skin

- shorter needle needed *Doesn't need to go in very far*
- not for irritating drugs
- no more than 2 ml injected

Intradermal (ID) - into the skin

- short needle needed
- very small amounts injected
- used for anesthetics, allergy tests. TB test

CHARACTERISTICS OF IV SOLUTIONS

- Clarity – *must be clear*
- Sterility – *if not sterile the contaminants go directly to the bloodstream. This causes more problems for patient.*
- pH - must be as close to neutral (7) as possible *if pH is off it will cause irritation and pain upon injection.*
- Isotonicity
 - isotonic - *# of particles in a solution equals the same # of particles in blood.....this is ideal*
 - hypotonic – *Solution has fewer # of particles than blood....water is pulled into blood cell and blood cell swells/bursts*
 - hypertonic – *Solution has more particles than blood...water is pulled out of blood cell and blood cell shrivels up like a raisin.*

INCOMPATIBILITIES OF IV ADMIXTURES

Physical - change in appearance, solubility, color, haze. For example: 1. *crystallization when refrigerated.* 2. *If you mix Ca and PO₄ salts they form white crystals (precipitation) and solution is unusable.*

Chemical - chemical reaction between one or more of the ingredients. No visible changes (not noticeable) *The pH may change and decomposition may occur. Also, the presence of light may decompose the ingredients.*

Therapeutic - result from mixing together two or more drugs which change the therapeutic response of the drugs. *Some drugs such as Heparin and insulin and Nitroglycerin bind onto the IV bags which are made of PVC. Must use another type of bag.*

Stability- the extent to which a dosage form retains its properties/characteristics between the current time and when it was prepared.

Total Parenteral Nutrition (TPN)

The goal of a total nutrient admixture is to provide all necessary nutrients in a single container. It is designed to provide caloric intake if a patient cannot do this orally.

The TPN is usually put in the subclavian for 8-24 hours. (This vein leads directly into the heart and allows for rapid dilution.) Therefore Aseptic Technique is mandatory. Containers of injectable medications must be sterile and pyrogen-free. Pyrogens cause fever and infection in the patient.

Components: The normal ratio is 50% dextrose, 10% amino acids, and 20% fats

1) **Amino Acids** - protein source; without enough amino acids the body breaks down muscle as a source of protein.

Aminosyn II- contains both essential and non-essential

Aminosyn RF - only essential ; for renal failure

2) **Dextrose** - a poor source of energy; carbohydrate source

Strengths: 5%,10%,20%,50%,70%

3) **Fats** - largest amount of energy to the patient

4) **Electrolytes** - sodium, calcium, magnesium, calcium, phosphate

5) **Vitamins** - fat and water soluble

6) **Others** - vitamin K, iron, insulin

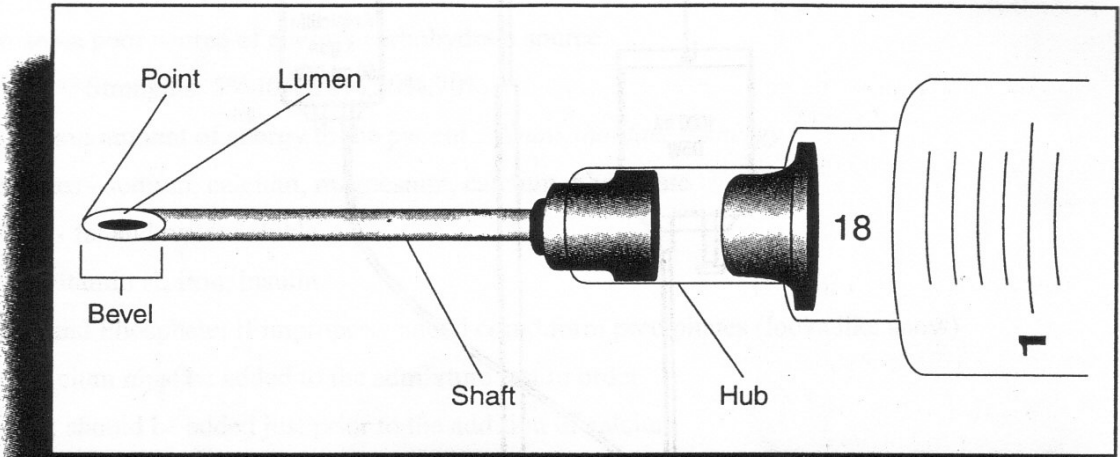
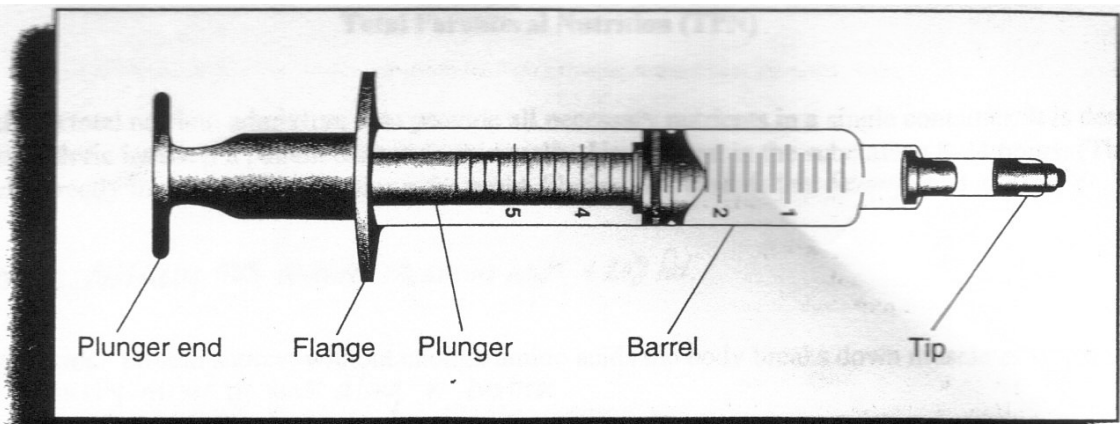
7) **Calcium and Phosphate:** If improperly added could form precipitates (looks like snow)

- Calcium must be added to the admixture last in order

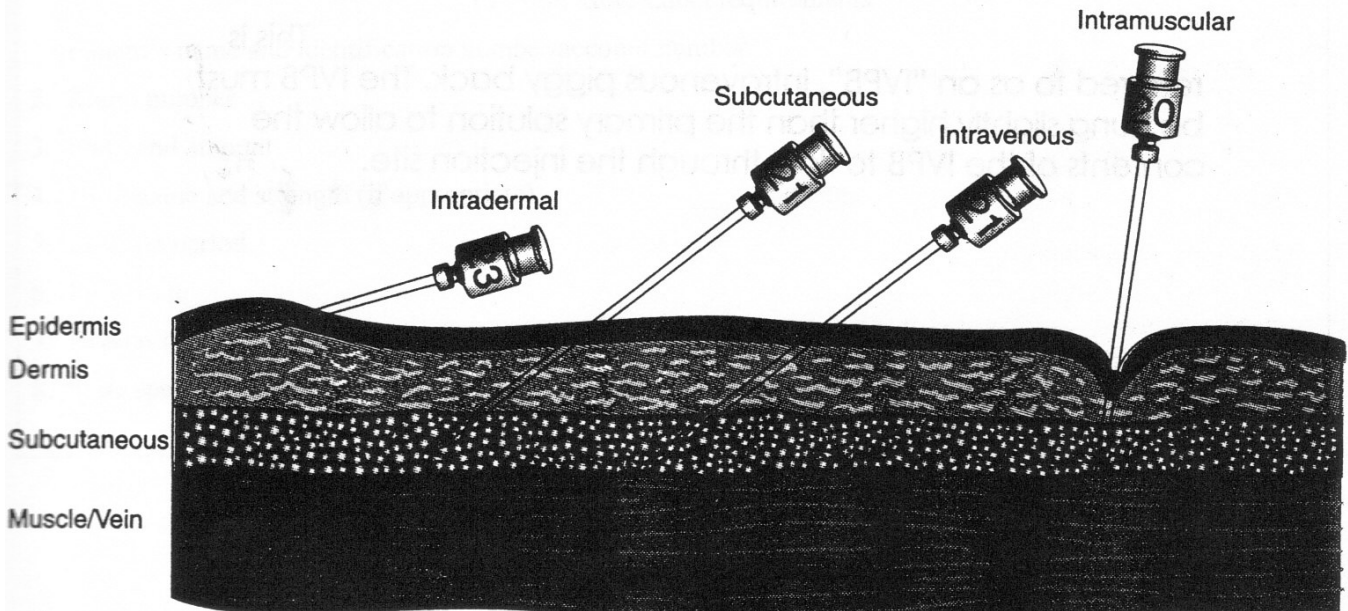
8) **Vitamins:** should be added just prior to the addition of calcium

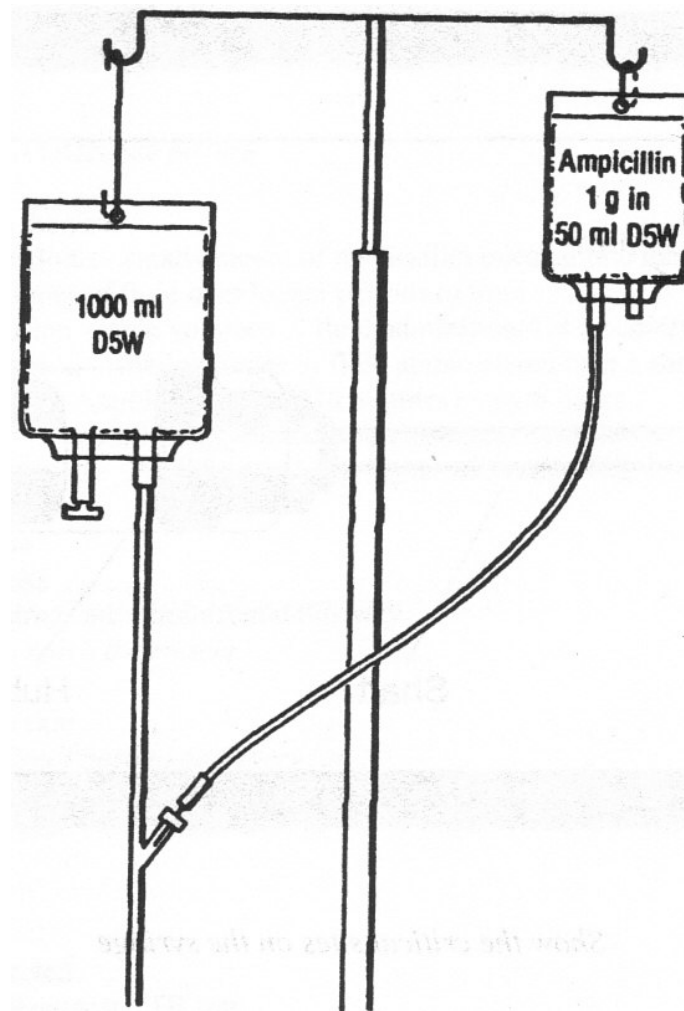
IV Admixture Label Requirements

1. Patient's name and identification number/account number
2. Room number
3. Fluid and amount
4. Drug name and strength (if appropriate)
5. Infusion period
6. Flow rate
7. Expiration date and time
8. State specifics: auxiliary labels, storage requirements, and device-specific information



Show the critical sites on the syringe





This is an example of an IVPB, intravenous piggyback. The IVPB must be hung higher than the primary bag to allow the contents of the piggyback to flow into the main tubing.

This is ideal for antibiotics that have to be given multiple times a day. By piggybacking them, you decrease the number of times you poke into the patient.

Medication Distribution and Inventory Control Systems

22% of Exam

Medication Distribution

Institutional (Hospital)

- Unit-dose systems are commonly used in institutional settings.
- These “ready-to-administer” packages are delivered to nurses’ stations via a cart exchange.
- Automated dispensing systems: *These systems store and dispense medication*

A. **Decentralized** systems are located at the patient care unit and contain floor stock medication, supplies, and controlled substances

- i.e. Pyxis MedStation
Baxter SureMed
Owen Healthcare Meditrol

Be able to recall these robot names.

B. **Centralized** systems are located in the central pharmacy and used to fill the unit-dose carts. It combines bar code technology, microcomputers, a conveyor system, and a robot to pick drugs and place them into patient medication drawers.

- i.e. Baxter ATC-212
Automated Healthcare Automated Pharmacy Station [APS]

Ambulatory Care

- Think Retail pharmacy. What are the steps you do when a patient drops off a prescription?

Inventory Control *Must have control over inventory to decrease unwanted drugs which costs the pharmacy money. Control also ensures that the wanted medication is in stock.*

Formulary System

- lists the product name, dosage form, concentration, and package size
- drugs that are to be maintained in stock
- controls drug costs
- updated every 12-18 months
- in an institutional setting (hospital) the formulary is developed by the Pharmacy and Therapeutics Committee (**P & T Committee**)
- The P & T Committee consists of physicians, pharmacists, nurses, dietitians, and administrators
- third-party payers also develop a formulary on which drugs they will reimburse

Inventory Systems

1) Computerized Inventory Systems

PAR Value (Periodic Automated Replacement)

- each dispensing medication going out is subtracted from the inventory log that is maintained by the computer
- when the quantity on the shelf reaches a predetermined point- the drug is automatically ordered.*
- all products received are added to the inventory log

2) Manual Inventory Systems

- a) **Minimum/maximum level** – bases on historical use. This is a predetermined number that states the minimum and maximum amount of medication to be kept on the shelf.
- b) **Want book**- when a medication runs out it is ordered immediately. Sell one – order one. The tech orders into the computer ordering device after filling a prescription.

Purchasing, Receiving and Stocking are 2 important duties of technicians. A poorly operated system puts people at risk and increases costs to the pharmacy.

Purchasing - *know the different types*

- 1) **Direct Purchasing** - a purchase order between the pharmacy and the manufacturer
- 2) **Purchasing Groups** - pharmacies, health systems, and hospitals join together to receive a group discount from the manufacturer.
- 3) **Wholesaler purchasing** - pharmacy can use a single source to purchase numerous products from numerous manufacturers
- 4) **Prime Vendor Purchasing** - the pharmacy enters into a contractual agreement to purchase 80-95% of its pharmaceuticals from a single wholesaler.
- 5) **Just-in-time ordering (JIT)**- A strategy of ordering a product before its use. Reduces costs to pharmacy by minimizing tying up funds for long periods of time.

Receiving -

- 1) Verify the name and address on the boxes.
- 2) Verify that the number of boxes matches the courier's clip board
- 3) Inspect each box for damage
- 4) Check the drug's name, brand, dosage form, size, strength, quantity against the receiving copy of the purchase order.
- 5) Check the drug's expiration date - *product must have expiration dates of at least 6 months from receiving*
- 6) Sign, date, and file the copy of the receiving slip and forward original to accounts payable.

NOTE: The refrigerator items should be done first

Stocking -

- 1) ROTATE - ROTATE – ROTATE - *new in back/ old in front*
- 2) Compare expiration dates
- 3) Remove products already in stock that have expired

Returning Inventory - *Technicians may be responsible for the completion and filing of paperwork and the packaging of returns **with pharmacist supervision.***

3 REASONS why inventory would be returned:

Ordering Errors

Returns due to ordering errors requires authorization from the original supplier and appropriate forms.

Expired Pharmaceuticals - *MOST COMMON REASON OF RETURNS*

Technicians must complete the paperwork required by the manufacturer or the vendor and package the products so that they may be shipped.

Drug and Medical Device Recalls

- Recalled by the manufacturer and/or the FDA
 - mislabeling
 - contamination
 - lack of potency

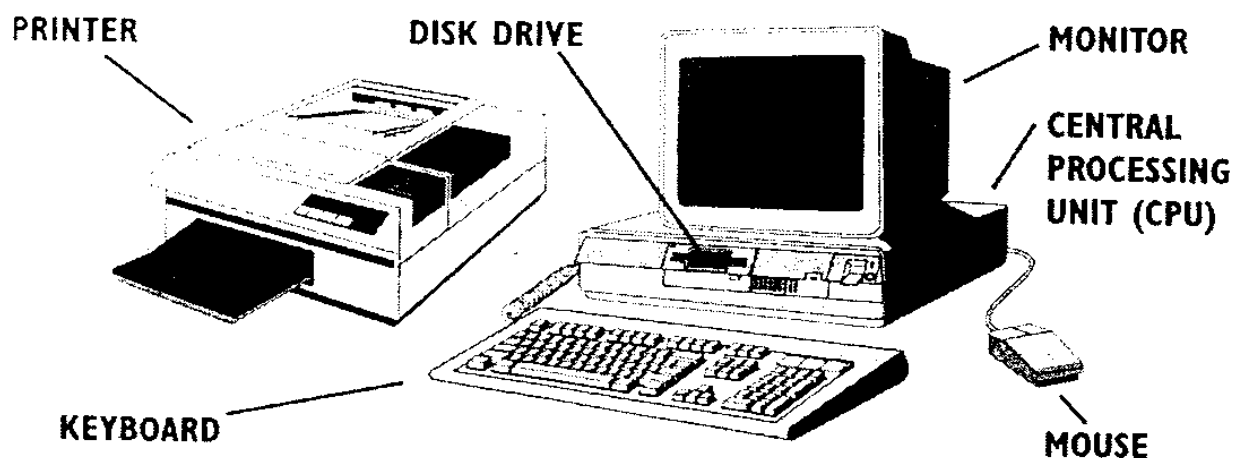
- Recall notices are sent in writing to the pharmacies by the manufacturer of the product or by the drug wholesalers.

- reason of recall
- name of the recalled product
- the manufacturer
- all lot numbers affected
- instructions on how to return the product

- Technicians must follow the following procedures upon receipt of a product recall notice:
 1. Check stock. If none on your shelf, you must write “ none in stock” on the recall notice and file in the recall log.
 2. Gather, package, and return recalled products to the manufacturer per instructions on notice.
 3. Write a summary of actions taken on the recall notice and file in the recall log.
 4. Order more stock (if necessary)

Computer Terminology

1. **Computer**- an electronic device for inputting, storing, processing, and/or outputting information.
2. **Keyboard, mouse, touch screen**- these are input devices for getting information into the computer
3. **Central Processing Unit (CPU)** - this processes data that is input prior to output or storage. (it is the big rectangular box that the computer screen sits on or it can stand alone. It also has the reboot button on it)
4. **Floppy, hard, tape, or removable disk drives** - these are storage devices for storing information that has been input into the computer
5. **Random-access memory (RAM)** - which is the temporary, nonpermanent memory of the computer. Information is held while it is being input and processed.
6. **Monitor** - also called a display - provides visual representation of data that has been input and/or processed.
7. **Printer** - for creating hardcopy, or paper output, such as patient profiles, medication labels, and receipts.
8. **Modem** - device for connecting a computer to a remote network via telephone lines.
9. **Operating systems** - software program that has functions such as maintaining a list of file names.
10. **Mnemonic**- a shortened term used to facilitate data entry. TCN500 = Tetracycline 500mg



Pharmacy Law

Pharmacy Technician: is a certified, supportive personnel, who aids in delivering quality pharmacy services under the supervision of a pharmacist.

FDA - Federal, Drug, and Cosmetic Act

- Protects the public health
- Label requirements for safe consumer use of **OTC** products
- prohibits the sale of “adulterated” or “misbranded” foods and drugs
 - adulterated** - presence of any decomposed substance, packaging under unsanitary conditions or if the product’s strength or purity is different from what is indicated on the label.
 - misbranding** – when the label is false or misleading or when proper warnings and directions are absent.
 - if the label does not have the name and place of business of the manufacturer.
 - fails to carry a “Warning – May be habit forming.” if it is habit forming.

Everything in this law section is on the exam. You will not need to know any extra law information.

NDA - New Drug Application

- When a drug is in the process of being made or discovered, this application must be filed with the FDA to prove efficacy and safety before being commercially available.

Durham - Humphrey Amendment

- Separates drugs into 2 categories: **LEGEND AND NON-LEGEND (OTC)**
- Also called the “Prescription Drug Amendment”
- Allows **verbal new prescriptions** to be called in over the phone and allows **refill okays** to be done over the phone.

Legend – Requires a prescription because the person requires supervision of a physician. The stock bottle is not required to have directions of use but must have on bottle label, “Caution: Federal law prohibits dispensing without a prescription.”

Non-legend – Requires that all products to have directions of use. Does not require a prescription.

Kefauver - Harris Amendment

- **Label requirements** for manufacturers and dispenser to the patients
- Regulates proper drug advertising and package inserts issued by the manufacturer
- Requires manufacturers to: 1) register annually 2) be inspected every 2 years 3) report any drug reactions
- Requires all medication on the U.S. market to be pure, safe, and effective.

PPI'S - Patient Package Inserts

- Regulated by the **FDA**
 - Must supply a PPI to patients receiving the following medications:
 - Oral contraceptives
 - Estrogen
 - Progestin
 - Isotretinoin (Accutane)
 - Intrauterine devices
 - Inhalers
- Information on the PPI :* product description
- indications for use
- contraindications (when/what it interacts with)
- warnings (extreme side effects)
- precautions (less severe side effects)
- dose (how much to take and how often)

Occupational and Safety Act of 1970

- ensures a safe and healthful workplace for employees by reducing hazards in the workplace. Audits show compliance.
 - gave rise to **Occupational Safety and Health Administration (OSHA)**
 - ensures **job safety** standards and an injury reporting system for job-related injuries or illnesses.
 - all pharmacies should:
 - post the phone number to poison control
 - have a reference guide for toxicities
 - must have **Material Safety Data Sheets (MSDS)** for any “hazardous materials” in pharmacy
- The impact on pharmacy: air contaminants, flammable/combustible liquids, and eye/skin protection.

Poison Prevention Packaging Act

- enacted to reduce accidental poisonings in children
- requires pharmacies must use child resistant containers (and most OTCs)
 - *defined as: difficult for 80% of children under 5 yrs. to open and allows 90% of adults to open.*
- prohibits re-use of child resistant containers- *because the wear and tear of normal use may decrease the effectiveness*

Exceptions to this legislation:

- medications used as medical emergencies such as nitroglycerin sublingual tablets for chest pain
- written requests from Drs or patients
 - i.e.. arthritic patients cannot open bottles
- OTC medications must be labeled “package not child resistant” if it is not child resistant
- betamethasone, mebendazole, methylprednisolone (<85 mg), Oral Contraceptives, Pancrelipase, cholestyramine

Poison Log

Log must include:

- date of sale
- name and address of purchaser
- name and quantity of poison dispensed
- reason for purchase
- full name of dispenser

Poison substances must be labeled with:

- complete name of poison
- the word “POISON” boldly imprinted on label
- place of business of the seller
- proper directions of use

All pharmacies should be well stocked with “Syrup of Ipecac” and “Activated Charcoal”

Dose of Syrup of Ipecac is 15 ml (1 tablespoon)

Activated Charcoal works by absorbing the poison in the body and eliminating it. A person cannot take both or the charcoal absorbs the Ipecac and will not work to either absorb the poison or make the person vomit.

Controlled Substance Act of 1970 (CSA) *The CSA is enforced and regulated by the DEA*

regulates use and distributes drugs with high abuse potential and/or addiction into one of five schedules (CI – CV)

Schedule I
crack cocaine
crystal methamphetamine
ecstasy
hashish
heroin
LSD
marijuana
mescaline
PCP
peyote

Schedule I’s have no medicinal use and have the highest abuse potential

Schedule II	
Generic Name	Brand Name
amphetamine/dextroamphetamine	Adderall
codeine	Codeine
cocaine	Cocaine
meperidine	Demerol
dextroamphetamine	Dexedrine
hydromorphone	Dilaudid
methadone	Dolophine
fentanyl	Duragesic
morphine	MS Contin
oxycodone	Oxycontin
APAP + oxycodone	Percocet
ASA + oxycodone	Percodan
methylphenidate	Ritalin
secobarbital	Seconal

Schedule II’s have medicinal use but still have a very high abuse potential

You will have to know what category all these controlled substances belong to.

Make flashcards.

Schedule III	
Generic Name	Brand Name
hydrocodone + APAP	Vicodin, Lortab
codeine + APAP	Tylenol with Codeine
ASA + codeine	Empirin #3
hydrocodone	Hycodan
ibuprofen + hydrocodone	Vicoprofen
chlorpheniramine + hydrocodone	Tussionex
carisoprodol + codeine	Soma with codeine
hydrocodone + guaifensin	Hycotuss

Schedule IIIs have medicinal use but still have a high abuse potential but not as high as II's.

Schedule IV	
Generic Name	Brand Name
lorazepam	Ativan
flurazepam	Dalmane
propoxyphene + APAP	Darvocet N
alprazolam	Xanax
diazepam	Valium
clorazepate	Tranxene
pentazocine-naloxone	Talwin NX
pentazocine	Talwin
temazepam	Restoril
clonazepam	Klonopin
triazolam	Halcion
phentermine	Fastin

Schedule IVs have medicinal use and still have an abuse potential but not as high as III's.

- **Schedule V** : -medical use examples: Lomotil and Robitussin AC
- lowest abuse potential of the five
- If the state wishes, it may permit C-V's to be dispensed without a prescription if the following standards are met:

- person is 21 years or older
- drug is sold by pharmacist
- log of sale must be kept in a logbook containing:
 - name, address and full signature of purchaser
 - date and time of sale
 - name, strength, and quantity of drug sold
 - full signature of R.Ph.
 - no more than 120ml or 120 gm of drug sold in 4 days

- Each pharmacy must make a complete inventory of controlled substances every 2 years and kept for 2 years.
- Each medication label on a control medication should state, "Caution, Federal law prohibits the transfer of this drug to any person other than the patient for whom it was prescribed." *Do not cover with an auxiliary label.*

DEA # is 2 letters and 7 numbers

- 1st number is either A or B (Residents usually are M)
- 2nd letter is the first letter of the Dr.s last name

example: Dr. Henry AH1234563

- 1) add the 1st, third, and fifth
 $1+3+5=9$
- 2) add the 2nd, 4th, and 6th # and multiply it by 2
 $(2 + 4 + 6) \times 2 = 24$
- 3) add line 1) and line 2) together
 $9+ 24 = 33$
- 4) last digit of the total sum and last digit of the DEA match
33 matches AH1234563

Practice, Which ones are valid?

AH0185265	AB1012983	BB10066123
AH2233447	AH0530750	BH5020037

• Refilling Controlled Substances

This will be on the test

- Control II's are not refillable
 - Patient must have a new written prescription each time from the doctor
- Control III and IV
 - no more than 5 times in a 6 month period.
 - oral prescriptions are allowed over the phone with the Dr responsible to provide a written "cover" prescription
- Control V
 - recorded in the Schedule V log book if state allows no prescription
 - or no more than 5 times in 6 months

Limitations of Pharmacy Technician Duties:

This will be on the test

- varies by state
- Federal law: may perform all functions of pharmacy practice under the direction of the pharmacist except:
 - 1) pharmacy technician shall not receive oral prescriptions over the phone
 - 2) shall not exercise professional judgment in any matter of pharmacy practice
 - 3) *can not transfer prescriptions.*

Drug Recalls:

This will be on the test

- A drug is recalled if it was improperly made or labeled and causes severe adverse reaction. 3 classes of drug recalls
- Class I - where exposure to the product will cause severe health problems/death
 - Class II - where exposure to the product may cause temporary (meaning reversible) adverse health hazard
 - Class III - where exposure to the product is not likely to cause adverse health hazards

Federal vs. State Law

Think of it as Federal law is more laid back and State law is very strict.

State law can be stricter than Federal law but not more laid back than Federal.

Always follow the more strict law if the two differ.

Repackaging of medications

(this involves the pharmacy tech so they must know requirements)

1) Labeling:

- generic name of drug
- strength
- dosage form
- manufacturer and lot number
- expiration date after repackaging
- repacked medication is 50% of expiration date on stock bottle to max of 1 year.

2) Repackaging Log – documentation

- reviewed by R.Ph
- date of repackaging
- name of drug
- manufacturer
- exp. date of manufacturer and lot #
- quantity repacked
- R.Ph. initials or signature

OBRA 90- Omnibus Reconciliation Act of 1990

- Directed toward the pharmacist but the pharmacist cannot do this without the help of the technician.
- Improves quality of drug therapy and saves health care costs.

Counseling must include:

- name and description of medication
- dosage form, dose, route of administration and duration of therapy
- special directions/precautions
- side effects and ways to prevent
- techniques for self-monitoring
- storage
- refill information
- action to take if missed a dose

Drug Use Evaluation

- ensures medications are used safely, effectively, and appropriately.
- **required by JCAHO - Joint Commission on Accreditation of Health Care Organizations**

JCAHO is quality control. This organization makes sure the procedures and end product meet standards. They help prevent errors by enforcing log books and inspections.

Pharmacy Technicians roles are review patient charts, computer reports, prepare DUE reports

Adverse Drug Reaction (ADR)

Any undesirable or unexpected event that requires stopping a drug, modifying the dose, prolonging hospitalization, or providing supportive treatment.

Type A ADR - expected from the known properties of the medication
most ADRs are Type A
unlikely life-threatening

Type B ADR - infrequent and not predictable allergic reactions
may cause cancer and birth defects serious and **life-threatening**

Pharmacy Technician roles: identifying, documenting, analyzing and reporting ADR to the FDA

DEA 41

Destruction of outdated or damaged controlled substances.

Must be sent to the DEA

Must indicate name, strength, and quantities of controlled substances, date & method of destruction and witnesses.

DEA 106

Theft of controlled substances

Pharmacy must notify: the nearest DEA office, the local police, and complete for 106 and send original to DEA office and keep a copy in pharmacy.

DEA 224

Pharmacy's registration to the DEA

Must re-new every 3 years.

DEA 222

How Schedule II's are ordered.

Form must be signed by the individual in whose name the DEA registration is listed.

Triplicate order form = Brown, Green, Blue

Must be completed by typewriter, pen, or indelible pencil.

Valid for only 60 days

The number of lines ordered must be written on the form and signed by the pharmacist.

Only 10 lines so only 10 orders per form maximum.

Brown copy goes to supplier, green goes to DEA, blue stays in pharmacy.

Unused forms must be kept secure

Upon receipt of shipment, the product must be checked in against the blue copy. Must be signed and dated by the pharmacist. Must be stamped with red C stamp if filed with other than 222 forms. Must be kept 2 years.

Technician Task Evaluations in a Retail Setting

1) Purchasing and Inventory Control:

- a) Understands inventory goals - a well stocked pharmacy consists of sufficient stock for proper dispensing without shortages.
- b) Can differentiate the source of each medication - "Direct" ordering is the purchasing of drugs directly from the manufacturer. This direct price is the lowest price for a drug but since many companies will not sell directly to the retailer, many drugs must be purchased from the "Wholesaler". The Wholesale price is usually 10% higher than the direct price but they offer a wider variety of products.
- c) Utilizes a "reorder list" - writes the product to be ordered into a "want book"
- d) Performs purchasing process
- e) Properly checks and reorders inventory
- f) "Checks-in" orders properly - checks for shortages, damaged items, correctness of price
- g) Stocks meds correctly - places refrigerated items in refrigerator, properly rotates stock by placing the product with the shortest expiration date first and restocks items in their correct place.
- h) Handles returns and credits properly - understands the proper procedures and documentation required for returning drugs for credit
- i) Understands procedure for "drug recalls"
- j) Checks for expired meds in inventory - each time a medication is handled the expiration date is checked. If med is expired, knows proper procedure for return.
- k) Can retrieve medications from stock
- l) Monitors proper drug storage conditions - as outlined by the USP-NF with regards to heat; light, and moisture.
- m) Understands the process of borrowing meds

2) Administrative Tasks - Policies and Procedures

- a) Understands basic policy and procedures
- b) Can differentiate between pharmacist and tech responsibilities
- c) Respects patient confidentiality
- d) Ability to interact with other professionals
- e) Ability to interact with the consumer
- f) Displays proper phone etiquette
- g) Complies with professional and legal standards
- h) Understands workload priorities - when multiple tasks are required, the pharmacy tech must prioritize tasks correctly
- i) Knows hours of business

3) Prescription Processing – Dispensing

- a) Knows normal Rx workload flow
- b) Obtains proper information for patient profile - including patient name, address, phone # and age, medical history and diagnosis, method of payment, allergies, and type of vial (child-proof or easy-open)
- c) Determines if prescription is valid and properly written by prescriber
- d) Interprets all aspects of prescription correctly
- e) Enters order into computer properly
- f) Correctly retrieves refill prescription from files
- g) Knows trade and generic names of medications
- h) Fills order correctly
- i) Correctly completes proper records
- j) Knows refill status for all medications
- k) Knows how to reconstitute oral powders
- l) Affixes proper auxiliary labels to containers
- m) Correctly bills patient for Rx

- n) Completes charge and cash transactions correctly
- o) Correctly files prescriptions - CII , CIII- CV and non-controlled prescriptions
- p) Understands various routes of drug administration - including ophthalmic, otic, vaginal, rectal, nasal and transdermal patches.
- q) Can correctly calculate doses and units to be dispensed
- r) Knows when to substitute for generic equivalents
- s) Maintains an organized, clean work area
- t) Properly uses the cash register

4) Third Party Insurance:

- a) Identifies proper prescription coverages
- b) Differentiates correctly among prescription plans.
- c) Checks patient and dependant eligibility - prior to filling the prescription
- d) Fills prescription according to plan coverage
- e) Bills co-pay correctly
- f) Runs computerized third party payment forms

5) Computer systems:

- a) Understands technicians computer responsibilities
- b) Correctly performs order entry on the computer
- c) Modifies existing orders when needed
- d) Generates proper label
- e) Reviews patient profile properly - diagnosis, allergy
- f) Monitors inventory control

6) Controlled Substances:

- a) Knows federal, state and local pharmacy laws
- b) Understands all schedules of controlled substances
- c) Knows the process of ordering CII medications
- d) Files CII drugs appropriately
- e) Knows procedure for storage of controlled drugs
- f) Maintains on-going inventory of controlled drugs
- g) Can identify a fraudulent prescription
- h) Knows procedure for Schedule V over-the-counter drugs
- i) Knows refill procedures for all schedules
- j) Understands how/where to file controlled drugs

7) OTC medications

- a) Understands the use for major OTC products
- b) Can locate OTC products for the consumer

The responsibilities listed above are expected from a certified technician.

If you do not know how to do a task please ask your Pharmacy Manager.

Class I Review Quiz

1. A prescription is written for penicillin VK 250mg tabs po qid for 10 days. If the patient cannot swallow tablets and requests a liquid dosage form, what volume of 250mg/5ml suspension should be dispensed?
 - a) 50ml
 - b) 100ml
 - c) 150ml
 - d) 200ml
2. The directions for use of a medication is “i sl prn”. The meaning of “sl” is;
 - a) into the skin
 - b) under the tongue
 - c) into the muscle
 - d) into the right eye
3. The directions for use for Timoptic is 2 gtts os bid. What is the meaning of os?
 - a) both eyes
 - b) right eye
 - c) left ear
 - d) left eye
4. What is the Latin abbreviation for “after meals”?
 - a) ac
 - b) pc
 - c) qd
 - d) hs
5. An order reads “Tylenol 325mg pr q 4 h prn”. What dosage form should be dispensed?
 - a) tablets
 - b) capsules
 - c) syrup
 - d) suppositories
6. A pharmacy technician repacks bulk solid dosage forms into unit dosed packages. What expiration date will appear on the package?
 - a) 3 months
 - b) 6 months
 - c) 50% of labeled expiration date to a maximum of 1 year
 - d) the original expiration date on the bulk solid
7. The expiration date on a bottle of Cipro 500mg tablets states 4/09. When does this drug expire?
 - a) midnight 3/31/09
 - b) midnight 4/1/09
 - c) midnight 4/30/09
 - d) midnight 5/1/09
8. A physician prescribes Ceclor 375mg po bid. What is wrong with this prescription?
 - a) the Rx lacks a drug strength
 - b) the Rx lacks directions for use
 - c) the Rx lacks a route of drug administration
 - d) the Rx lacks a duration of therapy
9. Which dosage form is formulated to dissolve in the intestine rather than the stomach?
 - a) sublingual
 - b) transdermal
 - c) enteric-coated
 - d) intranasal

10. What is the term for the process by which substances are taken up and transported to the bloodstream?
- absorption
 - distribution
 - metabolism
 - excretion
11. What is "room temperature"?
- 2-8 degrees Centigrade
 - 8-15 degrees Centigrade
 - 15-30 degrees Centigrade
 - 30-40 degrees Centigrade
12. The process whereby a drug is transformed by the liver is referred to as;
- absorption
 - distribution
 - metabolism
 - excretion
13. A patient enters the pharmacy complaining of persistent heartburn. The pharmacy technician should:
- tell the patient to call their doctor
 - tell the patient to go to the ER immediately
 - tell the patient to speak to the pharmacist
 - suggest the use of Tagamet HB
14. Which of the following duties may a pharmacy technician not do?
- enter a prescription data into the computer
 - call the wholesaler for a drug order
 - affix a drug label to a prescription container
 - accept a verbal medication order from a physician
15. The directions for use of a medication are "ii gtts au q 4 h x 5d". What is au?
- in both eyes
 - in both ears
 - in right eye
 - in right ear
16. The directions for use for prednisone 5mg tablets reads: sig: 2 tabs po bid x 3 days, 3 tabs po qd x 2 days, 2 tabs po qd for 2 days, 1 tab po qd x 1 day then 1/2 tab po qd for 1 day. How many tablets should be dispensed?
- 22
 - 24
 - 26
 - 28
17. The Roman numerals XLII is equivalent to:
- 42
 - 62
 - 402
 - 92
18. The dispensing label on an outpatient pharmacy prescription requires:
- manufacturers lot #
 - physicians DEA #
 - legal name of pharmacy and address
 - physicians state license #
19. The NDC on a medication bottle refers to the:
- manufacturer
 - drug product
 - quantity packaged
 - all the above

20. Which of the following dosage forms is formulated to mask an objectionable taste of a medication?
- sublingual tablets
 - chewable tablets
 - buccal tablets
 - film-coated tablets
21. Which of the following dosage forms has the highest concentration of alcohol in its formulation?
- a syrup
 - an elixir
 - a tincture
 - an emulsion
22. Which of the following is NOT required on a unit-dosed packaged drug?
- expiration date
 - lot #
 - storage requirements
 - strength of medication
23. A 500 tablet bottle of ferrous sulfate costs \$ 17.86. What would be the cost of 39 tablets?
- \$1.78
 - \$1.39
 - \$2.87
 - \$2.43
24. Convert 528 g to mg.
- 0.528
 - 5.28
 - 52.8
 - 528,000
25. Nonprescription drugs should not be included in the patient profile.
- true
 - false
- 26) Amoxicillin oral suspension is stable in a refrigerator for how many days after reconstitution?
- 7
 - 10
 - 14
 - 20
- 27) Which drug is likely to cause a photosensitivity reaction?
- Biaxin
 - penicillin
 - Cipro
 - tetracycline
- 28) The abbreviation 'PCN' means what?
- allergy
 - penicillin
 - nothing by mouth
 - carcinoma
- 29) Which of the following 2 drug classes have cross sensitivity?
- tetracycline and penicillin
 - penicillin and erythromycin
 - erythromycin and penicillin
 - penicillin and cephalosporin

- 30) Cleocin suspension is available in a concentration of 75 mg/ 5mL How many ml are required for a 300mg dose?
- a) 10 ml
 - b) 15 ml
 - c) 20 ml
 - d) 25 ml
- 31) Heparin is available in a vial labeled 20,000 U/ml. How many ml are required for a 12,500 U dose?
- a) 0.625 ml
 - b) 0.75 ml
 - c) 0.5 ml
 - d) 0.25ml
- 32) Mylanta and Donnatal are to be combined in a 2:1 ratio. How much of each is required to make 90 ml of the suspension?
- a) 75ml/15ml
 - b) 15ml/75ml
 - c) 60ml/30ml
 - d) 30ml/ 60ml
- 33) 1+1/2 tablespoons is equivalent to how many ml?
- a) 7.5ml
 - b) 22.5 ml
 - c) 17.5 ml
 - d) 12.5 ml
- 34) How many ounces are contained in one pint?
- a) 32oz
 - b) 8 oz
 - c) 16oz
 - d) 400 oz
- 35) How many ml of water should be added to 95% ethyl alcohol to make 1 liter of a 30% ethyl alcohol solution?
- a) 685 ml
 - b) 315 ml
 - c) 750ml
 - d) 250ml
- 36) How many gallons are contained in 144 pints?
- a) 17
 - b) 18
 - c) 19
 - d) 20
- 37) 185 ml is equivalent to how many fluid ounces?
- a) 5.75
 - b) 6.0
 - c) 6.16
 - d) 6.5
- 38) What is the % equivalent of an 1: 8 ratios?
- a) 12.5 %
 - b) 14.5%
 - c) 16.5%
 - d) 18.5%
- 39) What is the storage requirement for reconstituted amoxicillin 250 mg/ 5ml?
- a) -4 to 4degrees F
 - b) 36 to 46 degrees F
 - c) 46 to 59 degrees F
 - d) 59 to 86 degrees F

40) What volume of Benadryl elixir is needed to prepackage 152 pints?

- a) 38 gallons
- b) 19 gallons
- c) 9.5 gallons
- d) 4.75 gallons

41) Digoxin Elixir is available in a concentration of 0.05 mg/ml. What quantity is needed for a 0.125mg dose?

- a) 2.0 ml
- b) 2.5 ml
- c) 3.0 ml
- d) 3.5 ml

42) Translate the following into good English:

- a. Gtt ii o.u. q 4 h prn
- b. M. ft ung
- c. tsp i q 4 h or 5 h prn itching

43) How many times can an unscheduled prescription be refilled on a PRN prescription order?

44) What schedule are the following drug products?

Vicodin _____

Valium _____

Codeine _____

Lomotil _____

45) Acetaminophen possesses all of the following except

- a) analgesic
- b) anti-inflammatory
- c) antipyretic

46) How does activated charcoal work in an overdose?

47) The dose of syrup of ipecac for children is _____

48) The normal dose of fexofenadine is:

- a) 10 mg daily
- b) 25 mg bid
- c) 50 mg daily
- d) 60 mg bid

49) The highest strength of Demerol is:

- a) 10mg
- b) 25mg
- c) 50mg
- d) 100mg

50) List 3 known routes of transmission of HIV infections.

51) Medication class of Provera?

- a) estrogen
- b) progestin
- c) testosterone
- d) eye drop

- 52) What volume of a 2% erythromycin solution can be made from 15 gm of erythromycin powder?
- a) 250 ml
 - b) 500 ml
 - c) 750 ml
 - d) 1000 ml
- 53) Estraderm is available in which dosage form?
- a) oral
 - b) patch
 - c) topical cream
 - d) IV
- 54) Pseudoephedrine, a common ingredient in cold preparations, is contraindicated in which of the following disease states?
- a) hypertension
 - b) asthma
 - c) constipation
 - d) cancer
- 55) Which of the following drugs is a benzodiazepine?
- a) Fiorinal
 - b) Percodan
 - c) Demerol
 - d) Klonopin
- 56) What drug is used to treat dyspepsia (ulcers)?
- a) Lasix
 - b) Pepcid
 - c) Inderal
 - d) Dilantin
- 57) A patient hands you an empty vial of Ritalin and asks for the Rx to be refilled. What should you do?
- a) refill the Rx if the physician specified a refill
 - b) ask the pharmacist to call the physician for a refill
 - c) tell the patient that the medicine is not refillable
 - d) refill the Rx immediately
- 58) Which of the following drugs is not an OTC product?
- a) Advil
 - b) Nuprin
 - c) Ibuprofen 400mg
 - d) Tylenol suppositories
- 59) Which of the following drugs is used in chest pain?
- a) meperidine
 - b) diltiazem
 - c) nitroglycerin
 - d) piroxicam
- 60) What ratio of 25% dextrose and 10% dextrose should be mixed to make a 20% solution?
- a) 1:1
 - b) 2:1
 - c) 3:1
 - d) 4:1
- 61) Codeine, meperidine and oxycodone all belong to which controlled schedule?
- a) I
 - b) II
 - c) III
 - d) IV

- 62) What is "Syrup of Ipecac" indicated for?
- a) to suppress a dry cough
 - b) to induce vomiting
 - c) to relieve the itching from hives
 - d) as a sweetening agent in pharmaceutical products
- 63) Which of the following drugs is not a laxative?
- a) Dulcolax
 - b) Metamucil
 - c) Imodium
 - d) Colace
- 64) A patient on warfarin therapy should never take which of the following medications?
- a) Percocet
 - b) Tylenol
 - c) Demerol
 - d) Percodan
- 65) Which of the following is a Scheduled IV controlled substance?
- a) Lomotil
 - b) Xanax
 - c) Demerol
 - d) Haldol
- 66) Heparin belongs to which pharmacological category?
- a) anticonvulsant
 - b) anticoagulant
 - c) antibiotic
 - d) antipsychotic
- 67) Which of the following medications is an anticonvulsant?
- a) atenolol
 - b) dextromethorphan
 - c) carbamazepine
 - d) isoxsuprine
- 68) Terbutaline belongs to which drug classification?
- a) antineoplastic
 - b) anticonvulsant
 - c) bronchodilator
- 69) The joint action of drugs in which their combined effect is more intense or longer in duration than the sum of their individual effects is:
- a) addition
 - b) side effects
 - c) synergism
 - d) dependence
- 70) The most used drug in parkinsonism is
- a) Cogentin
 - b) Sinemet
 - c) Permax
 - d) Symmetrel
- 71) The exact amount of a drug administered to get a specific response is the
- a) potency
 - b) dose
 - c) half-life
 - d) duration of action

- 72) When dispensing an antidepressant; the patient should be informed that
- they will feel much better tomorrow
 - it may take as long as two weeks before the drug is effective
 - depression is difficult to treat
 - none of the above
- 73) Which drug has a loading dose as part of the regimen?
- Macrodantin
 - Zithromax
 - Cipro
 - Doxycycline
- 74) Treatment for migraine is most effective if
- the headache is full blown
 - initiated early in the attack
 - the headache occurs more than twice a month
 - the pattern is predictable
- 75) Expectorants are used in lung disease to
- dry up secretions
 - prevent coughing
 - stimulate respiratory secretions and break up mucus
 - all of the above
- 76) Which drugs listed should be taken on an empty stomach
- tetracycline
 - NSAIDS
 - Dilantin
 - all of the above
- 77) Which B vitamins need to be given IM?
- B1
 - B2
 - B6
 - B12
- 78) The nitro patch should not be worn 24 hours a day in order to avoid
- headaches
 - nausea
 - tolerance
 - skin irritation
- 79) Which OTC lowers cholesterol and can cause a flushing reaction?
- psyllium
 - niacin
 - questran
 - Lopid
- 80) The technician should check for which drugs in the profile if the patient is on a potassium supplement?
- ACE inhibitors
 - Dyazide
 - Maxzide
 - all of the above
- 81) Nitroglycerin may be stored in all of the listed except
- an amber glass bottle
 - prescription bottles
 - original container
 - none of the above

- 82) Why are diuretics commonly used in congestive heart failure?
- a) to increase the heart rate
 - b) to increase the heart rhythm
 - c) to decrease the amount of fluid in the body by increasing urination
 - d) diuretics have no use in congestive heart failure
- 83) All of the following belong to the class of drugs known as ACE inhibitors except
- a) captopril
 - b) digoxin
 - c) enalapril
 - d) ramipril
- 84) Most superpotent topical steroids have restrictions limiting their use to
- a) 2 weeks
 - b) 40-50 grams in one week
 - c) a and b
 - d) none of the above
- 85) The NSAID most frequently used to treat gout is
- a) indomethacin
 - b) naproxen
 - c) allopurinol
 - d) colchicine
- 86) Which urinary analgesic will turn urine orange?
- a) Septra
 - b) Pyridium
 - c) Dyazide
 - d) Maxzide
- 87) Which drug reduces blood pressure and grows hair?
- a) Inderal
 - b) Catapres
 - c) Loniten
 - d) Aldomet
- 88) Which drug dissolves a clot once it has formed?
- a) heparin
 - b) Coumadin
 - c) Fragmin
 - d) urokinase
- 89) Which drug is a loop diuretic?
- a) Bumex
 - b) Dyazide
 - c) Diltiazem
 - d) Ziac
- 90) Which drug is a calcium channel blocker?
- a) digoxin
 - b) nitroglycerin
 - c) verapamil
 - d) Zestril
- 91) The drug most used for an acute gout attack is
- a) Zyloprim
 - b) colchicine
 - c) Benemid
 - d) Accutane

Answers to Classroom Quiz 1

1. d	24. d	43. As needed for one year.	64. d
2. b	25. b	44. 3,4,2,5	65. b
3. d	26. c	45. b	66. b
4. b	27. d	46. absorbs the poison	67. c
5. d	28. b	47. 15 ml	68. c
6. c	29. d	48. d	69. c
7. c	30. c	49. d	70. b
8. d	31. a	50. bodily fluids, blood transfusions, Mom to fetus	71. b
9. c	32. c	51. b	72. b
10. a	33. b	52. c	73. b
11. c	34. c	final wt x %(decimal) = gm	74. b
12. c	35. a	So, $X \times 0.02 = 15 \quad 15/0.02$	75. c
13. c	36. b	53. b	76. a
14. d	37. c	54. a	77. d
15. b	38. a	55. d	78. c
16. b	39. b	56. b	79. b
17. a	40. b	57. c	80. d
18. c	41. b	58. c	81. b
19. d	42. Place 2 drops into both eyes every 4 hours as needed.	59. c	82. c
20. d	Mix and make an ointment.	60. b	83. b
21. c	Take one teaspoonful by mouth every 4 to 5 hours as needed for itch.	61. b	84. c
22. c		62. b	85. a
23. b		63. c	86. b
			87. c (minoxidil)
			88. d
			89. a
			90. c
			91. a

Classroom Quiz 2

1. a	10. b	19. b	28. d
2. d	11. d	20. c	29. a
3. c	12. d	21. b	30. b
4. b	13. b	22. c	31. c
5. a	14. c	23. c	
6. a	15. a	24. c	
7. 3.6 mg qid	16. b	25. b	
8. 120 mg (2 grain)	17. c	26. b	
9. 20.8 gtts	18. a	27. a	

CLASSROOM II REVIEW QUIZ

- 1) What type of prescription balance must be used for compounding 120 mgs of a 1% topical antifungal cream?
 - a) class A
 - b) class B
 - c) analytical
 - d) bulk prescription balance

- 2) What type of measuring device should be used to measure 3 ml of a liquid for compounding?
 - a) 5ml beaker
 - b) 10 ml conical graduate
 - c) 2ml pipette
 - d) 10 ml cylindrical graduate

- 3) Grinding of tablets into a fine powder in a porcelain mortar is an example of:
 - a) levigation
 - b) motivation
 - c) trituration
 - d) emulsification

- 4) What is the proper method of measuring a liquid in a graduated cylinder?
 - a) hold at eye level and read the top of the meniscus
 - b) hold at eye level and read the bottom of the meniscus
 - c) place graduate on table and read meniscus from above

- 5) The process of producing a smooth dispersion of a drug with a spatula is called
 - a) levigation
 - b) trituration
 - c) micturition
 - d) mixation

- 6) Which of the following is the most accurate device for measuring liquids?
 - a) cylindrical graduate
 - b) conical graduate
 - c) measuring cup
 - d) a 2oz cup

- 7) Using Young's Rule calculate the dose for a child who is 2 years old and weighs 44 if the adult dose for a drug is 25mg qid.

- 8) What is the smallest weight a class A balance can weigh?

- 9) A medication order calls for 1000ml of DSW to be administered over an 8 hour period. How many drops/min should be delivered to the patient if 10 drops/ml?

- 10) When dispensing a Ventolin inhaler, how often must the Patient Package insert (PPI) be included with the drug product?
 - a) at the time the original Rx is dispensed
 - b) every time the prescription is dispensed
 - c) every other time that the prescription is dispensed
 - d) it should never be dispensed with the prescription

- 11) Which drug requires a follow-up "Cover" prescription when dispensed as a verbal order?
 - a) phenobarbital
 - b) vicodin
 - c) valium
 - d) all the above

- 12) What is the proper procedure for cleaning a laminar flow hood?
a) clean side to side, front to back
b) clean the plexiglas with isopropyl alcohol
c) with a damp cloth
d) side to side, back to front
- 13) Which procedure would you not do when opening an ampule?
a) wipe the neck with an alcohol pad
b) after wiping with an alcohol pad, dry the neck with a paper towel
c) break the ampule with an alcohol pad covering the neck
d) filter the contents with a filter needle
- 14) How far into the hood should the pharmacy technician work?
a) as far as possible
b) 3 inches
c) 6 inches
d) anywhere
- 15) What size filter is considered a sterilizing filter?
a) 0.22 micron
b) 0.3 micron
c) 0.45 micron
d) 5 micron
- 16) How often must a laminar flow hood be checked?
a) every 3 months
b) every 6 months
c) once a year
d) when it breaks down
- 17) How long may a schedule class II drug be refilled?
a) 1 year
b) 5 refills or 6 months
c) no refills
d) as many as the Dr. indicates
- 18) If a HCTZ prescription states, 'refill prn', for how long may this Rx be refilled?
a) 1 year
b) 2 years
c) 6 months
d) as long as the patient wants
- 19) How often must controlled substances be physically inventoried?
a) once a year
b) once every 2 years
c) twice a year
d) once every 3 years
- 20) Which governmental agency is responsible for safety in the workplace?
a) DEA
b) NDA
c) OSHA
d) FDA
- 21) Determine the flow rate of an IVPB containing 120 ml of gentamicin, if the solution into be infused over a 1 hour period and the administration set is calibrated to deliver 10 drops per ml.
a) 10 gtts/min
b) 20 gtts/min
c) 30 gtts/min
d) 40 gtts/min
- 22) A piggyback has 50 ml of antibiotic infusing at a rate of 30gtts/min. How long will it take for this solution to be administered if the set is calibrated to deliver 15gtts/ml?
a) 15 minutes
b) 20 minutes
c) 25 minutes
d) 30 minutes

- 23) The "C" designation for controlled substances must appear on a controlled prescription:
- a) in red in the lower left hand corner of the Rx
 - b) in any color in the lower left hand corner of the Rx
 - c) in red in the lower right hand corner of the Rx
 - d) in any color in the lower right hand corner of the Rx
- 24) A vial of reconstituted Adriamycin breaks inside a vertical flow hood. What should the technician do?
- a) wipe up the spill with absorbent paper towels
 - b) dilute the spill with isopropyl alcohol
 - c) clean up the spill with a spill kit
 - d) dilute the spill with water
- 25) Which federal legislation enacted in 1970 regulates the use and distribution of substances with high abuse potential?
- a) FDCA
 - b) CSA
 - c) DEA
 - d) FDA
- 26) Which legislation established two classes of drugs?
- a) FDA
 - b) Durham-Humphrey Amendment
 - c) Federal Food and Drug Act
 - d) OBRA
- 27) The manufacturing, dispensing and distribution of controlled substances is regulated by the:
- a) FDA
 - b) DEA
 - c) FBI
 - d) IRS
- 28) Which law allows nasal inhalers to be dispensed without a child-resistant container?
- a) Durham-Humphrey Amendment
 - b) FDA
 - c) Occupational Health and Safety Act of 1970
 - d) Poison Control Act of 1970
- 29) Which law allows pharmacists/interns to take prescriptions over the telephone from a physician's office?
- a) Durham-Humphrey Amendment
 - b) FDA
 - c) Kefauver-Harris Amendment
 - d) CSA
- 30) Which organization oversees Medicare and Medicaid service?
- a) APhA
 - b) CMS
 - c) DEA
 - d) JCAHO
- 31) How long is a DEA Form 222 valid?
- a) 7 days
 - b) 30 days
 - c) 60 days
 - d) 90 days

1) Print the meaning of each abbreviation:

- DAW
- CMS
- DEA
- AWP
- FDA
- HIPAA
- JCAHO
- NABP
- OSHA
- OTC
- P & T COMMITTEE
- D10W
- NDA
- PPI (2 MEANINGS)
- CSA
- OBRA
- ADR
- DUE
- PDR

2) Write the generic name for the following brand names:

- Coumadin
- Ogen
- Prilosec
- Provera
- Xanax
- Compazine
- Voltaren
- Lodine
- Ritalin
- Klonopin
- Prozac
- Axid
- Imodium
- Reglan
- Flagyl
- Biaxin
- Aldactone

3) Write the Brand name for the following generic names:

- cefuroxime
- azithromycin
- minocycline
- sulfamethoxazole/trimethoprim
- ciprofloxacin
- clotrimazole
- fluconazole
- clobetazol
- isosorbide
- verapamil
- sotalol
- losarten
- docusate sodium
- bisacodyl
- scopolamine
- famotidine
- esomeprazole
- fluticasone
- loratadine
- glipizide
- propoxyphene + APAP

Be a little resourceful here.

You will remember more if you look up the answer and write it over and over again.

If you can't figure one out, email me.



4) What is the following used for:

- Novolin 70/30
- Materna
- Loestrin FE
- Cytomel
- Retin A
- Terazol 7
- metformin
- tramadol
- fluconazole
- albuterol
- simethicone
- valproate
- Estroderm
- nadolol
- lansoprazole
- sumatriptan
- lovastatin
- Ultram
- Ambien
- Depakote
- Bactroban
- nortriptyline

5) What is the medication class of the following:

- Feldene
- Motrin
- Effexor
- Sinemet
- acyclovir
- oxycodone
- Glucophage
- carbamazepine
- verapamil
- quinapril
- etodolac
- diazepam
- amitriptyline
- citalopram
- levonorgestrel
- cyanocobalamine
- zidovudine
- lidocaine
- fluoxetine
- omeprazole
- pravastatin
- atenolol
- digoxin
- cefprozil
- lisinopril
- triamcinolone
- triamterene
- fexofenadine

Actual Past Exam Questions (So Focus on these Areas)

- 1) Methylphenidate treats:
 - ADHD
 - NARCOLEPSY
- 2) PRN refills on methylphenidate last how long?
 - no refills are allowed on C-II drugs
- 3) What does the symbol  stand for?
 - drams
- 4) What does the symbol  stand for?
 - fluid ounces
- 5) Which antibiotics cause photosensitivity?
 - Bactrim DS/ Septra DS (sulfameth/trimeth)
 - tetracycline (all the - cyclines)
- 6) Pseudoephedrine is contraindicated to what disease state?
 - Pseudoephedrine is Sudafed and this is cannot be taken with hypertension or heart disease
- 7) Which drug is a calcium channel blocker?
 - know all generic/brand names of this class of medication especially diltiazem (Cardizem) and verapamil (Calan)
- 8) Which drug is a beta blocker?
 - Beta blockers end in -olol. Know the generic/brand names of this class of medication. You know that the generics end in -olol but the test will list the answers in the brand names.
- 9) The three parts of a needle are:
 - shaft, lumen, and hub
- 10) Which book gives information on general disease categories and their treatments?
 - Merck Index
- 11) Coumadin and aspirin.
 - Coumadin (warfarin) interacts with aspirin. Coumadin thins the blood and so does aspirin. If taken together - the blood could be thinned too much and unusual bleeding can occur.
 - Drugs with aspirin: Percodan, Fiorinal, Ecotrin, Bayer, Bufferin, Excedrin, Darvon
 - A customer has a prescription for coumadin and asks the tech if it is okay to take aspirin occasionally. What should the tech do? Answer: refer the customer to the pharmacist.
- 12) Digoxin is a:
 - Cardiac glycoside
 - Anti-arrhythmic
 - If you can only pick one and not both - pick cardiac glycoside
- 13) Know what agency is responsible for what.
 - OSHA
 - Kefauver-Harris
- 14) Which drug is a class III drug?
 - Know a couple of examples for C-II, C-III, C-IV, C-V

- 15) If a patient came in with a script containing 5 different drugs listed (one drug is TCN) what should the patient be warned about?
- Know your auxiliary labels and side effects of medications
 - TCN: photosensitivity, no calcium products, no antacids, not for children and pregnancy, if expired it is fatal
- 16) If a patient is deficient in cyanocobalamin, what should the patient take?
- Vitamin B-12
- 17) What you should know about the expiration date:
- Expires the last day of the month at midnight
 - 50% of the manufacturer date to a maximum of 1 year on repackaging of medication.
- 18) What are capsules made out of?
- gelatin, sugar, and water
- 19) What schedule is codeine?
- Codeine by itself is a C-II
 - Codeine mixed within the medication is a CIII
- 20) What size is a HEPA filter?
- 0.22 micron
 - It filters out 0.3 micron particles and larger
- 21) Conversions (i.e. mg to grams to grains to drams to ounces)
- 22) Celsius to Fahrenheit and vs.
- 23) Know computer technology
- mnemonic - a shortened term used to facilitate data entry
- 24) DEA #'s have 2 letters and 7 numbers. Know how to calculate if it is valid or not.
- 25) Know what requirements are needed on a repackaging log: The answers might be formulated as follows:
- a) _____ , _____ , _____
- b) _____ , _____ , _____
- c) _____ , _____ , _____
- 26) Know Histamine-2 blockers (generic and brand names)
- cimetidine (Tagamet)
 - famotidine (Pepcid)
 - nizatidine (Axid)
 - ranitidine (Zantac)
- 27) Know recalls
- Class 1 recall = death
 - Class 2 recall = exposure to drug causes temporary or reversible side effects
 - Class 3 recall = exposure to drug causes no harm (probably just mislabeled)
- 28) The use for syrup of ipecac is:
- To induce vomiting in case of an overdose of medication or poison
- 29) The largest amount of energy in an IV bag is:
- comes from FATS
- 30) NaHCO_3
- Sodium bicarbonate
- 31) A hospital gown is tied in the back

- 32) Phenazopyridine (Pyridium) causes orange urine
- 33) How would you dispose of a needle?
- sharps container
- 34) Know how to dispose chemotherapy medications and that there is a spill kit to use if you spill chemo drugs
- to dispose: place in a leak proof, puncture resistant container, placed in a larger container and incinerated.
- 35) What would you use for a dry, hacking cough?
- Anti-tussive : Robitussin DM , Vicks 44 DM, DM stands for dextromethorphan,
 - HYCODAN (hydrocodone) tablets- schedule III drug
- 36) Cozaar and Hyzaar :
- they are both ACE inhibitors use for high blood pressure
 - they do not produce the side effect of cough like the other ACE inhibitors
 - other ACE inhibitors end in -pril
- 37) Know the mechanism of action for bronchodilators
- They relax bronchial muscle (in the lungs)
- 38) An ampule lid is made out of what?
- An ampule is entirely made out of glass (one piece)
- 39) Most common drug used in Parkinson's disease:
- Sinemet (Carbidopa/levidopa)
- 40) Which of the following is not a HIV drug?
- Be able to recognize HIV medications (they have a v and an i in the name or contains "vir")
- 41) Know which drugs require a potassium supplement.
- See Diuretics
- 42) What are buccal tablets?
- It is a tablet that is placed in-between the cheek and gum.
 - Intended to dissolve slowly to stay in the mouth (where the infection) is longer
- 43) HS stands for what?
- at bedtime (hour of sleep)
- 44) Intron A is stored where?
- In the refrigerator
- 45) 1 grain (gr) = 65 mg (the range is actually 60-65 mg)
- 46) How would you use PenG and where would you store it?
- Penicillin G is an antibiotic and would be stored in the refrigerator
 - Any liquid penicillin in a syringe will be stored in the refrigerator
- 47) A pre-filled syringe is made out of glass or plastic?
- glass
- 48) Know which vitamins are fat soluble:
- Vitamins A,D,E,K are fat soluble - which means they are stored in the fat cells of the body and could build up to a toxic level. The other vitamins are water soluble and will not accumulate.
- 49) What is mupirocin?
- The brand name is Bactroban and is an antiseptic cream or ointment for the skin.
- 50) PRN refills on CIII , CIV , and CV mean what?
- They are refillable to a maximum of 5 refills or 6 months

- 51) State vs. Federal Law:
- Always follow the more strict
- 52) Work done with antineoplastic drugs is done in a vertical laminar flow hood. (also called: Biological Safety Cabinet)
- 53) Where are controlled drugs kept?
- Pharmacies may dispense these substances (including CII's) throughout their stock of non-controlled substances in a manner that will obstruct theft.
 - CII's cannot be placed in automatic counting devices.
- 54) Where are antineoplastic drugs kept?
- Separate storage area where the drug cartons, shelves, bins, counters, and trays have warning labels and designed to minimize falling and breakage of materials.
 - Only specific trained personnel allowed access
- 55) Type B-ADR (Adverse Drug Reaction) is serious and life threatening.
- 56) Where is Domboro stored? Domboro is an OTC antiseptic....it would be stored next to the bacitracin ointment in the first aid section of the pharmacy.
- 57) Know examples of enteric-coated drugs. Ecotrin is one.
- 58) What does AWP mean?
- Average Wholesale Price
- 59) How many units per ml in insulin? (i.e. U-100 insulin)
- U-100 means that there are 100 units per 1 ml of insulin.
 - A vial is 10 ml therefore there are 1000 units per vial. (100 units/ml x 10 ml)
- 60) Know what drugs qualify as an "Automatic Stop Order"
- Antibiotics
 - Antineoplastics
- 61) Know examples of antibiotics for the ear.
- Cortisporin Otic : neomycin/polymyxin B/hydrocortisone
- 62) Know drugs that cause photosensitivity. Ask your pharmacist.
- 63) Know elements required on a Rx label.
- 64) ss = 1/2
5ml = 1 teaspoon
15 ml = 1 Tablespoon
- 65) What is the most important tech function when entering medication orders?
- Correctly inputting patient information
- 67) Tech may only tell the customer factual information. Information that could be found in a book.
- i.e. "Does amoxicillin come in a liquid form?" The tech may answer yes.
- 68) Class B balance weighs up to 120 gms (grams not milligrams) (Bulk balance)
- 69) The most accurate weigh to measure a liquid?
- With a graduated cylinder reading the bottom of the meniscus at eye level on a level surface.
- 70) What is the shelf-life of an antibiotic after reconstitution?
- 14 or 10 days
- 71) Know the elements of a hospital drug order.

- 72) What does water soluble mean?
- Refers to vitamins, when taken in excessive they will not build up in the body and become toxic
- 73) A customer brings in two prescriptions to be filled. One is for atenolol and the other is for Tenormin. What should the technician do next?
- Atenolol is the generic of Tenormin; therefore the patient does not need both due to a possible drug overdose. The technician should bring this to the attention of the pharmacist. **THIS IS DUPLICATE THERAPY**
- 74) Know which drugs require a PPI and how often should you dispense it?
- MDI's, Birth Control, Estrogens, Progesterones, Accutane, and IUD's.
 - Must be dispensed every time.
- 75) What is the generic name of Accutane? What is the special warning?
- Isotretinoin
 - Will cause severe birth defects. Women of child bearing age must test negative to pregnancy before starting Accutane.
 - No refills are allowed and prescription should be filled within 7 days of written date.
- 76) Only one type of insulin can go into an IV bag. Which one?
- Regular
- 77) What is a formulary?
- A list of medications that are to be maintained in stock.
 - Third party payers' formulary is a list of medications that they will reimburse.
- 78) What is Prime Vendor Purchasing?
- The pharmacy enters into agreement that they will purchase 80-95% of its pharmaceuticals from a single wholesaler.
- 79) When filling a prescription, what do you do when you notice an outdate?
- Bring it to the attention of the pharmacist. Do not fill the prescription with that medication. See if there is additional medication on the shelf that is not expired to fill the prescription with. Return the medication to the wholesaler.
- 80) DEA form 222 orders CII drugs. No mistakes can be made when filling out the form. Brown copy stays with pharmacy and green copy is sent to the DEA office. Know specific names of CII drugs. Ask your pharmacist for a tour of some CII's.
- 81) When doing controlled inventory, is the count exact or approximate amounts?
- Should be exact on CII- CV
- 82) What does antipyretics do?
- Lower fever - for examples see NSAIDS
- 83) What is angina?
- Insufficient oxygen to the heart muscle causing sudden, severe substernal pain radiating to the left arm.
- 84) Where is Phenergan suppositories stored?
- In the same place as insulin- the refrigerator.
 - Remember, Tigan suppositories are stored at room temperature and Phenergan suppositories will melt at room temperature.
- 85) Which drugs are available in patch form?
- Climara, Vivelle, Nicoderm, Nitroglycerin, Minitran, Estraderm, Testosterone.
- 86) Work must be done at least 6 inches into a laminar flow hood.
- 87) What is the vial pressure of hazardous drugs?
- Negative pressure will prevent the spraying of medication out of the vial onto the technician.
- 88) What does gauge mean?
- It refers to the diameter size of a needle.
 - The higher the number gauge the smaller the needle diameter.

- 89) What is MSDS?
- Material Safety Data Sheets
 - Available from manufacturer. They describe in detail the ingredients contained in the product and emergency procedures for ingestion or improper handling.
 - Required by all pharmacies storing “hazardous materials”
 - Regulated by OSHA
- 90) Define:
- Absorption - drug goes “into the bloodstream”.
 - Distribution - drug goes to “where it is needed”
 - Metabolism - drug is “broken down” by the liver
 - Elimination - “excretion” of the drug out of the body
- 91) What is unit dose?
- Amount of a drug prepackaged for a single administration
 - Individually wrapped tablets remain sterile and can be returned to stock if not used, therefore decreases costs.
- 92) What is Diastix?
- Strips that are to be held in the urine stream to measure ketones and glucose levels. (for diabetic patients)
- 93) If a syringe is inserted incorrectly into a vial, what may happen?
- Coring - a piece of rubber is lodged into the needle.
- 94) What is Maximum & Minimum system used for?
- An inventory system done manually. This system has a predetermined order quantity and an order point. The minimum and maximum stock quantity is written on mylars placed in front of the medication. The technician walks around the shelves looking for any quantity that is at or below the minimum number. To order the technician prepares a purchase order for the wholesaler.
- 95) What method does the pharmacy use in order to keep inventory?
- Minimum/Maximum system - described above
 - Want book
 - Computerized inventory systems - the shelf minimum is in the computer bank. When the level goes below this level the computer automatically generates a purchase order.
- 96) What is the generic name of Ceftin?
- Cefuroxime – this falls into the classification of cephalosporin antibiotics
- 97) If a patient develops hives from Gantrisin, what allergy should be noted on their profile?
- Allergy to sulfa drugs (generic name is sulfisoxazole)
- 98) What is Noroxin used for?
- It is an antibacterial used to treat UTI’s, sexual transmitted diseases such as gonorrhea.
- 99) What is lidocaine used for?
- Anything that ends in -caine will numb the area applied.
 - It numbs the skin especially for mouth sores or sore throats.
- 100) Know the popular antifungals and the generic names. What is the maximum application? 50grams/week (2weeks max)
- 101) Is contact lense fluid poisonous or dangerous to kids? Is there a label saying so? Yes/No
- 102) What is the process by which a third party payer sets a price for a drug?
- Adjudication
- 103) Are there any special requirements concerning an IV with fats in it?
- Instability

104) What does the word “Contraindicated” mean?

- That a drug should not be administered for the possibility of side effects, adverse effects, drug-drug interactions, drug-disease interactions.
- Text book definition: any condition, especially disease, which renders some particular line of treatment improper or undesirable.

105) What is the term for the leakage of IV fluid into muscular tissue?

- Infiltration

106) Know flow rate calculations. ml/hr, drops/minute

107) Know alligation calculations. AKA - tic-tac-toe problems

108) Know % markup.

109) Know mg/kg/day

110) Once the prescription has been filled, the pharmacist “owns” the prescription.

111) A hyperglycemic pamphlet would refer to sugar levels.

112) Room temperature is:

- 15 - 30 degrees Celsius
- 59 - 86 degrees Fahrenheit

113) Refrigerator temperature is:

- 2 - 8 degrees Celsius
- 36 - 46 degrees Fahrenheit

114) What is an agonist?

- It is a drug that is capable of binding to, and activating, a receptor.

115) What is an antagonist?

- They block the action of an agonist getting to the receptor to elicit a response, therefore no response is made.

116) How many units of NPH U-100 would be administered if the patient’s dose is 0.25ml?

- U-100 means that there are 100 units per ml.
- $\frac{100 \text{ Units}}{1 \text{ ml}} = \frac{X \text{ Units}}{0.25 \text{ ml}}$ Cross multiply: $\frac{(100 \times 0.25)}{1} = 25$ units administered

117) Who is responsible for drug recalls?

- The FDA determines the health hazard potential of the product and assigns a drug recall.

118) What does NDC mean?

- National Drug Code 99999-9999-99
- First set of numbers refer to the manufacturer
- Second set of numbers refer to the name of the drug
- Last 2 numbers refer to the package size

119) Insulin and nitroglycerin bind to IV bags made out of polyvinylchloride (PVC). Meaning that the medicine sticks to the walls of the the PVC bag. Therefore, must be dispensed in non-PVC containers and tubing.

120) What is the generic name for Aldactone?

- Spironolactone
- See diuretics

121) mnemonic is a shortened term used to facilitate data entry

- Amo500 = Amoxil 500

122) DEA form #41 is for destroying CII’s. All 3 copies of form #41 are submitted to respective DEA office.

123) DEA form #106 is for CII theft and local police must be notified.

124) Know the responsibilities of JCAHO.

- Joint Commission on Accreditation of Health Care Organizations.
- Ensures medications are used safely, effectively, and appropriately. (Drug Use Evaluation)

125) What two of the following drugs have the same therapeutic effect? Then it will list drug names.

- Having the same therapeutic effect means that the two drugs do the same thing in the body. Most correct answer will be brand/generic. For example, the answer will be listed as A) Zestril/lisinopril.....this is brand/generic so pick this one.

126) Know a list of medications that are stored in the refrigerator.

- All insulin including Lantus and Novolog
- Miacalcin (calcitonin-salmon)
- Phenergan (promethazine) suppositories
- Norvir (ritonavir)
- Xalatan (latanoprost) eye drops
- Combipatch (estradiol-norethindrone)
- Foradil (formoterol)
- Alkeran (melphalan)
- Ortho Evra (norgestrel/ethinyl estradiol)
- Epogen / Procrit (epoetin alpha)
- Avonex (interferon)
- Neupogen (filgrastim)
- Leukeran (chlorambucil)
- Thyrolar
- Viroptic (trifluridine)
- Enbrel (etanercept)
- **Etoposide** phosphate (Eposin®, Etopophos®, Vepesid®, VP-16®)

127) Know a list of medications that are stored in the freezer.

- Prostaglandin
- IV bags of gentamicin and vancomycin

128) What medication cannot be put in a syringe?

- Potassium Chloride cannot be put in a syringe.
- Amiodarone
- Alteplase

129) What medications can only be dispensed/stored in glass containers?

- Nitroglycerin (IV form and sublingual)
- Depakene liquid

130) Know that for injectables that are thick (oily) require a low number gauge syringe. The lower number means the bigger the diameter of the opening of the syringe to accommodate thicker liquids. If the liquid is watery (aqueous) it requires a thinner syringe which means a higher gauge number.

131) Know a couple of IM medications.

- Depo-testosterone / Depo-Provera
- Phenergan (promethazine)
- Demerol (meperidine)
- Trimethobenzamide (Tigan)
- These medications require a long needle to reach the muscle under the skin. (1" or 1 ½ ")

132) Know that SQ medications require a very short needle. (5/8" or 1/2")

- Example is insulin

133) When would an alert be prompted in regard to getting too much APAP?

- a) 1000 mg b) 2000 mg c) 3000 mg **d) 4000 mg**

- 134) Which is a CI?
- Marijuana
- 135) Which one is an anticoagulant?
- Heparin
- 136) Which one is an antifungal?
- ketoconazole
- 137) How long does a laminar flow hood run before use?
- 30-60 minutes
- 138) What do you clean a laminar flow hood with?
- isopropyl alcohol
- 139) Amlodopine is what?
- Norvasc (Calcium Channel Blocker)
- 140) Drugs that end in “-pril” are what?
- ACE Inhibitors
- 141) Drugs that end in “-azepam” are what?
- benzodiazepines (class IV)
 - anti-anxiety agents
- 142) What is duplicate therapy?
- Two drugs that (not necessarily would be in the same class) do the same end effect.
 - ie. simvastatin and gemfibrozil : both lower cholesterol. It makes the pharmacist ask the question, “Are both necessary for this patient?”
- 143) Percodan interacts with Coumadin
- 144) Know when a pharmacist needs to help the patient, not the tech.
- 145) What is the generic for Dyazide?
- triamterene/Hydrochlorothiazide
- 146) What is the generic for Betagan?
- levobunolol
- 147) Zestril and lisinopril are therapeutic equivalents
- 148) Know how to solve prices for the medications with discounts
- 149) What does OBRA stand for? What is it?
- Omnibus Reconciliation Act (of 1990)
- 150) What is the Orange Book?
- 151) What is the generic name for Narcan?
- 152) If you were to file Provera under its generic, what letter would you file it under?
- 153) What is considered durable medical equipment?
- a) Cane b) Insulin c) Syringe d) Vial

154) What is the number pattern for the sequence of a NDC?

- 5 numbers, 4 numbers, 2 numbers

155) In which direction does the air flow in a laminar flow hood?

156) When would you use a filter needle to extract a solution/liquid?

- vial or **ampule**?

157) Therapeutic Equivalence

- Same active ingredients
- Same dosage form
- Same route of administration
- Identical in strength/concentration
- May differ in shape, scoring configuration, packaging, and color
- Must have same clinical effect
- Good Example : Zestril = lisinopril
- Bad Example : Lopid = Lipitor

Cheat Sheet

Selling Price = Cost + Markup

Percentage Markup = $\frac{\text{Markup (actual dollar amount)}}{\text{Cost}}$

Selling price = cost + [cost x percentage markup]

Cost = $\frac{\text{Selling Price}}{1 + \text{Percentage Markup (expressed as a decimal)}}$

Net Profit = Selling Price – [Cost + Overhead]

$F = (9/5) \times C + 32$ or $F = (1.8 \times C) + 32$

$C = \frac{(F - 32)}{1.8}$

- 1 gallon = 3785 ml
- 1 gram = 15.4 grains
- 1 grain = 65 mg
- 1 pound = 454 g
- 1 ounce = 30 g
- 1 teaspoon= 5 ml
- 1 tablespoon= 15 ml
- 3 teaspoons (tsp.) = 1 tablespoon
- 2 tablespoons = 1 fluid ounce
- 1 fluid ounce = 30 ml
- 8 fluid ounces = 1 cup
- 1 cup = 240 ml
- 1 pint = 480 ml = 16 oz
- 2 pints = 1 quart
- 4 quarts = 1 gallon
- 2.2 pounds = 1 kg

ss	½
I or I	1
V or v	5
X or x	10
L or l	50
C or c	100
D or d	500
M or m	1000

Final volume : Initial volume :: Initial strength : Final strength

Final volume or weight of the finished product x Percentage strength as a decimal = gram or ml of the substance to be dissolved

Young’s Rule : $\frac{\text{age of child (in yrs)}}{\text{age of child}} \times \text{adult dose} = \text{child’s dose}$

Clark’s Rule: $\frac{\text{weight of child (lbs)}}{150} \times \text{adult dose} = \text{child’s dose}$

Flow Rates

To figure out gtts/min:

size of bag	ML	drop set	DROPS		1 HR
time to infuse	HR		ML		60 MIN

You are not allowed to use this sheet during the exam. Please commit to memory.