

REFERENCE GUIDE FOR  
PHARMACEUTICAL  
CALCULATIONS

2014-2015 EDITION

MANAN SHROFF

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# **PREFACE**

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I am very pleased to announce to release of the 2014-2015 Edition for The Reference Guide For Pharmaceutical Calculations. It is a resourceful practice guide for preparation of the NAPLEX®, FPGEE®, PTCB® and California Pharmacy Board exams.

This edition contains 650 calculation problems to prepare students for an actual exam. In this Third Edition, I have also included some calculations on creatinine clearance and opioid conversions.

The NAPLEX®, FPGEE®, PTCB® and California Pharmacy Board exams are currently putting more emphasis on calculation problems. A significant percentage of these exams, at least 25% to 30%, consist of calculations.

Calculations related to I.V., I.V. infusion, TPN and dosages are very important in retail and institutional pharmacy settings. This guide will provide complete practice on related calculation problems and help in the achievement of an exceptional score on the examinations.

Best of luck,

Manan Shroff

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**COMMONLY USED UNITS FOR PHARMACEUTICAL CALCULATIONS**

*	1 kilogram	=	1000 grams			
*	1 gram	=	1000 milligrams			
*	1 milligram	=	1000 micrograms			
*	1 microgram	=	0.001 milligrams			
*	1 microgram	=	$10^{-6}$ grams			
*	1 nanogram	=	$10^{-9}$ grams			
*	1 grain	=	65 milligrams			
*	1 liter	=	1000 cc			
*	1 ounce (oz)	=	30 cc			
*	16 ounce (oz)	=	480 cc	=	1 pint	
*	1 pint	=	480 cc			
*	1 quart	=	960 cc	=	2 pints	
*	1 gallon	=	3840 cc	=	8 pints	= 4 quarts
*	1 kg	=	2.2 lbs			
*	1 lb	=	454 grams			
*	1 teaspoonful	=	5 cc			
*	1 tablespoonful	=	15 cc			
*	1 teacupful	=	120 cc			
*	Density	=	weight/volume			
*	Proof gallon	=	(gal x % v/v strength) / 50% v/v			
*	% strength	=	proof spirit / 2			
*	Proof gal	=	(gal x proof spirit) / 100			
*	PV	=	nRT			
*	PV	=	W/M x R x T			
*	Equivalent wt	=	molecular weight / number of valence			
*	mEq	=	equivalent weight in mg / 1000			
*	mOsmol/L	=	(weight of substance [g/L] x no of species x 1000) / mol wt			
*	pH	=	pKa + log (salt/acid)			
*	Young (child)	=	(age in years / age + 12) x adult dose			
*	Clark's	=	(weight in lbs / 150) x adult dose			
*	Child's dose	=	(body surface area of child / 173 mm <sup>2</sup> ) x adult dose			
*	Fried's rule	=	(age in months / 150) x adult dose			
*	FP of blood	=	-0.52°C			
*	Each gm of hydrous dextrose provides	=	3.4 calories / kcal			
*	Each gm of anhydrous dextrose provides	=	4 calories / kcal			
*	Each gm of fat provides	=	9 calories / kcal			
*	Each gm of protein/aminoacid provides	=	4 calories / kcal			
*	Each gm of medium chain triglyceride (mct)	=	8.3 calories / kcal			
*	Each gm of glycerol provides	=	4.3 calories / kcal			
*	Each cc of alcohol provides	=	5.6 calories / kcal			
*	1 cc of 10% fat emulsion provides	=	1.1 calories / kcal			
*	1 cc of 20% fat emulsion provides	=	2.0 calories / kcal			

*	pH = pKa + log (salt/acid) or (ionized/unionized) (for weak acid)	
*	pH = pKw - pKb + log (base/salt) (for weak base)	
*	$B = \frac{2.3 \times C \times K_a \times H_3O^+}{(K_a + H_3O^+)^2}$	(Van slyke's buffer capacity equation)
	where, C = total buffer concentration, $H_3O^+$ = hydrogen ion concentration	
*	$B_{max} = 0.576 \times C$	(maximum buffer capacity)
	where C = total buffer concentration	
*	Acceleration gravity (g)	= 980 cm/sec <sup>2</sup>
*	Gas constant (R)	= 0.082 lit atm/ mole deg
*	1 calorie	= 4.184 x 10 <sup>7</sup> erg
*	Avogadro's number	= 6.0221 x 10 <sup>23</sup> mole <sup>-1</sup>
*	$K = \frac{2.303}{t} \log \frac{C_0}{C}$	where C <sub>0</sub> = initial concentration of drug where C = concentration of drug at time 't'
*	$t_{1/2} = 0.693/K$	where t <sub>1/2</sub> = half life of drug where K = rate constant
*	$V_d = M/C_p$	where V <sub>d</sub> = volume of distribution where M = amount of drug in body where C <sub>p</sub> = plasma concentration of drug
*	$R_i = C_{ss} \times V_d \times K$	where R <sub>i</sub> = rate of infusion where C <sub>ss</sub> = steady state plasma concentration where V <sub>d</sub> = volume of distribution where K = drug elimination constant
*	$L_d = C_{ss} \times V_d$	where L <sub>d</sub> = loading dose of drug where C <sub>ss</sub> = steady state plasma concentration where V <sub>d</sub> = volume of distribution
*	Normality (N):	It is defined as the presence of number of gram equivalent weight of solute in 1000 ml or (1L) solution.
*	Molarity (M):	It is defined as the presence of number of moles of solute in 1000 ml or (1L) of solution.
*	Molality (m):	It is defined as the presence of number of moles of solute in 1000 gm of solvent.

\* Temperature conversion:  $9 (^{\circ}\text{C}) = 5 (^{\circ}\text{F}) - 160$

\* 
$$\text{CrCl} = \frac{\text{weight (kg)} \times (140 - \text{age})}{72 \times \text{serum creatinine (mg/dL)}}$$

\* 
$$\text{CrCl (female)} = 0.85 \times \text{male (CrCl)}$$

\* The number of vials of Digibind required = 
$$\frac{\text{Total digitalis body load in mg} \times 0.8}{0.5 \text{mg of digitalis bound}}$$

# QUESTIONS

1. Sulfur 3%  
Salicylic acid 3%  
White Petrolatum.....q.s. 80 gm

Find out the amount of Sulfur required to fill the above prescription?

- a. 1.2 gm  
b. 2.4 gm  
c. 3.0 gm  
d. 4.8 gm

2. How many grams of Dextrose are required to prepare 5% of 500 cc solution?

- a. 2.5 gm  
b. 25 gm  
c. 55 gm  
d. 5 gm

3. How much Lidocaine is required to prepare 1 : 1000, 30 cc of solution of Lidocaine?

- a. 10 mg  
b. 0.03 mg  
c. 30 mg  
d. 300 mg

4. How many milligrams are equal to 1/150 gr of Nitroglycerine?

- a. 150 mg  
b. 65 mg  
c. 55 mg  
d. 0.43 mg

5. How much Atropine is required to dispense 1 quart of 1 in 100 solution?

- a. 9.6 mg  
b. 1.48 gm  
c. 2.3 mg  
d. 9600 mg

6. How many cc of 75% alcohol should be mixed with 10% of 1000 cc alcohol to prepare 30% of 500 cc alcohol solution ?

- a. 346.16 cc  
b. 234.43 cc  
c. 153.84 cc  
d. 121.12 cc

7. How many grams of Heparin are required to prepare 1 quart of 0.45% solution?

- a. 2.16 gm  
b. 4.32 gm  
c. 0.45 gm  
d. 4.5 gm

8. If a prescription reads "Augmentin 875 mg po bid x 10 days," how many cc of Augmentin 250 mg/5 cc are required to fill a ten-day supply?

- a. 350 cc  
b. 35 cc  
c. 17.5 cc  
d. 5 cc

9. If 250 mg of Cefazolin powder are diluted with water up to the 250 cc mark, what is the % of drug in the final solution ?

- a. 10%  
b. 0.1%  
c. 11%  
d. 0.01%

10. If 1 teaspoonful of Thioridazine concentrated solution (30 mg/cc) is diluted up to the 480 cc mark with plain water, what is the strength of drug in mg/ml in the final solution ?

- a. 1mg/cc  
b. 0.52 mg/cc

- c. 0.31 mg/cc
- d. 0.75 mg/cc

**11.** If a prescription reads “Diphenhydramine 50 mg po hs x 30 days”, what would be the dispensed quantity of drug in ml (12.5 mg / 5 cc) for thirty-day supply?

- a. 20 cc
- b. 5 cc
- c. 300 cc
- d. 600 cc

**12.** Erythromycin 2% 60 cc topical solution contains:

- a. 2 gm erythromycin
- b. 2.4 gm erythromycin
- c. 0.6 gm erythromycin
- d. 1.2 gm erythromycin

**13.** If 60 mg of elementary iron are present in 325 mg of ferrous sulfate, what is the % of elementary iron?

- a. 20.00%
- b. 10.25%
- c. 18.46%
- d. 9.25%

**14.** If 60 gm of 1% hydrocortisone are mixed with 80 gm of 2.5% hydrocortisone, what is the % of hydrocortisone in the final mixture?

- a. 2.2% w/w
- b. 1.85% w/w
- c. 0.25% w/w
- d. 1.75% w/w

**15.** If a prescription reads “100 mcg cyanocobalamin i.m. every week”, how many ampuls of 1000 mcg / cc are required to fill a month supply?

- a. 4
- b. 3
- c. 1
- d. 2

**16.** If 1000 tablets of Risperdal 1 mg cost \$2250 and the mark-up on prescription is 20%, what would be the retail price for 30 tablets?

- a. \$150
- b. \$17
- c. \$500
- d. \$81

**17.** How much Clobetasole is present in 60 gm of 0.5% ointment?

- a. 1.2 gm
- b. 3.0 gm
- c. 2.1 gm
- d. 0.3 gm

**18.** If the ratio of ionized to unionized species of drugs is  $10^3$  and  $PK_a = 2.2$ , what is the pH of the solution?

- a. 2.2
- b. 0.8
- c. 5.2
- d. 3.0

**19.** If a prescription reads “Augmentin 875 mg by mouth twice a day”, how many cc of Augmentin 400 mg/5 cc are required to dispense a 10 day supply?

- a. 10.93 cc
- b. 218.75 cc
- c. 75.00 cc
- d. 100.00 cc

**20.** Find out the weight in gm of 500 cc glycerine. [Specific gravity = 1.25 gm/ml]

- a. 625 gm
- b. 50 gm
- c. 400 gm
- d. 0.25 gm

**21.** Find out the volume of 5 lb of glycerine.  
[density = 1.25 gm/ml]

- a. 1816 cc
- b. 6.25 cc
- c. 637 cc
- d. 40 cc

**22.** Calculate the weight of 500 cc of acid.  
[density of acid = 2.5 gm/ml]

- a. 1000 gm
- b. 1250 gm
- c. 500 gm
- d. 200 gm

**23.** Find out the ratio of ionized to unionized species of drugs at pH = 7. [pKa = 5]

- a. 10
- b. 1
- c. 100
- d. 1000

**24.** If the pH of the solution is 3, what is the concentration of  $H_3O^+$  in gm ion /L?

- a. 0.01 gm-ion/L
- b.  $1 \times 10^3$  gm-ion/L
- c. 0.05 gm-ion/L
- d.  $10^{-3}$  gm-ion/L

**25.** What is the pH of a solution having a ratio of ionized to unionized species of drugs of  $1 \times 10^{-6}$  ? [PKa = 7]

- a. 2
- b. 5
- c. 3
- d. 1

**26.** How many 500 mg tablets of erythromycin are required to prepare 240 cc of 2% solution of erythromycin?

- a. 3
- b. 5
- c. 6
- d. 10

**27.** How many milligrams are equal to 1/150 grains?

- a. 0.65 mg
- b. 1.21 mg
- c. 0.43 mg
- d. 1.56 mg

**28.** How many 975 mg tablets of aspirin are required to prepare 100 tablets of 1 grain?

- a. 6 tablets
- b. 10 tablets
- c. 5 tablets
- d. 3 tablets

**29.** If 3 capsules of 150 mg of Clindamycin are added to 150 cc of 1% Cleocin topical solution, what is the % of Clindamycin in the final mixture ?

- a. 1.5%
- b. 1.3%
- c. 1.1%
- d. 0.9%

**30.** The adult dose of a drug is 500 mg. What is the dose for a 2 year old child? [use young rule]

- a. 71.42 mg
- b. 101.53 mg
- c. 25.46 mg
- d. 31.18 mg

**280.** How many mls of Infed (50mg/2 ml) are required for a patient with blood loss of 350mls? [Patient's hematocrit = 25%]

- a. 1.75
- b. 2.52
- c. 3.46
- d. 4.15

**281.** If 1 teaspoonful of Diazepam concentrated solution (5mg/cc) is diluted up to the 1 pint mark with plain water, what is the strength of drug in mcg/ml in the final solution?

- a. 12
- b. 52
- c. 22
- d. 35

**282.** If a normal dose of a drug is 0.02mg/kg/day, how many 250mcg/50cc ready-infusion bags are required to fill the above order? [Patient's weight = 155 lbs.]

- a. 3
- b. 6
- c. 5
- d. 4

**283.** If 10cc of Lidocaine 0.05mg/cc are diluted with water up to the 50cc mark, what would be the strength of drug in mcg/ml?

- a. 10
- b. 60
- c. 90
- d. 40

**284.** Four grams of Levofloxacin (mixed with 500cc 0.9% NaCl) is administered via slow I.V. infusion over 24 hours. If the I.V. set delivers 10 drops/ml, what would be the rate of flow in drops/min?

- a. 1.21
- b. 1.85
- c. 2.14
- d. 3.47

**285.** How many mEqs of  $K^+$  are present in 750mg of a KCl capsule? [ $K^+ = 39$ ,  $Cl^- = 35.5$ ]

- a. 10
- b. 19
- c. 63
- d. 54

**286.** How many grams of  $CaCl_2$  are required to prepare a 1 gallon solution that contains 20 meq of calcium ions? [mw  $CaCl_2 = 111$ gm/mole]

- a. 2.52
- b. 1.11
- c. 3.25
- d. 4.54

**287.** What is the half-life of a drug that has a rate of constant of 0.025 minutes?

- a. 0.22 hrs
- b. 0.56 hrs
- c. 0.65 hrs
- d. 0.46 hrs

**287.** If the I.V. dose of a drug is 10mg/I.V./kg, what would be the plasma concentration of the drug in micrograms per ml for a patient weighing 95 lbs.? [An apparent volume of distribution of drug is 0.025 L/kg]

- a. 400
- b. 254
- c. 333
- d. 652

**288.** If a prescription calls to dispense 8 fl oz of KCl in such a way that 1 teaspoonful of solution contains 0.5 mEq of drug, how many grams of KCl are required to prepare the above prescription? [mw of KCl = 74.5gm/mole]

- a. 2.65
- b. 1.78
- c. 6.52
- d. 9.11

**289.** One teaspoonful of Risperdal concentrated solution (5mg/5cc) is diluted up to 500cc with distilled water; 5cc of this resultant solution are diluted up to 250cc with distilled water. What would be the concentration of drug in mcg/cc in the final solution?

- a. 1.2
- b. 0.2
- c. 0.625
- d. 0.0002

**290.** 10cc of 0.25% KCl solution, 20cc of 3.25% NaHCO<sub>3</sub> solution and 20cc of 2.25% CaCl<sub>2</sub> are mixed with a 5% 500cc dextrose solution. The infusion should be administered over 8 hours. What is the flow rate in drops/min? [I.V. set delivers = 10 drops/cc]

- a. 5
- b. 20
- c. 12
- d. 17

**291.** If the serum creatinine value for Jennifer is 1.5mg/dl, what would be the creatinine clearance value in ml/min? [Patient's age = 45 years; Weight = 180lbs.]

- a. 65ml/min
- b. 80ml/min
- c. 23ml/min
- d. 61ml/min

**292.** If a prescription reads 2 capsule (500mg Dicloxacillin) daily for 7 days, how many teaspoonfuls of 500mg/5cc oral suspension are required to fill the complete order?

- a. 42
- b. 11
- c. 14
- d. 32

**293.** If the serum creatinin concentration of a 65-year-old male patient is 3.5mg/dl, what is creatinine clearance in ml/minute? [Patient's weight = 160 lbs.]

- a. 76
- b. 34
- c. 59
- d. 22

**294.** How many milligrams of Erythromycin are required to prepare a one pound 0.03% ointment?

- a. 136
- b. 232
- c. 143
- d. 114

**295.** A prescription says to take 10mg of Morphine po q4h. Below is a chart with the recommended initial Duragesic dose based upon daily oral Morphine dose:

Oral-24 hour Morphine (mg/day)	Duragesic dose (mcg/h)
45-134	25
135-224	50
225-314	75
315-404	100

How many 25mcg/hr Duragesic patches are required to fill a 10-day supply?

- a. 5
- b. 9
- c. 3
- d. 10

**296.** A 45-year-old patient is taking 25mg of Meperidine by mouth, six times day, to relieve pain associated with knee injury. If a prescriber wants to switch him over to Hydromorphone, how many mls of 0.5mg/ml Hydromorphone suspension are required to fill a 30-day supply?

	Oral Prior (opioid) (multiplication factor)	Parenteral Prior (opioid)
Oxycodone	0.25	N/A
Codeine	0.04	N/A
Morphine	0.12	N/A
Meperidine	0.02	N/A
Hydromorphone	1.0	N/A

- a. 90
- b. 180
- c. 150
- d. 240

**297.** A prescription says a 25mcg/hr patch of Duragesic TDS is to be changed every 72 hours. If a prescriber wants to switch this to Oxycodone, how many 5mg tablets of Oxycodone are required to fill a 7-day supply? [Assume 18 hrs after removal of the transdermal fentanyl patch, approximately 10mg of oxycodone q12h can be substituted for each 25mcg/h of transdermal fentanyl to start.]

- a. 140
- b. 12
- c. 52
- d. 28

**298.** If a prescription says “Augmentin 250mg po tid x 7 days,” how many cc of Augmentin 250mg/5 cc are required to fill a 7-day supply?

- a. 125
- b. 211
- c. 105
- d. 90

**299.** If a normal dose of a drug is 0.05mg/kg/day, how many 500mcg/50cc ready-infusion bags are required to fill the above order? [Patient’s weight is 110lbs.]

- a. 4
- b. 3
- c. 5
- d. 6

**300.** How many milliosmols per 100ml are present in 25ml D25W solution? [mw of dextrose = 180gm/mole]

- a. 111
- b. 451
- c. 139
- d. 214

# ***ANSWERS***

**1. (b)** 2.4 grams.

The amount of sulfur required to fill the above prescription is  $\frac{80 \times 3}{100} = 2.4$  grams.

**2. (b)** 500 cc of 5% Dextrose solution contains:  
 $\frac{500 \times 5}{100} = 25$  grams of dextrose.

**3. (c)** 1: 1000 is generally interpreted as 1 gm in 1000 cc of solution. The amount of lidocaine in 30 cc of 1:1000 solution can be calculated as follows:

$$= \frac{30 \times 1}{1000} = 0.03 \text{ gm} = 30 \text{ milligrams.}$$

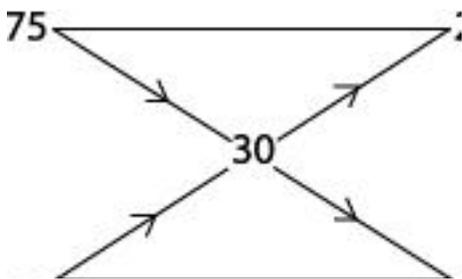
**4. (d)** 1 grain is equal to 65 milligrams, therefore 1/150 grains are equal to:

$$= \frac{1 \times 65}{150} = 0.43 \text{ milligrams}$$

**5. (d)** 1 in 100 solution is interpreted as 1 gm of drug in 100 cc of solution. We want to find out how much atropine is required to dispense 1 quart (960 cc) of 1 in 100 solution, therefore:

$$= \frac{960 \times 1}{100} = 9.6 \text{ gm atropine} = 9600 \text{ mg.}$$

**6. (c)** To solve this type of problem, we need to use the alligation method.



To prepare 65 (30%) 20 parts (75%) needed  
To prepare 500 (30%) ?

$$= \frac{500 \times 20}{65} = 153.84 \text{ cc (75\% alcohol)}$$

If we mixed 153.84 cc of 75% alcohol with 346.16 cc [500 cc - 153.84 cc] of 10% alcohol, then we can get 500 cc of 30% alcohol solution.

**7. (b)** We want to prepare 1 quart (960 cc) of 0.45% heparin solution, therefore we can say

$$= \frac{960 \times 0.45}{100} = 4.32 \text{ gm.}$$

4.32 gms of heparin are required.

**8. (a)** This type of calculation is classified as a dosage calculation and can be calculated as follows:

We have a suspension of Augmentin 250 mg/5 cc and we want to dispense dose of 875 mg,

$$= \frac{5 \times 875}{250} = 17.5 \text{ cc}$$

The patient is taking 875 mg twice a day and therefore:

$$= 2 \times 17.5 \text{ cc} = 35 \text{ cc per day.}$$

Patient is taking drug for 10 days therefore,

= 35 x 10 = 350 cc would be the dispensed quantity of drug.

**9. (b)** 250 mg (0.25 gm) of cefazolin powder are diluted with water up to 250 cc mark and we want to find out the % of drug in the final solution.

$$= \frac{100 \times 0.25}{250} = 0.1\%$$

**10. (c)** 1 teaspoonful (5 cc) of Thioridazine solution (30mg/cc) contains 150 mg of drug. This solution is diluted up to a mark of 480 cc therefore:

$$= \frac{150}{480} = 0.31 \text{ mg/ml}$$

**11. (d)** We have 12.5mg/5cc Benadryl solution. We want to dispense a 50 mg dose:

$$= \frac{50 \times 5}{12.5} = 20 \text{ cc for 1 day}$$

For 30 day supply:

$$= 20 \times 30 = 600 \text{ cc.}$$

**12. (d)** Erythromycin 2% topical solution contains =  $\frac{60 \times 2}{100}$

$$= 1.2 \text{ gm of erythromycin.}$$

**13. (c)** The % of elementary iron can be found as follows:

$$= \frac{100 \times 60}{325} = 18.46\%$$

**14. (b)** The amount of Hydrocortisone in 60 gm, 1%:

$$\frac{60}{100} = 0.6 \text{ gm of hydrocortisone.}$$

Amount of hydrocortisone in 80 gm, 2.5%

$$\frac{80 \times 2.5}{100} = 2 \text{ gm hydrocortisone}$$

$$\frac{\% \text{ of hydrocortisone in final mixture}}{= \frac{100 \times 2.6 (2 \text{ gm} + 0.6 \text{ gm})}{140 (80 \text{ gm} + 60 \text{ gm})}}$$

$$= 1.85\% \text{ w/w.}$$

**15. (c)** 1 ampul

Patient is taking 100 mcg of the drug I.M. every week, therefore:

$$= \frac{100}{1000} = 0.1 \text{ cc of drug every week.}$$

The number of cc required for a 1 month supply:

$$= 0.1 \times 4 = 0.4 \text{ cc}$$

The correct answer should be 1 ampul.

**16. (d)** 1000 tablets of Risperdal 1mg cost \$2250. The % mark up on prescriptions is 20%.

Therefore the retail price of 1000 tablets would be:

$$= \frac{120 \times 2250}{100} = \$2700$$

\*\* Each \$100 cost = \$120 retail cost\*\*

Price for 30 tablets would be:

$$= \frac{30 \times 2700}{1000} = \$81$$

**17. (d)** We want to find out the quantity of Clobetasole present in 60 grams of 0.5% ointment.

$$= \frac{60 \times 0.5}{100} = 0.3 \text{ gm of clobetasole.}$$

**18. (c)** A pH of the solution can be found by the following formula:

$$\text{pH} = \text{pKa} + \log \frac{\text{ionize}}{\text{unionize}}$$

$$\begin{aligned}
 &= 2.2 + \log 10^3 \\
 &= 2.2 + 3 \\
 &= 5.2
 \end{aligned}$$

**19. (b)** We have 400 mg/5 cc Augmentin in stock. We want to find the dispensed quantity for a 10-day supply.

$$= \frac{875 \times 5}{400} = 10.93 \text{ cc for each dose}$$

The patient is taking a dose twice a day for 10 days therefore :

$$\begin{aligned}
 &= 10.93 \times 2 \times 10 \\
 &= 218.75 \text{ cc}
 \end{aligned}$$

**20. (a)** Weight in grams = no of ml x sp gr

$$\begin{aligned}
 &= 500 \text{ cc} \times 1.25 \text{ gm/cc} \\
 &= 625 \text{ gm}
 \end{aligned}$$

**21. (a)** Weight = density x volume

$$\text{Volume} = \frac{\text{weight}}{\text{density}}$$

$$= \frac{5 \times 454 (1 \text{ lb} = 454 \text{ gm})}{1.25}$$

$$= 1816 \text{ cc glycerine.}$$

**22. (b)** Weight = density x volume

$$\begin{aligned}
 &= 2.5 \times 500 \\
 &= 1250 \text{ gm of acid.}
 \end{aligned}$$

**23. (c)**  $\text{pH} = \text{pKa} + \log \frac{\text{salt}}{\text{acid}}$

$$7 = 5 + \log \frac{\text{salt}}{\text{acid}}$$

$$\log [\text{salt}/\text{acid}] = 2$$

salt/acid =  $10^2$ , ratio of ionized to unionize drug will be 100.

**24. (d)**  $\text{pH} = -\log [\text{H}_3\text{O}^+]$

$$\begin{aligned}
 3 &= -\log [\text{H}_3\text{O}^+] \\
 -3 &= \log [\text{H}_3\text{O}^+]
 \end{aligned}$$

$$[\text{H}_3\text{O}^+] = 10^{-3} \text{ gm ion/L}$$

**25. (d)**  $\text{pH} = \text{pKa} + \log [\text{salt}/\text{acid}]$

$$\begin{aligned}
 \text{pH} &= 7 + \log [10^{-6}] \\
 &= 7 - 6 \\
 &= 1
 \end{aligned}$$

**26. (d)** 240 cc 2% Erythromycin solution contains:

$$= \frac{240 \times 2}{100} = 4.8 \text{ gm of Erythromycin}$$

The number of 500 mg tablets of Erythromycin:

$$= \frac{4800}{500} = 9.6 \cong 10 \text{ tablets.}$$

**27. (c)** 1 grain is equal to 65 mg therefore: 1/150 grains will contain:

$$= \frac{1 \times 65}{150} = 0.43 \text{ mg}$$

**28. (a)** 100 tablets of 1 grain of Aspirin contains:  $100 \times 65 = 6500 \text{ mg of Aspirin.}$

The number of 975 mg tablets of Aspirin:

$$= \frac{6500}{975} = 6.66 \cong 6 \text{ tablets}$$

**29. (b)** 1 % 150 cc Cleocin solution contains:

$$= \frac{150 \times 1}{100} = 1.5 \text{ gm Clindamycin}$$

The addition of 3 capsules each weighing 150 mg will result in:  $1.5 \text{ gm} + 0.45 \text{ gm} = 1.95 \text{ gm}$

% of Clindamycin in final mixture would be:

$$= \frac{1.95 \times 100}{150} = 1.3\%$$

**30. (a)** 71.42 mg

Young rule =  $\frac{\text{age in year}}{\text{age} + 12} \times \text{adult dose}$

$$= \frac{2}{14} \times 500 = 71.42 \text{ mg}$$

**31. (a)** 100 mg

Clark's rule =  $\frac{\text{Weight in lbs} \times \text{adult dose}}{150}$

$$= \frac{20 \times 750}{150} = 100 \text{ mg}$$

**32. (c)** 0.06 cc

According to Fried's rule:

$$= \frac{\text{age in months} \times \text{adult dose}}{150}$$

$$= \frac{15 \times 325}{150} = 32.5 \text{ mg}$$

The dropper is calibrated to deliver 325 mg of Iron sulfate in 0.6 cc, therefore:

$$= \frac{0.6 \times 32.5}{325} = 0.06 \text{ cc}$$

**33. (d)** 11.56 mg

A child dose can be calculated by:

$$= \frac{\text{Body surface area of child} \times \text{adult dose}}{173 \text{ mm}^2}$$

$$= \frac{20 \times 100}{173}$$

$$= 11.56 \text{ mg}$$

**34. (d)** 1 grain is equal to 65 mg, therefore 10 grains contain

$$= 10 \times 65 = 650 \text{ mg of the drug.}$$

**35. (c)** Patient weight is 156 lbs, therefore weight in Kg would be  $\frac{156}{2.2} = 70.9 \text{ kg}$ .

A normal therapeutically recommended dose of drug is 10mg/kg/day, therefore the dose in the above patient is:

$$= 10 \times 70.9 = 709 \text{ mg}$$

Each ready-infusion-bag contains 250 mg of drug, so the number of bags required to fill the order would be

$$= \frac{709}{250} = 2.83 \cong 3 \text{ bags.}$$

**36. (b)** 1/100 grains contains:

$$= \frac{1 \times 65 \times 1000}{100} \quad [1 \text{ mg} = 1000 \text{ mcg}]$$

$$= 650 \text{ micrograms}$$

A prescription calls for 50 mcg of a drug three times a day for 10 days, therefore the number of tablets required to fill the order is:

$$= \frac{50 \times 3 \times 10}{650} = 2.30 \cong 3 \text{ tablets}$$

**37. (a)** A patient is taking 125 mcg of Lanoxin every day, therefore to fill a 30 day order,

$$= 30 \times 125 = 3750 \text{ mcg of Lanoxin.}$$

Each ml of Lanoxin elixir provides 50 mcg of a drug, therefore the number of cc required to fill the entire order is:

$$= \frac{3750}{50} = 75 \text{ cc of Lanoxin elixir.}$$

**38. (a)** A prescription reads to dissolve 2 gm of Guaifenesin in 100 cc of plain water, therefore the amount of drug present in 1 teaspoonful (5 cc) of solution would be

$$= \frac{5 \times 2000}{100} = 100 \text{ mg} = \frac{100}{65} = 1.53 \text{ grain}$$

**39. (b)**

100 mg of Lactaid is equal to 4500 units, therefore 1 unit is equal to:

$$= \frac{100}{4500} = 0.02 \text{ mg of Lactaid}$$

**40. (c)** 28 cc

A 7 year-old child is taking 50 mg Ampicillin by mouth twice a day for 7 days, therefore:

$$\begin{aligned} &= 50 \times 2 \times 7 \\ &= 700 \text{ mg of Ampicillin} \end{aligned}$$

We have 125 mg/5 cc suspension in stock:

$$= \frac{5 \times 700}{125} = 28 \text{ cc}$$

**41. (d)** 477 mg

An adult dose of drug can be calculated by the following formula:

$$\frac{\text{Body surface area}}{173 \text{ mm}^2} \times \text{adult dose}$$

$$= \frac{110}{173} \times 750 = 476.87 \text{ mg} \cong 477 \text{ mg}$$

**42. (d)** 240cc of 10% solution will contain:

$$= \frac{240 \times 10}{100} = 24 \text{ gm of drug.}$$

**43. (c)** 6.75 gm sodium chloride

The amount of sodium chloride required:

$$= \frac{750 \times 0.9}{100} = 6.75 \text{ gm of sodium chloride}$$

**44. (b)** D<sub>25</sub>W will be interpreted as 25% Dextrose solution.

The amount of dextrose present:

$$= \frac{500 \times 25}{100} = 125 \text{ gm of dextrose.}$$

**45. (a)** 1 : 1000 solution is interpreted as 1 gm of drug in 1000 cc of solution.

The amount of Lidocaine required:

$$= \frac{30 \times 1}{1000} = 0.03 \text{ gm} = 30 \text{ mg of Lidocaine}$$

## PRACTICE TEST

1. How many milligrams are present in a 1/150 gr Nitrostat tablet?
  - a. 1.2 mg
  - b. 0.43 mg
  - c. 45 mg
  - d. 3.5 mg
  
2. How many 1/200 gr of tablets can be prepared from 500 mg of active ingredient?
  - a. 167
  - b. 432
  - c. 1538
  - d. 1100
  
3. How many milligrams of Guiafenesin will be present in 480cc (15 mg/5 cc) of solution?
  - a. 908 mg
  - b. 1440 mg
  - c. 1000 mg
  - d. 521 mg
  
4. If the retail cost of each Zyprexa tablet is \$2.40, what would be the retail cost for 30 tablets?
  - a. 72
  - b. 111
  - c. 24
  - d. 67
  
5. How many grams of dextrose are required to prepare a 1000 cc D<sub>5</sub>w solution?
  - a. 125 gm
  - b. 75 gm
  - c. 50 gm
  - d. 500 gm
  
6. How much atropine is required to prepare a 1:500, 500 cc solution of atropine ?
  - a. 0.5 gm
  - b. 0.005 gm
  - c. 10 gm
  - d. 1 gm
  
7. How many grams of Lidocaine are required to dispense 1 quart of 1 in 50 solution?
  - a. 11.4 gm
  - b. 5 gm
  - c. 19.2 gm
  - d. 21 gm
  
8. How many calories are provided by 1 quart of a 1 in 500 solution of dextrose?
  - a. 11.2 calories
  - b. 9.55 calories
  - c. 55.6 calories
  - d. 6.53 calories
  
9. How much Xylocaine is required to prepare 30 cc of a 1:500 solution of Xylocaine?
  - a. 120 mg
  - b. 90 mg
  - c. 60 mg
  - d. 30 mg
  
10. In what proportion should 49% alcohol be mixed with water to prepare 1000 cc of a 25% alcohol solution?
  - a. 30.5 cc
  - b. 810 cc
  - c. 111 cc
  - d. 510.2 cc
  
11. How much Heparin is required to dispense a 0.25% 750 cc solution?
  - a. 1.875 gm
  - b. 5.25 gm
  - c. 0.115 gm
  - d. 2.10 gm

**12.** If a prescription calls for “Biaxin 500 mg po bid x 10 days”, how many cc of Biaxin 125 mg/5 cc are required to dispense a 10 day supply?

- a. 200 cc
- b. 100 cc
- c. 400 cc
- d. 50 cc

**13.** If a prescription is written to take 50 mg of diphenhydramine by mouth four times a day for 5 days, how many cc of 12.5 mg/5 cc diphenhydramine solution are required to dispense 5 day supply?

- a. 400 cc
- b. 20 cc
- c. 80 cc
- d. 10 cc

**14.** If 125 mcg of a drug are diluted with water up to 50 cc, what is the % of drug ?

- a. 0.25%
- b. 1.25%
- c. 0.00025%
- d. 0.0025%

**15.** If 1 tablespoonful of Thioridazine intense solution (100 mg/cc) is diluted with water up to 1 quart, what is the % of drug in the final solution?

- a. 1.25%
- b. 0.005%
- c. 0.156%
- d. 2.75%

**16.** If 10 teaspoonfuls of Risperdal oral solution (100 mcg/5 cc) are diluted with water up to 480 cc, what is the concentration of drug in mcg/cc in the final solution?

- a. 1.2 mcg/ml
- b. 2.5 mg/ml

- c. 2.083 mcg/ml
- d. 5.10 mcg/ml

**17.** How many cc of 10% Benzoyl peroxide are required to prepare a 5% 20 cc Benzoyl peroxide solution?

- a. 10 cc
- b. 50 cc
- c. 25 cc
- d. 100 cc

**18.** How many milligrams of Clindamycin are present in 60 cc of 0.1% topical gel of clindamycin?

- a. 100 mg
- b. 30 mg
- c. 60 mg
- d. 45 mg

**19.** How many tablets of 250 mg erythromycin are required to prepare 500 cc of 2% topical solution of erythromycin?

- a. 10
- b. 40
- c. 80
- d. 20

**20.** If 325 mg of ferrous sulfate contains 22% elementary iron, how many milligrams of elemental iron will the patient receive with each dose?

- a. 20 mg
- b. 60 mg
- c. 71.5 mg
- d. 50 mg

**21.** If niferex liquid solution provides 10 mg of elemental iron in 1 teaspoonful, how many cc of solution are required to provide 55 mg of elemental iron ?

- a. 27.5 cc
- b. 12.5 cc
- c. 25.0 cc
- d. 30.5 cc

**22.** If 30 gm of 0.1% Triamcinolone cream are mixed with 70 gm of 0.25% Triamcinolone cream, what is the % w/w of Triamcinolone in the final mixture?

- a. 0.15%
- b. 0.005%
- c. 0.205%
- d. 0.27%

**23.** If a prescription reads “50 mg Haldol decanoate I.M. every week”, how many vials of Haldol decanoate (10 mg/cc, 5 cc) are required to dispense a 30 day supply of the drug?

- a. 4 vials
- b. 1 vial
- c. 2 vials
- d. 10 vials

**24.** If 1000 tablets of Zyvox cost \$8550, and the mark up on the prescription is 15%, what would be the retail price of 30 tablets?

- a. \$294.97
- b. \$125.10
- c. \$312.5
- d. \$111.12

**25.** How much betamethasone is required to prepare 80 gm of 0.05% ointment ?

- a. 25 mg
- b. 145 mg
- c. 40 mg
- d. 75 mg

**26.** If the ratio of ionized to unionized is  $10^5$  and  $pK_a = 3$ , what is the pH of the solution?

- a. 2
- b. 7
- c. 8
- d. 4

**27.** If a prescription calls for “Amoxicillin 500 mg by mouth twice a day for 10 days”, how many cc of Amoxicillin 125 mg/5 cc are required to dispense a 10 day supply?

- a. 400 cc
- b. 200 cc
- c. 100 cc
- d. 50 cc

**28.** What is the weight in grams of 50 cc of glycerine having a specific gravity of 1.25 gm/cc?

- a. 40 gm
- b. 62.5 gm
- c. 0.025 gm
- d. 6.25 gm

**29.** What is the volume of 10 lbs of chloroform having a density of 1.5 gm/ml?

- a. 3026 cc
- b. 1232 cc
- c. 456 cc
- d. 585 cc

**30.** How many milliosmols/L are represented by 1000 cc 0.9% sodium chloride?

- a. 307.7
- b. 111.2
- c. 235
- d. 55

**31.** How many milliosmols per liter are represented by a 50 cc 50% sodium bicarbonate solution? [mw = 84 gm/mole]

- a. 2345
- b. 11904
- c. 1232
- d. 556

**32.** How many milliosmols per 100 cc are represented by a 100 cc 0.1% sodium phosphate solution? [mw of  $\text{Na}_3(\text{PO}_4) = 259$ ]

- a. 19.3
- b. 23.4
- c. 5.06
- d. 1.54

**33.** Calculate the ratio of ionized to unionized drugs at a pH = 5. [pKa = 3]

- a. 1:100
- b. 100:1
- c. 10:1
- d. 1:10

**34.** What is the PH of a solution having a ratio of ionized drugs to unionized drugs of 100:1? [PKa = 5]

- a. 3
- b. 5
- c. 7
- d. 2

**35.** How many 150 mg Clindamycin capsules are required to prepare 480 cc of 1% topical solution?

- a. 23
- b. 14
- c. 56
- d. 32

**36.** If 5 tablets each of weighing 500 mg of erythromycin are added to 240 cc of 2% erythromycin topical solution, what is the % of erythromycin in the final solution?

- a. 3.04
- b. 1.21
- c. 2.50
- d. 6.87

**37.** How many 325 mg tablets of aspirin are required to prepare 30 tablets of 10 grains?

- a. 45
- b. 90
- c. 60
- d. 75

**38.** Calculate the dose for a 3-year old child. An adult dose of the drug is 500 mg. [use young rule]

- a. 100 mg
- b. 50 mg
- c. 650 mg
- d. 180 mg

**39.** If an adult dose of drug is 750 mg, what is the dose for a child weighing 25 lbs?

- a. 250 mg
- b. 81 mg
- c. 125 mg
- d. 375 mg

**40.** If an adult dose of drug is 500 mg, what is the dose for a person having a body surface area of 130  $\text{mm}^2$ ?

- a. 121.11
- b. 375.72
- c. 456.98
- d. 234.65

**41.** If the recommended dose of levofloxacin is 7.5 mg/kg/day, how many 125 mg/50 cc ready to infuse bags are required to fill the order ? [patient's weight = 170 lbs]

- a. 8.00 bags
- b. 4.63 bags
- c. 2.50 bags
- d. 3.25 bags

**42.** If the prescription calls for “125 mcg by mouth four times a day for 30 days”, how many 1/250 grain tablets are required to fill a 30 day supply?

- a. 25
- b. 58
- c. 75
- d. 34

**43.** If a prescription calls for “Lanoxin 0.375 mg by mouth every day”, how many cc of Lanoxin pediatric elixir (50 mcg/cc) are required to dispense a 30-day supply?

- a. 150 cc
- b. 225 cc
- c. 350 cc
- d. 450 cc

**44.** If 2 gms of dextromethorphan are dissolved in 1000 cc of water, how many grains of dextromethorphan are present in 1 tablespoonful of solution?

- a. 1.2 gr
- b. 0.85 gr
- c. 0.46 gr
- d. 0.95 gr

**45.** What is the dose of a rocephine for a patient that has 140 mm<sup>2</sup> body surface area? The average adult dose of drug is 500 mg.

- a. 123.12 mg
- b. 226.18 mg
- c. 404.62 mg
- d. 560 mg

**46.** How many grams of sodium chloride are required to prepare 1000 cc of 0.45% normal saline solution?

- a. 9.0 gm
- b. 2.2 gm
- c. 4.5 gm
- d. 1.2 gm

**47.** How many calories are provided by 500 cc of D<sub>5</sub>W solution?

- a. 34 kcal
- b. 25 kcal
- c. 44 kcal
- d. 85 kcal

**48.** How many grams of dextrose are required to prepare 10 L of 1 in 500 dextrose solution?

- a. 12 gm
- b. 10 gm
- c. 45 gm
- d. 20 gm

**49.** What is the % of acetic acid in 1 in 50 solution?

- a. 2%
- b. 0.5%
- c. 1%
- d. 5%

**50.** To dispense 7% of 240 cc solution of risperdal, how many cc of stock solution are required? [stock solution: 100 mg/cc, 1000]

- a. 168 cc
- b. 222 cc
- c. 123 cc
- d. 145 cc

**51.** If a half pint of risperdal oral solution (1 mg/cc) is diluted with water up to 1000 cc, what is the strength of drug in mg/cc in the final solution?

W.H.O. recommends 0.45 grams of protein per kilogram of ideal body weight per day. How many bottles of Ensure Plus are required daily for a person weighing 120 lbs?

- 2
- 5
- 7
- 9

**359.** Each 8-ounce Ensure Plus labeling provides the following information:

<u>Amount/serving</u>	<u>%DV</u>	<u>Serving Size</u>
Total fat (11gm)	17%	(8 fl oz)
Saturated fat (1gm)	5%	(350 calories)
Trans fat (0gm)		
Cholesterol (< 5mg)	< 2%	
Sodium (240mg)	10%	
Potassium (500mg)	14%	
Protein (13gm)	26%	
Carbohydrate (50gm)	17%	
Sugar (18gm)		

If we mix 250mg of KCl powder with 4 ounces of Ensure Plus, what would be mEq of KCl in a final mixture? (K = 39, Cl = 35.5)

- 5.96
- 6.71
- 3.46
- 1.52

**360.** A 42-year-old patient is taking 10mg of Meperidine by mouth four times a day to relieve pain associated with a knee injury. If a prescriber want to switch him over to Hydromorphone, how many mls of 0.8mg/ml Hydromorphone suspension are required to fill a 72-hour supply?

Oral Prior Opioid	Multiplication Factor	Parenteral Prior Opioid
Oxycodone	0.25	N/A
Codeine	0.04	N/A
Morphine	0.12	N/A
Meperidine	0.02	N/A
Hydromorphone	1.0	N/A

- 10
- 6
- 3
- 25

**361.** A prescription says to take 15mg of Morphine po q4h. Below is a chart with the recommended initial Duragesic dose based upon daily oral Morphine dose:

Morphine Dose (daily in mg)	Duragesic Dose (mcg)
45-134	25
135-224	50
225-314	75
315-404	100

How many 25mcg/hr Duragesic patches are required to fill a 10-day supply?

- 3
- 9
- 12
- 10

**362.** A 65-year-old patient is taking 5mg of Meperidine by mouth, six times day, to relieve pain associated with lung transplantation. If a prescriber wants to switch him over to Hydromorphone, how many mls of 0.6mg/ml Hydromorphone suspension are required to fill a 7-day supply?

Oral Prior Opioid	Multiplication Factor	Parenteral Prior Opioid
Oxycodone	0.25	N/A
Codeine	0.04	N/A
Morphine	0.12	N/A
Meperidine	0.02	N/A
Hydromorphone	1.0	N/A

- a. 28
- b. 21
- c. 14
- d. 7

**363.** A prescription says a 50mcg/hr patch of Duragesic TDS is to be changed every 72 hours. If a prescriber wants to switch this to Oxycodone, how many 5mg tablets of Oxycodone are required to fill a 7-day supply? (Assume 18 hrs after removal of the transdermal fentanyl patch, approximately 5mg of oxycodone q12h can be substituted for each 25mcg/h of transdermal fentanyl to start.)

- a. 140
- b. 120
- c. 52
- d. 28

**364.** A prescription says to take 30mg of Morphine po q6h. Below is a chart with the recommended initial Duragesic dose based upon daily oral Morphine dose:

Morphine Dose (daily in mg)	Duragesic Dose (mcg)
45-134	25
135-224	50
225-314	75
315-404	100

How many 25mcg/hr Duragesic patches are required to fill a 30-day supply?

- a. 5
- b. 10
- c. 15
- d. 20

**365.** A 55-year-old patient is taking 15mg of Meperidine by mouth, four times day, to relieve pain associated with brain tumor. If a prescriber wants to switch him over to Hydromorphone, how many mls of 2mg/ml Hydromorphone suspension are required to fill a 10-day supply?

Oral Prior Opioid	Multiplication Factor	Parenteral Prior Opioid
Oxycodone	0.25	N/A
Codeine	0.04	N/A
Morphine	0.12	N/A
Meperidine	0.02	N/A
Hydromorphone	1.0	N/A

- a. 6
- b. 9
- c. 12
- d. 18

**ANSWERS FOR PRACTICE TEST**

1.	B	43.	B	85.	B	127.	D
2.	C	44.	C	86.	B	128.	A
3.	B	45.	C	87.	C	129.	A
4.	A	46.	C	88.	C	130.	B
5.	C	47.	D	89.	D	131.	C
6.	D	48.	D	90.	A	132.	D
7.	C	49.	A	91.	B	133.	C
8.	D	50.	A	92.	C	134.	B
9.	C	51.	C	93.	A	135.	C
10.	D	52.	C	94.	B	136.	A
11.	A	53.	D	95.	C	137.	A
12.	C	54.	A	96.	D	138.	A
13.	A	55.	D	97.	A	139.	B
14.	C	56.	A	98.	A	140.	D
15.	C	57.	D	99.	B	141.	D
16.	C	58.	D	100.	C	142.	B
17.	A	59.	C	101.	A	143.	B
18.	C	60.	B	102.	B	144.	B
19.	B	61.	A	103.	A	145.	C
20.	C	62.	A	104.	A	146.	D
21.	A	63.	B	105.	A	147.	A
22.	C	64.	B	106.	C	148.	B
23.	A	65.	A	107.	D	149.	A
24.	A	66.	B	108.	A	150.	B
25.	C	67.	C	109.	A	151.	C
26.	C	68.	C	110.	C	152.	C
27.	A	69.	D	111.	C	153.	C
28.	B	70.	A	112.	D	154.	C
29.	A	71.	A	113.	B	155.	D
30.	A	72.	B	114.	A	156.	C
31.	B	73.	B	115.	B	157.	C
32.	D	74.	B	116.	B	158.	C
33.	B	75.	B	117.	C	159.	D
34.	C	76.	D	118.	C	160.	C
35.	D	77.	C	119.	D	161.	C
36.	A	78.	A	120.	D	162.	C
37.	C	79.	B	121.	D	163.	B
38.	A	80.	C	122.	D	164.	A
39.	C	81.	D	123.	A	165.	A
40.	B	82.	A	124.	B	166.	A
41.	B	83.	A	125.	C	167.	A
42.	B	84.	A	126.	C	168.	A

- 345. C
- 346. D
- 347. D
- 348. C
- 349. D
- 350. A
- 351. C
- 352. A
- 353. A
- 354. A
- 355. B
- 356. C
- 357. A
- 358. A
- 359. B
- 360. C
- 361. A
- 362. D
- 363. D
- 364. B
- 365. A