LESSON ASSIGNMENT

LESSON 2 Pharmacology

TEXT ASSIGNMENT Paragraphs 2-1 through 2-34.

LESSON OBJECTIVES After completing this lesson, you should be able to:

2-1. Compute medication dosages by the ratio and proportion method.

2-2. Convert from one unit to another, using the metric system, apothecary system, and houshold measurements.

2-3. Compute medication dosages for tablets, pills, and capsules.

2-4. Compute oral medication dosages for prepared strength liquids.

2-5. Compute dosages for parenteral medications.

2-6. Compute dosages for medications manufactured in standardized units.

2-7. Compute medication dosages based on body weight.

2-8. Compute continuous intravenous infusion rates.

2-9. Compute intravenous infusion rates for medication.

2-10. Given a medication label, identify the following information: generic name, trade name, strength of the medication, special storage considerations, and expiration date.

2-11. Given a physician's order for medication administration and the concentration of a drug solution, suspension, or dosage form, calculate the volume of the solution, suspension, tablet, or capsule to be given.

SUGGESTION After completing the assignment, complete the exercises at the end of this lesson.

LESSON 2

PHARMACOLOGY

Section I. RATIO AND PROPORTION OPERATIONS

2-1. DEFINITIONS

a. **Ratio**.

(1) The relationship of two quantities.

(2) May be expressed as a:

(a) Ratio 1:8, 1:200

(b) Fraction $\frac{1}{8}$, $\frac{1}{200}$

b. **Proportion**:

The equality of two ratios $\frac{1}{2} = \frac{3}{6}$

2-2. CROSS MULTIPLYING

A check as to the equality of two ratios can be made by cross multiplying.

a. Multiply the numerator of the first ratio times the denominator of the second ratio.

b. Then, multiply the denominator of the first ratio times the numerator of the second ratio.

c. If the ratios are the same or equal, the results of the cross multiplication will be the same.

EXAMPLE:

$$\frac{1}{2} = \frac{3}{6}$$

$\frac{1}{2}$  $\frac{3}{6}$

(1) 1 x 6 = 6

(2) 2 x 3 = 6

(3) 6 = 6 Therefore, the ratios are equal.

2-3. "X" AS THE UNKNOWN FACTOR

Because the products of the cross multiplications are always equal in a proportion, if one factor of either ratio is unknown, it may be solved by substituting "X" for the unknown factor in the proportion.

EXAMPLE:

$$\frac{1}{2} = \frac{X}{6}$$

$$\frac{1}{2} \times \frac{X}{6}$$

Cross multiply:

$$2\,(X) = 1\,(6)$$

$$2X = 6$$

$$\frac{2X}{2} = \frac{6}{2}$$

$$X = 3$$

2-4. RULES FOR RATIO AND PROPORTION OPERATIONS

a. The numerators must have the same units.

b. The denominators must have the same units.

c. Three of the four variables must be known.

2-5. SETTING UP THE PROPORTION

The expression of strength of a medication is usually the first ratio of the proportion, and this ratio is put in proportion to the amount of medication to be administered.

a. Example--If one aspirin tablet contains five grains of aspirin, then how many tablets will you give in order for the patient to receive 15 grains of aspirin?

NOTE: The EXPRESSION OF STRENGTH is "one tablet contains five grains of aspirin" and should be written as the first ratio of the proportion.

$$\underline{\text{IF}} \qquad \underline{\text{THEN}}$$

$$\frac{1 \text{ tablet}}{5 \text{ grains}} = \underline{\qquad\qquad}$$

b. Next, assign "X" its proper place in the second proportion. Because the question asks "How many tablets?" the "X" is placed opposite the tablets in the first ratio.

$$\underline{\text{IF}} \qquad \underline{\text{THEN}}$$

$$\frac{1 \text{ tablet}}{5 \text{ grains}} = \underline{X \text{ tablets}}$$

c. The question asks you to calculate the number of tablets required in order to give 15 grains of aspirin; therefore, the 15 grains will be placed opposite the grains in the first ratio.

$$\underline{\text{IF}} \qquad \underline{\text{THEN}}$$

$$\frac{1 \text{ tablet}}{5 \text{ grains}} = \frac{X \text{ tablets}}{15 \text{ grains}}$$

NOTE: Prior to cross-multiplying, be sure that corresponding units in each ratio are the same.

2-6. SOLVING for "X"

a. You have set up the proportion:

$$\underline{\text{IF}} \qquad \underline{\text{THEN}}$$

$$\frac{1 \text{ tablet}}{5 \text{ grains}} = \frac{X \text{ tablets}}{15 \text{ grains}}$$

b. Now, cross multiply:

$$5(X) = 1(15)$$

c. Solve for X:

$$\frac{5X}{5} = \frac{15}{5}$$

$$X = 3$$

d. Refer back to step a. to find the units of X. The units for X in this problem is tablets; therefore, the answer is 3 tablets.

NOTE: The most common mistake is the failure to label units. Labeling units will ensure that corresponding units of the proportion are the same.

2-7. ROUNDING OFF

a. When rounding answers to the nearest tenth, you must take your calculation out to the hundredth place and then round to the tenth place.

EXAMPLE: 3.91 = 3.9

b. When rounding answers to the hundredth place, you must take your calculation out to the thousandth place and then round to the hundredth place.

EXAMPLE: 3.846 = 3.85

c. *DO NOT ROUND UNTIL THE LAST STEP OF YOUR CALCULATION!!!!*

2-8. PRACTICE 2-1 (RATIO AND PROPORTION)

Round answers to the nearest tenth.

On Hand	Doctor's Order	Answer
a. Mellaril 100 mg/tab	50 mg.	__________
b. Gantrisin 0.5 Gm/cc	2 Gm	__________
c. Demerol 50 mg/cc	25 mg	__________
d. Dilantin 100 mg/cc	250 mg	__________
e. Valium 2.5 mg/tab	15 mg	__________
f. Ampicillin 0.5 Gm/tsp	1 Gm	__________
g. Lincocin 500 mg/0.5 cc	250 mg	__________

h.	Aldomet 0.1 Gm/cc	0.15 Gm	________
i.	Atropine gr 1/200/cc	gr 1/300	________
j.	Digoxin 0.125 mg/0.6 cc	0.25 mg	________
k.	Vistaril 100 mg/2 cc	75 mg	________
l.	Morphine 8 mg/cc	10 mg	________
m.	Polycillin 250 mg/ml	500 mg	________
n.	Digoxin 0.125 mg/tablet	0.250 mg	________
o.	Omnipen 125 mg/0.5 ml	350 mg	________
p.	Kantrex 1 gm/3 ml	0.5 gm	________
q.	Lanoxin Elixir 0.01 mg/ml	0.05 mg	________
r.	Lasix 20 mg/ml	70 mg	________
s.	Dilaudid 2 mg/tablet	3 mg	________
t.	Robitussin 10 mg/30 ml	30 mg	________
u.	Ativan 0.5 mg/tablet	2 mg	________
v.	Luminal 30 mg/tablet	90 mg	________
w.	Gantrisin 0.25 gm/tablet	1 gm	________
x.	Cedilanid 0.25 mg/2 cc	0.5 mg	________
y.	Scopolomine 0.6 mg/2 ml	0.3 mg	________
z.	Methicillin 500 mg/cc	750 mg	________

2-9. ANSWERS TO PRACTICE 2-1

a. $\frac{\text{1 tab}}{\text{100 mg}} = \frac{\text{X tabs}}{\text{50 mg}}$

100 X = 50

$= \frac{1}{2}$ tab

b. $\frac{1\text{ cc}}{0.5\text{ Gm}} = \frac{X\text{ cc}}{2\text{ Gm}}$

0.5 X = 2

X = 4 cc

c. $\frac{1\text{ cc}}{50\text{ mg}} = \frac{X\text{ cc}}{25\text{ mg}}$

50 X = 25

X = .5 cc

d. $\frac{1\text{ cc}}{100\text{ mg}} = \frac{X\text{ cc}}{250\text{ mg}}$

100 X = 250

X = 2.5 cc

e. $\frac{1\text{ tab}}{2.5\text{ mg}} = \frac{X\text{ tabs}}{15\text{ mg}}$

2.5 X = 15

X = 6 tabs

f. $\frac{1\text{ tsp}}{0.5\text{ Gm}} = \frac{X\text{ tsp}}{1\text{ Gm}}$

0.5X = 1

X = 2 tsp

g. $\frac{0.5\text{ cc}}{500\text{ mg}} = \frac{X\text{ cc}}{250\text{ mg}}$

500X = 125

X = 0.25 = 0.3 cc

h. $\frac{1\ cc}{0.1\ Gm} = \frac{X\ cc}{0.15\ Gm}$

$0.1X = 0.15$

$X = 1.5$ cc

i. $\frac{1\ cc}{gr\ 1/200} = \frac{X\ cc}{gr\ 1/300}$

$\frac{1}{200}X = \frac{1}{300}$

$X = \frac{1}{300} \div \frac{1}{200}$

$X = 0.66 = 0.7$ cc

j. $\frac{0.6\ cc}{0.125\ mg} = \frac{X\ cc}{0.25\ mg}$

$0.125X = .150$

$X = 1.2$ cc

k. $\frac{2\ cc}{100\ mg} = \frac{X\ cc}{75\ mg}$

$100X = 150$

$X = 1.5$ cc

l. $\frac{1\ cc}{8\ mg} = \frac{X\ cc}{10\ mg}$

$8X = 10$

$X = 1.3$ cc

m. $\frac{1\ ml}{250\ mg} = \frac{X\ ml}{500\ mg}$

$250X = 500$

$X = 2$ ml

n. $\frac{\text{1 tablet}}{\text{0.125 mg}} = \frac{\text{X tablets}}{\text{0.250 mg}}$

0.125X = 0.250

X = 2 tablets

o. $\frac{\text{0.5 ml}}{\text{125 mg}} = \frac{\text{X ml}}{\text{350 mg}}$

125X = 175

X = 1.4 ml

p. $\frac{\text{3 ml}}{\text{1 gm}} = \frac{\text{X ml}}{\text{0.5 gm}}$

X = 1.5 ml

q. $\frac{\text{1 ml}}{\text{0.01 mg}} = \frac{\text{X ml}}{\text{0.05 mg}}$

0.01X = 0.05

X = 5 ml

r. $\frac{\text{1 ml}}{\text{20 mg}} = \frac{\text{X ml}}{\text{70 mg}}$

20X = 70

X = 3.5 ml

s. $\frac{\text{1 tablet}}{\text{2 mg}} = \frac{\text{X tablets}}{\text{3 mg}}$

2X = 3

X = $1\frac{1}{2}$ tablets

t. $\frac{\text{30 ml}}{\text{10 mg}} = \frac{\text{X ml}}{\text{30 mg}}$

10X = 900

X = 90 ml

u. $\frac{1 \text{ tablet}}{0.5 \text{ mg}} = \frac{X \text{ tablets}}{2 \text{ mg}}$

0.5X = 2

X = 4 tablets

v. $\frac{1 \text{ tablet}}{30 \text{ mg}} = \frac{X \text{ tablets}}{90 \text{ mg}}$

30X = 90

X = 3 tablets

w. $\frac{1 \text{ tablet}}{0.25 \text{ gm}} = \frac{X \text{ tablets}}{1 \text{ gm}}$

0.25X = 1

X = 4 tablets

x. $\frac{2 \text{ cc}}{0.25 \text{ mg}} = \frac{X \text{ cc}}{0.5 \text{ mg}}$

0.25X = 1.0

X = 4 cc

y. $\frac{2 \text{ ml}}{0.6 \text{ mg}} = \frac{X \text{ ml}}{0.3 \text{ mg}}$

0.6X = 0.6

X = 1 ml

z. $\frac{1 \text{ cc}}{500 \text{ mg}} = \frac{X \text{ cc}}{750 \text{ mg}}$

500 X = 750

X = 1.5 cc

Section II. SYSTEMS OF MEASUREMENT

2-10. NOTES

a. **The Metric System.**

(1) Units used in the metric system:

(a) Liter for volume (fluids).

(b) Gram for weight (solids).

(c) Meter for measure (length).

(2) Metric equivalents used in medicine:

(a) Volume--1000 milliliters (ml) = 1 liter (L).

(b) Weight:

1 1000 micrograms (mcg) = 1 milligram (mg).

2 1000 mg = 1 gram (gm).

3 1000 gm = 1 kilogram (kg).

(3) Procedure for conversion from one unit of the metric system to another:

(a) To change milligrams to grams (mg to gm), milliliters to liters (ml to L), or to change grams to kilograms, set up a ratio and proportion based on the equivalent.

EXAMPLE 1. Express 50 mg as grams.

50 mg = X gm

$$\frac{1000 \text{ mg}}{1 \text{ gm}} = \frac{50 \text{ mg}}{X \text{ gm}}$$

1000X = 50

X = .05 gm

EXAMPLE 2. Express 2200 ml as liters.

$$2200 \text{ ml} = X \text{ L}$$

$$\frac{1000 \text{ ml}}{1 \text{ L}} = \frac{2200 \text{ ml}}{X \text{ L}}$$

$$1000X = 2200$$

$$X = 2.2 \text{ L}$$

(b) To change liters to milliliters, kilograms to grams, grams to milligrams, set up a ratio and proportion based on the equivalent.

EXAMPLE 1. Express 3.5 liters as ml.

$$3.5 \text{ L} = X \text{ ml}$$

$$\frac{1 \text{ L}}{1000 \text{ ml}} = \frac{3.5 \text{ L}}{X \text{ ml}}$$

$$X = 3500 \text{ ml}$$

EXAMPLE 2. Express 0.5 gm as mg.

$$0.5 \text{ gm} = X \text{ mg}$$

$$\frac{1 \text{ gm}}{1000 \text{ mg}} = \frac{0.5 \text{ gm}}{X \text{ mg}}$$

$$X = 500 \text{ mg}$$

b. **The Apothecaries' System.**

(1) The apothecary system is the original system of medication measurement used by pharmacists and physicians. The system is still in use today to a limited extent. In general, drugs that continue to be ordered and dispensed in apothecary units are those that have been in use for many years. For most other drugs the metric system is the system of measurement commonly used.

(2) Apothecary equivalents to the metric system.

(a) Volume:

1 ounce (oz) = 30 ml
8 oz = 240 ml (approximate)
1 quart (qt) = 1000 ml (approximate) (4 cups)

(b) Weight:

1 grain (gr) = 60 mg
1 oz = 30 gm
2.2 lbs = 1 kg
1000 gm = 1 kg

(3) It is important to understand that the apothecary system is only approximately equivalent to the metric system and to the common household system.

(4) In the apothecary system, fractions and Roman numerals are commonly used to designate numbers. Morphine, for example, may be ordered as 1/4, 1/6, or 1/8 grain. In addition, atropine may be ordered as 1/150 grain or 1/200 grain.

(5) Roman numerals may or may not be capitalized and are often used in combination with "SS", which indicates 1/2. Therefore, the term ISS means 1 1/2, and iiss means 2 1/2.

c. **Household Measure.**

Approximate equivalents to household measure:

1 teaspoon (tsp) = 5 ml
1 tablespoon (tbsp) = 15 ml = 1/2 oz
3 teaspoons (tsp) = 1 tbsp
2 tablespoon (tbsp) = 30 ml = 1 oz

d. **Conversion Between Apothecaries' and Metric Systems.**

(1) Essential equivalents must be learned in order to convert between these two systems.

(2) Ratio and proportion is the easiest way to carry out these conversions.

(3) EXAMPLES:

(a) 45 mg = X gr

$$\frac{60 \text{ mg}}{1 \text{ gr}} = \frac{45 \text{ mg}}{X \text{ gr}}$$

60X = 45

X = 3/4 gr

(b) gr V = X mg

$$\frac{1 \text{ gr}}{60 \text{ mg}} = \frac{5 \text{ gr}}{X \text{ mg}}$$

X = 60(5)

X = 300 mg

(c) 5 tbsp = X ml

$$\frac{1 \text{ tbsp}}{15 \text{ ml}} = \frac{5 \text{ tbsp}}{X \text{ ml}}$$

X = 75 ml

(d) 3 oz = X ml

$$\frac{1 \text{ oz}}{30 \text{ ml}} = \frac{3 \text{ oz}}{X \text{ ml}}$$

X = 90 ml

(e) 7 lbs = X kg

$$\frac{2.2 \text{ lbs}}{1 \text{ kg}} = \frac{7 \text{ lbs}}{X \text{ kg}}$$

2.2X = 7

X = 3.2 kg

(4) Rules for converting between systems.

(a) All units of measurement must be in the same system, that is, volume to volume, weight to weight.

(b) Label all units of measurement.

(c) BE SURE that the relationship between units is the same on both sides of the equation.

2-11. COMMON EQUIVALENTS

Metric	Apothecary	Household
1000 ml = 1 liter	equals approx. 1 quart = 4 cups	1 quart
500 ml	equals approx. 1 pint = 2 cups	1 pint
240 ml	equals approx. 8 ounces	1 cup
30 ml	equals approx. 1 ounce	

Approximate Common Equivalents

1 tbsp = 15 ml = 1/2 oz
1 tsp = 5 ml = 1/6 oz
3 tsp = 1 tbsp
2 tbsp = 6 tsp = 30 ml = 1 oz
8 oz = 240 ml = 1 cup

2.2 lbs = 1 kg

60 mg = 1 gr
1000 mcg = 1 mg
1000 mg = 1 gm
1000 gm = 1 kg

1 ml = 1 cc
1000 ml = 1 liter

1 unit whole blood = 500 ml
1 unit packed red blood cells = 250 ml

2-12. PRACTICE 2-2 (SYSTEMS OF MEASUREMENT)

a. Change the following measures to equivalents within the metric system:

(1) 1000 mg = ________ gm

(2) 500 mg = ________ gm

(3) 200 ml = ________ L

(4) 1500 mg = ________ gm

(5) 0.1 L = ________ ml

(6) 750 mg = ________ gm

(7) 1 kg = __________ gm

(8) 5 L = __________ ml

(9) 4 mg = __________ gm

(10) 100 gm = _________ kg

(11) 0.25 L = ________ ml

(12) 0.0006 gm = _______ mg

(13) 250 mg = ________ gm

(14) 2.5 L = _________ ml

(15) 0.05 gm = ________ mg

(16) 300 mcg = ________ mg

(17) 1 mg = __________ mcg

(18) 0.05 mg = ________ mcg

(19) 4700 ml = ________ L

(20) 0.75 gm = ________ mg

b. Change the following measures to approximate household measures:

(1) 10 ml = _______ tsp

(2) 120 ml = _______ tbsp

(3) 2 oz = ________ tsp

(4) 60 ml = _______ oz

(5) 20 tbsp = ______ oz

(6) 1/2 fl oz = _____ tbsp

(7) 60 ml = _______ tsp

(8) 6 tsp = _______ oz

(9) 1 oz = ________ tsp

(10) 16 tbsp = ______ oz

c. Change the following apothecary measures to the <u>metric</u> equivalent:

(1) gr XV = ____________

(2) 6 fl oz = ____________

(3) gr 1/6 = ____________

(4) gr 1/8 = ____________

(5) gr 1/4 = ____________

(6) gr 1/10 = ____________

(7) 11 lbs = ____________

(8) 154 lbs = ____________

(9) 8 fl oz = ____________

(10) 1 pint = ____________

(11) 1 oz = ____________

(12) gr X = ____________

d. Convert the following units of measure as indicated using the ratio and proportion method.

(1) 45 mg = X gr

(2) 10 ml = X tsp

(3) 5 tbsp = X ml

(4) 500 mcg = X mg

(5) 0.6 gm = X mg

(6) 30 ml = X tbsp

(7) 0.0004 mg = X mcg

(8) 400 mg = X gm

(9) 120 mg = X gr

(10) 400 mcg = X gm

(11) 80 mg = X gr

(12) 10 mg = X gr

(13) 1/4 gr = X mg

(14) 1/6 gr = X mg

2-13. ANSWERS TO PRACTICE 2-2 (SYSTEMS OF MEASUREMENT)

a. (1) 1000 mg = 1 gm

(2) 500 mg = .5 gm

(3) 200 ml = .2 L

(4) 1500 mg = 1.5 gm

(5) 0.1 L = 100 ml

(6) 750 mg = .75 gm

(7) 1 kg = 1000 gm

(8) 5 L = 5000 ml

(9) 4 mg = .004 gm

(10) 100 gm = .1 kg

(11) 0.25 L = 250 ml

(12) 0.0006 gm = .6 mg

(13) 250 mg = .25 gm

(14) 2.5 L = 2500 ml

(15) 0.05 gm = 50 mg

(16) 300 mcg = .3 mg

(17) 1 mg = 1000 mcg

(18) 0.05 mg = 50 mcg

(19) 4700 ml = 4.7 L

(20) 0.75 gm = 750 mg

b. (1) $\frac{1 \text{ tsp}}{5 \text{ ml}} = \frac{X \text{ tsp}}{10 \text{ ml}}$

5X = 10

X = 2 tsp

(2) $\frac{1 \text{ tbsp}}{15 \text{ ml}} = \frac{X \text{ tbsp}}{120 \text{ ml}}$

15X = 120

X = 8 tbsp

(3) $\frac{1 \text{ tsp}}{1/6 \text{ oz}} = \frac{X \text{ tsp}}{2 \text{ oz}}$

1/6 X = 2

X = 12 tsp

(4) $\frac{1 \text{ oz}}{30 \text{ ml}} = \frac{X \text{ oz}}{60 \text{ ml}}$

30X = 60

X = 2 oz

(5) $\frac{1 \text{ oz}}{2 \text{ tbsp}} = \frac{X \text{ oz}}{20 \text{ tbsp}}$

2X = 20

X = 10 oz

(6) $\frac{1}{2}$ fl oz = 1 tbsp

(7) $\frac{1 \text{ tsp}}{5 \text{ ml}} = \frac{X \text{ tsp}}{60 \text{ ml}}$

$5X = 60$

$X = 12$ tsp

(8) $\frac{1/6 \text{ oz}}{1 \text{ tsp}} = \frac{X \text{ oz}}{6 \text{ tsp}}$

$\underline{X} = 1$ oz

(9) 1 oz = 6 tsp

(10) $\frac{1 \text{ oz}}{2 \text{ tbsp}} = \frac{X \text{ oz}}{16 \text{ tbsp}}$

$2X = 16$

$X = 8$ oz

c. (1) $\frac{60 \text{ mg}}{\text{gr } 1} = \frac{X \text{ mg}}{\text{gr } 15}$

$\underline{X} = 900$ mg

(2) $\frac{30 \text{ ml}}{1 \text{ fl oz}} = \frac{X \text{ ml}}{6 \text{ fl oz}}$

$X = 180$ ml

(3) $\frac{60 \text{ mg}}{\text{gr } 1} = \frac{X \text{ mg}}{\text{gr } \frac{1}{6}}$

$X = 10$ mg

(4) $\frac{60 \text{ mg}}{\text{gr } 1} = \frac{X \text{ mg}}{\text{gr } \frac{1}{8}}$

$X = 7.5$ mg

(5) $\frac{60 \text{ mg}}{\text{gr } 1} = \frac{X \text{ mg}}{\text{gr } \frac{1}{4}}$

$\underline{X} = 15$ mg

(6) $\frac{60 \text{ mg}}{\text{gr } 1} = \frac{X \text{ mg}}{\text{gr } \frac{1}{10}}$

$X = 6$ mg

(7) $\frac{1 \text{ kg}}{2.2 \text{ lbs}} = \frac{X \text{ kg}}{11 \text{ lbs}}$

$2.2X = 11$

$X = 5$ kg

(8) $\frac{1 \text{ kg}}{2.2 \text{ lbs}} = \frac{X \text{ kg}}{154 \text{ lbs}}$

$2.2X = 154$

$X = 70$ kg

(9) $\frac{30 \text{ ml}}{1 \text{ fl oz}} = \frac{X \text{ ml}}{8 \text{ fl oz}}$

$X = 240$ ml

(10) 1 pt = 500 ml

(11) 1 oz = 30 ml

(12) $\frac{60 \text{ mg}}{\text{gr } 1} = \frac{X \text{ mg}}{\text{gr } 10}$

$X = 600$ mg

d. (1) 45 mg = $\underline{X}$ gr

$\frac{60 \text{ mg}}{1 \text{ gr}} = \frac{45 \text{ mg}}{X \text{ gr}}$

$60X = 45$

$X = 3/4$ gr

(2) 10 ml = X tsp

$$\frac{5 \text{ ml}}{1 \text{ tsp}} = \frac{10 \text{ ml}}{X \text{ tsp}}$$

5X = 10

X = 2 tsp

(3) 5 tbsp = X ml

$$\frac{1 \text{ tbsp}}{15 \text{ ml}} = \frac{5 \text{ tbsp}}{X \text{ ml}}$$

X = 75 ml

(4) 500 mcg = X mg

$$\frac{1000 \text{ mcg}}{1 \text{ mg}} = \frac{500 \text{ mcg}}{X \text{ mg}}$$

1000X = 500

X = .5 mg

(5) 0.6 gm = X mg

$$\frac{1 \text{ gm}}{1000 \text{ mg}} = \frac{0.6 \text{ gm}}{X \text{ mg}}$$

X = 600 mg

(6) 30 ml = X tbsp

$$\frac{15 \text{ ml}}{1 \text{ tbsp}} = \frac{30 \text{ ml}}{X \text{ tbsp}}$$

15X = 30

X = 2 tbsp

(7) 0.0004 mg = X mcg

$$\frac{1 \text{ mg}}{1000 \text{ mcg}} = \frac{0.0004 \text{ mg}}{X \text{ mcg}}$$

X = .4 mcg

(8) 400 mg = X gm

$$\frac{1000 \text{ mg}}{1 \text{ gm}} = \frac{400 \text{ mg}}{X \text{ gm}}$$

1000X = 400

X = .4 gm

(9) 120 mg = X gr

$$\frac{60 \text{ mg}}{1 \text{ gr}} = \frac{120 \text{ mg}}{X \text{ gr}}$$

60X = 120

X = 2 gr

(10) 400 mcg = X gm

$$\frac{1{,}000{,}000 \text{ mcg}}{1 \text{ gm}} = \frac{400 \text{ mcg}}{X \text{ gm}}$$

1,000,000X = 400

X = .0004 gm

(11) 80 mg = X gr

$$\frac{60 \text{ mg}}{1 \text{ gr}} = \frac{80 \text{ mg}}{X \text{ gr}}$$

60X = 80

X = 1 1/3 gr

(12) 10 mg = X gr

$$\frac{60 \text{ mg}}{1 \text{ gr}} = \frac{10 \text{ mg}}{X \text{ gr}}$$

60X = 10

$$X = \frac{1}{6} \text{ gr}$$

(13) 1/4 gr = X mg

$$\frac{1 \text{ gr}}{60 \text{ mg}} = \frac{1/4 \text{ gr}}{X \text{ mg}}$$

X = 15 mg

(14) 1/6 gr = X mg

$$\frac{1 \text{ gr}}{60 \text{ mg}} = \frac{1/6 \text{ gr}}{X \text{ mg}}$$

X = 10 mg

Section III. COMPUTING MEDICATION DOSAGES

2-14. INFORMATION REQUIRED IN EVERY PHYSICIAN'S MEDICATION ORDER

a. Date and time the order is written.

b. Name of the medication.

c. Dosage of the medication.

d. Directions for administration.

(1) Route:

(a) I.M.: intramuscular or intramuscularly.

(b) I.V.: intravenous or intravenously.

(c) P.O. or p.o.: by mouth.

(d) p.r.: per rectum or rectally.

(e) SC (or SQ): subcutaneous or subcutaneously.

(2) Time interval or frequency:

(a) q 4h: every 4 hours.

(b) b.i.d.: twice a day.

(c) p.r.n.: if needed, as needed.

(d) q.d.: every day, daily.

(e) q.i.d.: 4 times a day.

(f) q.o.d.: every other day.

(g) t.i.d.: 3 times a day.

2-15. FIVE "RIGHTS" OF MEDICATION ADMINISTRATION

a. The right patient.

b. The right drug.

c. The right dose.

d. The right route.

e. The right time.

2-16. COMPUTING DOSAGES FOR TABLETS, PILLS, AND CAPSULES

EXAMPLE: You are to give 0.5 gm of medication to a patient P.O.
On hand are 250 mg capsules.

a. Set up the proportion. LABEL ALL UNITS.

$$\frac{\text{1 capsule}}{\text{250 mg}} = \frac{\text{X capsules}}{\text{0.5 gm}}$$

b. Convert the strength of the medication ordered and the strength of the medication stocked to the same unit of measurement.

0.5 gm = X mg

$$\frac{\text{1 gm}}{\text{1000 mg}} = \frac{\text{0.5 gm}}{\text{X mg}}$$

X = 500 mg

c. Cross-multiply.

$$\frac{1 \text{ capsule}}{250 \text{ mg}} = \frac{X \text{ capsules}}{500 \text{ mg}}$$

250X = 500

d. Solve for "X." Label the answer.

X = 2 capsules

EXAMPLE: You are to give Ampicillin 375 mg P.O. Ampicillin is stocked in 250 mg scored tablets.

$$\frac{1 \text{ tablet}}{250 \text{ mg}} = \frac{X \text{ tablets}}{375 \text{ mg}}$$

250 X = 375

X = 1 1/2 tablets

PRACTICE: Try this one yourself. Then refer to the solution provided to check your work.

You are to administer phenobarbital gr 1/2 P.O. to a patient. On hand are 15 mg tablets.

SOLUTION:

$$\frac{1 \text{ tablet}}{15 \text{ mg}} = \frac{X \text{ tablets}}{\text{gr } 1/2}$$

$$\frac{\text{gr } 1}{60 \text{ mg}} = \frac{\text{gr } 1/2}{X \text{ mg}}$$

$$\frac{60 \text{ mg}}{\text{gr } 1} = \frac{X \text{ mg}}{\text{gr } 1/2}$$

X = 30 mg

$$\frac{1 \text{ tablet}}{15 \text{ mg}} = \frac{X \text{ tablets}}{30 \text{ mg}}$$

15 X = 30

X = 2 tablets

e. Round dosages for tablets, pills, and capsules to the <u>whole</u> or <u>half</u>.

2-17. COMPUTING DOSAGES FOR ORAL LIQUID MEDICATIONS (PREPARED-STRENGTH LIQUIDS)

NOTE: Remember that the size (total # of mls) of the bottle of medication has no influence on the Expression of Strength of the medication.

EXAMPLE #1: You are to give 125 mg of a liquid medication to a patient. The medication is stocked in a 100 ml bottle that contains 250 mg of the medication per 5 ml.

a. Set up the proportion. *LABEL ALL UNITS*.

$$\frac{250 \text{ mg}}{5 \text{ ml}} = \frac{125 \text{ mg}}{X \text{ ml}}$$

b. Convert the strength of the medication ordered and the strength of the medication stocked to the same unit of measurement.

(not applicable here)

c. Cross-multiply.

250X = 725

d. Solve for "X." Label the answer.

X = 2.5 ml

EXAMPLE #2: Administer ampicillin 125 mg P.O. to a pediatric patient. On hand is a 100 ml bottle of ampicillin suspension labeled 0.2 gm per 4 ml. How many ml will you give?

a. Set up the proportion. *LABEL ALL UNITS*.

$$\frac{0.2 \text{ gm}}{4 \text{ ml}} = \frac{125 \text{ mg}}{X \text{ ml}}$$

b. Convert the strength of the medication ordered and the medication stocked to the same unit of measurement.

$$\frac{1 \text{ gm}}{1000 \text{ mg}} = \frac{0.2 \text{ gm}}{X \text{ mg}}$$

X = 200 mg

$$\frac{200 \text{ mg}}{4 \text{ ml}} = \frac{125 \text{ mg}}{X \text{ ml}}$$

c. Cross-multiply.

200X = 500

d. Solve for "X." Label the answer.

X = 2.5 ml

NOTE: Round P.O. liquids to the nearest tenth place.

PRACTICE: The physician has ordered KCL 40 mEq P.O. for your patient. On hand is KCL 15 mEq per 5 ml. How many ml will you administer?

SOLUTION:

$$\frac{15 \text{ mEq}}{5 \text{ ml}} = \frac{40 \text{ mEq}}{X \text{ ml}}$$

15X = 200

X = 13.3 = 13.3 ml

PRACTICE: The physician's order reads: Tylenol elixir gr V P.O. q 4h p.r.n. for pain. The medication label reads: Tylenol elixir 60 mg per 0.5 ml. How many ml will you administer?

SOLUTION:

$$\frac{60 \text{ mg}}{0.5 \text{ ml}} = \frac{5 \text{ gr}}{X \text{ ml}}$$

$$\frac{60 \text{ mg}}{1 \text{ gr}} = \frac{X \text{ mg}}{5 \text{ gr}}$$

X = 300 mg

$$\frac{60 \text{ mg}}{0.5 \text{ ml}} = \frac{300 \text{ mg}}{X \text{ ml}}$$

60X = 150

X = 2.5 ml

2-18. COMPUTING DOSAGE FOR PARENTERAL MEDICATIONS

a. **Parenteral Medication Calculations.** The procedure for computing parenteral medication dosages is the same as for oral liquid medications (prepared strength liquids).

EXAMPLE: The order is to give Demerol (meperidine) 35 mg I.M. q4h p.r.n. for pain. The medication is supplied in an ampule marked 50 mg per ml. How much of the medication should you give?

(1) Set up the proportion. Label all units.

$$\frac{50 \text{ mg}}{1 \text{ ml}} = \frac{35 \text{ mg}}{X \text{ ml}}$$

(2) Convert the strength of the medication ordered and the strength of the medication stocked to the same unit of measurement.

(not applicable here)

(3) Cross-multiply.

50X = 35

(4) Solve for "X." Label answers.

X = .7 ml

NOTE: Round parenteral medications to the tenth, except for heparin and insulin, which are rounded to the hundredth.

PRACTICE: The order is to give morphine sulfate gr 1/8 I.M. q 4h p.r.n. for pain. On hand are ampules labeled 10 mg per ml. How much medication should you give?

SOLUTION:

$$\frac{10 \text{ mg}}{1 \text{ ml}} = \frac{\frac{1}{8} \text{ gr}}{X \text{ ml}}$$

$$\frac{60 \text{ mg}}{1 \text{ gr}} = \frac{X \text{ mg}}{\frac{1}{8} \text{ gr}}$$

X = 7.5 mg

$$\frac{10 \text{ mg}}{1 \text{ ml}} = \frac{7.5 \text{ mg}}{X \text{ ml}}$$

10X = 7.5

X = .75 = .8 ml

PRACTICE: The order is to give 0.3 mg of atropine I.M. on call to surgery. The medication is stocked in a vial labeled gr 1/150 per ml. How much medication should you give?

SOLUTION:

$$\frac{\text{gr } 1/150}{1 \text{ ml}} = \frac{0.3 \text{ mg}}{X \text{ ml}}$$

$$\frac{60 \text{ mg}}{\text{gr } 1} = \frac{X \text{ mg}}{\text{gr } 1/150}$$

X = .4 mg

$$\frac{.4 \text{ mg}}{1 \text{ ml}} = \frac{0.3 \text{ mg}}{X \text{ ml}}$$

.4 X = 0.3

X = .75 = .8 ml

PRACTICE: The physician orders Gentamicin 60 mg I.M. q 8h. The vial is labeled 80 mg per 2 ml. How much medication should you give?

SOLUTION:

$$\frac{80 \text{ mg}}{2 \text{ ml}} = \frac{60 \text{ mg}}{X \text{ ml}}$$

80X = 120

X = 1.5 ml

b. **Reconstitution of Medications for Injection.**

(1) Some medications will become unstable in solution over time. You may see these medications manufactured as dry powders.

(2) Prior to administration of these medications, an appropriate diluent (sterile water, normal saline, and so forth) must be added. The term used to describe the process of adding the diluent to the medication is reconstitution.

(3) Usually the volume of the diluent is expanded somewhat when added to the dry powder. For example, when 2 ml of diluent are added to a dry vial of 1 gram of Mefoxin, the resulting withdrawable volume is 2.5 ml.

(4) The directions for reconstitution of a medication may list a number of different amounts of diluent, each resulting in a different concentration. If that is the case, choose a concentration, which would provide an appropriate volume for the injection. When selecting a concentration, keep in mind that no more than 3-4 ml should be injected into one I.M. site. However, it may be necessary to divide the dose and inject it into two different sites.

EXAMPLE: The order is to give 300,000 units of Penicillin G Potassium I.M. A concentration of 200,000 units/ml should be used. The medication on hand is in a 1,000,000 unit vial. How many ml will you give? (Directions for reconstitution are listed below.)

<u>1,000,000 unit vial</u>:

Concentration	Diluent to be Added
100,000 units/ml	9.6 ml
200,000 units/ml	4.6 ml
250,000 units/ml	3.6 ml

NOTE: Figure 2-1 below illustrates the process of reconstitution of the medication in this example.

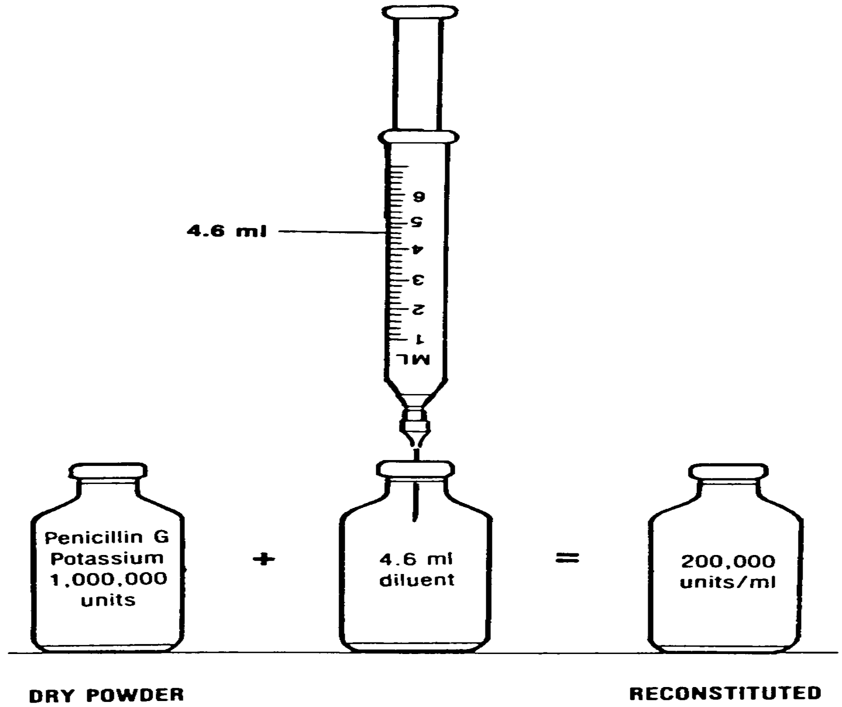


Figure 2-1. The process of reconstitution.

(a) Set up the proportion. Label all units.

$$\frac{200{,}000 \text{ units}}{1 \text{ ml}} = \frac{300{,}000 \text{ units}}{X \text{ ml}}$$

(b) Cross-multiply.

200,000X = 300,000

(c) Solve for X. Label answer.

X = 1.5 ml

PRACTICE: The physician has ordered 0.5 gm of Mefoxin I.M. b.i.d. You have a 1 gm vial available. Directions for reconstitution are:

Concentration	Amount of Diluent	Withdrawable Volume
400 mg/ml	2 ml for I.M. use	2.5 ml
95 mg/ml	10 ml for I.V. use	10.5 ml

1 Which concentration should be used?

2 How many ml should be administered?

a Set up the proportion. Label all units.

b. Convert the strength of the medication ordered and the strength of the medication stocked to the same unit of measurement.

c. Cross-multiply.

d. Solve for X. Round off to the nearest tenth. Label answer.

SOLUTION:

1. 400 mg/ml

2. a. $\frac{400 \text{ mg}}{1 \text{ ml}} = \frac{0.5 \text{ gm}}{X \text{ ml}}$

b. $\frac{1 \text{ gm}}{1000 \text{ mg}} = \frac{0.5 \text{ gm}}{X \text{ mg}}$

X = 500 mg

$\frac{400 \text{ mg}}{1 \text{ ml}} = \frac{500 \text{ mg}}{X \text{ ml}}$

c. 400X = 500

d. X = 1.25 = 1.3 ml

PRACTICE: The order is to give Cleocin Phosphate 300 mg I.V. Directions for reconstitution state: Add 50 ml of sterile water. Each ml will contain 12 mg of medication. How many ml will you give?

SOLUTION:

$\frac{1 \text{ ml}}{12 \text{ mg}} = \frac{X \text{ ml}}{300 \text{ mg}}$

12X = 300

X = 25 ml

c. **Heparin Calculations.**

(1) Heparin is supplied in various concentrations, labeled in units per ml.

(2) It is administered subcutaneously or intravenously.

(3) All heparin calculations should be carried out to the thousandth decimal place and rounded to the hundredth place.

(4) Subcutaneous injections of heparin should be administered using a tuberculin syringe.

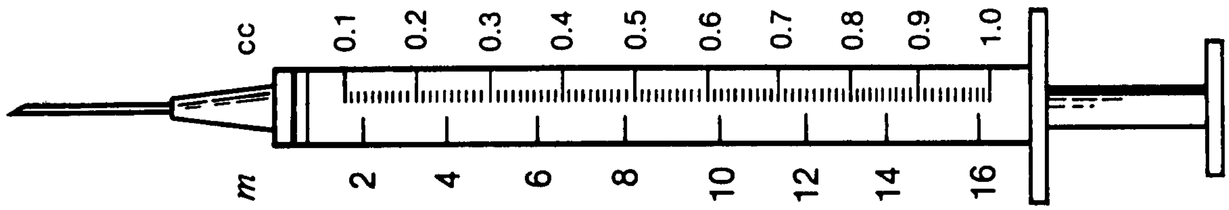


Figure 2-2. Tuberculin (T.B.) syringe.

EXAMPLE: The physician has ordered heparin 5,000 units SC q 8h. Using a vial labeled 40,000 units per ml, calculate the amount of heparin to give.

(a) Set up the proportion. Label all units.

$$\frac{40{,}000 \text{ units}}{1 \text{ ml}} = \frac{5{,}000 \text{ units}}{X \text{ ml}}$$

(b) Cross-multiply.

40,000X = 5,000

X = 0.125 ml

Give 0.13 ml

PRACTICE: The order is for 15,000 units of heparin SC q 12h. You have a vial labeled 20,000 units per ml. How much medication will you give?

SOLUTION:

$$\frac{20{,}000 \text{ units}}{1 \text{ ml}} = \frac{15{,}000 \text{ units}}{X \text{ ml}}$$

20,000X = 15,000

X = 0.75 ml

PRACTICE: The order is to give heparin 11,000 units SC q 8h. Available is a vial containing 20,000 units per ml. How much medication will you give?

SOLUTION:

$$\frac{20{,}000 \text{ units}}{1 \text{ ml}} = \frac{11{,}000 \text{ units}}{X \text{ ml}}$$

20,000X = 11,000

X = 0.55 ml

d. **Insulin Calculations.**

(1) Insulin is supplied in 10 ml vials labeled in the number of units per ml. U-100 insulin is the most commonly used concentration.

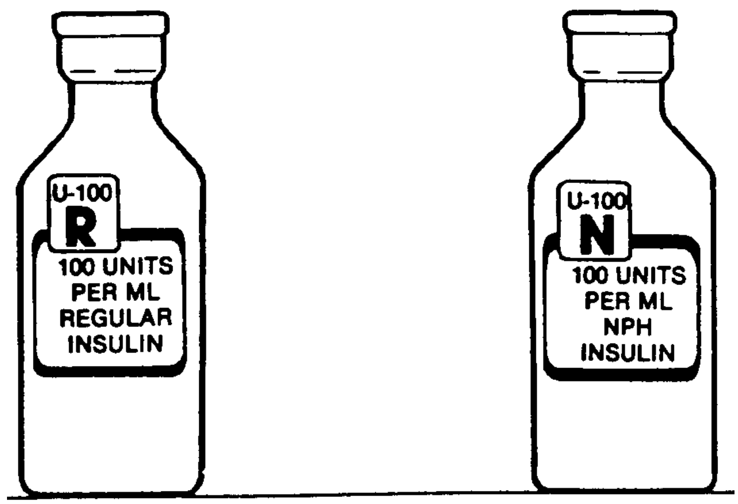


Figure 2-3. U-100 insulin.

(2) The simplest and most accurate way to measure insulin is with an insulin syringe. An insulin syringe is calibrated in units and the ordered dose is read directly on the syringe. Therefore, to measure 16 units of U-100 insulin, you would simply measure to the 16 unit mark on the U-100 insulin syringe.

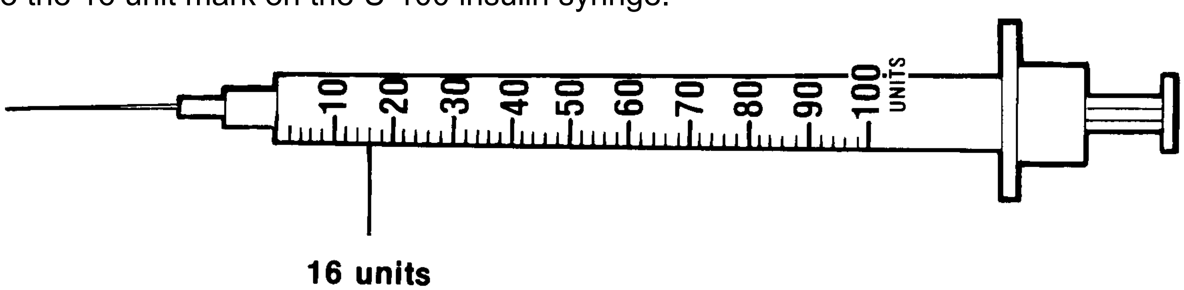


Figure 2-4. Measuring insulin in an insulin syringe.

(3) When measuring U-100 insulin (100 units per ml) in a 1 ml tuberculin syringe, the number of units ordered will always equal an equivalent number of hundredths of a milliliter. Therefore, to measure 16 units of U-100 insulin, measure to the 0.16 ml mark on the tuberculin syringe. Be sure to use the cc scale on the syringe.

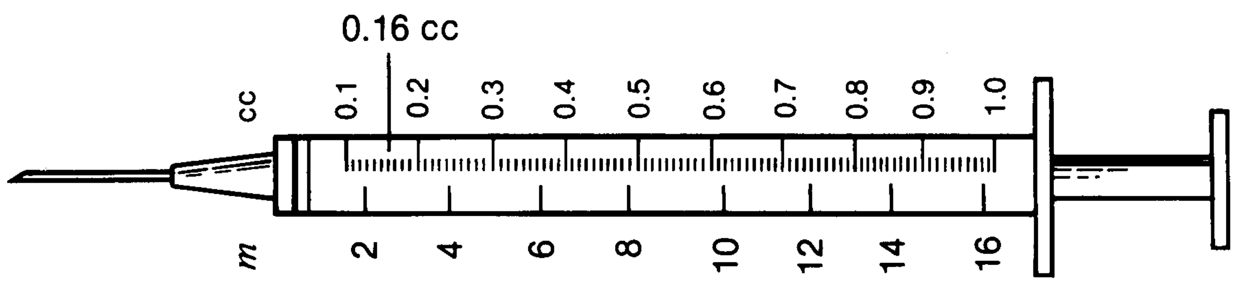


Figure 2-5. Measuring insulin in a tuberculin syringe.

(4) Calculations for insulin dosages are carried out in the same manner as for other parenteral medications. However, as with heparin, all insulin calculations should be rounded to the hundredth place.

EXAMPLE: The order is to give 20 units of Regular Insulin. You are using U-100 insulin and a tuberculin syringe. What is the required dose?

$$\frac{100 \text{ units}}{1 \text{ ml}} = \frac{20 \text{ units}}{X \text{ ml}}$$

100X = 20

X = 0.2 ml

PRACTICE: The order is to give 30 units of NPH insulin SC. Available is a 10 ml vial labeled U-100 NPH insulin. Calculate the amount of insulin to give.

SOLUTION:

$$\frac{100 \text{ units}}{1 \text{ ml}} = \frac{30 \text{ units}}{X \text{ ml}}$$

100X = 30

X = 0.3 ml

e. **Calculation of Medication Based on Body Weight.** Medication doses are often based on the patient's body weight, especially with infants and children. Although this is primarily a professional responsibility, you may use the manufacturer's recommendations to determine if a prescribed dose is a reasonable dose to administer.

EXAMPLE #1: The manufacturer's recommendation for pediatric Tylenol is 10 mg/kg/dose. How many mg are recommended for each dose for a 20 kg child?

Calculate the dosage (mg) of Tylenol the child is to receive, using the proportion method.

$$\frac{10\text{ mg}}{1\text{ kg}} = \frac{X\text{ mg}}{20\text{ kg}}$$

1 X = 200 mg/dose for 20 kg child

EXAMPLE #2: The recommendation for Garamycin is 2 mg/kg/dose. The child weighs 15 kg. The Garamycin is supplied 10 mg/ml. How many mg are recommended for each dose for a 15 kg child? How many ml are required for a single dose?

a. Calculate the dosage (mg) of Garamycin to be given to the 15kg child for one dose.

$$\frac{2\text{ mg}}{1\text{ kg}} = \frac{X\text{ mg}}{15\text{ kg}}$$

1 X = 30 mg for the 15 kg child.

b. Calculate the amount (ml) of Garamycin to be given for one dose.

$$\frac{10\text{ mg}}{1\text{ ml}} = \frac{30\text{ mg}}{X\text{ ml}}$$

10 X = 30

X = 3 ml

Therefore, 3 ml will provide the recommended dose for a 15 kg child.

PRACTICE #1: A patient who weighs 154 pounds is to receive a medication that has a recommended one time dosage of 3 mg/kg. The medication is stocked in a vial labeled 50 mg/ml. Calculate the volume of the medication to be administered.

a. Convert the patient's body weight to kilograms.

$$\frac{1\text{ kg}}{2.2\text{ lbs}} = \frac{X\text{ kg}}{154\text{ lbs}}$$

2.2 X = 154

X = 70 kg

b. Calculate the dosage of the medication based on the patient's body weight.

$$\frac{3 \text{ mg}}{1 \text{ kg}} = \frac{X \text{ mg}}{70 \text{ kg}}$$

1 X = 210 mg

c. Calculate the volume of the drug to be administered.

SOLUTION TO c.:

$$\frac{50 \text{ mg}}{1 \text{ ml}} = \frac{210 \text{ mg}}{X \text{ ml}}$$

50X = 210

X = 4.2 ml

PRACTICE #2: The order is for Depakene 15mg/kg/day for a patient who weighs 110 pounds. The medication is to be given in 3 divided doses. Depakene is stocked in 125 mg/capsules. Calculate the number of capsules to give per dose.

SOLUTION:

a. Convert the patient's body weight to kilograms.

$$\frac{1 \text{ kg}}{2.2 \text{ lbs}} = \frac{X \text{ kg}}{110 \text{ lbs}}$$

2.2 X = 110

X = 50 kg

b. Calculate the dosage (per day) of medication based on the patient's body weight.

$$\frac{15 \text{ mg}}{1 \text{ kg}} = \frac{X \text{ mg}}{50 \text{ kg}}$$

X = 750 mg per day

c. Calculate the number of capsules to be administered per day.

$$\frac{125 \text{ mg}}{1 \text{ capsule}} = \frac{750 \text{ mg}}{X \text{ capsules}}$$

125X = 750

X = 6 capsules per day

d. Calculate the number of capsules to be administered per dose.

6 ÷ 3 = 2 capsules per dose.

2-19. MODIFIED PROPORTION METHOD FOR COMPUTING DOSAGES

NOTE: The final examination at the end of the subcourse will not include information from paragraph 2-19. This alternative method of computing dosages is for your information only.

$$\frac{D}{H} \times Q \qquad \frac{\text{Desired Dose} \times \text{Quantity}}{\text{On Hand Dose}}$$

PRACTICE: You are to administer 300 mg of a medication to a patient. The medication is stocked in a vial labeled 250 mg per 2.5 ml. How many ml will you administer?

SOLUTION:

$$\frac{300 \text{ mg}}{250 \text{ mg}} \times 2.5 \text{ ml} = \frac{750}{250} = 3 \text{ ml}$$

2-20. PRACTICE 2-3 (COMPUTING MEDICATION DOSAGES)

1. You are to administer Dilantin 300 mg P.O. to a patient. Dilantin is stocked in 100 mg capsules. You will administer ____capsules.

2. Aspirin tablets are labeled 0.3 gm. How many tablets are needed for a dose of 600 mg?_______________

3. The doctor has ordered Diabinese tablets 0.25 gm for your patient. You have available Diabinese 100 mg tablets. You will administer ______ tablets to your patient.

4. You are to administer Digoxin 0.375 mg P.O. to a patient. On hand are 0.25 mg tablets. You will administer _____ tablets.

5. You are to administer Phenobarbital gr 1/4 P.O. to a patient. On hand are 15 mg tablets. How many tablets will you give? _______

6. Your patient is to receive Digoxin 0.25 mg P.O. You have available a bottle labeled 0.05 mg per 1 ml. You will administer ___ ml to your patient.

7. The doctor has ordered Mellaril liquid 0.1 gm for your patient. You have available Mellaril liquid labeled 30 mg/ml. You will administer ____ ml to your patient.

8. The physician's order is KCL 40 mEq P.O. On hand is KCL 15 mEq per 5 ml. You will administer ______ml.

9. Administer Ampicillin 125 mg P.O. to a pediatric patient. On hand is a 100 ml bottle of Ampicillin suspension containing 200 mg per 4 ml. How many ml will you give? ____________

10. The order reads: Tylenol elixir gr X P.O., p.r.n. for pain. The medication label reads: Tylenol elixir 60 mg per 0.5 ml. You will administer _____ ml.

11. The physician has ordered Ritalin 30 mg P.O. t.i.d. On hand are 20 mg scored tablets. How many tablets will you give? _______

12. The order is for Mysoline 125 mg P.O. t.i.d. On hand are 250 mg tablets. How many tablets will you give per dose? ________ per day?________

13. You are to give the patient Ampicillin 250 mg P.O. q 6h. The suspension on hand contains 125 mg per 5 ml. How many ml will the patient receive per dose? _______

14. The order is to give Dilantin 100 mg P.O. t.i.d. The available suspension contains 30 mg per 5 ml. How many ml. will you give?_______

15. The physician has ordered Tetracycline syrup 500 mg q 6h P.O. The available medication contains 125 mg per 5 ml. How many ml will you give? ______

16. The doctor has ordered 65 mg of Garamycin I.M. for your patient. You have available a multidose vial of Garamycin labeled 40 mg/ml. How much of the medication will the patient receive? _______

17. The doctor has ordered an injection of Atropine 0.3 mg I.M. for your patient. You have available a multi-dose vial labeled Atropine 1 mg/ml. You will administer ______ ml to your patient.

18. The doctor orders Morphine gr 1/4 I.M. for your patient. You have available Morphine 10 mg/ml. How much of the solution will you administer? ______

19. The doctor has ordered Digoxin 0.125 mg I.M. You have a vial of Digoxin labeled 0.5 mg/2 ml. How much of the medication should the patient receive? _______

20. You are to administer Atropine gr 1/200 I.M. to a patient. On hand is Atropine gr 1/150 per 0.8 ml. How many ml will you give?_______

21. The vial of powdered medication is labeled Staphcillin 1 gm. The directions say to add 1.5 ml of sterile saline. The solution will then equal 2 ml. How much of the solution should you give if the order is Staphcillin 500 mg I.M.? _______

22. The doctor has ordered Keflin 250 mg I.M. for a 5-year-old patient. You have available a vial of powdered drug labeled 1 gm Keflin. You read the manufacturer's directions and find you should add 4 ml of sterile water to dissolve the drug and produce a solution in which 2.2 ml equals 500 mg of Keflin. How many ml will you give?_______

23. The doctor has ordered Regular Insulin 46 units SC for your patient. Using Regular Insulin U-100, how many ml will you administer if the medication is drawn up in a tuberculin syringe? _______

24. You are to give 20 u of Regular Insulin. You have U-40 Regular Insulin available. How much will you give using a tuberculin syringe? ______

25. The physician has ordered Heparin 2000u SC for your patient. On hand is a 20 ml vial of Heparin labeled 10,000u per ml. You will give ________ ml.

26. The order is to give Prostaphlin 350 mg I.M. q 4h. Directions for reconstitution of the 1 gm vial state: Add 5.7 ml of sterile water. Each 1.5 ml will then contain 250 mg of medication. How many ml will you give? ___

27. The order is to give 0.25 gm Cefobid I.M. q 12h. Directions for reconstitution of the 1 gm vial state: Add 2.8 ml of sterile water to produce a concentration of 333 mg. per ml. How many ml will you give? ______

28. The order is to give Pipracil 750 mg I.M. q 8h. Directions for reconstitution of the 2 gm vial state: Add 4 ml of sodium chloride to produce a concentration of 1 gm per 2.5 ml. How many ml will you give?________

29. The following refers to reconstitution of penicillin:

Diluent	=	Concentration
3.2 ml =		1,000,000 units/ml
8.2 ml =		500,000 units/ml
18.2 ml =		250,000 units/ml

Using the 3.2 diluent, how much penicillin (ml) must be used to administer 1.5 million units? (1.5 million = 1,500,000)

30. The recommended dose of Penicillin G is 250,000 units/kg/day divided in 6 equal doses. The medication is available as 1,000,000 units per 10 ml. The child weighs 30 kg. Determine the number of ml to be administered <u>per</u> <u>dose</u>. ______.

31. The doctor has ordered 2000 units of Heparin SC. You have available a 5 ml vial labeled 10,000 units per ml. How many ml will you administer? _______

32. The order is to give Penicillin G 300,000 units I.M. for your patient. You have a vial that contains 200,000 units/ml. How much medication will you administer? _______

33. The order is to give Atropine gr 1/200 I.M. On hand is an ampule labeled gr 1/150 per 2 ml. How many ml will you give? ________

34. The order is to give Morphine 6 mg I.M. q 4h, p.r.n. The available vial is labeled 1/6 gr per ml. How many ml will you give?_______

35. The order is to give Phenobarbital gr 1/4 I.M., q 4-6 h p.r.n. On hand is a tubex (prefilled syringe) labeled 30 mg/2 ml. How many ml will you give? _______

36. The order is to give Methicillin 0.6 gm I.M. q 6h. On hand is a vial labeled 150 mg per ml. How many ml should you give? _______

37. The order is to give Mylanta 45 ml P.O. q 2h. How many ounces will you administer? _______

38. The order is to give Erythromycin base 0.5 gm P.O. q 6h. On hand are 125 mg tablets. How many tablets will you give? _______

39. The physician has ordered Synthroid 25 mcg P.O. q AM. Available are 0.05 mg tablets. How many tablets will you give?_______

40. The order is for Slophyllin 60 mg P.O. q 8h. The medication is supplied in a syrup 80 mg/15 ml. How many ml will you give?_______

2-21. ANSWERS TO PRACTICE 2-3 (COMPUTING MEDICATION DOSAGES)

1. $\frac{\text{1 capsule}}{\text{100 mg}} = \frac{\text{X capsules}}{\text{300 mg}}$

   100 X = 300

   X = 3 capsules (paras 2-2, 2-3, 2-16)

2. (a) $\frac{\text{1 tablet}}{\text{0.3 gm}} = \frac{\text{X tablets}}{\text{600 mg}}$

   (b) 0.3 gm = X mg

   $\frac{\text{1 gm}}{\text{1000 mg}} = \frac{\text{0.3 gm}}{\text{X mg}}$

   X = 300 mg

   (c) $\frac{\text{1 tablet}}{\text{300 mg}} = \frac{\text{X tablets}}{\text{600 mg}}$

   300 X = 600

   X = 2 tablets (paras 2-2, 2-3, 2-7, 2-16)

3. (a) $\frac{\text{1 tablet}}{\text{100 mg}} = \frac{\text{X tablets}}{\text{0.25 gm}}$

   (b) 0.25 gm = X mg

   $\frac{\text{1 gm}}{\text{1000 mg}} = \frac{\text{0.25 gm}}{\text{X mg}}$

   X = 250 mg

   (c) $\frac{\text{1 tablet}}{\text{100 mg}} = \frac{\text{X tablets}}{\text{250 mg}}$

   100 X = 250

   X = 2.5 or 2 1/2 tablets (paras 2-2, 2-3, 2-7, 2-16)

4. $\frac{\text{1 tablet}}{\text{0.25 mg}} = \frac{\text{X tablets}}{\text{0.375 mg}}$

   0.25 X = 0.375

   X = 1.5 or 1 1/2 tablets (paras 2-2, 2-3, 2-16)

5. (a) $\frac{\text{1 tablet}}{\text{15 mg}} = \frac{\text{X tablets}}{\text{gr 1/4}}$

   (b) $\frac{\text{gr 1}}{\text{60 mg}} = \frac{\text{gr 1/4}}{\text{X mg}}$

   X = 15 mg

   (c) $\frac{\text{1 tablet}}{\text{15 mg}} = \frac{\text{X tablets}}{\text{15 mg}}$

   15 X = 15

   X = 1 tablet (paras 2-2, 2-3, 2-7, 2-16)

6. $\frac{\text{0.05 mg}}{\text{1 ml}} = \frac{\text{0.25 mg}}{\text{X ml}}$

   0.05 X = 0.25

   X = 5 ml (para 2-14)

7. (a) $\frac{\text{30 mg}}{\text{1 ml}} = \frac{\text{0.1 gm}}{\text{X ml}}$

   (b) 0.1 gm = X mg

   $\frac{\text{1 gm}}{\text{1000 mg}} = \frac{\text{0.1 gm}}{\text{X mg}}$

   X = 100 mg

   (c) $\frac{\text{30 mg}}{\text{1 ml}} = \frac{\text{100 mg}}{\text{X ml}}$

   30 X = 100

   X = 3.3 ml (paras 2-2, 2-3, 2-7, 2-17)

8. $\frac{15 \text{ mEq}}{5 \text{ ml}} = \frac{40 \text{ mEq}}{X \text{ ml}}$

15 X = 200

X = 13.3 ml (paras 2-2, 2-3, 2-17)

9. $\frac{200 \text{ mg}}{4 \text{ ml}} = \frac{125 \text{ mg}}{X \text{ ml}}$

200 X = 500

X = 2.5 ml (paras 2-2, 2-3, 2-17)

10. (a) $\frac{60 \text{ mg}}{0.5 \text{ ml}} = \frac{\text{gr } 10}{X \text{ ml}}$

(b) gr 10 = X mg

$\frac{\text{gr } 1}{60 \text{ mg}} = \frac{\text{gr } 10}{X \text{ mg}}$

X = 600 mg

(c) $\frac{60 \text{ mg}}{0.5 \text{ ml}} = \frac{600 \text{ mg}}{X \text{ ml}}$

60 X = 300

X = 5 ml (paras 2-2, 2-3, 2-7, 2-17)

11. $\frac{1 \text{ tablet}}{20 \text{ mg}} = \frac{X \text{ tablets}}{30 \text{ mg}}$

20 X = 30

X = 1.5 or 1 1/2 tablets (paras 2-2, 2-3, 2-14, 2-16)

12. $\frac{1 \text{ tablet}}{250 \text{ mg}} = \frac{X \text{ tablets}}{125 \text{ mg}}$

250 X = 125

X = 1/2 tablet per dose

1/2 X 3 = 1 1/2 tablets per day (paras 2-2, 2-3, 2-14, 2-16)

13. $\frac{125 \text{ mg}}{5 \text{ ml}} = \frac{250 \text{ mg}}{X \text{ ml}}$

125 X = 1250

X = 10 ml (paras 2-2, 2-3, 2-17)

14. $\frac{30 \text{ mg}}{5 \text{ ml}} = \frac{100 \text{ mg}}{X \text{ ml}}$

30 X = 500

X = 16.7 ml (paras 2-2, 2-3, 2-10, 2-14, 2-17)

15. $\frac{125 \text{ mg}}{5 \text{ ml}} = \frac{500 \text{ mg}}{X \text{ ml}}$

125 X = 2500

X = 20 ml per day (paras 2-2, 2-3, 2-17)

16. $\frac{40 \text{ mg}}{1 \text{ ml}} = \frac{65 \text{ mg}}{X \text{ ml}}$

40 X = 65

X = 1.6 ml (paras 2-2, 2-3, 2-18a)

17. $\frac{1 \text{ mg}}{1 \text{ ml}} = \frac{0.3 \text{ mg}}{X \text{ ml}}$

X = 0.3 ml (paras 2-2, 2-3, 2-18a)

18. (a) $\frac{10 \text{ mg}}{1 \text{ ml}} = \frac{\text{gr } 1/4}{X \text{ ml}}$

(b) $\frac{60 \text{ mg}}{\text{gr } 1} = \frac{X \text{ mg}}{\text{gr } 1/4}$

X = 15 mg

(c) $\frac{10 \text{ mg}}{1 \text{ ml}} = \frac{15 \text{ mg}}{X \text{ ml}}$

10 X = 15

X = 1.5 ml (paras 2-2, 2-3, 2-10, 2-18a)

19. $\frac{0.5 \text{ mg}}{2 \text{ ml}} = \frac{0.125 \text{ mg}}{X \text{ ml}}$

0.5 X = 0.250

X = 0.5 ml (paras 2-2, 2-3, 2-18a)

20. $\frac{\text{gr } 1/150}{0.8 \text{ ml}} = \frac{\text{gr } 1/200}{X \text{ ml}}$

$\frac{1}{150} X = .004 \text{ ml}$

X = 0.6 ml (paras 2-2, 2-3, 2-15a)

21. (a) $\frac{1 \text{ gm}}{2 \text{ ml}} = \frac{500 \text{ mg}}{X \text{ ml}}$

(b) 1 gm = 1000 mg

(c) $\frac{1000 \text{ mg}}{2 \text{ ml}} = \frac{500 \text{ mg}}{X \text{ ml}}$

1000 X = 1000

X = 1 ml (paras 2-2, 2-3, 2-10, 2-18a)

22. $\frac{2.2 \text{ ml}}{500 \text{ mg}} = \frac{X \text{ ml}}{250 \text{ mg}}$

500 X = 550

X = 1.1 ml (paras 2-2, 2-3, 2-18b)

23. $\frac{100 \text{ units}}{1 \text{ ml}} = \frac{46 \text{ units}}{X \text{ ml}}$

100 X = 46

X = 0.46 ml (paras 2-2, 2-3, 2-18d)

24. $\frac{40 \text{ units}}{1 \text{ ml}} = \frac{20 \text{ units}}{X \text{ ml}}$

40 X = 20

X = 0.5 ml (paras 2-2, 2-3, 2-18d)

25. $\frac{10{,}000 \text{ units}}{1 \text{ ml}} = \frac{2000 \text{ units}}{X \text{ ml}}$

10,000 X = 2000

X = 0.2 ml (paras 2-2, 2-3, 2-18c)

26. $\frac{250 \text{ mg}}{1.5 \text{ ml}} = \frac{350 \text{ mg}}{X \text{ ml}}$

250 X = 525

X = 2.1 ml (paras 2-2, 2-3, 2-18b)

27. (a) $\frac{333 \text{ mg}}{1 \text{ ml}} = \frac{0.25 \text{ gm}}{X \text{ ml}}$

(b) $\frac{1 \text{ gm}}{1000 \text{ mg}} = \frac{0.25 \text{ gm}}{X \text{ mg}}$

X = 250 mg

(c) $\frac{333 \text{ mg}}{1 \text{ ml}} = \frac{250 \text{ mg}}{X \text{ ml}}$

333 X = 250

X = 0.8 ml (paras 2-2, 2-3, 2-10, 2-18b)

28. (a) $\frac{1 \text{ gm}}{2.5 \text{ ml}} = \frac{750 \text{ mg}}{X \text{ ml}}$

(b) $\frac{1 \text{ gm}}{1000 \text{ mg}} = \frac{X \text{ gm}}{750 \text{ mg}}$

1000 X = 750

X = .75 gm

(c) $\frac{1 \text{ gm}}{2.5 \text{ ml}} = \frac{.75 \text{ gm}}{X \text{ ml}}$

X = 1.875 = 1.9 ml (paras 2-2, 2-3, 2-10, 2-18b)

29. $\frac{1{,}000{,}000 \text{ units}}{1 \text{ ml}} = \frac{1{,}500{,}000 \text{ units}}{X \text{ ml}}$

1,000,000 X = 1,500,000

X = 1.5 ml (paras 2-2, 2-3, 2-18b)

30. (a) $\frac{250{,}000 \text{ units}}{1 \text{ kg}} = \frac{X \text{ units}}{30 \text{ kg}}$

X = 7,500,000 units per day

(b) $\frac{1{,}000{,}000 \text{ units}}{10 \text{ ml}} = \frac{7{,}500{,}000 \text{ units}}{X \text{ ml}}$

1,000,000 X = 75,000,000

X = 75 ml per day

75. 6 = 12.5 ml per dose (paras 2-2, 2-3, 2-18e)

31. $\frac{10{,}000 \text{ units}}{1 \text{ ml}} = \frac{2000 \text{ units}}{X \text{ ml}}$

10,000 X = 2,000

X = 0.2 ml (paras 2-2, 2-3, 2-18c)

32. $\frac{200{,}000 \text{ units}}{1 \text{ ml}} = \frac{300{,}000 \text{ units}}{X \text{ ml}}$

200,000 X = 300,000

X = 1.5 ml (paras 2-2, 2-3, 2-18a)

33. $\frac{gr\ \frac{1}{150}}{2\ ml} = \frac{gr\ \frac{1}{200}}{X\ ml}$

$\frac{1\ X}{150} = \frac{1}{100}$

X = 1.5 ml (paras 2-2, 2-3, 2-18a)

34. (a) $\frac{\frac{1}{6}\ gr}{1\ ml} = \frac{6\ mg}{X\ ml}$

(b) $\frac{\frac{1}{1}\ gr}{60\ mg} = \frac{6\ gr}{X\ mg}$

X = 10 mg

(c) $\frac{10\ mg}{1\ ml} = \frac{6\ mg}{X\ ml}$

10 X = 6

X = 0.6 ml (paras 2-2, 2-3, 2-10, 2-18a)

35. (a) $\frac{30\ mg}{2\ ml} = \frac{gr\ 1/4}{X\ ml}$

(b) $\frac{gr\ 1}{60\ mg} = \frac{gr\ 1/4}{X\ ml}$

X = 15 mg

(c) $\frac{30\ mg}{2\ ml} = \frac{15\ mg}{X\ ml}$

30 X = 30

X = 1 ml (paras 2-2, 2-3, 2-10, 2-18a)

36. (a) $\frac{150 \text{ mg}}{1 \text{ ml}} = \frac{0.6 \text{ gm}}{X \text{ ml}}$

(b) $\frac{1 \text{ gm}}{1000 \text{ mg}} = \frac{0.6 \text{ gm}}{X \text{ mg}}$

X = 600 mg

(c) $\frac{150 \text{ mg}}{1 \text{ ml}} = \frac{600 \text{ mg}}{X \text{ ml}}$

150 X = 600

X = 4 ml (paras 2-2, 2-3, 2-10, 2-18a)

37. $\frac{1 \text{ oz}}{30 \text{ ml}} = \frac{X \text{ oz}}{45 \text{ ml}}$

30 X = 45

X = 1.5 oz (paras 2-2, 2-3, 2-11, 2-17)

38. (a) $\frac{1 \text{ tablet}}{125 \text{ mg}} = \frac{X \text{ tablets}}{0.5 \text{ gm}}$

(b) $\frac{1 \text{ gm}}{1000 \text{ mg}} = \frac{0.5 \text{ gm}}{X \text{ mg}}$

X = 500 mg

(c) $\frac{1 \text{ tablet}}{125 \text{ mg}} = \frac{X \text{ tablets}}{500 \text{ mg}}$

125 X = 500

X = 4 tablets (paras 2-2, 2-3, 2-10, 2-16)

39. (a) $\frac{1 \text{ tablet}}{0.05 \text{ mg}} = \frac{X \text{ tablets}}{25 \text{ mcg}}$

(b) $\frac{1 \text{ mg}}{1000 \text{ mcg}} = \frac{X \text{ mg}}{25 \text{ mcg}}$

1000 X = 25

X = 0.025 mg

(c) $\frac{1 \text{ tablet}}{0.05 \text{ mg}} = \frac{X \text{ tablets}}{0.025 \text{ mg}}$

0.05 X = 0.025

X = 0.5 or 1/2 tablet (paras 2-2, 2-3, 2-10, 2-16)

40. $\frac{80 \text{ mg}}{15 \text{ ml}} = \frac{60 \text{ mg}}{X \text{ ml}}$

80 X = 900

X = 11.3 ml (paras 2-2, 2-3, 2-17)

Section IV. COMPUTING INTRAVENOUS INFUSION RATES

2-22. INFORMATION REQUIRED ON AN ORDER FOR I.V. FLUIDS

a. Type of fluid to be infused.

b. Volume of the fluid to be infused.

c. Time period over which the fluid is to be infused.

2-23. I.V. ADMINISTRATION SET CALIBRATIONS

a. I.V. flow rates are regulated in drops per minute (gtts/min).

b. The size of the drop (drop factor) varies from large to small, and depending on the manufacturer and type of set used, it will require 10, 15, or 20 gtts to equal 1 ml in standard macrodrip sets, and 60 gtts to equal 1 ml in micro- or minidrip sets. (See examples in figure 2-6.)

2-24. OBJECTIVES OF I.V. THERAPY

a. To supply fluids when patients are unable to take adequate fluids by mouth.

b. To provide salts needed to maintain electrolyte balance: KCL, calcium, magnesium.

c. To provide glucose for metabolism.

(1) D_5W = 5% Dextrose.

(2) $D_{10}W$ = 10% Dextrose.

(3) $D_5\ _{1/2}NS$ = 5% Dextrose, .45% Normal Saline.

(4) D_5NS = 5% Dextrose, .9% Normal Saline.

(5) $D_5\ _{1/4}NS$ = 5% dextrose, .23% Normal Saline.

d. To provide water-soluble vitamins.

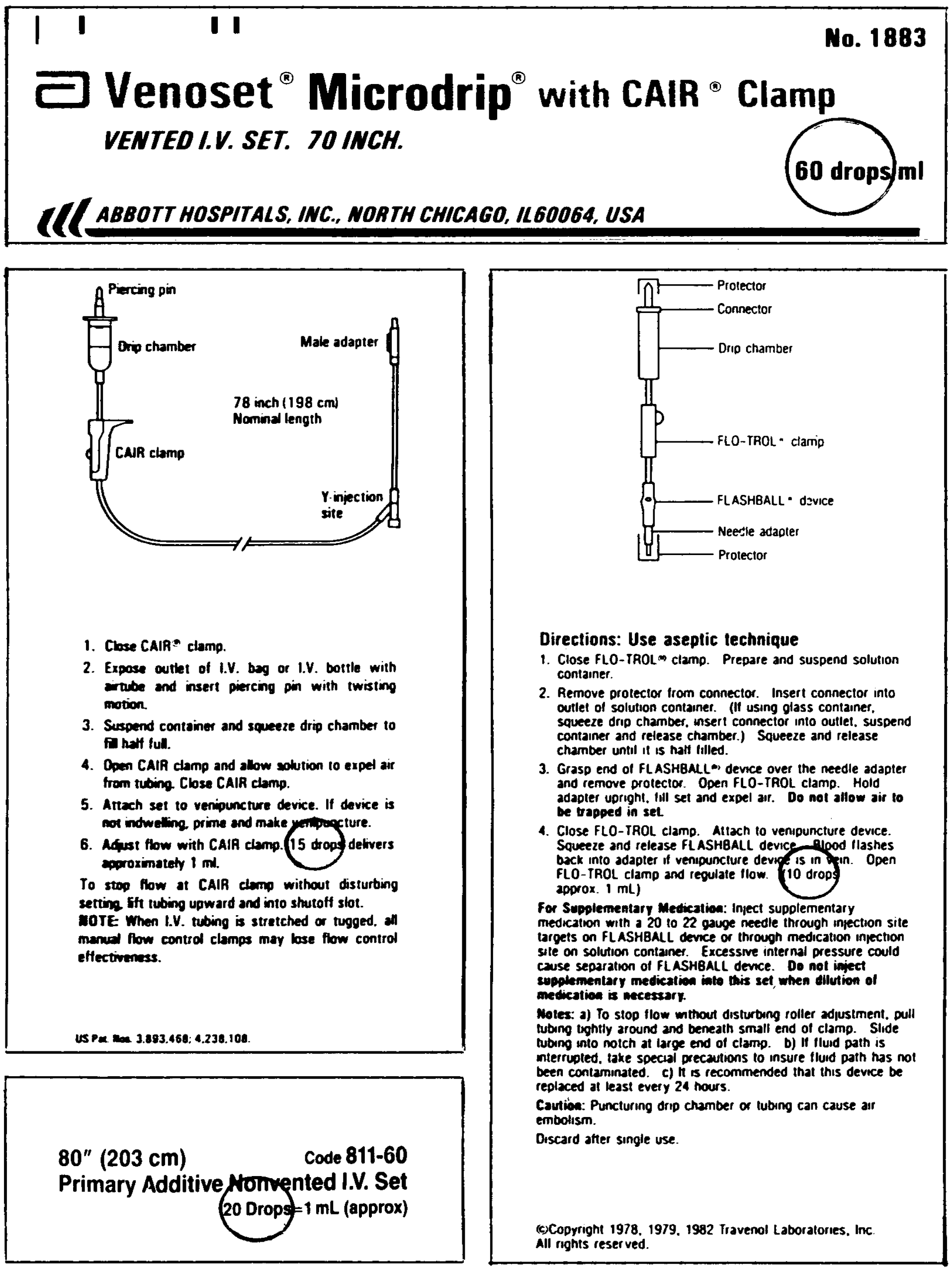


Figure 2-6. I.V. set calibrations.

2-25. FACTORS THAT INFLUENCE VOLUME DETERMINATION

a. Patient's daily maintenance requirements.

b. Volume losses prior to therapy.

c. Concurrent losses; gastric suction, vomiting, or diarrhea.

d. Patient's metabolic requirements.

2-26. COMPUTING CONTINUOUS I.V. INFUSION RATES

a. **I.V. Formula.**

EXAMPLE #1: The order is for $D_{5\ 1/2}$NS 1000 ml to be infused over eight hours. Calculate the infusion rate using an I.V. set calibrated to deliver 20 gtts/ml.

a. $$\frac{\text{Volume (ml) x drop factor (gtts/ml)}}{\text{Time (minutes)}}$$

b. $$\frac{\text{1000 ml x 20 gtts/ml}}{480}$$

c. $$\frac{20{,}000}{480} = 41.67 = 42 \text{ gtts/min.}$$

NOTE: For I.V.'s, round off to the nearest whole number.

EXAMPLE #2: The patient is to receive 1000 ml of 0.45% sodium chloride over the next 10 hours. The drop factor of the tubing is 15 gtts/ml. Determine the rate in gtts/min.

$$\frac{\text{1000 ml x 15 gtts/ml}}{\text{600 minutes}}$$

$$\frac{15{,}000}{600} = 25 \text{ gtts/min.}$$

EXAMPLE #3: The order is to infuse $D_{5\ 1/2}$NS at 125 ml/hr for the next 24 hours. The I.V. administration set is calibrated 20 gtts/ml. Calculate the infusion rate.

a. Volume x drop factor / Time (min.)

$$\frac{\text{Volume x drop factor}}{\text{Time (min.)}}$$

b. 125 ml/hr x 20 gtts/ml / 60 min.

$$\frac{\text{125 ml/hr x 20 gtts/ml}}{\text{60 min.}}$$

c. $\frac{2500}{60}$ = 42 gtts/min.

PRACTICE 1: The order is to infuse 1500 ml of Ringer's lactate over the next 24 hours. The drop factor of the tubing is 60 gtts/ml. Determine the rate in gtts/min.

SOLUTION:

$$\frac{\text{1500 ml x 60 gtts/ml}}{1440}$$

$\frac{90,000}{1440}$ = 63 gtts/min

PRACTICE 2: The order is to give 250 ml of Rheomacrodex (dextran 40) over 45 minutes. The drop factor of the tubing is 10 gtts/ml. Determine the rate in gtts/min.

SOLUTION:

$$\frac{\text{250 ml x 10 gtts/ml}}{45}$$

$\frac{2500}{45}$ = 56 gtts/min

b. **Practice Problems.**

(1) The patient is to receive 2000 ml of D_5NS over 12 hours. The drop factor of the tubing is 15 gtts/ml. Determine the infusion rate.

SOLUTION:

$$\frac{2000 \text{ ml} \times 15 \text{ gtts/ml}}{720}$$

$$\frac{30{,}000}{720} = 42 \text{ gtts/ml}$$

(2) The physician has ordered 2000 ml of NS at a rate of 125 ml/hr for the next 16 hours. The drop factor of the tubing is 20 gtts/ml. Determine the rate in gtts/min.

SOLUTION:

$$\frac{125 \text{ ml} \times 20 \text{ gtts/ml}}{60}$$

$$\frac{2500}{60} = 42 \text{ gtts/min}$$

(3) The order is to infuse 1500 ml of Ringer's lactate over the next 24 hours. The drop factor of the tubing is 20 gtts/ml. Determine the rate in gtts/min.

SOLUTION:

$$\frac{1500 \text{ ml} \times 20 \text{ gtts/ml}}{1440}$$

$$\frac{30{,}000}{1440} = 21 \text{ gtts/min.}$$

(4) The patient is to receive Intralipid 10% at a rate of 500 ml over 4 hours. The drop factor of the tubing is 10 gtts/ml. Determine the infusion rate.

SOLUTION:

$$\frac{500 \text{ ml} \times 10 \text{ gtts/ml}}{240}$$

$$\frac{5000}{240} = 21 \text{ gtts/min.}$$

(5) The order is to infuse 1000 ml of D_5W over 24 hours to keep the vein open. Using I.V. with a drop factor of 60 gtts/ml, determine the infusion rate.

SOLUTION:

$$\frac{1000 \text{ ml} \times 60 \text{ gtts/ml}}{1440}$$

$$\frac{60{,}000}{1440} = 42 \text{ gtts/min.}$$

2-27. ADMINISTRATION OF MEDICATIONS BY IVPB (INTERMITTENT INFUSION)

NOTE: Intermittent infusion of medications requires giving a drug through an in-progress I.V. or through a special I.V. catheter called a heparin lock.

a. The terms piggyback and I.V. piggyback (IVPB) are commonly used when referring to any intermittent infusion that requires more than 5 minutes to complete.

b. The medication is usually diluted in 50 to 100 ml of I.V. fluid and infused over about 30 minutes.

EXAMPLE: The order is to give Cimetidine 300 mg IVPB q 6h. It is recommended that this medication be dissolved in 100 ml of I.V. solution (D_5W) and infused over 30 minutes. Using a drop factor of 20 gtts/ml, determine the infusion rate.

$$\frac{100 \text{ ml} \times 20 \text{ gtts/ml}}{30}$$

$$\frac{2000}{30} = 67 \text{ gtts/min.}$$

PRACTICE #1: The order is to give 6,000,000 units of Penicillin G IVPB q 4h. The medication is to be dissolved in 150 ml of I.V. fluid, and the recommended infusion time is 1 1/2 hours. Using a drop factor of 20 gtts/ml, determine the infusion rate.

SOLUTION:

$$\frac{150 \text{ ml} \times 20 \text{ gtts/ml}}{90}$$

$$\frac{3000}{90} = 33 \text{ gtts/min.}$$

PRACTICE #2: The order is to give Solu-Medrol 125 mg IVPB q.4h. The medication is to be dissolved in 50 ml of I.V. fluid and the recommended administration time is 15 minutes. Using a drop factor of 20 gtts/ml, determine the infusion rate.

SOLUTION:

$$\frac{50 \text{ ml} \times 20 \text{ gtts/ml}}{15}$$

$$\frac{1000}{15} = 67 \text{ gtts/min.}$$

2-28. ADMINISTRATION OF MEDICATIONS BY CONTINUOUS INFUSION

NOTE: With continuous I.V. infusions of medications, the physician will order a medication dosage and not fluid volume. For example, the order may specify mg/hr or units/hr.

EXAMPLE: The order is to administer a continuous I.V. Heparin drip at a rate of 1200 units per hour. The pharmacy sends up a 250 ml bag of Normal Saline with 25,000 units of Heparin added. Using a drop factor of 60 gtts/ml, determine the infusion rate to deliver the ordered amount of medication.

a. Determine the amount of drug in the solution.

$$\frac{25{,}000 \text{ units}}{250 \text{ ml}}$$

b. Determine the number of ml/hr to be administered to give the ordered dosage.

$$\frac{25{,}000 \text{ units}}{250 \text{ ml}} = \frac{1200 \text{ units}}{X \text{ ml}}$$

$$25{,}000 X = 300{,}000$$

$$X = 12 \text{ ml/hr}$$

c. Determine the infusion rate in gtts/min.

$$\frac{12 \text{ ml} \times 60 \text{ gtts/ml}}{60}$$

$$\frac{720}{60} = 12 \text{ gtts/min}$$

PRACTICE #1: The physician has ordered a continuous infusion of Aminophylline at a rate of 25 mg/hr. The pharmacy sends up a 500 ml bag of D_5W with 500 mg of Aminophylline added. Using a drop factor of 60 gtts/ml, determine the infusion rate.

SOLUTION:

a. $\frac{500 \text{ mg}}{500 \text{ ml}}$

b. $\frac{500 \text{ mg}}{500 \text{ ml}} = \frac{25 \text{ mg}}{X \text{ ml}}$

500 X= 12,500

X = 25 ml/hr

c. $\frac{25 \text{ ml} \times 60 \text{ gtts/ml}}{60}$

$\frac{1500}{60}$ = 25 gtts/min

PRACTICE #2: The patient is to receive a regular insulin drip of 10 units/hr. The pharmacy sends up a 250 ml bag of normal saline with 100 units of regular insulin added. The I.V. administration set delivers 60 gtts/ml. How many gtts/min will you administer?

SOLUTION:

a. $\frac{100 \text{ units}}{250 \text{ ml}}$

b. $\frac{100 \text{ units}}{250 \text{ ml}} = \frac{10 \text{ units}}{X \text{ ml}}$

100 X = 2500

X = 25 ml/hr

c. $\frac{25 \text{ ml} \times 60 \text{ gtts/ml}}{60}$

$\frac{1500}{60}$ = 25 gtts/min

2-29. PRACTICE 2-4 (COMPUTING INTRAVENOUS INFUSION RATES)

a. The order is to infuse an I.V. of D_5W 1000 ml over 12 hours. Calculate the infusion rate using an I.V. set that delivers 20 gtts/ml.

b. The order is to infuse a 0.9% normal saline 250 ml over 45 minutes. Calculate the infusion rate using an I.V. set that delivers 10 gtts/ml.

c. The order is to infuse D_5RL 1000 ml q 8h for 24 hours. Calculate the infusion rate using a drop factor of 15 gtts/ml.

d. The order is for 2000 ml of hyperalimentation to infuse over 24 hours. The I.V. set delivers 60 gtts/ml. The solution should be administered at a rate of _______ gtts/min.

e. The patient is to receive 1200 ml of D_5RL over 10 hours. The I.V. set delivers 20 gtts/ml. The infusion rate will be ______ gtts/min.

f. Administer 150 ml of Normal Saline over 30 minutes using an I.V. set that delivers 10 gtts/ml. The infusion rate will be ______.

g. The order is for Amikacin Sulfate 100 mg to be dissolved in 150 ml of D_5W to run over 1 hour. Using an I.V. set that delivers 20 gtts/ml, determine the infusion rate.

h. The order is for Gentamycin 180 mg IVPB q 8h. The medication is dissolved in 100 ml of D_5W and should infuse over 45 minutes. Using a drop factor of 20 gtts/ml, determine the infusion rate.

i. The order is to infuse 500 ml of 0.9% NS over 2 hours. The I.V. administration set delivers 15 gtts/ml. How many gtts/min will you administer?

j. You are to infuse D_5W at 15 ml/hr to a pediatric patient. The I.V. administration set delivers 60 gtts/ml. Determine the infusion rate.

k. The order is to give two units of whole blood (1 unit is 500 ml). The blood is to infuse over the next 4 hours and the drop factor of the tubing is 10 gtts/ml. Determine the infusion rate in gtts/min.

l. The patient is to receive 3 units of packed red blood cells (1 unit equals 250 ml) to be infused over the next 4 hours. The drop factor is 10 gtts/ml. Determine the infusion rate in gtts/min.

m. The order is to infuse 1000 ml D_5NS with 40 mEq KCl* over the next 8 hours. Using I.V. tubing with a drop factor of 20 gtts/ml, determine the infusion rate.

* KCl (potassium chloride) is always measured in milliequivalents (mEq).

n. The physician orders an I.V. of 1000 ml of $D_{5\ 1/4}NS$ to have 20 mEq of KCl added. The KCl is available in multiple dose vials with 2 mEq per ml. How many ml of KCl should be added to the I.V. solution?

o. An I.V. of D_5W with 20 mEq KCl is ordered to run at 20 ml/hr using a microdrop set calibrated at 60 gtts/ml. Determine the infusion rate.

p. The order is to infuse Intralipids 500 ml over 6 hours using a drop factor of 10 gtts/ml. Determine the infusion rate.

q. The order is for 0.45% NaC1 500 ml to infuse in 4 hours. The I.V. set drop factor is 20 gtts/min. Determine the infusion rate.

r. The order is to give Geopen 2 gm IVPB q 6h. The recommended dilution is 2 gm in 50 ml of I.V. solution to be administered over 15 minutes. Using a drop factor of 20 gtts/ml, determine the infusion rate.

s. The patient is to receive Aldomet 500 mg IVPB q 6h. The medication is dissolved in 100 ml of I.V. fluid. Each 500 mg is to be run in over 1 hour. Using a drop factor of 15 gtts/ml, determine the infusion rate.

t. The order is to give 100 mg of Aminophyllin in a total of 35 ml of fluid over the next 45 minutes. Using a drop factor of 60 gtts/ml, determine the rate in gtts/min.

u. The patient is to receive Heparin at a rate of 1500 units per hour. The I.V. has 30,000 units per 500 ml of D_5W. Using a drop factor of 60 gtts/ml, determine the infusion rate in gtts/min and ml/hr.

v. The patient is to receive Heparin 1400 units per hour. The pharmacy sends up a 250 ml bag of 0.9 normal saline with 25,000 units of heparin added. The I.V. set delivers 60 gtts/ml. Determine the infusion rate in gtts/min and ml/hr.

w. The order is for a continuous Regular Insulin drip of 15 units/hr. The pharmacy sends up a 250 ml bag of normal saline with 150 units of regular insulin. The I.V. administration set delivers 60 gtts/ml. Determine the infusion rate in gtts/min and ml/hr.

x. The order is for Aminophylline at 20 mg/hr. The pharmacy sends up a 500 ml bag of D_5W with 500 mg of Aminophylline added. Using a drop factor of 60 gtts/ml, determine the infusion rate in gtts/min and ml/hr.

2-30. ANSWERS TO PRACTICE 2-4 (COMPUTING INTRAVENOUS INFUSION RATES)

a. $\frac{1000 \text{ ml} \times 20 \text{ gtts/ml}}{720}$

$\frac{20{,}000}{720}$ = 28 gtts/min

b. $\frac{250 \text{ ml} \times 10 \text{ gtts/ml}}{45}$

$\frac{2500}{45}$ = 56 gtts/min

c. $\frac{1000 \text{ ml} \times 15 \text{ gtts/ml}}{480}$

$\frac{15{,}000}{480}$ = 31 gtts/min

d. $\frac{2000 \text{ ml} \times 60 \text{ gtts/ml}}{1440}$

$\frac{120{,}000}{1440}$ = 83 gtts/min

e. $\frac{1200 \text{ ml} \times 20 \text{ gtts/ml}}{600}$

$\frac{24{,}000}{600}$ = 40 gtts/min

f. $\frac{150 \text{ ml} \times 10 \text{ gtts/ml}}{30}$

$\frac{1500}{30}$ = 50 gtts/min

g. $\frac{150 \text{ ml} \times 20 \text{ gtts/ml}}{60}$

$\frac{3000}{60} = 50$ gtts/min

h. $\frac{100 \text{ ml} \times 20 \text{ gtts/ml}}{45}$

$\frac{2000}{45} = 44$ gtts/min

i. $\frac{500 \text{ ml} \times 15 \text{ gtts/ml}}{120}$

$\frac{7500}{120} = 63$ gtts/min

j. $\frac{15 \text{ ml} \times 60 \text{ gtts/ml}}{60}$

$\frac{900}{60} = 15$ gtts/min

k. $\frac{1000 \text{ ml} \times 10 \text{ gtts/ml}}{240}$

$\frac{10{,}000}{240} = 42$ gtts/min

l. $\frac{750 \text{ ml} \times 10 \text{ gtts/ml}}{240}$

$\frac{7500}{240} = 31$ gtts/min

m. $\frac{1000 \text{ ml} \times 20 \text{ gtts/ml}}{480}$

$\frac{20{,}000}{480} = 42$ gtts/min

n. $\frac{2 \text{ mEq}}{1 \text{ ml}} = \frac{20 \text{ mEq}}{X \text{ ml}}$

$2X = 20$

$X = 10$ ml

o. $\frac{20 \text{ ml} \times 60 \text{ gtts/ml}}{60}$

$\frac{1200}{60}$ = 20 gtts/min

p. $\frac{500 \text{ ml} \times 10 \text{ gtts/ml}}{360}$

$\frac{5000}{360}$ = 14 gtts/min

q. $\frac{500 \text{ ml} \times 20 \text{ gtts/min}}{240}$

$\frac{10,000}{240}$ = 42 gtts/min

r. $\frac{50 \text{ ml} \times 20 \text{ gtts/ml}}{15}$

$\frac{1000}{15}$ = 67 gtts/min

s. $\frac{100 \text{ ml} \times 15 \text{ gtts/ml}}{60}$

$\frac{1500}{60}$ = 25 gtts/min

t. $\frac{35 \text{ ml} \times 60 \text{ gtts/ml}}{45}$

$\frac{2100}{45}$ = 47 gtts/min

u. (1) $\frac{30,000 \text{ units}}{500 \text{ ml}} = \frac{1500 \text{ units}}{X \text{ ml}}$

30,000 X = 750,000

X = 25 ml/hr

(2) $\frac{25 \text{ ml} \times 60 \text{ gtts/ml}}{60}$

$\frac{1500}{60}$ = 25 gtts/min

v. (1) $\frac{25{,}000 \text{ units}}{250 \text{ ml}} = \frac{1400 \text{ units}}{X \text{ ml}}$

25,000 X = 350,000

X = 14 ml/hr

(2) $\frac{14 \text{ ml} \times 60 \text{ gtts/ml}}{60}$

$\frac{840}{60}$ = 14 gtts/min

w. (1) $\frac{150 \text{ units}}{250 \text{ ml}} = \frac{15 \text{ units}}{X \text{ ml}}$

150 X = 3750

X = 25 ml/hr

(2) $\frac{25 \text{ ml} \times 60 \text{ gtts/ml}}{60}$

$\frac{1500}{60}$ = 25 gtts/ml

x. (1) $\frac{500 \text{ mg}}{500 \text{ ml}} = \frac{20 \text{ mg}}{X \text{ ml}}$

500 X = 10,000

X = 20 ml/hr

(2) $\frac{20 \text{ ml} \times 60 \text{ gtts/ml}}{60}$

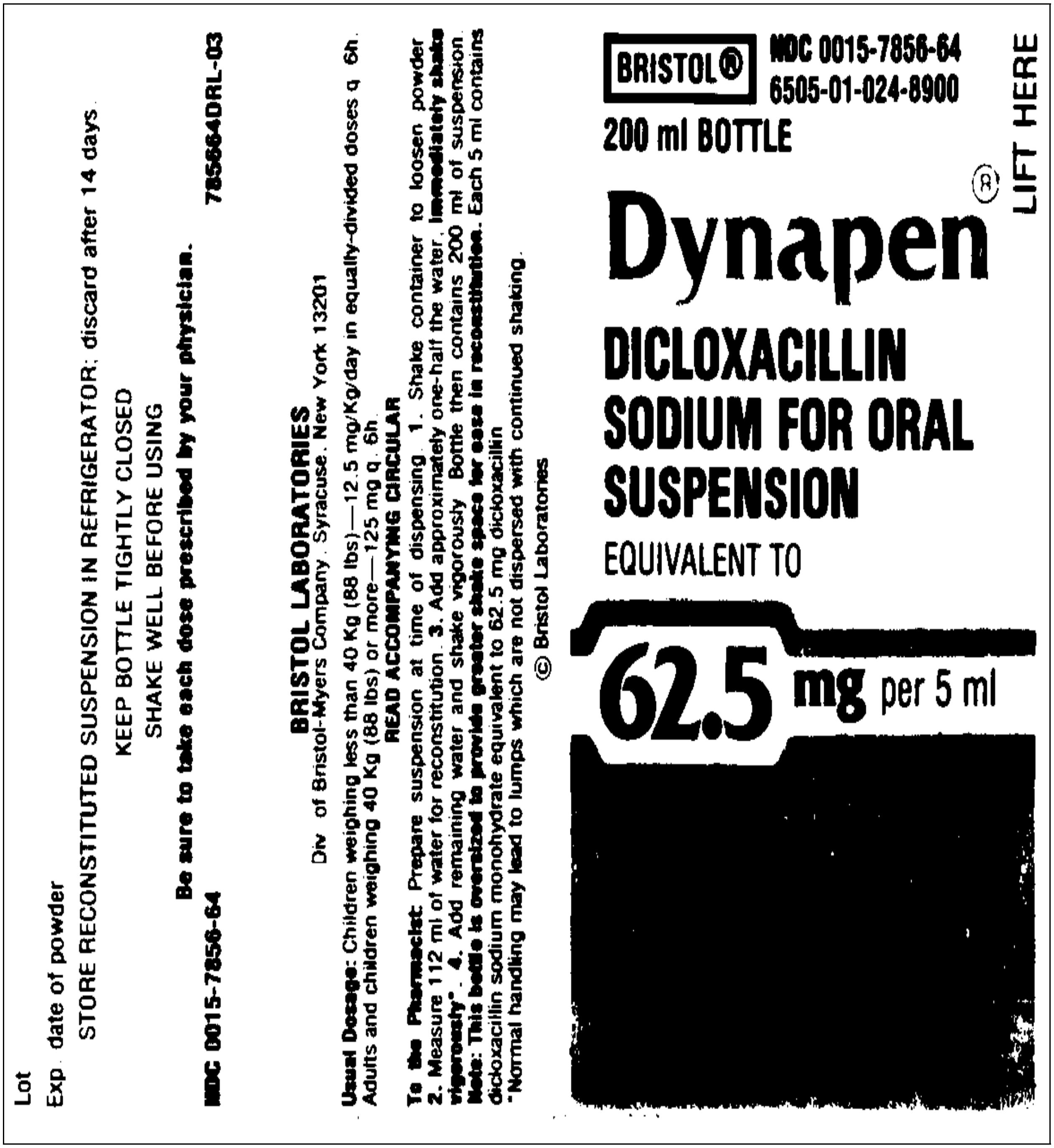
$\frac{1200}{60}$ = 20 gtts/min

Section V. BASIC DOSE CALCULATIONS

2-31. INTERPRETING INFORMATION FROM A MEDICATION LABEL

a. Generic name--the chemical name for a drug.

b. Trade name--a drug company's name for a particular drug.



c. Strength of the medication.

(1) Instructions for reconstitution.

(2) Concentration of the drug in a given volume of solution.

d. Special storage considerations--temperature.

e. Expiration date interpretation.

2-32. PRACTICE EXERCISE--LABEL INTERPRETATION (PART 1)

Directions: Read the labels provided to calculate the indicated doses (next page). All medications are in oral form, either tablet, pill, suspension, or capsules. Fill in the blanks; then check the solutions provided in paragraph 2-33.

a. Prepare a 20 mg dosage of Inderal _____ tab(s)

b. The order is for Ampicillin susp. 375 mg _____ ml

c. The order is for Benadryl 100 mg _____ cap(s)

d. Prepare 500 mg of penicillin V potassium _____ tab(s)

e. Prepare 500 mg of Amoxicillin susp _____ ml

f. Isosorbide dinitrate 40 mg _____ cap(s)

g. Prepare 150,000 u. of nystatin oral suspension . _____ ml

h. Acetaminophen 325 mg is ordered _____ tab(s)

i. The order is for allopurinol 300 mg _____ tab(s)

j. Prepare sulfasalazine 1000 mg _____ tab(s)

SP 470-2
Inderal®
(propranolol hydrochloride)
10 mg
Ayerst
EXP 7/92
LOT 7PBX1
PULL UP

SQUIBB
150 mL NDC 0003-1738-45
after constitution
250 mg per 5 mL
when constituted as directed
TRIMOX® '250'
for ORAL SUSPENSION
Amoxicillin for
Oral Suspension USP
Caution: Federal law prohibits
dispensing without prescription
6505-01-066-4195

Benadryl® 25 mg
(Diphenhydramine HCl
Capsules, USP)
Protect From Moisture
PARKE-DAVIS
Div of Warner-Lambert Co
Morris Plains, NJ 07950
Lot 06 -5F-B
Exp. Mar 91
PULL

Azulfidine®
(SULFASALAZINE USP)
TABLET
500 mg.
CONTROL NO. 8M025C
EXPIRES SEPT 1993
Pharmacia Inc
Piscataway, NJ 08854
PULL

PEEL
ZYLOPRIM®
(ALLOPURINOL)
100 mg
per tablet
BURROUGHS WELLCOME CO.
Research Triangle Park, NC
8Z2535
EXP 2/91

REGULAR STRENGTH
TYLENOL®
acetaminophen
TABLET
325 mg
McNEIL
FAM 557
EXP. 10/93

Pen•Vee®K
(penicillin V
potassium)
250 mg
Lot 1890141
Exp. 2/92
SP 41 1-88-GF
Wyeth® Phila.

NDC 47679-265-35
ISOSORBIDE DINITRATE
CONTROLLED RELEASE CAPSULE
40 mg
PKD/DIST BY **BAXTER HEALTHCARE CORP.**

BRISTOL® NDC 0015-7998-64
6505-00-283-3198
LIFT HERE
Polycillin®
AMPICILLIN FOR ORAL SUSPENSION
EQUIVALENT TO
250 mg per 5 ml
200ml

SQUIBB
60 mL NDC 0003-0588-60
100,000 units per mL
MYCOSTATIN®
ORAL SUSPENSION
Nystatin Oral
Suspension USP
Caution: Federal law prohibits
dispensing without prescription
EXP. DATE:SEPT. 1,'92
CONTROL 9J28067

2-33. ANSWERS TO PRACTICAL EXERCISE--LABEL INTERPRETATION (PART I)

a. $\frac{1 \text{ tab}}{10 \text{ mg}} = \frac{X \text{ tabs}}{20 \text{ mg}}$

10 X = 20

X = 2 tabs

b. $\frac{250 \text{ mg}}{5 \text{ ml}} = \frac{375 \text{ mg}}{X \text{ ml}}$

250 X = 1875

X = 7.5 ml

c. $\frac{1 \text{ cap}}{25 \text{ mg}} = \frac{X \text{ caps}}{100 \text{ mg}}$

25 X = 100

X = 4 caps

d. $\frac{1 \text{ tab}}{250 \text{ mg}} = \frac{X \text{ tabs}}{500 \text{ mg}}$

250 X = 500

X = 2 tabs

e. $\frac{250 \text{ mg}}{5 \text{ ml}} = \frac{500 \text{ mg}}{X \text{ ml}}$

250 X = 2500

X = 10 ml

f. 40 mg = 1 cap

g. $\frac{100{,}000 \text{ units}}{1 \text{ ml}} = \frac{150{,}000 \text{ units}}{X \text{ ml}}$

100,000 X = 150,000

X = 1.5 ml

h. 325 mg = 1 tab

i. $\frac{1 \text{ tab}}{100 \text{ mg}} = \frac{X \text{ tabs}}{300 \text{ mg}}$

100 X = 300

X = 3 tabs

j. $\frac{1 \text{ tab}}{500 \text{ mg}} = \frac{X \text{ tabs}}{1000 \text{ mg}}$

500 X = 1000

X = 2 tabs

2-34. PRACTICAL EXERCISE--LABEL INTERPRETATION (PART II)

DIRECTIONS. Read the labels provided to prepare the indicated dosages. Round oral dosages to the nearest tenth, and parenteral dosages to the nearest hundredth. Fill in the blanks on items a through j; then check the solutions provided.

a. Aminophylline 200 mg P.O. q 6h ______ ml

b. Ampicillin 400 mg P.O. q 6h ______ ml

c. Sulfamethoxazole 350 mg (trimethoprim 70 mg) P.O. ______ ml

d. Digoxin elixir 0.08 mg P.O. _____ ml

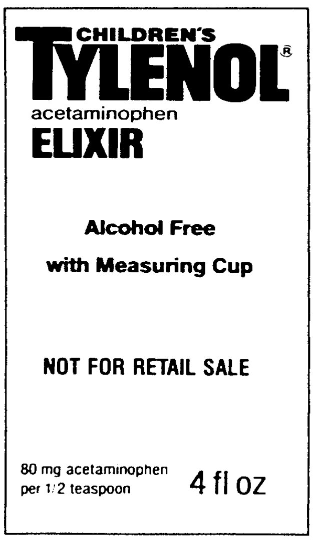
e. Ceftriaxone 250 mg I.M. q 12h _____ ml

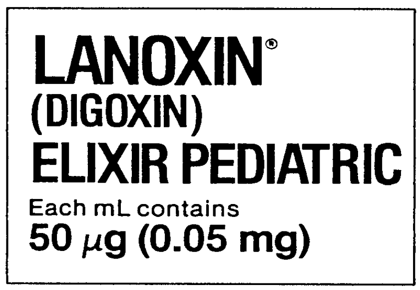
f. Dicloxicillin 150 mg P.O. q 8h _____ ml

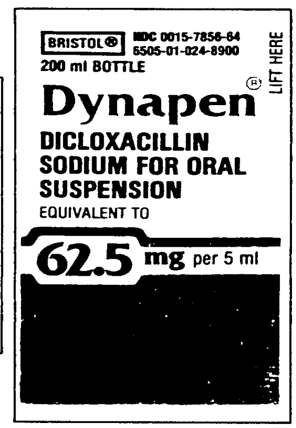
g. Acetaminophen elixir 240 mg P.O. q 4h _____ ml

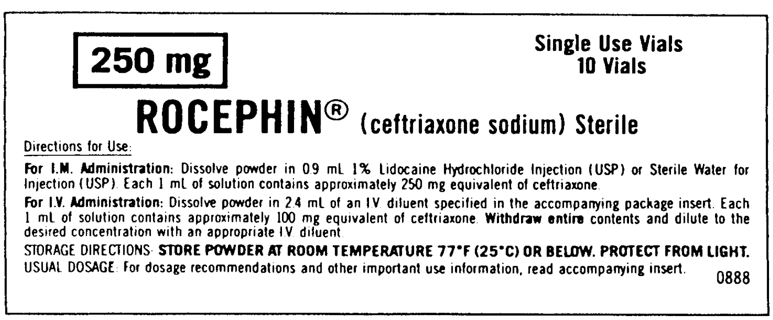
Vial Strength	Concentration (units/ml)	Amount of Diluent
h. Penicillin G Potassium 20,000,000 units	500,000	_____ ml

* Refer to the Penicillin G Potassium vial label and package insert to answer question h.







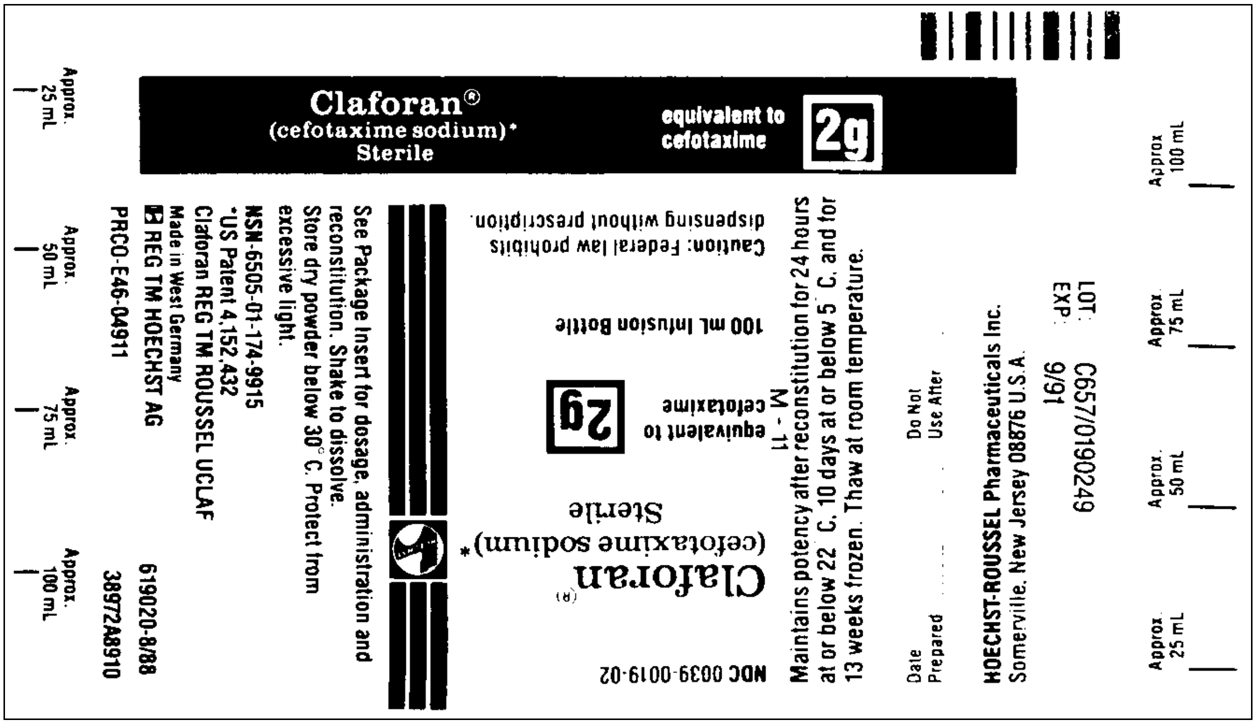


The following table shows the amount of solvent required for solution of various concentrations of 20,000,000 units:

Desired Concentration (units/ml)	For Intravenous Infusion Only 20,000,000 units Approximate Volume (ml) of Solvent
250,000	72.0
500,000	32.0
1,000,000	12.0

	Vial Strength	Amount of Diluent	Dosage Strength of Prepared Solution
i.	cefotaxime 2 g (prepare for I.M. injection)	(1) ______ ml	(2) ______ mg/ml

* Refer to the cefotaxime vial label and package insert to answer question i.



Preparation of Solution: Claforan for IM or IV administration should be reconstituted as follows:

Strength	Amount of Diluent To Be Added (ml)	Approximate Withdrawable Volume (ml)	Approximate Average Concentration (mg/ml)
Intramuscular			
1 g vial	3	3.4	300
2 g vial	5	6.0	330
Intravenous			
1 g vial	10	10.4	95
2 g vial	10	11.0	180

Shake to dissolve; inspect for particulate matter and discoloration prior to use. Solutions of Claforan range from very pale yellow to light amber, depending on concentration, diluent used, and length and condition of storage. For intramuscular use: Reconstitute VIALS with Sterile Water for Injection or Bacteriostatic Water for Injection as described above.

2-35. ANSWERS TO PRACTICAL EXERCISE--LABEL INTERPRETATION (PART II)

a. $\frac{105 \text{ mg}}{5 \text{ ml}} = \frac{200 \text{ mg}}{X \text{ ml}}$

105 X = 1000

X = 9.5 ml

b. $\frac{250 \text{ mg}}{5 \text{ ml}} = \frac{400 \text{ mg}}{X \text{ ml}}$

250 X = 2000

X = 8 ml

c. $\frac{200 \text{ mg}}{5 \text{ ml}} = \frac{350 \text{ mg}}{X \text{ ml}}$ or $\frac{40 \text{ mg}}{5 \text{ ml}} = \frac{70 \text{ mg}}{X \text{ ml}}$

200 X = 1750 or 40 X = 350

X = 8.8 ml X = 8.8 ml

d. $\frac{0.05 \text{ mg}}{1 \text{ ml}} = \frac{0.08 \text{ mg}}{X \text{ ml}}$

0.05 X = 0.08

X = 1.6 ml

e. 250 mg/1 ml

f. $\frac{62.5 \text{ mg}}{5 \text{ ml}} = \frac{150 \text{ mg}}{X \text{ ml}}$

62.5 X = 750

X = 12 ml

g. $\frac{80 \text{ mg}}{1/2 \text{ tsp}} = \frac{240 \text{ mg}}{X \text{ ml}}$

$\frac{1 \text{ tsp}}{5 \text{ ml}} = \frac{1/2 \text{ tsp}}{X \text{ ml}}$

X = 2.5 ml

$\frac{80 \text{ mg}}{2.5 \text{ ml}} = \frac{240 \text{ mg}}{X \text{ ml}}$

80 X = 600

X = 7.5 ml

h. 32.0 ml

i. (1) 5 ml (2) 330 mg/ml

2-36. SUMMARY OF ROUNDING RULES FOR MEDICATION CALCULATIONS

a. Express IV DRIP RATES in WHOLE NUMBERS.

b. Express TABLETS in WHOLE OR HALVES.

c. INJECTABLES should be rounded to TENTHS, except for HEPARIN AND INSULIN, which are rounded to HUNDREDTHS.

d. P.O. LIQUIDS should be rounded to TENTHS.

e. Round KILOGRAMS to TENTHS.

Continue with Exercises

Return to Table of Contents

EXERCISES, LESSON 2

INSTRUCTIONS: Answer the following items by writing the answer in the space provided.

After you have completed all of these items, turn to "Solutions to Exercises" at the end of the lesson and check your answers with the solutions.

1. You wish to administer a dose of 15 mg of a particular drug to a patient. The drug is supplied in a multidose vial labeled 5 mg/ml. Calculate the volume (ml) of the drug to be administered.

2. A patient has been given five capsules. Each capsule contained 250 mg of a particular drug. Calculate the total number of mg of drug the patient received.

3. The mother of a pediatric patient tells you that she has given her child a total of 7 tsp of cough syrup over the past 24 hours. The amount of 7 tsp equals ____ ml.

4. The physician has ordered Chlorpromazine 20 mg I.M. for your patient. Chlorpromazine is labeled 25 mg/ml. Determine how many mls you will give.

5. The order is for Morphine gr 1/6 I.M. On hand is a Morphine tubex labeled 15 mg/ml. You will give ___ ml.

6. Convert the following weights to their equivalents:

   a. 1650 gm = ____ kg

   b. 19 lbs = _____ kg

   c. 14.5 lbs = ____ kg

   d. 70 lbs = _____ kg

   e. 200 mg = ____ gm

   f. 5 mg = ____ gr

   g. 10 mg = _____ gr

   h. 2 gm = _____ mg

   i. 40 gm = _____ mg

   j. 2.2 lbs = ____ kg

7. Your patient is to receive Lasix 40 mg P.O. q AM. Lasix is stocked in 20 mg tablets. How many tablets will you administer?

8. Your patient is to receive Digoxin 0.25 mg P.O. q AM. Digoxin is stocked in 0.125 mg tablets. How many tablets will you administer?

9. The physician has ordered Heparin 10,000 units SQ for your patient. Heparin is stocked in a multidose vial labeled 20,000 units/ml. How many ml's will you give?

10. The order is to give Atropine 0.6 mg. I.M. on call to surgery. On hand is a vial labeled Atropine 0.4 mg/ml. How many ml's will you give?

11. The order is to give Morphine 4 mg I.M. stat. Available is a vial labeled morphine 10 mg/ml. How many ml's will you give?

12. The order is to give Demerol 35 mg I.M. q 4h p.r.n. pain. The medication is supplied in a tubex labeled 50 mg/ml. How many ml's will you give?

13. The order is to give Valium 8 mg I.M. on call to surgery. The Valium stocked is labeled 10 mg/2 ml. How many ml's will you give?

14. The order is to give Prostaphlin 350 mg I.M. q 4h. Directions for reconstitution of the 1 gm vial state: Add 5.7 ml of sterile water. Each 1.5 ml will then contain 250 mg of medication. How many ml's will you give?

15. The order is to give Polycillin-N 700 mg I.M. q 4h. The directions for reconstitution of each 1-gm vial of Polycillin state: Add 3.4 ml of sodium chloride to produce a concentration of 250 mg/ml. How many ml's will you give?

16. The patient is to receive Vistaril 75 mg I.M. q 4h p.r.n. nausea. On hand is a vial containing 100 mg/2 ml. How many ml's will you give?

17. The order is to give Omnipen 350 mg I.M. q 6h. The directions on the vial state: Add 1.9 ml to produce a concentration of 125 mg/0.5 ml. How many ml will you give?

18. The patient is to receive 3 units of whole blood over the next 6 hours. Each unit contains 500 ml. Using a drop factor of 10 gtts/ml, determine the infusion rate.

19. The order is for 1000 ml D_5W with 20 mEq KCl to alternate with 1000 ml $D_{51/2}NS$ with 20 mEq KCl over the next 24 hours at a rate of 150 ml/hr. Using a drop factor of 15 gtts/ml, determine the infusion rate.

20. The order is to give Cimetidine 300 mg IVPB q 6h. The medication is dissolved in 100 ml of D_5W and is to infuse in 30 minutes. Using a drop factor of 20 gtts/ml, determine the infusion rate.

21. The order is to give Tobramycin 80 mg IVPB q 12h. The medication is added to 100 ml of D_5W and is to infuse in 60 minutes. Using a drop factor of 15 gtts/ml, determine the infusion rate.

22. The order is to infuse 1500 ml of Ringer's lactate over the next 24 hours. The drop factor of the tubing is 60 gtts/ml. Determine the rate in gtts/min.

23. The patient is to receive 1000 ml of $D_{51/4}NS$ at 125 ml/hr. Using a drop factor of 20 gtts/ml, determine the infusion rate.

24. Your patient is to receive heparin 1500 units/hr by a continuous I.V. infusion. The pharmacy sends up a 500 ml bag of 0.9% sodium chloride with 25,000 units of heparin added. The I.V. set delivers 60 gtts/ml. The solution should be administered at a rate of ___gtts/min and ____ml/hr.

25. Case Study.

Mr. K. was admitted with shortness of breath; rule out left lower lobe pneumonia. His current diagnosis is chronic obstructive pulmonary disease (COPD). Among his medical orders are the following: oxygen at 2 liters/min via nasal prongs; pulmonary toilet q 2h, out of bed as tolerated; Brethine 5 mg P.O. t.i.d.; Erythromycin 400 mg q 6h P.O.; Potassium Chloride solution 30 mEq P.O. b.i.d., dilute each tablespoon in 4 oz water or fruit juice.

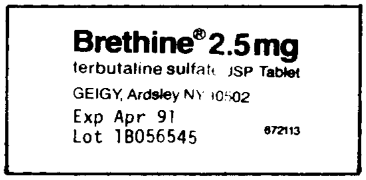
Refer to the labels of the ordered medications to answer the questions that follow.

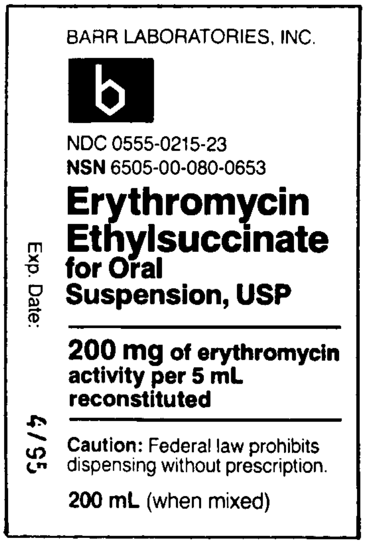
a. How many mg's does each Brethine tablet contain?

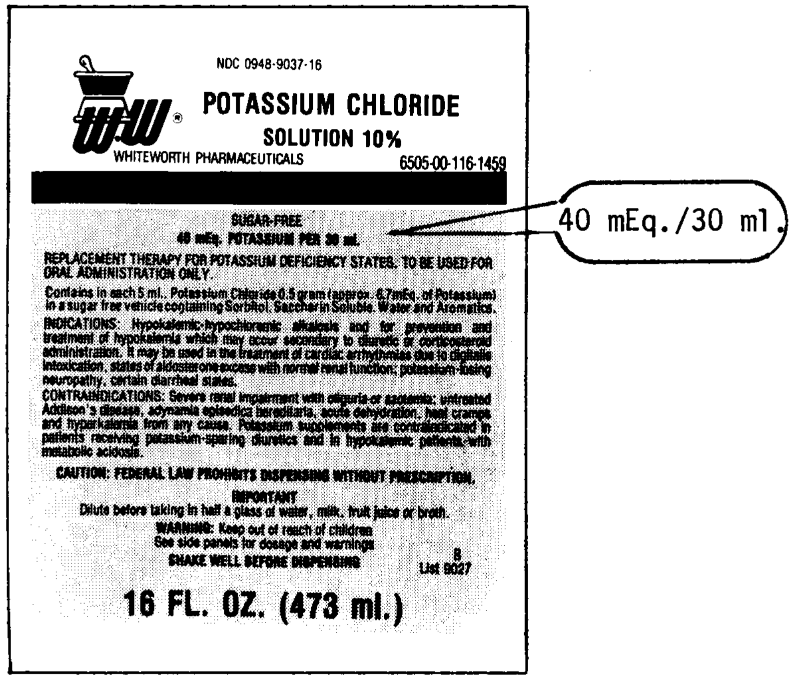
b. How many Brethine tablets will you administer per dose? ____ per day?

c. How many mg are in 1 ml of Erythromycin?

d. How many ml's of Erythromycin will you administer per dose?
____ per day ?







e. How many days will one bottle of Erythromycin last?

f. How many ml's of Potassium Chloride should you give?

g. How many ounces of fruit juice should be used to dilute one dose of Potassium Chloride?

26. Case Study

G.W. is a 9-month-old child admitted with a chronic urinary tract infection. G.W. weighs 22 lbs. Currently, G.W. has a temperature of 104□R. Among her medical orders are foley catheterization to straight drainage; force fluids; urine for culture and sensitivity; Tylenol elixir q.i.d. p.r.n. for temp 101□ or greater; vital signs q 4h; I.V. of D_5RL at 30°ml/hr; Sulfatrim suspension 10 mg q 6h; intake and output (weigh all diapers).

Refer to the dosage guidelines and medication labels to answer the questions which follow.

Dosage guidelines for Children's Tylenol Elixir:

4-11 months	one-half teaspoon
12-23 months	three-quarters teaspoon
2-3 years	one teaspoon
4-5 years	one and one-half teaspoons
6-8 years	two teaspoons
9-10 years	two and one-half teaspoons
11-12 years	three teaspoons

Dosage guidelines for Sulfatrim

The recommended dosage of Sulfatrim for children with urinary tract infections is 8 mg/kg trimethoprim and 40 mg/kg sulfamethoxazole per 24 hours, given in two divided doses every 12 hours for 10 days. Use the following table as a guide for children two months of age or older.

Weight		Dose--every 12 hours
lb	kg	Teaspoonfuls
22	10	1 (5 ml)
44	20	2 (10 ml)
66	30	3 (15 ml)
88	40	4 (20 ml)

a. Does the baby need a dose of Tylenol now? If so, how many cc's should you give?

b. How many mg of acetaminophen are in each dose of Tylenol?

c. Should you administer another dose of Tylenol later in the day?

d. It is 1400 hours and you have just checked vital signs. What time should you check again?

e. How many ml's of Sulfatrim should you administer?

f. How many mg of each of the two active ingredients are contained in each dose of Sulfatrim?

27. How many tablets of Tylenol would you administer if the physician ordered 600 mg for pain? On hand are 10 gr tablets.

28. The order is to give 1 oz of Maalox. How many tbsp's would you give?

29. The order is for 2.0 gm of Neomycin. On hand are 500 mg tablets. How many tablets will you give?

30. How many ounces of Maalox will you give if the order is for 45 ml?

31. The physician orders gr 1/32 of Dilaudid P.O. q 3-4h p.r.n. for pain. On hand are tablets gr 1/64 each. How many tablets will you give?

32. The order is for Erythromycin base 0.5 gm q 6h. On hand are 125 mg tablets. How many tablets will you give?

33. The order is to give 250 mcg of Lanoxin P.O. q AM using 0.125 mg tablets. How many tablets will you give?

34. The physician orders Fiorinal 30 mg P.O. On hand are gr 1/8 capsules. How many capsules will you give?

35. The order is to give Achromycin (tetracycline) syrup 0.25 gm P.O. q.i.d. The medication is available in syrup form, 125 mg per 5 ml. How many tsp's will you give?

36. The physician ordered Synthroid 25 mcg q AM. Available are 0.05 mg tablets. How many tablets will you give?

37. Case Study

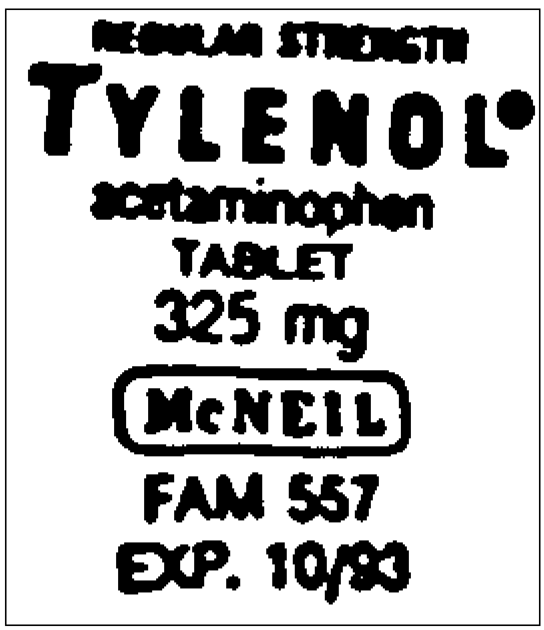
H.B., a 64-year-old male, was re-admitted with a post-operative wound infection. He was discharged three days earlier after having his appendix removed. He is seven days post-op. He has consistently had a temperature of 103º; wound is red with foul-smelling purilent drainage. Among his current medical orders are: Wet to dry dressing changes q 4h; vitals q 4h; antibiotic Prostaphlin IVPB 250 mg to be given q 6h; Tylenol 2 tabs q 4h prn for temp greater than 101º; up ad lib.

Refer to the reconstitution guidelines and label to answer the questions that follow.

Reconstitution guidelines for Prostaphlin IV

Vial Size	Diluent	Resulting Concentration
250 mg	1.4 cc	250 mg/1.5 cc
500 mg	2.7 cc	250 mg/1.5 cc
1 gm	5.7 cc	250 mg/1.5 cc

Reconstitute with sterile water or sodium chloride injection.



a. What diluent(s) can be used to reconstitute the Prostaphlin?

b. How many ml of diluent should be added to the vial of Prostaphlin for reconstitution?

c. After reconstituting the vial of Prostaphlin, the 250 mg is further diluted in 100 ml of D_5W. Using minidrop (60 gtts/ml) tubing, how many gtts/min are needed to administer the Prostaphlin if the IV is to run for 1 1/2 hours?

d. How many mg of acetaminophen will each dose of Tylenol contain?

e. What is the maximum number of mg of Tylenol you can administer per day?

38. The physician ordered Cleocin 120 mg IVPB q 8h. The antibiotic is supplied in vials with 300 mg/2 ml. The guidelines for administration of Cleocin are to dilute the medication in 50 ml of D_5W and infuse over 30 minutes.

    a. How many ml's of Cleocin will you add to 50 ml of D_5W for the ordered dose?

    b. Using a drop factor of 60 gtts/ml, determine the infusion rate.

39. The order is to give 0.3 mg of Atropine I.M. on call to surgery. The medication is provided in a vial labeled gr 1/150 per ml. How many ml's should you give?

40. The order is to administer Regular Insulin at a rate of 7 u/hr via a continuous I.V. infusion. The pharmacy sends a 500-ml bag of 0.9% sodium chloride with 250 units of Regular insulin added. Using a drop factor of 60 gtts/ml, calculate the infusion rate in gtts/min and ml/hr.

41. The order is to give Mandol (Cefamandole) 1 gm q 6h IVPB. Recommended dilution is 100 ml of D_5W or NS. Recommended rate of infusion is over 30 minutes. Using a drop factor of 20 gtts/ml, determine the infusion rate in gtts/min.

42. The order is to give Keflin 480 mg IVPB q 6h to a 19 kg child. The medication is supplied in a 500 mg vial. Reconstitution directions are: Add 5 ml of diluent to give a concentration of 500 mg/2.7 ml. You are to administer the Keflin in 25 ml of I.V. fluid over 30 minutes.

    a. How many ml of medication will you add to the I.V. fluid?

    b. Using a drop factor of 60 gtts/ml, determine the infusion rate.

43. The order is to administer 47 units of NPH insulin SQ q AM. You have a 10ºml vial of U100 NPH insulin. Using a tuberculin syringe, determine how many ml's to give.

44. The physician has ordered 700 units per hour of Heparin. The pharmacy sends 500 ml of D_5NS with 20,000 u of Heparin. Using a drop rate factor of 60 gtts/ml, determine the infusion rate.

45. The physician has ordered 11,000 units of Heparin SQ q 12h. On hand is a vial labeled 40,000 units/ml. How many ml's will you give?

46. The order is for Decadron 5 mg I.M. Decadron is stocked in multiple dose vials labeled 4 mg/ml. How many ml's will you give?

47. The order is to give Atarax 30 mg I.M. Atarax is stocked in vials labeled 50 mg/ml. How much will you give?

48. The order is for Elixophyllin 100 mg P.O. q 6h. Elixophyllin is stocked 80 mg/15 ml. How many ml's will you administer?

49. The order is for Amoxicillin 375 mg P.O. q 8h. Amoxicillin is stocked as an oral suspension with 250 mg per 5 ml. How many ml's will you give?

50. The order is to infuse 1000 ml of $D_5$1/2NS at 125 ml/hr for the next 24 hours. Using a drop factor of 15 gtts/ml, determine the infusion rate.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 2

1. $\frac{5\text{ mg}}{1\text{ ml}} = \frac{15\text{ mg}}{X\text{ ml}}$

   5 X = 15

   X = 3 ml (paras 2-5, 2-6, 2-17)

2. $\frac{1\text{ cap}}{250\text{ mg}} = \frac{5\text{ caps}}{X\text{ mg}}$

   X = 1250 mg (para s 2-5, 2-6, 2-16)

3. $\frac{1\text{ tsp}}{5\text{ ml}} = \frac{7\text{ tsp}}{X\text{ ml}}$

   X = 35 ml (para 2-5,2-6, 2-10)

4. $\frac{25\text{ mg}}{1\text{ ml}} = \frac{20\text{ mg}}{X\text{ ml}}$

   25 X = 20

   X = 0.8 ml (para 2-5, 2-6, 2-18)

5. $\frac{15\text{ mg}}{1\text{ ml}} = \frac{\text{gr }1/6}{X\text{ ml}}$

   $\frac{\text{gr }1}{60\text{ mg}} = \frac{\text{gr }1/6}{X\text{ mg}}$

   X = 10 mg

   $\frac{15\text{ mg}}{1\text{ ml}} = \frac{10\text{ mg}}{X\text{ ml}}$

   15 X = 10

   X = 0.7 ml (paras 2-5, 2-6, 2-7, 2-10, 2-18)

6. a. $\frac{1000 \text{ gm}}{1 \text{ kg}} = \frac{1650 \text{ gm}}{X \text{ kg}}$

1000 X = 1650

X = 1.65 kg or 1.7 kg

b. $\frac{2.2 \text{ lbs}}{1 \text{ kg}} = \frac{19 \text{ lbs}}{X \text{ kg}}$

2.2 X = 19

X = 8.6 kg

c. $\frac{2.2 \text{ lbs}}{1 \text{ kg}} = \frac{14.5 \text{ lbs}}{X \text{ kg}}$

2.2 X = 14.5

X = 6.6 kg

d. $\frac{2.2 \text{ lbs}}{1 \text{ kg}} = \frac{70 \text{ lbs}}{X \text{ kg}}$

2.2 X = 70

X = 31.8 kg

e. $\frac{1000 \text{ mg}}{1 \text{ gm}} = \frac{200 \text{ mg}}{X \text{ gm}}$

1000 X = 200

X = 0.2 gm

f. $\frac{1 \text{ gr}}{60 \text{ mg}} = \frac{X \text{ gr}}{5 \text{ mg}}$

60 X = 5

X = 1/12 gr

g. $\frac{1 \text{ gr}}{60 \text{ mg}} = \frac{X \text{ gr}}{10 \text{ mg}}$

$60X = 10$

$X = 1/6$ gr

h. $\frac{1 \text{ gm}}{1000 \text{ mg}} = \frac{2 \text{ gm}}{X \text{ mg}}$

$X = 2000$ mg

i. $\frac{1 \text{ gm}}{1000 \text{ mg}} = \frac{40 \text{ gm}}{X \text{ mg}}$

$X = 40{,}000$ mg

j. 2.2 lbs = 1 kg (para 2-10)

7. $\frac{1 \text{ tablet}}{20 \text{ mg}} = \frac{X \text{ tablets}}{40 \text{ mg}}$

$20X = 40$

$X = 2$ tablets (paras 2-5, 2-6, 2-16)

8. $\frac{1 \text{ tablet}}{0.125 \text{ mg}} = \frac{X \text{ tablets}}{0.25 \text{ mg}}$

$0.125X = 0.25$

$X = 2$ tablets (paras 2-5, 2-6, 2-16)

9. $\frac{20{,}000 \text{ units}}{1 \text{ ml}} = \frac{10{,}000 \text{ units}}{X \text{ ml}}$

$20{,}000X = 10{,}000$

$X = 0.5$ ml (paras 2-5, 2-6, 2-18)

10. $\frac{0.4 \text{ mg}}{1 \text{ ml}} = \frac{0.6 \text{ mg}}{X \text{ ml}}$

$0.4X = 0.6$

$X = 1.5$ ml (paras 2-5, 2-6, 2-18)

11. $$\frac{10 \text{ mg}}{1 \text{ ml}} = \frac{4 \text{ mg}}{X \text{ ml}}$$

$10 X = 4$

$X = 0.4$ ml (paras 2-5, 2-6, 2-18)

12. $$\frac{50 \text{ mg}}{1 \text{ ml}} = \frac{35 \text{ mg}}{X \text{ ml}}$$

$50 X = 35$

$X = 0.7$ ml (paras 2-5, 2-6, 2-18)

13. $$\frac{10 \text{ mg}}{2 \text{ ml}} = \frac{8 \text{ mg}}{X \text{ ml}}$$

$10 X = 16$

$X = 1.6$ ml (paras 2-5, 2-6, 2-18)

14. $$\frac{1.5 \text{ ml}}{250 \text{ mg}} = \frac{X \text{ ml}}{350 \text{ mg}}$$

$250 X = 525$

$X = 2.1$ ml

(paras 2-5, 2-6, 2-18)

15. $$\frac{250 \text{ mg}}{1 \text{ mg}} = \frac{700 \text{ mg}}{X \text{ ml}}$$

$250 X = 700$

$X = 2.8$ ml (paras 2-5, 2-6, 2-18)

16. $$\frac{100 \text{ mg}}{2 \text{ ml}} = \frac{75 \text{ mg}}{X \text{ ml}}$$

$100 X = 150$

$X = 1.5$ ml (paras 2-5, 2-6, 2-18)

17. $\frac{125 \text{ mg}}{0.5 \text{ ml}} = \frac{350 \text{ mg}}{X \text{ ml}}$

125 X = 175

X = 1.4 ml (paras 2-5, 2-6, 2-18)

18. $\frac{1 \text{ unit}}{500 \text{ ml}} = \frac{3 \text{ units}}{X \text{ ml}}$

X = 1500 ml

$\frac{1500 \text{ ml x } 10 \text{ gtts/ml}}{360}$

$\frac{15{,}000}{360}$ = 41.7 = 42 gtts/min (paras 2-5, 2-6, 2-7, 2-28)

19. $\frac{150 \text{ ml x } 15 \text{ gtts/ml}}{60}$

$\frac{2250}{60}$ = 37.5 = 38 gtts/min (paras 2-7, 2-26)

20. $\frac{100 \text{ ml x } 20 \text{ gtts/ml}}{30}$

$\frac{2000}{30}$ = 66.7 = 67 gtts/min (paras 2-7, 2-27)

21. $\frac{100 \text{ ml x } 15 \text{ gtts/min}}{60}$

$\frac{1500}{60}$ = 25 gtts/min (para 2-27)

22. $\frac{1500 \text{ ml x } 60 \text{ gtts/ml}}{1440 \text{ min}}$

$\frac{90{,}000}{1440}$ = 62.5 = 63 gtts/min (paras 2-7, 2-26)

23. $\frac{125 \text{ ml} \times 20 \text{ gtts/ml}}{60}$

$\frac{2500}{60}$ = 41.7 = 42 gtts/min (paras 2-7, 2-16)

24. $\frac{25{,}000 \text{ units}}{500 \text{ ml}} = \frac{1500 \text{ units}}{X \text{ ml}}$

25,000 X = 750,000

X = 30 ml/hr

$\frac{30 \text{ ml} \times 60 \text{ gtts/ml}}{60 \text{ min}}$

$\frac{1800}{60}$ = 30 gtts/min (paras 2-5, 2-6, 2-18)

25. a. 2.5 mg

b. $\frac{2.5 \text{ mg}}{1 \text{ tablet}} = \frac{5 \text{ mg}}{\underline{X} \text{ tablets}}$

2.5X = 5

X = 2 tablets per dose

$\frac{2 \text{ tablets}}{1 \text{ dose}} = \frac{X \text{ tablets}}{3 \text{ doses}}$

X = 6 tablets per day

c. $\frac{200 \text{ mg}}{5 \text{ ml}} = \frac{X \text{ mg}}{1 \text{ ml}}$

5X = 200

X = 40 mg

d. $\frac{200 \text{ mg}}{5 \text{ ml}} = \frac{400 \text{ mg}}{X \text{ ml}}$ or $\frac{40 \text{ mg}}{1 \text{ ml}} = \frac{400 \text{ mg}}{X \text{ ml}}$

200 X = 2000   40 X = 400

X = 10 ml/dose   X = 10 ml/dose

$\frac{10 \text{ ml}}{1 \text{ dose}} = \frac{X \text{ ml}}{4 \text{ doses}}$

X = 40 ml/day

e. $\frac{40 \text{ ml}}{1 \text{ day}} = \frac{200 \text{ ml}}{X \text{ days}}$

40X = 200

X = 5 days

f. $\frac{40 \text{ mEq}}{30 \text{ ml}} = \frac{30 \text{ mEq}}{X \text{ ml}}$

40 X = 900

X = 22.5 ml

g. $\frac{15 \text{ ml (1 T)}}{4 \text{ oz}} = \frac{22.5 \text{ ml}}{X \text{ oz}}$

15 X = 90

X = 6 oz   (paras 2-5, 2-6, 2-10, 2-11, 2-14, 2-16, 2-17, 2-31--2-35)

26. a. yes

$\frac{1 \text{ tsp}}{5 \text{ cc}} = \frac{1/2 \text{ tsp}}{X \text{ cc}}$

X = 2.5 cc

b. $\frac{0.8 \text{ ml}}{80 \text{ mg}} = \frac{2.5 \text{ ml}}{X \text{ mg}}$

0.8 X = 200

X = 250 mg

c. If needed; if temp is 101 or greater.

d. 1400 + 4 = 1800 hrs

e. 5 ml

f. $\frac{2.2 \text{ lbs}}{1 \text{ kg}} = \frac{22 \text{ lbs}}{X \text{ kg}}$

2.2X = 22

X = 10 kg

$\frac{8 \text{ mg}}{1 \text{ kg}} = \frac{X \text{ mg}}{10 \text{ kg}}$

X = 80 mg trimethoprim/day

$\frac{80 \text{ mg}}{2 \text{ doses}} = \frac{X \text{ mg}}{1 \text{ dose}}$

2X = 80

X = 40 mg trimethoprim/dose

$\frac{40 \text{ mg}}{1 \text{ kg}} = \frac{X \text{ mg}}{10 \text{ kg}}$

X = 400 mg sulfamethoxazole/day

$\frac{400 \text{ mg}}{2 \text{ doses}} = \frac{X \text{ mg}}{1 \text{ dose}}$

2X = 400

X = 200 mg sulfamethoxazole/dose (paras 2-5, 2-6, 2-10, 2-14, 2-17, 2-31--2-35)

27. $\frac{\text{1 tab}}{\text{10 gr}} = \frac{\text{X tabs}}{\text{600 mg}}$

$\frac{\text{60 mg}}{\text{1 gr}} = \frac{\text{600 mg}}{\text{X gr}}$

60 X = 600

X = 10 gr

10 gr = 1 tab (paras 2-5, 2-6, 2-10, 2-16)

28. 1 oz = 2 tbsp (para 2-10)

29. $\frac{\text{1 tab}}{\text{500 mg}} = \frac{\text{X tabs}}{\text{2.0 gm}}$

$\frac{\text{1 gm}}{\text{1000 mg}} = \frac{\text{2.0 gm}}{\text{X mg}}$

X = 2000 mg

$\frac{\text{1 tab}}{\text{500 mg}} = \frac{\text{X tabs}}{\text{2000 mg}}$

500 X = 2000

X = 4 tabs (paras 2-5, 2-6, 2-10, 2-16)

30. $\frac{\text{1 oz}}{\text{30 ml}} = \frac{\text{X oz}}{\text{45 ml}}$

30 X = 45

X = 1 1/2 oz (paras 2-5, 2-6, 2-10, 2-17)

31. $\frac{\text{1 tab}}{\text{gr 1/64}} = \frac{\text{X tabs}}{\text{gr 1/32}}$

1/64 X = 1/32

X = 2 tabs (paras 2-5, 2-6, 2-16)

32. $\frac{1 \text{ tab}}{125 \text{ mg}} = \frac{X \text{ tabs}}{0.5 \text{ gm}}$

$\frac{1 \text{ gm}}{1000 \text{ mg}} = \frac{0.5 \text{ gm}}{X \text{ mg}}$

X = 500 mg

$\frac{1 \text{ tab}}{125 \text{ mg}} = \frac{X \text{ tabs}}{500 \text{ mg}}$

125 X = 500

X = 4 tabs (paras 2-5, 2-6, 2-10, 2-16)

33. $\frac{1 \text{ tab}}{0.125 \text{ mg}} = \frac{X \text{ tabs}}{250 \text{ mcg}}$

$\frac{1 \text{ mg}}{1000 \text{ mcg}} = \frac{X \text{ mg}}{250 \text{ mcg}}$

1000 X = 250

X = 0.25 mg

$\frac{1 \text{ tab}}{0.125 \text{ mg}} = \frac{X \text{ tabs}}{0.25 \text{ mg}}$

0.125 X = 0.25

X = 2 tabs (paras 2-5, 2-6, 2-10, 2-16)

34. $\frac{1 \text{ cap}}{\text{gr } 1/8} = \frac{X \text{ caps}}{30 \text{ mg}}$

$\frac{60 \text{ mg}}{1 \text{ gr}} = \frac{X \text{ mg}}{1/8 \text{ gr}}$

X = 7.5 mg

$\frac{1 \text{ cap}}{7.5 \text{ mg}} = \frac{X \text{ caps}}{30 \text{ mg}}$

7.5 X = 30

X = 4 caps (para 2-16)

35. a. $\frac{125\ mg}{5\ ml} = \frac{0.25\ gm}{X\ tsp}$

b. $\frac{1\ gm}{1000\ mg} = \frac{0.25\ gm}{X\ mg}$

X = 250 mg

c. $\frac{125\ mg}{1\ tsp\ (5\ ml)} = \frac{250\ mg}{X\ tsp}$

125 X = 250

X = 2 tsp (paras 2-5, 2-6, 2-10, 2-11, 2-17)

36. $\frac{1\ tab}{0.05\ mg} = \frac{X\ tabs}{25\ mcg}$

$\frac{1\ mg}{1000\ mcg} = \frac{X\ mg}{25\ mcg}$

1000 X = 25

X = .025 mg

$\frac{1\ tab}{0.05\ mg} = \frac{X\ tabs}{.025\ mg}$

0.05 X = .025

X = 0.5 or 1/2 tab (paras 2-5, 2-6, 2-10, 2-16)

37. a. Sterile water or sodium chloride.

b. 1.4 ml.

c. $\frac{100\ ml\ X\ 60\ gtts/ml}{90}$

$\frac{6000}{90}$ = 66.7 = 67 gtts/min

d. $\frac{325\ mg}{1\ tab} = \frac{X\ mg}{2\ tabs\ (1\ dose)}$

X = 650 mg/dose

e. $\frac{650 \text{ mg}}{1 \text{ dose}} = \frac{X \text{ mg}}{6 \text{ doses}}$

X = 3900 mg (paras 2-5, 2-6, 2-11, 2-28, 2-31--2-35)

38. a. $\frac{300 \text{ mg}}{2 \text{ ml}} = \frac{120 \text{ mg}}{X \text{ ml}}$

300 X = 240

X = 0.8 ml

b. $\frac{50 \text{ ml} \times 60 \text{ gtts/ml}}{30}$

$\frac{3000}{30}$ = 100 gtts/min (paras 2-5, 2-6, 2-27)

39. $\frac{\text{gr } 1/150}{1 \text{ ml}} = \frac{0.3 \text{ mg}}{X \text{ ml}}$

$\frac{1 \text{ gr}}{60 \text{ mg}} = \frac{1/150 \text{ gr}}{X \text{ mg}}$

X = 0.4 mg

$\frac{0.4 \text{ mg}}{1 \text{ ml}} = \frac{0.3 \text{ mg}}{X \text{ ml}}$

0.4 X = 0.3

X = 0.75 = 0.8 ml (paras 2-5, 2-6, 2-7, 2-10, 2-18)

40. $\frac{250 \text{ units}}{500 \text{ ml}} = \frac{7 \text{ units}}{X \text{ ml}}$

250 X = 3500

X = 14 ml/hr

$\frac{14 \text{ ml} \times 60 \text{ gtts/ml}}{60}$

$\frac{840}{60}$ = 14 gtts/min (paras 2-5, 2-6, 2-28)

41. $\frac{100 \text{ ml} \times 20 \text{ gtts/ml}}{30}$

$\frac{2000}{30} = 66.7 = 67$ gtts/min

(paras 2-7, 2-27)

42. a. $\frac{500 \text{ mg}}{2.7 \text{ ml}} = \frac{480 \text{ mg}}{X \text{ ml}}$

500 X = 1286

X = 2.6 ml

b. $\frac{25 \times 60 \text{ gtts/ml}}{30}$

$\frac{1500}{30} = 50$ gtts/min (paras 2-5, 2-6, 2-7, 2-27)

43. $\frac{100 \text{ units}}{1 \text{ ml}} = \frac{47 \text{ units}}{X \text{ ml}}$

100 X = 47

X = 0.47 ml (paras 2-5, 2-6, 2-18d)

44. $\frac{20{,}000 \text{ u}}{500 \text{ ml}} = \frac{700 \text{ u/hr}}{X \text{ ml/hr}}$

20,000 X = 350,000

X = 17.5 ml/hr

$\frac{17.5 \text{ ml} \times 60 \text{ gtts/ml}}{60}$

$\frac{1050}{60} = 17.5 = 18$ gtts/min (paras 2-5, 2-6, 2-18c)

45. $\frac{40,000 \text{ units}}{1 \text{ ml}} = \frac{11,000 \text{ units}}{X \text{ ml}}$

40,000 X = 11,000

X = 0.275 = 0.28 ml (paras 2-5, 2-6, 2-7, 2-18c)

46. $\frac{4 \text{ mg}}{1 \text{ ml}} = \frac{5 \text{ mg}}{X \text{ ml}}$

4 X = 5

X = 1.25 = 1.3 ml paras 2-5, 2-6, 2-7, 2-18)

47. $\frac{50 \text{ mg}}{1 \text{ ml}} = \frac{30 \text{ mg}}{X \text{ ml}}$

50 X = 30

X = 0.6 ml (paras 2-5, 2-6, 2-18)

48. $\frac{80 \text{ mg}}{15 \text{ ml}} = \frac{100 \text{ mg}}{X \text{ ml}}$

80 X = 1500

X = 18.75 = 18.8 ml (paras 2-5, 2-6, 2-7, 2-17)

49. $\frac{250 \text{ mg}}{5 \text{ ml}} = \frac{375 \text{ mg}}{X \text{ ml}}$

250 X = 1875

X = 7.5 ml (paras 2-5, 2-6, 2-17)

50. $\frac{125 \text{ ml} \times 15 \text{ gtts/ml}}{60}$

$\frac{1875}{60} = 31 \text{ gtts/min}$ (paras 2-7, 2-26)

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