ANSWERS

CHAPTER 1

1. **The true volume of soda in a standard aluminum can is 355 mL. A student pours a can of soda into a separate container four different times and measures the volume to be 335, 336, 334, and 335 mL, respectively. Which statement below best describes the student's measurements?**

   a. They are neither precise nor accurate.
   b. They have good accuracy.
   c. They have good precision.
   d. They have poor precision.

2. **Four students are asked to measure the temperature of a solution, using the same thermometer, that has been sitting at room temperature (70°F) for 3 days. The students report the following results: 65, 79, 88, and 59°F. Which statement below best describes the student's measurements?**

   a. They are precise and accurate.
   b. They are neither precise nor accurate.
   c. They are accurate.
   d. They are precise.

CHAPTER 2

In pharmacy, roman numerals are most likely to be encountered when reading a prescription. Convert the following pharmacy-related examples as directed in the problem. Refer to Appendix A (Parts of a Prescription), and Appendix C (Frequently Used Prescription Abbreviations and Medical Terminology), for more information.

1. **Convert these roman numeral volumes to arabic numerals:**

   a. iv fluid ounces
      4 fluid ounces
   b. vii oz
      7 ounces
   c. XII oz
      12 ounces

2. **The following roman numeral notations might be found in the sig, or directions, of a prescription. Write the amount so a patient could read it.**

   a. iss tsp
      1 ½ teaspoonful

   b. ii tsp
      2 teaspoonsful
   c. ii gtts
      2 drops

3. **On a prescription, some prescribers write the number of tablets or capsules to be dispensed as roman numerals. Write the following arabic numerals as roman numerals.**

   a. 220 tablets
      CCXX tablets
   b. 36 capsules
      XXXVI capsules
   c. 44 tabs
      XLIV tablets

4. **Convert the following arabic numeral volumes or quantities to roman numerals:**

   a. 3 tsp
      iii tsp
   b. ½ fl oz
      ss fl ounces
   c. 5 mL
      v mL

5. **Write these roman numeral prescription quantities as arabic numerals. The abbreviation "Disp" means dispense.**

   a. Disp # XLV
      Disp #45
   b. Disp xxviii tablets
      Disp 28 tablets
   c. Disp xvi oz
      Disp 16 ounces

Answer the following problems about place value:

6. **Write the place value names for each digit in the following decimal fractions:**

   a. 0.125 mg
      0.125 mg; units, tenths, hundredths, thousandths
   b. 0.5 mL
      0.5 mL; units, tenths
   c. 0.375 g
      0.375 g; units, tenths, hundredths, thousandths
   d. 0.02389 g
      0.02389 g; units, tenths, hundredths, thousandths, ten-thousandths, hundred-thousandths

7. **Write the place value names for each digit in the following whole numbers:**

   a. 4

      4; units

   b. 55

      55; tens, units

   c. 675

      675; hundreds, tens, units

   d. 12,463

      12,463; ten thousands, thousands, hundreds, tens, units

Round as directed in the problem.

8. **Round the following to the nearest tenth:**

   a. 11.674

      11.7

   b. 22.449

      22.4

   c. 100.39

      100.4

   d. 49.73

      49.7

9. **Round the following to the nearest 0.5 mL:**

   a. 122.9 mL

      123 mL

   b. 1.4 mL

      1.5 mL

   c. 0.72 mL

      0.5 mL

   d. 17.6 mL

      17.5 mL

Complete the following word problems:

10. **Patrick is measuring salicylic acid for compounding an ointment. He calculates that he needs to measure 2,675 mg of salicylic acid, but the balance (a weighing device used in pharmacy) can only measure in increments of 10 mg. How many milligrams should Patrick weigh?**

    Patrick should weigh 2,680 mg of salicylic acid.

11. **Carole needs to measure 3.5 mL of amoxicillin 250 mg/5 mL for her toddler Bob's ear infection. She has a 5-mL oral syringe, marked in 0.2-mL increments. Can she accurately measure 3.5 mL in the 5-mL syringe?**

    Yes, she can draw the amoxicillin suspension up to half-way between the 3.4-mL line and the 3.6-mL line.

12. **Dr. Leland calculates that his patient needs a dose of phenobarbital, based on body weight, of 144.58 mg to be given twice a day. Phenobarbital is available in a concentration of 4 mg/mL, so you will need to draw up 36.145 mL for each dose. A 60-mL syringe has 1-mL calibration markings. To what volume should you round to measure as accurately as possible?**

    The volume should be rounded to 36 mL for accurate measuring.

13. **Patsy Pitts, the pharmacy technician at Save Rite Pharmacy, receives a prescription as follows:**

    Promethazine with codeine
    Disp: viii fl oz

    She sees a 16-fluid ounce bottle that appears to be about half full on the shelf. How many ounces of promethazine with codeine will be left after the prescription is filled?

    If she dispenses 8 ounces, as ordered, there will be no promethazine with codeine left after filling the prescription. Half of a 16-ounce bottle is 8 ounces.

14. **Rich Mann is trying to figure out how much medication to dispense for the following prescription:**

    Prednisone 1 mg/mL
    Disp: 10 day supply
    Sig: 3 mg (3 mL) p.o. daily

    How much prednisone will Rich dispense in order to provide 10 days' worth of medication?

    If 3 mg (3 mL) are given every day, then 3 mL/day × 10 days = 30 mL total needed.

15. **Jenny Jones, CPhT, prepares medications for patients who have been discharged from the hospital's surgery center. She receives an order for the following prescription:**

    Vicodin tablets
    Disp # XLVIII

    Jenny has only one bottle of 100 tablets left and has another prescription for 24 tablets. If she dispenses the Vicodin as ordered here, will she have enough left to fill the second prescription?

    XLVII = 48
    100 tablets – 48 tablets = 52 tablets
    She will have enough to fill both prescriptions.

Identify the error-prone prescription writing.

16, 17, 18. There are three examples of error-prone writing practices in the following prescription. Based on what you learned in this chapter, identify the problems and explain why they could be dangerous.

BEATRICE HEINZ, MD
1200 Du LacPlace
Lakeside, Minn

Name: Anne DeLong   Date: 1/1/19
Address: 1248 Saint Cloud Drive, Lakeside

Rx: Levothyroxine 125.0
      Disp: XXXX

Sig: One tablet P.O. daily

Refills: 0   1   2   3   *Beatrice Heinz* MD

16, 17, 18. *The prescription includes no units with the levothyroxine, which can lead to dose confusion. In addition, a trailing zero is included after 125. This creates opportunity for error, especially if the decimal point is inconspicuous. The roman numeral XXXX is an incorrectly written roman numeral. Did the physician intend to write 30, or intend for the patient to receive 40 tablets (XL)? This would require a telephone call for clarification before filling the prescription.*

19, 20. The pharmacy department receives the following drug order. Find the two error-prone writing practices in this order and explain why they are dangerous.

Morphine Sulfate 2 IV Q 2 h prn pain. If patient becomes overly sedated give Narcan .4 mg SC q 15 min prn excess sedation, up to 3 doses.

19, 20. *Units are not included in the morphine order and may cause confusion. Does the prescriber intend for the patient to receive 2 mg or 2 mL? In addition, the Narcan order requires a leading zero. Without it, the dose could be interpreted as 4 mg.*

CHAPTER 3

1. **Find the sum.**
   a. $3 + 9 = 12$
   b. $127 + 13 = 140$
   c. On Monday, Bill the pharmacy technician refers 19 customers to the pharmacist for prescription consultations, and technician Don refers 18 customers for consultations. Altogether, how many customers were seen for consultations on Monday?
       $19 + 18 = 37$ *patients*

2. **Find the difference.**
   a. $18 - 7 = 11$
   b. $256 - 34 = 222$
   c. The C. F. Eye Care Hospital had 100 bottles of artificial tears eye drops on the shelf. Fifty-nine bottles were removed because the expiration date had passed. How many bottles remained on the shelf?
       $100 - 59 = 41$ *bottles*

3. **Find the product.**
   a. $8 \times 7 = 56$
   b. $5 \times 8 \times 15 = 600$
   c. Dr. Dee Kay orders that two capsules of Zovirax 200 mg be administered 5 times daily for 14 days. How many capsules are needed?
       $2 \times 5 \times 14 = 140$ *capsules*

4. **Find the quotient.**
   a. $150 \div 25 = 6$
   b. $2\overline{)18} = 9$
   c. $\dfrac{14}{6} = 2\dfrac{1}{3}$ *or 2.33*

5. **Three hundred 250-mg tablets of vitamin C are to be distributed equally among 150 patients.**
   a. How many tablets will each patient receive? Will there be any tablets left over? If so, how many?
       $300 \div 150 = 2$ *tablets each, no leftovers*
   b. One thousand tablets are to be divided into prescription vials containing 30 tablets each. How many vials are needed? Will there be any tablets left over? If so, how many?
       $1000 \div 30 = 33$ *vials with 10 tablets left over*

6. **Simplify each fraction.**
   a. $\dfrac{3}{12} = \dfrac{1}{4}$
   b. $\dfrac{14}{42} = \dfrac{1}{3}$
   c. $\dfrac{8}{18} = \dfrac{4}{9}$

7. **Find the product. Write each product in its simplest form.**
   a. $\dfrac{2}{9} \times \dfrac{3}{4} = \dfrac{2 \times 3}{3 \times 3 \times 2 \times 2} = \dfrac{1}{6}$

b. $\dfrac{9}{28} \times \dfrac{14}{27} = \dfrac{3 \times 3 \times 2 \times 7}{2 \times 2 \times 7 \times 3 \times 3 \times 3} = \dfrac{1}{6}$

c. $\dfrac{3}{10} \times \dfrac{5}{6} = \dfrac{3 \times 5}{2 \times 5 \times 2 \times 3} = \dfrac{1}{4}$

8. **Find the quotient. Write each quotient in its simplest form.**

a. $\dfrac{2}{9} \div \dfrac{4}{3} = \dfrac{1}{6}$

b. $\dfrac{9}{10} \div \dfrac{6}{5} = \dfrac{3}{4}$

9. **Find the quotient. Write each quotient in its simplest form.**

a. $\dfrac{2}{27} \div \dfrac{4}{9} = \dfrac{2}{27} \times \dfrac{9}{4} = \dfrac{2 \times 3 \times 3}{3 \times 3 \times 3 \times 2 \times 2} = \dfrac{1}{6}$

b. Three-fourths of an ounce of hydrocortisone 1% is to be divided into three equal parts. How much will each part contain?

$\dfrac{3}{4} \div 3 = \dfrac{3}{4} \div \dfrac{3}{1} = \dfrac{3}{4} \times \dfrac{1}{3} = \dfrac{1}{4}$ *ounces*

10. **Find the sum or difference. Write each in the simplest form.**

a. $\dfrac{3}{8} + \dfrac{2}{8} = \dfrac{5}{8}$

b. $\dfrac{3}{4} - \dfrac{1}{4} = \dfrac{1}{2}$

c. $\dfrac{1}{9} + \dfrac{2}{9} = \dfrac{1}{3}$

d. $\dfrac{7}{8} - \dfrac{4}{8} = \dfrac{3}{8}$

e. $\dfrac{7}{10} - \dfrac{3}{10} = \dfrac{2}{5}$

11. **Find the sum or difference. Write each in its simplest form.**

a. LCD $= 12$, $\dfrac{2}{3} + \dfrac{1}{4} = \dfrac{2}{3} \times \dfrac{4}{4} + \dfrac{1}{4} \times \dfrac{3}{3} = \dfrac{8}{12} + \dfrac{3}{12} = \dfrac{11}{12}$

b. LCD $= 4$, $\dfrac{3}{4} + \dfrac{1}{8} = \dfrac{3}{4} \times \dfrac{2}{2} + \dfrac{1}{8} = \dfrac{6}{8} + \dfrac{1}{8} = \dfrac{7}{8}$

c. LCD $= 12$, $\dfrac{2}{3} - \dfrac{1}{12} = \dfrac{2}{3} \times \dfrac{4}{4} - \dfrac{1}{12} = \dfrac{8}{12} - \dfrac{1}{12} = \dfrac{7}{12}$

d. LCD $= 36$, $\dfrac{2}{9} + \dfrac{5}{12} = \dfrac{2}{9} \times \dfrac{4}{4} + \dfrac{5}{12} \times \dfrac{3}{3} = \dfrac{8}{36} + \dfrac{15}{36} = \dfrac{23}{36}$

e. LCD $= 45$, $\dfrac{8}{9} - \dfrac{2}{5} = \dfrac{8}{9} \times \dfrac{5}{5} - \dfrac{2}{5} \times \dfrac{9}{9} = \dfrac{40}{45} - \dfrac{18}{45} = \dfrac{22}{45}$

12. **Rewrite the mixed number as an improper fraction.**

a. $2\dfrac{3}{4} = \dfrac{11}{4}$

b. $9\dfrac{1}{8} = \dfrac{73}{8}$

c. $4\dfrac{2}{3} = \dfrac{14}{3}$

13. **Rewrite the improper fraction as a mixed number.**

a. $\dfrac{14}{3} = 14 \div 3$, so $\dfrac{14}{3} = 4\dfrac{2}{3}$

b. $\dfrac{21}{5} = 21 \div 5$, so $\dfrac{21}{5} = 4\dfrac{1}{5}$

c. $\dfrac{14}{9} = 14 \div 9$, so $\dfrac{14}{9} = 1\dfrac{5}{9}$

14. **Find the product.**

a. $2\dfrac{1}{3} \times \dfrac{3}{4} = 1\dfrac{3}{4}$

b. $4\dfrac{1}{2} \times 1\dfrac{1}{9} = 5$

c. $2\dfrac{2}{3} \times 1\dfrac{1}{4} = 3\dfrac{1}{3}$

15. **Find the quotient.**

a. $6\dfrac{2}{3} \div \dfrac{5}{3} = \dfrac{20}{3} \div \dfrac{5}{3} = \dfrac{20}{3} \times \dfrac{3}{5} = 4$

b. Three and one-half ounces of Robitussin DM is to be divided into portions that are one-fourth of an ounce each. How many portions will there be?

$3\dfrac{1}{2} \div \dfrac{1}{4} = \dfrac{7}{2} \div \dfrac{1}{4} = \dfrac{7}{2} \times \dfrac{4}{1} = 14$ *portions*

c. Two and one-half teaspoonfuls of amoxicillin suspension is to be given in two equally divided doses. How many teaspoonfuls will there be in each dose?

$2\dfrac{1}{2} \div 2 = \dfrac{5}{2} \div \dfrac{2}{1} = \dfrac{5}{2} \times \dfrac{1}{2} = \dfrac{5}{4} = 1\dfrac{1}{4}$ *teaspoonfuls*

16. **Find the sum.**

a. $3\dfrac{1}{6} + 1\dfrac{5}{8} = 4\dfrac{19}{24}$

b. Baby George is to be given two and one-half teaspoonfuls of prednisone 1 mg/mL each morning and one and one-fourth teaspoonfuls in the afternoon. How many teaspoonfuls of prednisone are to be taken each day?

$3\dfrac{3}{4}$ *teaspoonfuls*

17. **Rewrite the fraction as a decimal fraction.**

a. $\dfrac{3}{8} = 8\overline{)3.000}^{\,0.375}$

b. $\dfrac{9}{10} = 10\overline{)9.0}^{\,0.9}$

c. $\dfrac{4}{5} = 5\overline{)4.0}^{\,0.8}$

18. Dr. Denton prescribes one tablet of pseudo-ephedrine 60 mg to be taken twice daily for 1 month. How many tablets should be dispensed?

    60 tablets

19. Dr. Gohan N. Sumi directs patient Nora Maki to take one capsule of Augmentin XR 875 mg 2 times a day for 10 days. How many capsules should be dispensed?

    2 capsules/day × 10 days = 20 capsules

20. Mrs. Johnson is asked to give her daughter Pam three-fourths of a teaspoonful of Bactrim suspension 2 times a day for 14 days. The pharmacist fills the order with a bottle of 20 teaspoonfuls. Is this enough to last for 14 days?

    No, she needs 21 teaspoonfuls.

21. Wanda Hu gets three prescriptions filled every month. Although her insurance company provides prescription coverage, she pays a copay for each prescription. For her birth control tablets she pays $25.00, for her albuterol inhaler she pays $15.00, and for her Advair inhaler she pays $85.00 each month. What is the average copay Wanda pays?

    $25.00 + $15.00 + $85.00 = $125.00/3

    = $41.67

22. At the class picnic hot dog eating contest, the senior class representative eats 12 hot dogs in 15 minutes, while the junior class contestant can only manage 8 hot dogs in 15 minutes.

    a. Write the hot dog eating results for each class as a ratio of hot dogs/time, and reduce each to hot dogs per minute.
    Seniors: 12 hot dogs/15 minutes or 0.8 hot dogs per minute
    Juniors: 8 hot dogs/15 minutes or 0.53 hot dogs per minute

    b. Which class won the contest?
    Senior

23. Code Blue Insurance Company has granted approval for Wright Pharmacy to fill a 90-day supply of Evan Tooly's prescription. He takes two ibuprofen 400-mg tablets 3 times daily. How many tablets are needed to fill this prescription?

$$\frac{3 \times 2 \text{ tablets}}{\text{day}} \times 90 \text{ days} = 540 \text{ tablets}$$

24. Jon is returning to college and will not come home until fall break in 2 months. He has an inhaler that contains 200 metered doses. His doctor told him to take two inhalations twice daily. Does his inhaler contain enough doses to last until he returns home?

    2 inhalations × 2 per day = 4 metered doses per day

    4 metered doses × 60 days = 240 metered doses needed

    Therefore, no, one inhaler containing 200 metered doses will not last Jon until he returns home for fall break.

25. Complete the table.

Fraction	Decimal	Percent
1/2	0.5	50%
3/8	0.375	37.5%
3/4	*0.75*	75%
3/5	0.60	60%
1/4	0.25	25%
2/5	*0.40*	40%

26. To replenish required stock levels, a pharmacy technician needs to divide 2,000 g of zinc oxide ointment into several differently sized jars. Ten 60-g jars, eleven 90-g jars, and six 30-g jars are filled.

    a. What is the total amount of zinc oxide used to fill all the jars?
    10(60 g) + 11(90 g) + 6(30 g) = 600 g + 990 g + 180 g
    = 1770 g

    b. Write the ratio of the amount in the 60-g jars over the total amount of zinc oxide ointment used and reduce to the simplest form.

    $$600\,g/1770\,g = \frac{60}{177} = \frac{2 \times 2 \times \cancel{3} \times 5}{\cancel{3} \times 59} = 20/59$$

    c. Write the ratio determined in Part b as a decimal.
    20/59 = 0.34 when rounded to two decimal places

CHAPTER 4

1. **Which of the following are the correct fundamental units of length, weight, and volume in the metric system?**

   d. *Meter, gram, liter*

2. **Which of the following prefixes is equivalent to 1/1,000,000?**

   c. *Micro*

For questions 3–7, choose the most appropriate metric unit of length, weight, or volume from the following options: m, cm, L, mL, g, kg, or mg.

3. **A can of soda contains 12 oz (or approximately 355 *mL*) of liquid.**

4. **A paper clip weighs about 1 *g*.**

5. **Soda is sold in large bottles containing 2 *L* of liquid.**

6. **A baseball bat is approximately 1 *m* long.**

7. **The average adult male weighs 175 lb, or approximately 79.4 *kg*.**

8. **Rewrite the following numbers using arabic numerals and the appropriate abbreviation for the unit of measurement.**

   a. One hundred milliliters
      100 mL
   b. Three hundred thirty-four micrograms
      334 mcg
   c. One hundred ninety-eight centimeters
      198 cm
   d. Three hundred thirty-three milligrams
      333 mg
   e. Nine hundred fifty-five grams
      955 g
   f. Three kilograms
      3 kg

9. **Make the following conversions from one unit to another:**

   a. 1.8 g to milligrams
      1,800 mg
   b. 108 mg to micrograms
      108,000 mcg
   c. 500 g to kilograms
      0.5 kg
   d. 5,040 mcg to milligrams
      5.04 mg
   e. 278 mcg to grams
      0.000278 g
   f. 454 cm to meters
      4.54 m
   g. 2.67 m to centimeters
      267 cm
   h. 200 mL to liters
      0.2 L
   i. 4.17 L to milliliters
      4,170 mL

10. **Add 300 mL + 4 L + 1.5 L. Express answer in milliliters and in liters.**

    300 mL = 0.3 L
    0.3 L + 4 L + 1.5 L = 5.8 L
    5.8 L × 1,000 mL/L = 5,800 mL

11. **Add 12 mg + 3 g. Express answer in milligrams and in grams.**

    3,012 mg and 3.012 g

12. **Add 45.5 mg + 444 mcg. Express answer in milligrams and in micrograms.**

    444 mcg = 0.444 mg
    0.444 mg + 45.5 mg = 45.944 mg
    45.944 m̶g̶ × 1,000 mcg/m̶g̶ = 45,944 mcg

13. **Subtract 1.3 L – 500 mL. Express answer in liters and in milliliters.**

    0.8 L and 800 mL

14. **Subtract 3 g – 3,000 mg. Express answer in grams and in milligrams.**

    3,000 mg = 3 g
    3 g – 3 g = 0 g
    3,000 mg – 3,000 mg = 0 mg

15. **Subtract 2,500 mg – 1,000 mcg. Express answer in milligrams and in micrograms.**

    2,500 mg = 2,500,000 mcg
    2,500,000 mcg – 1,000 mcg = 2,499,000 mcg
    2,499,000 m̶c̶g̶ × 1 mg/1,000 m̶c̶g̶ = 2,499 mg

16. **Subtract 1 L – 75 mL. Express answer in liters and in milliliters.**

    75 mL = 0.075 L
    1 L – 0.075 L = 0.925 L
    0.925 Ⱡ × 1,000 mL/Ⱡ = 925 mL

17. **Use dimensional analysis to make the following conversions from one unit to another:**

    a. 1.33 kg = _____ mg

    1,330,000 mg

    b. 275 mL = _____ L

    0.275 L

    c. 100 cm = _____ m

    1 m

    d. 5,120 mcg = _____ g

    0.00512 g

18. **A local physician prescribes levothyroxine, which is a medication used to treat a disease called hypothyroidism. The prescription calls for levothyroxine 0.125-mg tablets, one tablet daily by mouth. Your pharmacy technician colleague fills the prescription using levothyroxine 125-mcg tablets. Use dimensional analysis to determine if the correct dose was dispensed.**

    0.125 mg × 1,000 mcg/mg = 125 mcg. This is the correct dose.

19. **Please make the following conversions from one unit to another:**

    a. 750 mcg = _____ mg

    0.75 mg

    b. 0.8 mg = _____ mcg

    800 mcg

    c. 2,326 mL = _____ L

    2.326 L

    d. 500,000 mg = _____ kg

    0.5 kg

CHAPTER 5

1. **Convert the following numeral volumes to milligrams:**

    a. 0.1 oz

    2,840 mg

    b. 1/8 gr

    8.1 mg (rounded)

2. **Convert numeral volumes to the units indicated in the first blank, then use that answer to complete the second conversion in each problem below.**

    a. 15 mL = 1/2 fl oz = 3 tsp

    15 mL = 1/2 fl oz (30 mL/oz)
    15 mL × 1 tsp/5 mL = 3 tsp

    b. 1 pt = 480 mL = 0.48 L

    16 oz/pt × 30 mL/oz = 480 mL
    480 mL × 1 L/1,000 mL = 0.48 L

    c. 1/2 pt = 1/4 qt = 0.24 L

    1 qt/2 pt × 1/2 pt = 1/4 qt
    1/4 qt × 960 mL/qt × 1 L/1,000 mL = 0.24 L

    d. 0.25 L = 250 mL = 8.3 fl oz

    0.25 L × 1,000 mL/L = 250 mL
    250 mL × 1 fl oz/30 mL = 8.3 fl oz

3. **Convert the following numeral volumes to grams:**

    a. 0.5 oz

    14.2 g

    b. 3/8 lb

    170.3 g

    c. 1.5 oz

    42.6 g

4. **Number the following measurements in order from 1 to 6, from smallest to largest volume:**

    Solution: Convert each quantity to mL and compare.

    a. Liter

    1,000 mL

    6

    b. Fluid ounce

    30 mL

    3

    c. Tablespoon

    15 mL

    2

    d. Milliliter

    1 mL

    1

    e. Pint

    480 mL

    4

    f. Quart

    960 mL

    5

5. **Convert the following numeral volumes to milliliters:**

    a. 2 fl dr

    8 mL

    b. 4 fl oz

    120 mL

    c. 2 qt

    1,920 mL

    d. 12 fl oz

    360 mL

e. 2 T
    30 mL

f. 1.5 tsp
    7.5 mL

6. **Convert the following numeral volumes as indicated in the problem:**

    a. 1.25 L
        1.3 qt
        1.25 L × 1,000 mL/L × 1 qt/960 mL = 1.3 qt

    b. 8 fl oz
        240 mL
        30 mL/fl oz × 8 fl oz = 240 mL

    c. 20 mL
        4 tsp
        20 mL × 1 tsp/5 mL = 4 tsp

    d. 180 mL
        6 fl oz
        180 mL × 1 fl oz/30 mL = 6 fl oz

7. **Number the following weights in order from 1 to 6, from smallest to largest:**

    a. 10,000 mcg
        2

    b. 1 mg
        1

    c. 5 gr
        3

    d. 0.9 g
        4

    e. 1 oz
        5

    f. 1/2 lb
        6

8. **Change the following numeral volumes to milligrams:**

    a. 0.4 lb
        0.4 lb × 454 g/lb × 1,000 mg/g = 181,600 mg

    b. 1.1 kg
        1.1 kg × 1,000 g/kg × 1,000 mg/g = 1,100,000 mg

    c. 8 oz
        8 oz × 28.4 g/oz × 1,000 mg/g = 227,200 mg

    d. 20 gr
        20 gr × 1 g/15.4 gr × 1,000 mg/g = 1,299 mg

9. **Convert the following body weights as indicated in the problem and round to the nearest tenth:**

    a. Newborn: 10.3 lb
        4.7 kg

    b. 1 year old: 21 lb
        9.5 kg

    c. 5 year old: 21.8 kg
        48 lb

    d. 18 year old: 77.6 kg
        170.7 lb

    e. 26 year old: 135 lb
        61.4 kg

    f. 35 year old: 264.5 lb
        120.2 kg

10. **Theresa Jones receives an order for a medication in suspension form. The order calls for 240 mL of the suspension to be dispensed. Theresa needs to select a prescription bottle for dispensing the medication. The bottles are sorted by volume in fluid ounces. What size bottle should Theresa pull from the shelf to prepare the prescription?**

    Theresa should pull an 8-fl-oz bottle from the shelf. Given that 1 fl oz = 30 mL (approximately), an 8-fl-oz bottle would be required to prepare a 240-mL suspension.

11. **Sara James is a 34-year-old woman with an acute infection of the kidneys. The hospital-based physician orders tobramycin 2 mg/kg as a one-time loading dose and requests pharmacist-managed dosing after that. The first dose must be calculated to prepare this medication. Sara weighs 145 lb.**

    a. **What is Sara's weight in kilograms (rounded to the nearest kilogram)?**
        145 lb × 1 kg/2.2 lb = 66 kg

    b. **How much tobramycin will Sara receive in the first dose (rounded to the nearest 10 mg)?**
        130 mg

    c. **Tobramycin solution contains 40 mg in 1 mL. How much tobramycin solution is required to make the dose calculated in Part B?**
        3.25 mL

12. **The technician at R$_x$ Pharmacy receives a new prescription from Mrs. Jones and checks the electronic patient profile to verify that the patient information is complete. Patients typically relay their weight in pounds to the pharmacy. Pharmacy technicians then must calculate the weight in kilograms. The patient information record indicates that Mrs. Jones weighs 113 lb or 249 kg. What is wrong with this information and how might the error have occurred?**

    The person who did the calculation multiplied pounds × 2.2 lb/kg instead of dividing. Mrs. Jones actually weighs 51.4 kg.

For problems 13–15, calculate the amount required per the drug orders.

13. **Amoxicillin 20 mg/kg/dose is ordered for James Town. James is 3 years old and weighs 30 lb. How much amoxicillin per dose will he receive?**

    273 mg, likely rounded to 275 mg

14. **A veterinarian ordered furosemide 2 mg/kg twice a day for Les Waters' dog, which has heart failure. The weight will subsequently need to be rounded to the nearest kilogram.**

    a. Les' dog weighs 45 lb. How much will the dog receive in one dose?
    45 lb × 1 kg/2.2 lb = 20 kg (rounded) × 2 mg/kg = 40 mg

    b. Les' prescription indicates that the furosemide solution contains 10 mg/mL. What volume will he need to measure for one dose?
    40 mg × 1 mL/10 mg = 4 mL

15. **April Schauer has a fever. Her mother states that the pediatrician ordered acetaminophen 20 mg/kg of body weight for her first dose, and then acetaminophen 15 mg/kg every 6 hours after that while her oral temperature is 100°F or more. April weighs 66 lb.**

    April weighs 30 kg

    a. How much acetaminophen should April's mother give her for the first dose?
    20 mg/kg × 30 kg = 600 mg

    b. What should April's subsequent acetaminophen doses be?
    15 mg/kg × 30 kg = 450 mg

16. **A physician orders nitroglycerin 1/150 gr to be placed under the tongue for chest pain. The pharmacy carries nitroglycerin in 0.4-mg and 0.6-mg tablets. Which tablet is correct for this order? (Note: Pharmaceutical companies that make nitroglycerin assume 60 mg = 1 gr.)**

    1/150 gr = 0.007 gr
    65 mg/1 gr = x/0.007 gr
    x = 0.45 mg
    The 0.4-mg tablet is the correct choice.

17. **Convert the following measurements as indicated:**

    a. 1 T
    15 mL

    b. 1 tsp
    5 mL

    c. 2.5 L
    5.2 pt

    d. 500 mL
    16.7 fl oz

18. **In 1 week during flu season, the pharmacy where you work received six different prescriptions for Hycodan cough syrup, including two prescriptions for 4 fl oz, one prescription for 240 mL, one prescription for 180 mL, one prescription for 120 mL, and one prescription for 6 fl oz.**

    a. What is the total number of fluid ounces of Hycodan dispensed that week?
    (2 × 4 fl oz) + 6 fl oz = 14 fl oz
    240 mL + 180 mL + 120 mL = 540 mL
    540 mL × 1 oz/30 mL = 18 fl oz
    14 fl oz + 18 fl oz = 32 fl oz dispensed

    b. How many milliliters of Hycodan were dispensed that week?
    32 fl oz × 30 mL/fl oz = 960 mL

19. **A full bottle of nitroglycerin 0.6 mg contains 25 sublingual tablets. How many grains of nitroglycerin are in a full bottle?**

    0.6 mg/tablet × 25 tablets = 15 mg nitroglycerin in one bottle

    15 mg × 1 gr/65 mg = 0.23 gr per bottle of 0.6 mg nitroglycerin

20. **Dr. Ole Mann still orders acetaminophen with codeine the old-fashioned way. Using the conversion formula provided in this text, how many milligrams of codeine should be in each tablet of the strengths listed below?**

    a. Tylenol with codeine 1/4 gr
    1/4 gr × 65 mg/gr = 16.25 mg

    b. Tylenol with codeine 1/2 gr
    1/2 gr × 65 mg/gr = 32.5 mg

    c. Tylenol with codeine 1 gr
    1 gr = 65 mg

21. **A prescription is written with the following directions: Take 1 1/2 tsp by mouth four times a day. How many fluid ounces must be dispensed to last 8 days for this prescription?**

    1 1/2 tsp = 7.5 mL
    7.5 mL × 4 times/day = 30 mL/day
    30 mL/day × 8 days = 240 mL needed for 8 days
    240 mL = 8 fl oz

22. **A prescription is written with the following directions: Take 2 tsp by mouth daily for 10 days. How many milliliters must be dispensed to satisfy the full therapy for this prescription?**

    2 tsp = 10 mL needed per day
    10 mL × 10 days = 100 mL must be dispensed

CHAPTER 6

1. **Dr. Payne orders penicillin G, 5 million units intravenous piggyback (IVPB) to be given to a patient at 2300 and every 4 hours thereafter throughout the day. At what times on a 12-hour clock should the penicillin IVPB be given?**

   2300 is 11:00 p.m. Therefore, medication should be given at 11:00 p.m., 3:00 a.m., 7:00 a.m., 11:00 a.m., 3:00 p.m., and 7:00 p.m.

2. **Patient Joe Kerr is in the emergency room for chest pain and reports taking nitroglycerin 0.4 mg sublingually at 11:45 p.m. and again at 12:15 a.m. Convert these times to military time.**

   2345 and 0015, respectively

3. **The records indicate that patient Leigh King was admitted to the hospital at 1600. What time is this on a 12-hour clock?**

   1600 − 1200 = 4:00 p.m.

4. **A patient is to be given KCl 20 mEq IVPB at 1300, 1700, and 2100. The medication was administered at 1:00 p.m., 7:00 p.m., and 11:00 p.m. Was the medication given at the correct times?**

   The first dose was given at the correct time; the second should have been given at 5:00 p.m. and the third at 9:00 p.m.

5. **Patient Ann Teac is to be given furosemide 20 mg PO at 2100 and every 6 hours thereafter for 24 hours. At what military times should the furosemide be given?**

   2100 is 9:00 p.m. (first dose). Subsequent doses should be given at 0300 (3:00 a.m.), 0900 (9:00 a.m.), 1500 (3:00 p.m.), and at 2100 (9:00 p.m.).

6. **Normal body temperature, measured orally, is 98.6°F. Convert this temperature to degrees centigrade.**

   37°C

7. **Normal body temperature, measured in the ear canal, is 37.6°C. Convert this temperature to degrees Fahrenheit.**

   °F = (1.8)°C + 32 = 37.6(1.8) + 32 = 99.7°F

8. **The average temperature of lava ranges between 1,300°F and 2,200°F. Convert this range to degrees centigrade.**

   Between 704°C and 1,204°C

9. **Water droplets in clouds are often supercooled; that is, they remain liquid at temperatures below the usual freezing point. A cloud droplet freezes as soon as its temperature drops below −40°C. Convert this temperature to degrees Fahrenheit.**

   °F = −40(1.8) + 32 = −40°F

10. **Plateau Station, Antarctica, recorded a temperature of −86.2°C on July 20, 1968. Convert this temperature to degrees Fahrenheit.**

    −123.2°F

11. **Mannitol may crystallize if exposed to temperatures of less than 20°C. Convert this temperature to degrees Fahrenheit.**

    68°F

12. **Glucagon should be stored at controlled room temperature between 20°C and 25°C. In what Fahrenheit temperature range should glucagon be stored?**

    Between 68°F and 77°F

13. **Diltiazem should be stored at 77°F but will tolerate temperatures between 59°F and 86°F for brief periods of transport. Convert this temperature range to degrees centigrade.**

    °C = (59 − 32)/1.8 = (27)/1.8 = 15°C
    (86 − 32)/1.8 = (54)/1.8 = 30°C
    Between 15°C and 30°C

14. **Some medications should be stored in a freezer in which the temperature can range from −4°F to 14°F. Convert this temperature range to degrees centigrade.**

    −20°C and −10°C

15. **Some laboratory specimens must be stored in a freezer in which the temperature ranges from −32°C to −26°C. Convert this temperature range**

to degrees Fahrenheit. Round to the nearest degree.

°F = 1.8(–32) + 32 = –26°F
°F = 1.8(–26) + 32 = –15°F
Between –26°F and –15°F when rounded

16. **Varivax (varicella virus) vaccine should be stored between –15°C and –50°C. The pharmacy freezer reads –10°F. Is this temperature within proper range?**

    Yes, that would be a temperature of –23°C.

17. **On January 16, 2009, the temperature at Big Black River in Maine was –50°F. Convert this temperature to degrees centigrade.**

    °C = (–50) – 32/1.8 = –46°C

18. **In Tipton, Oklahoma, the temperature was 120°F on June 27, 1994. Convert this temperature to degrees centigrade.**

    49°C

19. **Before it is opened, injectable insulin should be stored at 2°C to 8°C. Should it be stored in the refrigerator, in the freezer, or at room temperature?**

    °F = 1.8(2) + 32 = 36°F
    °F = 1.8(8) + 32 = 46°F
    Refrigerator temperatures range from 36°F to 46°F; therefore, the medication should be refrigerated.

20. **To maintain potency, Zostavax (zoster vaccine) should be stored between –58°F and 5°F. Convert this temperature range to degrees centigrade.**

    –50°C and –15°C

CHAPTER 7

1. **List eight pieces of information required on a prescription.**

   Patient name and address
   Name, formulation, and strength of the medication
   Quantity of the medication to dispense
   Directions to the patient (route of administration, frequency of administration)
   Date written (time in institutional setting, if applicable)
   Prescriber name and address
   Prescriber signature
   Prescriber license classification

2. **Write the meaning of the following abbreviations used in compounding:**

   a. **qs**
      a sufficient quantity
   b. **ad**
      up to
   c. **aa**
      of each

3. **Write the meaning of the following routes of administration:**

   a. **p.o.**
      by mouth
   b. **IVP**
      IV push
   c. **IM**
      intramuscular
   d. **Top.**
      topical

4. **Decode the following prescription directions and write a simple sentence in English as it would appear on a label.**

   a. **i tab p.o. b.i.d.**
      Take one (1) tablet by mouth two times a day.
   b. **ii caps p.o. q6h × 7 days**
      Take two (2) capsules by mouth every 6 hours for 7 days.
   c. **Lantus insulin 100 units/mL**
      sig: 20 units sc qAM
      Inject 20 units (0.2 mL) under the skin every morning.
   d. **Cortisporin Otic gtts disp: 15 mL**
      sig: gtts iii a.s. t.i.d. × 5 d. Place cotton in L canal P̄ gtts.
      Instill three (3) drops into the left ear three times a day for 5 days. Place cotton in the left ear canal after the drops.

5. **Check the following DEA numbers to see if they meet the test for validity. Indicate why you think they could be valid or are invalid.**

   a. **Wilma Ruth, MD, DEA Registration # AR1234563**
      1. 1 + 3 + 5 = 9   2. 2 + 4 + 6 = 12
      3. 2 × 12 = 24   4. 24 + 9 = 33
      Could be valid
   b. **Daniel Bones, MD, DEA Registration # BB2754388**
      1. 2 + 5 + 3 = 10   2. 7 + 4 + 8 = 19
      3. 2 × 19 = 38   4. 38 + 10 = 48
      Could be valid

c.   Rebecca Darling, DVM, DEA Registration
BD5704386

1. 5 + 0 + 3 = 8	2. 7 + 4 + 8 = 19
3. 19 × 2 = 38	4. 38 + 8 = 46

Could be valid

6. **A prescription for Tylenol with codeine liquid for Jonathan Jameson, who broke his leg, instructs him to take 15 mL every 4 hours if needed for pain. The physician wants the pharmacy to dispense a 5-day supply. How much should the pharmacy dispense? Assume Jonathan takes the medication as ordered around the clock.**

If Jonathan takes as many doses as possible, he will receive 6 doses per day.

$$\frac{24\,h\,/\,day}{4h} = 6\ doses\ per\ day$$

Each dose is 15 mL. 6 doses × 15 mL = 90 mL/day × 5 days = 450 mL

7. **Write the abbreviations that correspond to the following words or phrases:**

a.   capsule
cap

b.   suspension
susp.

c.   after meals
p.c.

d.   twice a day
BID

e.   as directed
u.d.

f.   no known allergies
NKA

8. **Lantus insulin contains 100 units per milliliter and is sold in a 10-mL vial. If a patient injects 15 units (0.15 mL) qhs, at what time of day will he or she be administering the insulin?**

At bedtime.

How much insulin will the patient use in 1 week?

He or she will use 105 units or 1.05 mL.

9. **Lantus insulin expires 28 days after a vial is opened. If the patient in Problem 8 uses his or her insulin as ordered, how much will be left in the vial after 28 days?**

0.15 mL/day × 28 days = 4.2 mL used
10 mL − 4.2 mL = 5.8 mL remaining

10. **What information is needed before you can fill the following prescription?**

Dan Kashain, M.D.
1689 South Court Street, Visalia, CA

Name: Carter Moss   Date: 2/29/21
Address: 15510 Ave 313, Visalia, CA

Rx: Azithromycin 250 mg/5 mL

Sig: i tsp q 6

Refills: - 0-   Dan Kashain   M.D.

The following information is missing from this prescription: the volume to be dispensed, the route of administration (it is safe to assume that it is to be given by mouth because it is ordered as a teaspoonful), and the duration of therapy.

11. **Write out the directions listed below completely as you would type them on a prescription label.**

a.   ii gtts o.s. qid while awake
Instill two (2) drops in the left eye four times a day while awake.

b.   15 mL p.o. q4h prn cough or congestion
Take one (1) tablespoonful (15 mL) by mouth every 4 hours as needed for cough or congestion.

c.   i tab sl q5 min × 3 prn chest pain
Place one (1) tablet under the tongue as needed for chest pain. May repeat every five (5) minutes for a total of 3 doses if chest pain persists.

d.   caps ii p.o. B.I.D. for blood pressure
Take two (2) capsules by mouth twice a day for blood pressure.

12. **Write the meaning of the following abbreviations:**

a.   oz
ounce

b.   AC and HS
before meals and at bedtime

c.   q8h
every eight (8) hours

d.   prn
as needed

e.   au
both ears

f.   qs
a sufficient quantity

13. **Calculate the number of tablets needed to fill the following prescription:**

Rx: Azithromycin 250-mg tablets
Disp: 5 days' supply

Sig: tabs ii now, then i tab daily
2 (now) + (1 tab/day × 4 d) = 6 tablets

14. **To answer the following questions, refer to this drug order: Vancomycin 1 g IVPB Q12h × 6 wk for osteomyelitis.**

    a. **How many IVPB doses will the patient receive daily?**
    Every 12 hours = 2 doses per day

    b. **How many doses will the patient receive over the entire course of therapy?**
    2 doses/day × 7 days/week × 6 weeks = 84 doses

15. **The following prescription for amoxicillin suspension for a child with an acute middle ear infection is received:**

    Amoxicillin susp. 400 mg/5 mL
    320 mg (4 mL) Q8H × 7 days

    Amoxicillin 400 mg/5 mL for suspension is available in 50 mL, 75 mL, and 100 mL bottles. Which size will be dispensed?

    4 mL/dose × 3 doses/day = 12 mL/day
    12 mL/day × 7 days = 84 mL; therefore, the 100-mL bottle is necessary

16. **The automated dispensing cabinet in the ICU needs to be filled with enough hydromorphone 1-mg vials to last the next 24 hours. Three patients in the unit have the following orders:**

    Patient A: Hydromorphone 1 mg Q4H prn moderate pain
    Patient B: Hydromorphone 1 mg Q2H prn moderate to severe pain
    Patient C: Hydromorphone 0.5 mg Q3H for pain
    Assume that each patient will take the maximum dose allowed. There are 12 vials available in the unit. Partial vials cannot be saved for another dose.

    a. **How many total vials are needed for 24 hours?**
    26; Patient A needs 6 vials, Patient B needs 12 vials and Patient C needs 8 vials to last for one 24 hour period.

    b. **How many more hydromorphone vials will you need to add to last 24 hours?**
    26 – 12 = 14

17. **For each of the sigs given below, state how many doses the patient will receive in 1 d.**

    a. **Q2h**
    24 hr/day × 1 dose/2 hr = 12 doses/day

    b. **TID**
    3 doses/day

    c. **Q8h**
    24 hr/day × 1 dose/8 hr = 3 doses/day

    d. **Q4h**
    24 hr/day × 1 dose/4 hr = 6 doses/day

    e. **BID**
    2 doses/day

    f. **Q6h**
    24 hr/day × 1 dose/6 hr = 4 doses/day

18. **How many tablets or capsules will be dispensed with each of the following prescriptions:**

    a. **Tetracycline 250-mg capsules, one BID for acne**
    disp: 1 month's supply
    2 doses/day × 30 days = 60 capsules

    b. **Lomotil tabs, q3h prn diarrhea, max 6/days**
    disp: 1 week's supply
    6 tablets/day × 7 days = 42 tablets

19. **For each of the past 4 weeks, the usage of Vicodin tablets from an automated dispensing cabinet is as follows:**

    Week 1: 86 tablets; Week 3: 93 tablets

    Week 2: 120 tablets; Week 4: 112 tablets

    a. **How many Vicodin tablets are used in an average week?**
    103 (rounded)

    b. **The current tablet count in the drawer is 7 tablets, and the maximum for the drawer is 125 tablets. How many tablets should be added to reach the maximum?**
    125 – 7 = 118 tablets

20. **Calculate the days' supply for the following prescriptions:**

    a. **R_x: Fluticasone propionate HFA 110 mcg**
    Sig: Inhale two (2) puffs by mouth twice a day
    Disp: 12 g (120 metered dose actuations)
    Total quantity dispensed = 120 puffs (metered dose acutations)
    2 puffs/dose × 2 doses/day (BID) = 4 puffs per day
    Days' supply = 120 puffs/4 puffs per day = 30 days' supply

    b. **Metoprolol tartrate 50-mg tabs**
    Sig: Take one (1) tablet by mouth twice a day
    Disp: 180 tabs
    Total quantity dispensed = 180 tabs
    1 tab/dose × 2 doses/day (BID) = 2 tabs per day
    Days' supply = 180 tabs/2 tabs per day = 90 days' supply

c. Humulin R U-100 (100 units/mL)
    Sig: Inject 0.3 mL (30 units total) under the skin
    before meals
    Disp: 2 10-mL vials
    Total quantity dispensed = 20 mL (2 10-mL vials)
    0.3 mL/dose × 3 doses/day (ac) = 0.9 mL per day
    Days' supply = 20 mL/0.9 mL per day = 22 days' supply
    (rounded)

21. **A prescription is written for an amoxicillin suspension 250 mg/5 mL; 1 tsp p.o. b.i.d., dispense 150 mL. What is the days' supply?**

    Total quantity dispensed = 150 mL
    5 mL/dose (1 tsp) × 2 doses per day = 10 mL per day
    Days' supply = 150 mL/10 mL per day = 15 days' supply

CHAPTER 8

1. $\dfrac{1}{10}x = 25$

   $\dfrac{1}{10}x = 25$

   $10 \times \dfrac{1}{10}x = 10 \times 25$

   $x = 250$

2. **0.1x = 20**

   $x = 200$

3. **12x = 144**

   $x = 12$

4. **x − 16 = 444**

   $x = 460$

5. **30x + 15 = 615**

   $30x + 15 = 615$
   $30x + 15 − 15 = 615 − 15$
   $30x = 600$
   $x = 20$

Identify the unknown (define the variable) in the following situations:

6. **A pharmacist wants to know how many individual prescriptions, each containing 30 amoxicillin 500-mg capsules, can be filled with the current supply on the shelf. Upon checking, you discover that the pharmacy has a supply of 4,322 amoxicillin**

500-mg capsules. How many prescriptions, each containing 30 capsules, can be dispensed?

Let x equal the number of individual prescriptions that can be dispensed.

7. **A prescription calls for levofloxacin 500 mg PO once daily for 10 days. Unfortunately, the pharmacy only has levofloxacin 250-mg tablets to dispense. How many 250-mg levofloxacin tablets are needed to fill this prescription?**

Let x equal the number of 250-mg tablets needed to fill the 10-day prescription.

8. **A prescription calls for diazepam 5 mg to be taken twice daily. How many grams of diazepam will the patient take in 30 days?**

Let x equal the number of grams of diazepam the patient will take in 30 days.

9. **A prescription calls for furosemide 20 mg to be given four times daily for 7 days. How many milligrams of furosemide will the patient take in 7 days?**

Let x equal the number of milligrams of furosemide the patient will take in 7 days.

10. **A prescription calls for metformin 500 mg to be taken twice daily with meals. How many milligrams of metformin will the patient take in 30 days?**

Let x equal the number of milligrams of metformin the patient will take in 30 days.

Identify the unknown (define the variable) in the following situations. Make an estimate of the answer.

11. **A prescription for risperidone 1 mg calls for one tablet two times daily for 1 day, then two tablets twice daily for 1 day, and then three tablets twice daily for 7 days. How many tablets are needed to fill the prescription?**

Let x equal the number of tablets needed to fill the prescription. Estimate 45 to 50 tablets (3 tablets twice a day = 6 per day for 7 days plus extras).

12. **Tetracycline is available in 250-mg capsules. A prescription calls for two capsules four times daily for 10 days and then one capsule four times daily for 20 days. How many milligrams of tetracycline will the patient ingest over 30 days?**

Let x equal the number of milligrams of tetracycline taken over 30 days. Estimate 50,000 mg.

13. A patient is prescribed sertraline 50 mg once daily for days 1 to 7, 75 mg once daily for days 8 to 14, and 100 mg thereafter. The patient requests that a 30-day supply of 25-mg tablets be dispensed. How many 25-mg tablets are necessary to complete this prescription?

    Let x equal the number of 25-mg sertraline tablets dispensed. By estimating two tablets for 7 days, three tablets for 7 days, and four tablets for 16 days, approximately 100 sertraline 25-mg tablets are needed.

14. A pharmacy stocks 150 bottles of multivitamins on the shelf. During your weekly quality and outdating check, you discover that two-thirds of these bottles expire the next day and must be removed/discarded. How many bottles of multivitamins remain on the shelf?

    Let x equal the number of bottles that remain after two-thirds are removed. Estimate 50.

15. A prescription calls for a total volume of 250 mL. Of the 250 mL, 25% is active ingredient, 10% is flavoring syrup, and the remaining 65% is water. What are the individual volumes of the active ingredient, the flavoring syrup, and the water in milliliters?

    Let x equal the number of milliliters of active ingredient. Estimate 60 mL (25% of 250 mL).

    Let y equal the number of milliliters of flavoring syrup. Estimate 25 mL (10% of 250 mL).

    Let z equal the number of milliliters of water. Estimate 250 mL – 60 mL (active ingredient) – 25 mL (flavoring syrup) = 165 mL of water.

Identify the unknown (define the variable) in the following situations. Make an estimate of the answer, translate the situation to an equation, solve the equation, and check the solution against your original estimate for reasonableness.

16. A pharmacy stocks 720 tablets on the shelf. Two-thirds of these tablets are used to fill prescriptions. How many tablets remain?

    240 tablets

17. The pharmacist asks you to compound three different strengths of a capsule in your specialty pharmacy. You have 2 g of active ingredient available and need to prepare the following compounds:

8 capsules each containing 0.0325 g

12 capsules each containing 0.015 g

18 capsules each containing 0.0008 g

Do you have enough active ingredient to prepare all the capsules? If so, how many grams of active ingredient are left after you prepare all the capsules?

Let x equal the number of grams of active ingredient that are left.

$x = 2 – 8(0.0325) – 12(0.015) – 18(0.0008)$

$x = 1.5456$ g

Yes, you have enough active ingredient to prepare all the capsules. There will be approximately 1.5 grams of active ingredient remaining.

18. A 45-g tube of anti-itch cream contains 1% diphenhydramine hydrochloride. How many grams of the diphenhydramine hydrochloride does the tube contain?

    0.45 g diphenhydramine hydrochloride

19. Zyrtec is available in scored 10-mg tablets. A patient takes 5 mg daily for 30 days. How many tablets are needed to fill the prescription?

    Let x equal the number of 10-mg Zyrtec tablets.

    $$x = \frac{5\ mg}{day} \times \frac{\frac{1}{2}\ tablet}{5\ mg} \times 30\ days = 15\ tablets$$

20. A patient is prescribed one 37.5-mg Effexor tablet twice daily for 14 days.

    a. How many tablets are taken during the 14 days?
       28 tablets
    b. How many milligrams of Effexor are taken during the 14 days?
       1,050 mg

21. A patient at the pharmacy states that his healthcare provider recommends acetaminophen for treatment of moderate pain. The patient was instructed to take 1,000 mg of acetaminophen every 6 hours as needed for pain, not to exceed 4,000 mg daily. Over-the-counter acetaminophen is available in 500-mg tablets, and the patient hopes to have enough tablets on hand for a maximum of 5 days of treatment. What is the minimum number of acetaminophen 500-mg tablets that this patient should buy?

    Let x equal the number of acetaminophen tablets needed for 5 days.

$x = (1{,}000\ mg \times 4\ times\ daily \times 5\ days\ of\ treatment)/$
500-mg tablets

$x = (4{,}000\ mg \times 5\ days)/500\text{-}mg\ tablets$

$x = \dfrac{20{,}000\ mg}{500\ mg\ /\ tablet} = 40\ tablets$

The patient must buy a bottle of acetaminophen 500 mg that contains a minimum of 40 tablets.

22. **A patient is prescribed warfarin 5 mg once daily for three months (90 days). How many milligrams of warfarin does the patient take in 3 months?**

    Let x equal the number of milligrams of warfarin taken in 3 months.

    $x = (5\ mg/day)(90\ days)$

    $x = 450\ mg$

    The patient takes 450 mg of warfarin in 3 months.

CHAPTER 9

1. **Write the following statements as ratios:**
   a. Many potato salad recipes call for 6 c of peeled and chopped potatoes for 8 servings of potato salad.
      6 c potatoes/8 servings
   b. Jennifer drives 475 miles on 10.5 gal of gas in her new Prius.
      475 miles/10.5 gal
   c. Mylanta suspension costs $6.99 for 12 oz.
      $6.99/12 oz
   d. There are 900 cal in a double cheeseburger.
      900 cal/1 double cheeseburger

2. **Write the following statements as ratios, using a colon to separate the values:**
   a. 1 g per 10,000 mL
      1:10,000
   b. 3 g per 100 mL
      3:100
   c. 1 part of vinegar to 3 parts of olive oil
      1:3

3. **Write the following ratios as fractions:**
   a. 3:4
      3/4
   b. 1:10
      1/10
   c. 9:1,000
      9/1,000
   d. 2:3
      2/3

4. **Write the following dosage strengths as ratios:**
   a. Tetracycline 250-mg capsule
      Tetracycline 250 mg/cap
   b. Phenobarbital 20 mg per 5 mL
      Phenobarbital 20 mg/5 mL
   c. Amikacin 250 mg per milliliter
      Amikacin 250 mg/mL
   d. Enalapril 10-mg tablet
      Enalapril 10 mg/tab

5. **On the following drug labels, find the drug strength per milliliter:**

   a.

   Source: Reprinted with permission of Hospira, Inc.
   20 mg/mL

   b.

   Source: Reprinted with permission of Pfizer, Inc.
   40 mg/mL

6. **When solving a ratio and proportion equation, make sure the _____ are the same in the numerator and denominator of each ratio.**

   units

7. **A vial of furosemide for injection contains 40 mg/4 mL. What volume of furosemide for injection contains 10 mg?**

   40 mg/4 mL = 10 mg/x

   x = 1 mL

8. **A pharmacy technician needs to make a vancomycin 500-mg IVPB bag. When reconstituted, the vancomycin vial will contain 1 g/10 mL. What**

volume of reconstituted vancomycin solution must the pharmacy technician draw up in the syringe to add the required 500-mg dose?

1 g/10 mL = 0.5 g/x
x = 5 mL

9. Epinephrine is available in a 1:1,000 solution and a 1:10,000 solution.

   a. Which product contains more epinephrine per milliliter?
   1:1,000 means 1 g/1,000 mL and 1:10,000 means 1 g/10,000 mL, so 1:1,000 contains more epinephrine per milliliter.

   b. How many milligrams of epinephrine are in 10 mL of a 1:10,000 solution?
   Because 1 g = 1,000 mg, 1,000 mg/10,000 mL = x/10 mL
   x = 1 mg

10. An IVPB order calls for amikacin 350 mg. The pharmacy stocks 500-mg vials that contain 2 mL. What volume of this solution will provide the needed 350 mg?

    1.4 mL

11. The pharmacy in the pediatrics clinic carries erythromycin ethylsuccinate suspension in a concentration of 400 mg/5 mL. Dr. Darlene Bebe orders a dose of 300 mg q 6 hr and wants a 10-day supply for her patient.

    a. What volume of the suspension contains 300 mg erythromycin ethylsuccinate?
    400 mg/5 mL = 300 mg/x
    x = 3.75 mL

    b. Should the pharmacy dispense the 100-mL bottle or the 200-mL bottle to provide enough medication for 10 days?
    24 hr/day × 1 dose/6 hr = 4 doses/day
    3.75 mL/dose × 4 doses/day = 15 mL/day or 150 mL in 10 days
    Dispense the 200-mL bottle

12. Normal saline solution contains 0.9 g sodium chloride in 100 mL. How much sodium chloride is contained in 250 mL normal saline?

    2.25 g sodium chloride in 250 mL normal saline

13. Phenytoin oral suspension contains 125 mg of the drug in 5 mL. The physician orders 250 mg to be given every 12 hours.

    a. What volume of the suspension will the patient receive per dose?

125 mg/5 mL = 250 mg/x
x = 10 mL

    b. When taken according to the directions, how many milliliters will the patient receive in a day?
    10 mL/dose × 2 doses/day = 20 mL/day

    c. How long will an 8-fl-oz bottle last?
    240 mL/bottle × 1 day/20 mL = 12 days/bottle

14. Solve the following proportion equations:

    a. 1:10,000:: 5:*x*
    Read 1 is to 10,000 as 5 is to x. Equation may be rewritten 1/10,000 = 5/x, or solved as follows: 1(x) = 5 (10,000)
    x = 50,000

    b. 1 g/10 mL = *x*/350 mL
    x (10 mL) = 1 g (350 mL)
    x = 35 g

    c. 500 mcg/2 mL = 750 mcg/*x*
    x (500 mcg) = 750 mcg (2 mL)
    x = 3 mL

    d. 3:18:: *x*:162
    3 (162) = 18 (x)
    x = 27

    e. 100 units/1 mL = 15 units/*x*
    x (100 units) = 15 units (1 mL)
    x = 0.15 mL

    f. 100 mg/*x* = 5 g/10 mL
    Given that 5 g = 5,000 mg, x (5,000 mg) = 10 mL (100 mg)
    x = 0.2 mL

15. Drug Y 292.5 g is the active ingredient used to make 130,000 tablets. What is the strength, in milligrams, of 1 tablet?

    292.5 g/130,000 tabs = 2.25 mg/tab

16. The total weight of 100 alprazolam 0.5-mg tablets is 3.75 g. What is the ratio of active ingredient to filler in 100 tablets?

    1 tablet weighs 37.5 mg
    0.5 mg active ingredients/37 mg filler, or 1:74

17. Deanna the dietician is talking to Betty Baker, who was recently diagnosed with diabetes, about her diet. Betty loves to make apple pies. Deanna says the calories in a 9-in apple pie come from 260 g carbohydrates (from apples, sugar, and flour) and 110 g fat. The entire pie contains 2,030 calories.

    a. If the pie is divided into eight equal pieces, how many calories are in three pieces?
    2,030 cal/8 pieces = x/3 pieces
    x = 761.25 cal

b. There are 1,040 calories provided by the 260 g of carbohydrates in the whole pie. How many calories does 1 g of carbohydrate provide?
   1,040 cals/260 g carbs = 4 cal/g carbohydrate
c. If the remaining calories come from 110 g of fat, how many calories are derived from 1 g of fat?
   2,030 total cal – 1,040 cal (from carbs) = 990 cal from fat
   990 cal/110 g fat = 9 cal/g fat

18. **The dermatologist at Our Town Pharmacy has a special formula for erythromycin 2% gel. The formula contains the following ingredients:**
    Erythromycin 2 g
    Hydroxypropyl cellulose 2 g
    Ethyl alcohol 70% qs 100 mL
    The pharmacy technician must prepare a pint of the gel.
    a. How much erythromycin is needed to make 1 pt?
       2 g/100 mL = x/480 mL
       x = 9.6 g erythromycin
    b. How much hydroxypropyl cellulose is needed to make 1 pt?
       9.6 g hydroxypropyl cellulose

19. **Peter Ivanakoff has a cold. He decides to purchase a bottle of cough syrup that contains guaifenesin 200 mg and pseudoephedrine 40 mg in 5 mL.**
    a. How much guaifenesin and pseudoephedrine are contained in 8 fl oz of the syrup?
       8 fl oz × 30 mL/fl oz = 240 mL
       200 mg/5 mL = x/240 mL
       x = 200 mg (48) = 9,600 mg or 9.6 g guaifenesin
       pseudoephedrine 40 mg/5 mL = x/240 mL
       x = 40 mg (48) = 1,920 mg or 1.92 g pseudoephedrine
    b. If the patient takes 10 mL of the syrup three times a day, how many days will an 8-fl-oz bottle last?
       10 mL/dose × 3 doses/day = 30 mL/day
       30 mL/day × 1 bottle/240 mL = 1 bottle/8 days

20. **Cheryl Jones has a bacterial infection. Her mother, Brenda, arrives at the local pharmacy with an order for Augmentin suspension 125 mg PO q 8 hr, and the medication is commercially available in a 250 mg/10 mL strength.**
    a. What volume of Augmentin suspension (in milliliters) will Cheryl take every 8 hours?
       250 mg/10 mL = 125 mg/x mL
       x (250 mg) = 125 mg (10 mL)
       x = 5 mL/8 hr

b. How much Augmentin (in milligrams) will Cheryl take each day?
   5 mL × 3 doses per day (q 8 hr) = 15 mL needed per day
   250 mg/10 mL = x mg/15 mL
   x (10 mL) = 15 mL (250 mg)
   x = 375 mg/day
c. If the prescription is written for a 10-day supply, how many milliliters must the pharmacy technician prepare and what size medication bottle, in fluid ounces, must the technician obtain from the shelf to complete the therapy for this prescription?
   15 mL/day × 10 days = 150 mL of Augmentin suspension are needed
   1 fl oz/30 mL = x fl oz/150 mL
   x (30 mL) = 150 mL (1 fl oz)
   x = 5 fl oz
   Therefore, the pharmacy technician would need to obtain an empty medication bottle from the shelf that would contain 5 fl oz of medication. In a community pharmacy practice, this most likely would mean that the pharmacy technician would obtain an 8-fl-oz bottle from the shelf to prepare the medication (assuming only 4-fl-oz and 8-fl-oz bottles are available within this range).

21. **Timothy Jones is a pharmacy technician assigned to batching a bulk compounded pantoprazole suspension into unit dose syringes. Each syringe contains 40 mg of pantoprazole. The pantoprazole suspension is 2 mg/mL.**
    a. What volume of pantoprazole suspension (in milliliters) must Timothy draw up for each syringe?
       2 mg/mL = 40 mg/x mL
       x (2 mg) = 40 mg (1 mL)
       x = 20 mL/syringe
    b. If Timothy can batch 100 syringes of pantoprazole from the bulk bottle compounded, how many grams of pantoprazole are contained within the bulk pantoprazole suspension bottle?
       20 mL/syringe × 100 syringes = 2,000 mL
       2 mg/mL = x mg/2,000 mL
       x (1 mL) = 2,000 mL (2 mg)
       x = 4,000 mg/bulk bottle
       Convert the 4,000 mg to the equivalent amount of grams. For this example, use another proportion equation to solve the conversion.
       4,000 mg/x g = 1,000 mg/g
       x (1,000 mg) = 4,000 mg (1 g)
       x = 4 g/bulk bottle

CHAPTER 10

1. A drug order from a nursing home that your pharmacy services reads "venlafaxine 56.25 mg PO BID." The pharmacy carries 37.5-mg tablets and 75-mg tablets.

   a. What strength tablets will you use to fill this order and why?
   You will provide 37.5-mg tabs because they require the least amount of tablet splitting, thereby being safest and most convenient for the patient.

   b. How many tablets will the patient take per dose?
   1.5 of the 37.5 mg tablets = 56.25 mg

2. Ondansetron 0.15 mg/kg IV push is ordered as premedication before chemotherapy for a 2-year-old patient who weighs 27 lb. The pharmacy stocks ondansetron injection 4 mg/2 mL.

   a. What is the patient's weight in kilograms?
   12.3 kg

   b. What is the calculated dose of ondansetron?
   12.3 kg (0.15 mg/kg) = 1.8 mg

   c. What volume of ondansetron solution contains this dose?
   0.92 mL

3. An 18-month-old child who weighs 19 lb is admitted to the pediatric hospital with meningitis. The admitting physician orders Rocephin, 80 mg/kg/day, in two divided doses.

   a. What is the child's weight in kilograms?
   19 lb × 1 kg/2.2 lb = 8.64 kg

   b. How many milligrams of Rocephin will the child receive?
   8.64 kg × 80 mg/kg = 691 mg

   c. The hospital carries Rocephin in a ready-to-use formulation that contains 1 g in 50 mL. What volume will you draw up to fill the order?
   1 g/50 mL = 0.691 g/x
   x = 35 mL
   This volume would be prepared across two divided doses (ie, two 17.5 mL doses).

4. You receive a prescription for azithromycin suspension that contains 200 mg/5 mL when reconstituted. The physician wants the patient to receive 400 mg on the first day and 200 mg daily for the next 4 days.

   a. How many milliliters of suspension will the patient take with the first dose?
   10 mL

   b. What volume will the patient take each day thereafter?
   5 mL every day for 4 days

   c. This product is available in 15-mL, 22.5-mL, and 30-mL sizes. Which size will last for the whole 5-day course?
   30 mL

5. You are making IVPB solutions. There are three different orders for gentamicin piggybacks. You have available a 30-mL vial of gentamicin 40 mg/mL.

   a. What volume of gentamicin solution will you draw up in a syringe to make a 60-mg IVPB?
   40 mg/1 mL = 60 mg/x
   x = 1.5 mL

   b. What volume of gentamicin do you need to make a 100-mg piggyback bag?
   40 mg/1 mL = 100 mg/x
   x = 2.5 mL

   c. After making two 60-mg doses, one 100-mg dose, and three 80-mg doses, how much gentamicin will be left in the vial?
   40 mg/mL × 30 mL/vial = 1,200 mg/vial
   Amount remaining = 1,200 mg – amount used
   Amount used = 60 mg (2) + 100 mg + 80 mg (3) = 460 mg used
   1,200 mg – 460 mg = 740 mg remaining

6. A female patient with a yeast infection comes to the pharmacy with a prescription for fluconazole tablets. She is to take 150 mg by mouth daily for 3 days. You find 100-mg tablets on the shelf in the pharmacy. The pharmacist asks the patient if she is willing to use the 100-mg tablets and she agrees.

   a. How many tablets will you dispense?
   4.5 tablets needed, so you must dispense 5 tablets

   b. How will the directions on the prescription read?
   Take 1.5 tablets (150 mg) by mouth daily for 3 days

7. Mrs. Berry is a frequent customer at Small's Pharmacy. Her 7-month-old, 16-lb son has a fever of 103°F. The prescriber recommends ibuprofen 10 mg/kg/dose with a maximum of 4 doses/day.

   a. How much ibuprofen should the baby receive per dose?
   16 lb × 1 kg/2.2 lb = 7.3 kg
   7.3 kg × 10 mg/kg = 73 mg

b. Mrs. Berry chooses ibuprofen children's suspension, which contains 100 mg ibuprofen in 5 mL. What volume of ibuprofen will her son receive per dose in Part A?

100 mg/5 mL = 73 mg/x

x = 3.7 mL (rounded)

8. **Convert the following weights to kilograms:**

   a. 215 lb
      97.7 kg
   b. 14 lb
      6.4 kg
   c. 176 lb
      80 kg
   d. 78 lb
      35.5 kg

9. **Convert the following weights to pounds:**

   a. 27.7 kg × 2.2 lb/kg
      60.9 lb
   b. 113 kg × 2.2 lb/kg
      248.6 lb
   c. 55 kg × 2.2 lb/kg
      121 lb
   d. 32.3 kg × 2.2 lb/kg
      71.1 lb

10. **Determine the volume of each dose of the following U-100 insulin orders:**

    a. Lantus insulin, 27 units daily at HS
       0.27 mL
    b. NPH U-100 insulin, 58 units q12hr
       0.58 mL
    c. Lispro insulin, 7 units before each meal
       0.07 mL

11. **How many days will a 10-mL vial of insulin last, when used correctly, for each of the orders listed in question 10?**

    a. *1 day/0.27 mL × 10 mL = 37 days. However, insulin is only good for 28 days after opening.*
    b. *1 day/1.16 mL × 10 mL = 8 days*
    c. *1 day/0.21 mL × 10 mL = 47 days. However, insulin is only good for 28 days after opening.*

12. **Find the BSA for the heights and weights listed. If using an Internet calculator, round to the nearest hundredth.**

    a. 5'9" and 168 lb
       1.93 m²
    b. 190.5 cm and 265 lb
       2.52 m²

c. 5'2" and 131 kg
   2.39 m²
d. 127 cm and 74 lb
   1.09 m²
e. 96 cm and 16 kg
   0.65 m²

13. **You need to prepare a syringe of heparin containing 22,500 units. The vial of heparin contains 10,000 units/mL. What volume of heparin will you draw up?**

    10,000 units/1 mL = 22,500 units/x

    x = 2.25 mL

14. **If a patient buys a 16-oz bottle of Pepto-Bismol and plans on taking two tablespoonsful twice a day while traveling in Central America, how long will the bottle last?**

    8 days

15. **An oncologist has ordered vinblastine 4 mg/m² to be given every week by slow IV push. The patient weighs 115 lb and is 62 in tall. What is the weekly dose (mg) of vinblastine? The patient's BSA = 1.5 m².**

    1.51 m² × 4 mg/m² = 6.04 mg or 6 mg (rounded) vinblastine/wk

16. **Annie Tyler is going to college and wants to take enough of her albuterol inhaler to last until she comes home at Thanksgiving (approximately 16 weeks). On average, she uses two puffs, four times each week. One canister provides around 200 inhalations. How many canisters will she need?**

    At 8 inhalations/week, one canister will last 25 weeks. She only needs one canister.

17. **There is a levothyroxine injection shortage, and the hospital has four postoperative patients who need this medication. The pharmacy will draw up a syringe for each patient, but a new single-dose vial must be used each day. The doses are as follows: 125 mcg, 0.175 mg, 100 mcg, and 0.075 mg each day. Each vial contains 0.5 mg levothyroxine.**

    a. What is the total amount (in milligrams) of levothyroxine used each day?
       125 mcg = 0.125 mg, 100 mcg = 0.1 mg
       Total mg/day = 0.125 mg + 0.175 mg + 0.1 mg + 0.075 mg = 0.475 mg
    b. The hospital has eight vials left. How long will they last?
       8 days

18. A pharmacy technician is preparing penicillin G 4 million units/50 mL 0.9% sodium chloride piggyback bags. She has three full 20-mL vials of penicillin G that have been reconstituted to 500,000 units/mL. How many 4-million-unit piggyback bags can she make?

7 bags with 4 mL of penicillin G left over

19. The pharmacy receives an order for vincristine 1.4 mg/m² once per week. The patient is a 33-year-old woman who is 5'5" tall and weighs 115 lb. What dose will the patient receive on a weekly basis?

1.56 m² × 1.4 mg/m² = 2.2 mg

20. You have been recently diagnosed with diabetes. Your physician has directed you to take Humalog 5 units before each meal as well as additional units if your blood sugar is higher than the goal of 110 mg/dL. For every 40 points above goal, you have been instructed to add 1 unit of insulin. Before lunch, you determine that your blood sugar level is 270 mg/dL. What dose of Humalog should you inject?

Blood sugar of 270 mg/dL – goal blood sugar of 110 mg/dL = excess blood sugar of 160 mg/dL

160 points sugar excess × 1 unit/40 points excess = 4 extra units

Total Humalog dose = 5 usual units + 4 units for excess = 9 units

For problems 21–24, refer to the following case:

A physician has ordered Trileptal suspension 300 mg/5 mL for a boy with a seizure disorder. The child is to receive 10 mg/kg/day initially, in two divided doses, with the dose to be increased gradually over time. The child weighs 66 lb.

21. What is the child's weight in kilograms, and how much Trileptal will he receive initially, per day and per dose?

66 lb × 1 lb/2.2 kg = 30 kg

30 kg × 10 mg/kg/day = 300 mg/day divided into 2 doses = 150 mg/dose

22. The physician orders that the boy's dose of Trileptal be increased on the third day of treatment by 5 mg/kg/day divided in two doses. What

is the new daily dose in mg/kg/day, and how many milligrams of Trileptal does he receive per dose?

15 mg/kg/day, 225 mg/dose

23. Eventually the child's dose is increased until he is receiving Trileptal suspension 450 mg BID. What volume will his mother measure to deliver a 450-mg dose of the medication?

300 mg/5 mL = 450 mg/x

x = 7.5 mL

24. When the mother comes to the pharmacy to refill the Trileptal, the new prescription reads as follows:

R$_x$: Trileptal suspension 300 mg/5 mL, 1-month supply

Sig: 450 mg BID

What volume of the drug should the pharmacy supply to last 1 month?

15 mL/day × 30 days = 450 mL

25. Tracy Tan is a 20-month-old girl with a serious bacterial infection. Her physician orders ceftriaxone 50 mg/kg/day, in two divided doses, to be started immediately. Tracy weighs 24.1 lb.

   a. What is Tracy's weight in kilograms?
   24.1 lb × 1 kg/2.2 lb = 10.9 kg

   b. How many milligrams of ceftriaxone will Tracy receive per day and per dose? Round the daily dose to the nearest 5 mg.
   10.9 kg × 50 mg/kg/day = 545 mg/day, 275 mg/dose

CHAPTER 11

1. Write the following values as percents:

   a. 0.15
   15 parts per 100 or 15%

   b. 22/100
   22%

   c. 0.63
   63%

   d. 3/4
   0.75 or 75%

   e. 1.1
   110%

   f. 17/24
   0.71 or 71% (rounded)

2. **Write the following values as percents:**

   a. 0.75

      75%

   b. 33/100

      33%

   c. 0.81

      81%

   d. 5/8

      62.5%

   e. 1.2

      120%

   f. 3/25

      12%

3. **From the labels shown, decide whether percent-age strengths would be w/w or w/v.**

   a. *mg/g = w/w*

   HYDROCORTISONE OINTMENT
   USP, 1%

Drug Facts	
Active ingredients (in each gram)	*Purpose*
Hydrocortisone 10 mg..	.... Anti-itch
Uses · for temporary relieve of itching associated with minor skin irritations and rashes due to: · eczema · insect bites · soaps and detergents · cosmetics · jewelry · seborrheic dermatitis · psoriasis · poisin ivy, oak or sumac · for external genital, feminine and anal itching · other uses of this product should be only under the advice and supervision of a doctor.	
Warnings **For external use only**	
Do not use · in children under 2 years of age · if you have a vaginal discharge · for the treatment of diaper rash	
Ask a doctor before use if you have · external genital or feminine itching · external anal itching · bleeding	
When using this product · avoid contact with eyes · do not exceed the recommended daily dosage unless directed by a doctor · do not put this product into the rectum by using fingers or any mechanical devices or applicator	
Stop use and ask a doctor · if condition worsens, or if symptoms persist for more than 7 days or clear up and occur again within a few days, stop use and do not begin use of any other hydrocortisone product	
Keep out of reach of children. If swallowed, get medical help or contact a Poison Control Center right away.	

   b. *g/mL = w/v*

   50 mL Single-dose

   NDC 0409-6648-02
   Rx only

   50% Dextrose
   Injection, USP

   25 grams/50 mL
   (0.5 g/mL)

   Each mL contains dextrose, hydrous 0.5 grams. May contain NaOH and/or HCl for pH adjustment. 2.53 mOsmol/mL (calc). pH 4.2 (3.2 to 6.5). Sterile, nonpyrogenic. Cleanse stopper with antiseptic. Aseptically add to a suitable solution in I.V. container or use undiluted. Use only if clear and seal is intact and undamaged. Contains no bacteriostat; use promptly; discard unused portion. For intravenous use. Usual dosage: See insert. Store at 20 to 25°C (68 to 77°F). [See USP Controlled Room Temperature.]

   Hospira, Inc.
   Lake Forest, IL 60045 USA   *Hospira*   RL-3040

   (01) 0 030409 664802

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4. **Write the following percents as ratios, including appropriate units:**

   a. 5% (w/v)

      5 g/100 mL

   b. 24% (w/w)

      24 g/100 g

   c. 0.1% (v/v)

      0.1 mL/100 mL

5. **Write the following percents as ratios, including appropriate units:**

   a. 0.9% (w/v)

      0.9 g/100 mL

   b. 0.75% (v/v)

      0.75 mL/100 mL

   c. 10% (w/w)

      10 g/100 g

6. **An order calls for 480 mL of the KCl l0% liquid shown here. How many grams are in this volume of KCl oral solution?**

   48 g

   ## POTASSIUM CHLORIDE ORAL SOLUTION, USP 10% SF ORANGE

   Each 15 mL (tablespoonful) contains: 20 mEq of potassium chloride (provided by potassium chloride 1.5 g), in a palatable, orange flavored, sugar free vehicle, alcohol 4.0%.
   Inactive ingredients: Citric acid, FD&C Yellow #6, flavor, methylparaben, propylene glycol, propylparaben, purified water, saccharin sodium, sorbitol.
   DOSAGE AND ADMINISTRATION: See package insert for complete dosage recommendations.
   MUST BE DILUTED.
   DISPENSE in a tight, light-resistant container as defined in the USP/NF.
   STORE at 20 to 25 C (68 to 77 F) (see USP Controlled Room Temperature).
   AVOID FREEZING.

   Rx only

   NET: 1 PINT (473 mL)

7. **How much pure ethanol is in 500 mL 70% (v/v) ethanol solution?**

   70% (v/v) = 70 mL/100 mL

   70 mL/100 mL = x/500 mL

   $$x = \frac{70\ mL(500\ mL)}{100\ mL} = 350\ mL$$

8. **The pharmacy staff is asked to make 240 mL of 3% hydrogen peroxide from the available 6% hydrogen peroxide solution and sterile water for irrigation. How much of each ingredient is needed to make the preparation? (Note: 3% hydrogen peroxide is half as strong as 6%.)**

   120 mL of sterile water plus 120 mL of 6% hydrogen peroxide will make 240 mL of 3% hydrogen peroxide.

9. **Dexamethasone for injection is available as 4 mg/mL and 10 mg/mL. What are the percent strengths of each product?**

   4 mg × 1 g/1,000 mg = 0.004 g in each mL or 0.4 g/100 mL = 0.4%

   10 mg × 1 g/1,000 mg = 0.01 g in each mL or 1 g/100 mL = 1%

10. **Timolol ophthalmic drops are available in 0.25% and 0.5% concentrations.**

    a. How many milligrams of timolol are in a 10-mL bottle of 0.25% solution?
    0.25 g/100 mL × 10 mL/bottle = 0.025 g/bottle = 25 mg/bottle

    b. How many milligrams of timolol are in a 15-mL bottle of 0.5% solution?
    0.5 g/100 mL × 15 mL/bottle = 0.075 g/bottle = 75 mg/bottle

11. **An injectable antibiotic is provided as 120 mg/2 mL. Write this ratio as a percent strength.**

    60 mg/mL = 6,000 mg/100 mL = 6 g/100 mL = 6%

12. **You need to compound 1 lb of 3% hydrocortisone cream from cream base and hydrocortisone powder.**

    a. How much hydrocortisone is contained in 1 lb of the cream?
    3% = 3 g/100 g
    1 lb = 454 g
    3 g/100 g = x/454 g

    $$x = \frac{3\ g(454\ g)}{100\ g} = 13.62\ g\ hydrocortisone\ in$$

    1 lb of 3% cream

    b. How much of the cream base is needed for this product?
    454 g total − 13.62 g hydrocortisone = 440.38 g base

    c. Is this a w/w or w/v problem?
    w/w

13. **A patient is receiving an IV of 5% dextrose in water. The dextrose solution infuses at a rate of 125 mL every hour.**

    a. How many grams of dextrose will the patient receive in 1 hour?
    6.25 g/hr

    b. How many grams of dextrose will the patient receive in 1 day?
    150 g/day

14. **Bumetanide for injection contains bumetanide 1 mg/mL. What is the percent strength?**

    1 mg/mL = 100 mg/100 mL or 0.1 g/100 mL = 0.1%

15. **A saline solution contains 2.25 g NaCl in 250 mL. What is the percent strength of this solution?**

    2.25 g/250 mL = 0.9%

16. **Mometasone cream contains 45 mg mometasone in 45 g of cream. What percent strength is the cream?**

    45 mg × 1 g/1,000 mg = 0.045 g
    0.045 g/45 g = 0.1%

17. **You are making a 1-L IV solution with 250 mL of 50% dextrose and 750 mL of amino acids, electrolytes, and sterile water.**

    a. What is the final concentration of dextrose in the 1-L bag?
    50% = 50 g/100 mL
    50 g/100 mL = x/250 mL
    x = 125 g dextrose
    Final solution contains 125 g/1,000 mL or 12.5% dextrose.

    b. Of the 750 mL added to the dextrose, 500 mL is 7% amino acids solution. What is the final concentration of amino acids in 1 L?
    7% = 7 g/100 mL
    7 g/100 mL = x/500 mL
    x = 35 g amino acid
    Final solution contains 35 g/1,000 mL or 3.5% amino acid.

18. **The pharmacy receives an order for 500 mL dextrose 10%. Unfortunately, this particular IV solution is out of stock, but dextrose 5% and dextrose 20% are available. How much of each solution is needed to make 500 mL of dextrose 10%?**

    Use the alligation alternate method to determine 10 parts of 5% dextrose and 5 parts of 20% dextrose/500 mL 10% dextrose.

    333.3 mL of 5% dextrose and 166.7 mL of 20% dextrose = 500 mL of 10% dextrose

19. **The local veterinarian would like 10 mL of phenobarbital for injection in a 7.5% solution. The pharmacy has phenobarbital 65 mg/mL and 130 mg/mL in stock.**

    a. What are the percent strengths of the 65 mg/mL and 130 mg/mL solutions for injection?
    65 mg/1 mL = 6,500 mg/100 mL or 6.5%
    130 mg/1 mL = 13,000 mg/100 mL or 13%

    b. How many milliliters of each strength phenobarbital for injection are needed to make 10 mL of 7.5% solution?

6.5 parts = 10 mL

$$\frac{6.5 \; parts}{10 \; mL} = \frac{5.5 \; parts}{x}$$

x = 8.46 mL of 6.5% phenobarbital injection

$$\frac{6.5 \; parts}{10 \; mL} = \frac{1 \; part}{y}$$

y = 1.54 mL of 13% phenobarbital solution

20. **Normal saline solution contains 0.9% NaCl. Other saline solutions may be referred to as one-half normal saline and one-fourth normal saline because they are one-half and one-fourth the concentration of normal saline.**

   a. **What is the percent strength of one-half normal saline?**
   0.9% × ½ = 0.45%

   b. **What is the percent strength of one-fourth normal saline?**
   0.9% × ¼ = 0.225%

21. **How much magnesium sulfate 50%, in milliliters, is needed for a patient requiring a dose of 8 g?**

   50% (w/v) = 50 g/100 mL
   50 g/100 mL = 8 g/x
   x (50 g) = 8 g (100 mL)
   x = 16 mL of 50% magnesium sulfate solution

22. **Rhonda Thomas is prescribed an order for a medication that requires dilution. What is the final concentration of the medication made by diluting a 2-oz bottle of a 10% solution (w/v) to a final volume of 0.5 L?**

   10% (w/v) = 10 g/100 mL
   10 g/100 mL = x g/60 mL
   x (100 mL) = 60 mL (10 g)
   x = 6 g of medication in 2 oz of solution

   Now that we know the amount of medication in the final solution after dilution (6 g), we can set up the following proportion equation to determine the final, diluted concentration:
   6 g/500 mL = x/100 mL
   x (500 mL) = 100 mL (6 g)
   x = 1.2 = 1.2 g/100 mL = 1.2%

CHAPTER 12

1. **Mrs. Rose Easkin brings in a prescription for 6 oz of coal tar ointment. The coal tar formula makes 8 oz. By what factor will you multiply each ingredient to reduce the formula from 8 oz to 6 oz?**

   6/8 or 3/4

2. **Advil Cold and Sinus caplets each contain ibuprofen 200 mg and pseudoephedrine 30 mg. How much of each ingredient does the manufacturer use to make a bottle of 60 caplets?**

   Ibuprofen 60 × 200 mg = 12,000 mg = 12 g

   Pseudoephedrine 60 × 30 mg = 1,800 mg = 1.8 g

Answer questions 3–5 using the following formula for mouthwash:

For patients with stomatitis (mouth sores or inflammation), the hospital where you work prepares a mouthwash called "magic mouthwash," which contains the following ingredients:

Hydrocortisone 100 mg/2 mL:	2 mL
Nystatin suspension:	30 mL
Viscous lidocaine 2%:	50 mL
Diphenhydramine elixir 12.5 mg/5 mL qs ad:	240 mL

3. **A recent change in order volume requires you to make 180 mL instead of 240 mL. By what factor will you reduce each ingredient to make the desired 180 mL?**

   180 mL/240 mL = 0.75

4. **How much diphenhydramine elixir was necessary for the original formula?**

   Total volume – volume of all other ingredients = volume of diphenhydramine

   240 mL – (2 mL + 30 mL + 50 mL) = 158 mL of diphenhydramine

5. **How much of each ingredient is used to make 180 mL of "magic mouthwash"?**

   Hydrocortisone 100 mg/2 mL = 2 mL × 0.75 = 1.5 mL

   Nystatin suspension = 30 mL × 0.75 = 22.5 mL

   Viscous lidocaine 2% = 50 mL × 0.75 = 37.5 mL

   Diphenhydramine elixir = 118.5 mL

6. A formula calls for 125 mg magnesium sulfate. The sensitivity rating of the balance is 10 mg, and there is an acceptable error rate of 4%.

   a. What is the MWQ for the magnesium sulfate?

   $$\frac{SR \times 100}{\% \ error} = MWQ$$

   MWQ = 250 mg

   b. The pharmacy technician must dilute the magnesium sulfate with equal parts lactose powder. The technician is asked to make 500 mg of the mixture of magnesium sulfate and lactose. How much lactose does he or she need?
   250 mg

   c. What aliquot is measured out to contain the desired (125 mg) amount of magnesium sulfate?
   250 mg

7. The sensitivity rating of your balance is 6 mg, and the acceptable error rate is 3.5%. What is the MWQ?

   $$\frac{SR \times 100}{\% \ error} = MWQ$$

   $$\frac{6 \ mg \ (100)}{3.5} = 171 \ mg$$

8. Find the MWQ for the following amounts:

   a. Sensitivity rating = 4 mg, permissible error rate 4%

   $$\frac{4 \ mg \times 100}{4} = 100 \ mg$$

   b. Sensitivity rating = 2 mg, acceptable error rate 5%

   $$\frac{2 \ mg \times 100}{5} = 40 \ mg$$

9. A physician orders morphine for a patient who has undergone surgery and is in pain. The morphine is to be drawn up into a 10-mL syringe and administered via a pump that can deliver as little as 0.5 mL/hr. The orders are for morphine 0.25 mg/hr with instruction for a nurse to increase the dose as needed to a maximum of 0.75 mg/hr. The pharmacist asks you to use 10 mg/mL morphine diluted with normal saline to make 10 mL of morphine 0.5 mg/mL.

   a. How much morphine is contained in 10 mL of morphine 0.5 mg/mL?
   0.5 mg/mL = x/10 mL
   x = 5 mg

   b. How much of the morphine 10 mg/mL is needed to make the dilute solution?
   10 mg/1 mL = 5 mg/x
   x = 0.5 mL of the morphine sulfate 10 mg/mL concentration

   c. How much normal saline is used to make the dilute solution?
   10 mL total − 0.5 mL morphine = 9.5 mL of normal saline

   d. What volume of the dilute solution contains 0.25 mg of morphine?
   0.5 mg/mL = 0.25 mg/x
   x = 0.5 mL

10. A veterinarian orders a solution that contains 10 mg of an antibiotic in 20 mL of solution. The balance in the pharmacy has a sensitivity rating of 5 mg, and the allowable error rate is 4%.

    a. What is the MWQ?
    (5 mg x 100)/4 = 125 mg

    b. What total volume of solution is needed to make the necessary final concentration?
    10 mg/20 mL = 125 mg/x
    x = 250 mL

11. An antacid product contains 650 mg calcium carbonate and 500 mg sorbitol in each tablet. Each bottle contains 120 tablets. How much of each ingredient is needed to make 1,000 bottles?
    120 tablets/bottle × 650 mg/tablet × 1,000 bottles
    = 78,000,000 mg = 78,000 g = 78 kg
    120 tablets/bottle × 500 mg/tablet × 1,000 bottles
    = 60,000,000 mg = 60,000 g = 60 kg

12. In the pharmacy technology laboratory, Mary weighs out 260 mg of acetylsalicylic acid powder. Her lab partner Diane reweighs the powder on the more accurate electronic balance and finds the weight of the powder to be 264 mg. What is the percent error of the less accurate balance?
    % error = (| 260 mg − 264 mg | / 264 mg)
    × 100 = (4 / 264) × 100
    % error = 1.5%

13. Jocelyn uses a graduated cylinder to measure 45 mL of an oral solution. The pharmacist tells her to draw the solution up in a 60-mL syringe instead because it will be more accurate. When she draws the solution up into the syringe, she sees that the volume is 42 mL.

   a. What could account for the shortage?
      The accuracy of the syringe or the accuracy of the graduated cylinder could account for the shortage. A graduated cylinder is generally considered less accurate than a syringe.

   b. Assuming that all the solution made it into the syringe, what is the percent error rate of the graduated cylinder Jocelyn originally used?
      % error = (| 42 mL − 45 mL | / 42 mL)
      × 100 = (3 / 42) × 100
      % error = 7.1%

14. An order is received in a rural community hospital for oseltamivir suspension. The hospital does not have any oseltamivir suspension in stock, so the pharmacy technician must compound it for the patient to begin therapy. The pharmacy technician is asked to compound 120 mL of a 30-mg/2-mL suspension using 75-mg oseltamivir capsules and grape syrup. What quantity of oseltamivir capsules is needed to compound the medication for this order?

   30 mg/2 mL = x mg/120 mL
   x (2 mL) = 120 mL (30 mg)
   x = 1,800 mg of oseltamivir are needed
   1,800 mg/75 mg per capsule = 24 capsules of oseltamivir are needed to compound this order

CHAPTER 13

1. A vial of cefazolin for IV use is reconstituted with 45 mL of fluid and contains 50 mL of cefazolin 1 g/5 mL when correctly reconstituted.

   a. What volume does the dry powder displace?
      50 mL − 45 mL = 5 mL displaced by powder

   b. How many grams of cefazolin are in the vial?
      1 g/5 mL × 50 mL = 50 g/5 mL = 10 g

   c. To prepare a 2-g dose, what volume will be withdrawn?
      1 g/5 mL = 2 g/x
      x = 10 mL

2. Gwen Tuphaz, CPhT, prepared the vial mentioned in Problem 1 using 65 mL of fluid instead of 45 mL.

   a. What is the concentration of the incorrectly prepared cefazolin?
      65 mL + 5 mL powder = 70 mL total volume and 10 g cefazolin
      1 g/7 mL

   b. What volume contains the desired 2-g dose?
      14 mL

3. When prepared correctly, amoxicillin oral suspension contains 500 mg/5 mL. A full bottle contains 150 mL. How much amoxicillin is in a full bottle?

   500 mg/5 mL = x/150
   x = 15,000 mg or 15 g

4. A ceftriaxone vial directs you to add 3.6 mL of fluid to a 1-g vial. The resulting solution contains 250 mg/mL.

   a. What is the total volume in the reconstituted vial?
      4 mL/vial

   b. What volume does the dry powder displace?
      0.4 mL

5. You receive a drug order for 5% dextrose in water 1,000 mL, plus 30 mEq KCl. A vial of KCl contains 2 mEq KCl/mL. What volume of KCl will you add to the 1,000-mL bag?

   1 mL/2 mEq x 30 mEq = 15 mL

6. Cephalexin for 100-mL oral suspension is mistakenly reconstituted with 96 mL of water instead of 71 mL. When correctly reconstituted, the suspension contains 250 mg/5 mL cephalexin.

   a. How much cephalexin does the bottle contain?
      5 g

   b. How much volume does the powder displace?
      100 mL – 71 mL = 29 mL

   c. What is the concentration of the incorrectly reconstituted suspension?
      40 mg/1 mL

   d. What volume of the incorrectly mixed product contains 250 mg?
      6.25 mL

7. Normal saline contains 0.9% NaCl. How many milliequivalents of sodium are in a 100-mL bag of normal saline? Refer to Table 13-1 for equivalent weight of NaCl.

   15.4 mEq/100 mL NS

8. **NaCl is available in 1-g tablets. How many milli-equivalents of sodium are in one tablet?**

    1,000 mg/tablet × 1 mEq/58.5 mg = 17.1 mEq/tab

9. **A patient receives one 50-mEq prefilled syringe of sodium bicarbonate IV during a code blue. One mEq of sodium bicarbonate weighs 84 mg. How many grams of sodium bicarbonate did the patient receive?**

    1 mEq/84 mg = 50 mEq/x
    x = 4,200 mg or 4.2 g

10. **A physician prescribes KCl 8-mEq tablets to be given three times a day. Unfortunately, only 10% KCl liquid is covered by the patient's insurance. The pharmacist gets the okay for a switch to liquid but wants you to calculate the dose for her to check (see Table 13-1).**

    a. How many milliliters of 10% KCl contain 8 mEq?
    8 mEq/dose × 74.5 mg/1 mEq × 1 mL/100 mg = 6 mL
    b. The patient must dilute KCl before drinking it. Usually, 20 mEq is mixed in 4 oz of juice or water. To mix 8 mEq in the same concentration, with what volume of juice or water will it be mixed?
    48 mL

11. **Prefilled sodium bicarbonate syringes, made especially for cardiac and respiratory emergencies in infants and young children, contain 10 mL of 4.2% sodium bicarbonate.**

    a. How many milliequivalents of sodium bicarbonate are in a syringe?
    4.2% = 4,200 mg / 100 mL × 1 mEq/84 mg × 10 mL/syringe = 5 mEq/syringe
    b. How many milliequivalents of sodium bicarbonate are in 1 mL of the solution?
    5 mEq/10 mL = 0.5 mEq/1 mL

12. **The directions on all of the following IVPB bags indicate that they should run in at a rate of 200 mL/hr. How long will each bag last?**

    a. 50 mL IVPB
    15 minutes (0.25 hour)
    b. 100 mL IVPB
    30 minutes (0.5 hour)
    c. 150 mL IVPB
    45 minutes (0.75 hour)
    d. 200 mL IVPB
    1 hour

13. **A physician orders that a patient receive 3,000 mL of TPN fluids over 24 hours.**

    a. How many milliliters/hour will the patient receive?
    3,000 mL/24 hr = x/1 hr
    x = 125 mL, or 125 mL/hr rate
    b. The orders for the TPN are received and processed at 1700 hours. The next batch of IV solutions will be made in the morning and delivered at 0900 hours. How many bags will the technician need to make to last until morning? One bag contains 1,000 mL TPN fluids.
    Calculate the time from 1700 to midnight and from midnight to 0900.
    (2400 – 1700) + (0900 – 0000) = 7 + 9 = 16 hours
    125 mL/hr × 16 hours = 2,000 mL
    2,000 mL × 1 bag/1,000 mL = two 1-liter bags

14. **At Little Hospital, near Tiny Town, TX, the 40-bed facility owns six IV pumps. If a seventh patient needs an IV, the nurses use drip rates to set the infusion rate. The IV set delivers 20 gtt/mL, and the IV needs to run at 60 mL/hr.**

    a. How many drops per hour will the patient receive?
    20 gtt/mL × 60 mL/hr = 1,200 gtt/hr
    b. How many drops per minute will provide 60 mL/hr?
    1,200 gtt/hr × 1 hr/60 min = 20 gtt/min

15. **A physician orders a 500-mL bag of fluid to run in over 4 hours. How many milliliters/minute will the patient receive?**

    500 mL/4 hr = 125 mL/hr
    125 mL/hr × 1 hr/60 min = 2.1 mL/min

16. **The standard magnesium sulfate bags for obstetrics contain 20 g magnesium sulfate/500 mL of fluid. The order you receive for Mrs. Bertha Cummins for her preterm labor are as follows: Initiate treatment with 4 g magnesium sulfate to run in over 30 minutes. Follow with magnesium sulfate 2 g/hr.**

    a. How many milliliters will contain the initial dose of 4 g?
    4 g in 100 mL
    b. How long will the first 500-mL bag last?
    First 100 mL will last 30 minutes + remaining 400 mL will last 8 hours
    Total time 8.5 hours
    c. How long will subsequent 500-mL bags last?
    10 hours

17. The ICU pharmacist calls the central pharmacy to have a dopamine drip made for a patient. The standard concentration for dopamine drips in your hospital is 1,600 mcg/mL. Dopamine is available as 40 mg/mL in a 5-mL vial. How much dopamine will you add to a 250-mL bag to achieve the standard concentration?

1,600 mcg/mL = 1.6 mg/mL × 250 mL = 400 mg dopamine/250 mL bag
40 mg/mL = 400 mg/x
x = 10 mL or two vials

18. A few hours after you make the dopamine bag in Problem 17, the ICU pharmacist calls to say that the patient is getting worse. The pharmacist asks for a double concentration of the dopamine in a 100-mL bag. He asks you to bring the mixed bag, with your calculations, right away because the patient is critically ill.

   a. How much dopamine will you add to 100 mL normal saline to make twice the concentration in Problem 17?
   1,600 mcg/mL × 2 = 3,200 mcg/mL = 3.2 mg dopamine/mL × 100 mL bag = 320 mg × 1 mL/40 mg = 8 mL

   b. If the double concentration bag is set to run at 400 mcg/min, how long will a 100-mL bag last?
   400 mcg/min × 60 min/hr = 24,000 mcg/hr = 24 mg/hr
   320 mg/bag × 1 hr/24 mg = 13.3 hours for one bag

19. A stat IV order is written for a dehydrated patient. The order reads "1,000 mL NS + 20 KCl, run in over 4 hours, then 150 mL/hr for 6 hours, then 125 mL/hr." After 6 hours, the orders are discontinued. How much normal saline has the patient received after 6 hours?

First 4 hours, 1,000 mL, then 150 mL/hr × 2 hours, for a total of 1,300 mL

20. The new orders for the patient in Problem 19 call for KCl 60 mEq/1,000 mL NS. A vial of KCl contains 2 mEq/mL. How many milliliters of KCl will be added to the new bag?

2 mEq/mL = 60 mEq/x
x = 30 mL

21. The home health pharmacy prepares TPN bags for an 83-year-old patient. The IV infuses at a rate of 100 mL/hr. The patient receives antibiotics at midnight as well as 0600, 1200, and 1800 hours. The TPN is turned off for 30 minutes every 6 hours while the antibiotics infuse. How many milliliters of the TPN does the patient receive in a 24-hour period?

100 mL/hr × 24 hr/day = 2,400 mL. However, the IV is turned off for 2 hours each day, so 2,400 mL – 200 mL = 2,200 mL/day.

22. In your hospital, the standard concentration of an insulin drip is 1 unit/mL in 100-mL bags. An ICU patient receives 8 units/hr for 4 hours, then 6 units/hr for 3 hours, and for the last 7 hours has received 5 units/hr. How much fluid is left in the patient's IV bag?

1 unit/mL, so 8 units/hr = 8 mL/hr; 8 × 4 hours = 32 mL; 6 mL/hr × 3 hours = 18 mL; 5 mL/hr × 7 hours = 35 mL Total used = 85 mL with 15 mL remaining

23. Dr. Yeti ordered 0.9% NaCl to be administered at 125 mL/hr. How many 1-L bags are required for a 24-hour period?

125 mL/hr × 24 hours = 3,000 mL = 3 L

Therefore, three 1,000-mL 0.9% NaCl bags are needed for a 24-hour period.

24. A heparin drip is ordered by a physician to be administered at 1,000 units/hour.

   a. What flow rate (in milliliters/hour) is needed if the IV bag contains heparin at a concentration of 50 units/mL?
   20 mL/hr

   b. If a 250-mL bag of D5W containing 12,500 units of heparin is hung at 1830 hours, at what time will the bag be empty?
   0700 hours

25. Vinney Torrent is to receive 1,000 mL of solution over a 6-hour period. The first 500 mL is to be infused over 2 hours. At what rate will the remaining solution be infused?

1,000 mL – 500 mL (used in first 2 hours) = 500 mL remaining
500 mL/4 hr (remaining in 6 hours) = 125 mL/hr

CHAPTER 14

1. Joe's Pharmacy buys 30 Lipitor 80-mg tablets for $175.00 and sells those 30 tablets for $190.00. What is the gross profit on this transaction?

$190.00 – $175.00 = $15.00

2. **Best Pharmacy buys 4-mg Avandaryl tablets at $350.00 per 100 tablets. The pharmacy then sells a bottle of 60 tablets for $300.00.**

   a. What does it cost Best Pharmacy to buy 60 tablets?

      $210.00

   b. What is Best Pharmacy's markup on the 60 tablets?

      $90.00

3. **Good Neighbor Pharmacy buys 90 Naprosyn 250-mg tablets for $16.00. Good Neighbor's markup rate on this item is 25%. What is the selling price for 90 Naprosyn 250-mg tablets?**

   $16.00 + 0.25($16.00) = $20.00

4. **Joe's Pharmacy buys fluconazole 100 mg for $350.00 for 30 tablets. It costs $5.00 to dispense 30 tablets, and a bottle of 30 tablets sells for $435.00. What is the net profit on this transaction?**

   $80.00

5. **Wholesale R$_x$ Inc. offers Best Pharmacy a 26% discount on Effexor 25-mg tablets. The regular wholesale price for 120 Effexor 25-mg tablets is $270.00. What price did the pharmacy pay for 120 Effexor 25-mg tablets?**

   $270.00 – 0.26($270.00) = $199.80

6. **The wholesaler Meds R Us offers Neighborhood Pharmacy 30 Nexium 20-mg capsules for $165.00. The regular wholesale price for Nexium 20-mg capsules is $195.00 for 30 capsules. What discount rate is being offered?**

   15%

7. **The regular price of Lipitor 40 mg is $98.50 for 60 tablets. The pharmacy gets a 14% discount when buying from a wholesaler.**

   a. What price does the pharmacy pay for 60 tablets of Lipitor 40 mg?

      $98.50 – 0.14($98.50) = $84.71

   b. It costs $5.00 to dispense 60 tablets. The pharmacy sells the 60 tablets for $95.48. What is the net profit on this sale?

      $95.48 – $84.71 – $5.00 = $5.77

8. **The AWP for Drug D 60 mg is $150.00 for 30 tablets. Neighborhood Pharmacy can purchase Drug D 60 mg for $120.00 for 30 tablets. It costs the pharmacy $6.00 to dispense the tablets.**

   a. How much does it cost Neighborhood Pharmacy to fill a prescription for 30 Drug D 60-mg tablets?

      $126.00

   b. The customer's insurance company will reimburse the pharmacy AWP + 4% + $4.00 dispensing fee. How much does the insurance company pay the pharmacy?

      $160.00

   c. What is Neighborhood Pharmacy's profit in this transaction?

      $34.00

9. **The AWP for Actonel 35 mg is $130.00 for 12 tablets. Joe's Pharmacy can purchase Actonel 35 mg for $115.00 for 12 tablets. It costs the pharmacy $4.00 to dispense the tablets.**

   a. How much does it cost Joe's Pharmacy to fill a prescription for 12 Actonel 35-mg tablets?

      $115.00 + $4.00 = $119.00

   b. The customer's insurance company will reimburse the pharmacy AWP + 3% + $2.00 dispensing fee. How much does the insurance company pay the pharmacy?

      $130.00 + 0.03($130.00) + $2.00 = $135.90

   c. What is the pharmacy's profit in this transaction?

      $135.90 – $119.00 = $16.90

10. **The AWP for Levoxyl 100 mcg is $54.00 for 100 tablets.**

    a. What is the AWP per tablet?

       $$\frac{\$54.00}{100} = \$0.54$$

    b. What is the AWP for 30 Levoxyl 100-mcg tablets?

       $$\frac{\$0.54}{tablet} \times 30\ tablets = \$16.20$$

11. **The AWP for Levoxyl 100 mcg is $54.00 for 100 tablets. Joe's Pharmacy can purchase 90 tablets for $45.00. It costs Joe $4.00 to dispense a prescription for 30 tablets. The insurance company will reimburse AWP + 3% + $3.00 dispensing fee. What is Joe's profit in filling a prescription for 30 tablets of 100-mcg Levoxyl?**

    Joe's cost: ($45.00/90 tablets) × 30 tablets = $15.00
    Joe pays: $15.00 + $4.00 = $19.00
    Insurance pays: $16.20 + 0.03($16.20) + $3.00 = $19.69
    Joe's profit: $19.69 – $19.00 = $0.69

12. In January, the staff at Joe's Pharmacy performs an inventory and discovers that the value of the inventory is $75,000.00. Six months later, the staff performs another inventory and the value is $60,000.00. What is the average inventory?

$$\frac{\$75,000 + \$60,000}{2} = \$67,500\ average\ inventory$$

13. In January, the staff at Joe's Pharmacy performs an inventory and discovers that the value of the inventory is $80,000.00. Six months later, the staff performs another inventory and the value is $100,000.00. Over the course of a year, Joe spends $360,000.00 purchasing items to sell at the pharmacy.

    a. Find the average inventory value and the turnover rate.

    $90,000.00 = inventory value*

    Turnover rate = 4

    b. How long does it take to "turn over" the inventory?

    3 months

    $$\frac{\$210,000.00}{\$70,000.00} = 3$$

    $$\frac{\$125,000 + \$120,000}{2} = \$122,500\ average\ inventory$$

14. Joe's Pharmacy buys a new automatic counter for $5,000.00. The expected lifetime of the equipment is 6 years. The disposal value of the counter is $2,400.00. Find the annual depreciation of the automatic counter.

$$\frac{\$5,000.00 - \$2,400.00}{6\ years} = \$433.33/yr$$

15. Tom's Pharmacy buys an electronic scale for $1,075.00. The expected life of the scale is 10 years. The disposal value is $475.00. Find the annual depreciation for the scale.

$$\frac{\$1,075.00 - \$475.00}{10\ years} = \$60.00/yr$$

16. Ralph's Pharmacy purchases sinus caplets for $4.54/60 and sells them for $6.81/60.

    a. What is the markup?

    $2.27

    b. What is the markup rate?

    50%

17. The regular wholesale price for anti-itch ointment is $5.25/oz. A pharmacy buys anti-itch ointment from Prescriptions R Us for $4.00/oz.

    a. What is the discount offered by Prescriptions R Us?

    $5.25 – $4.00 = $1.25

    b. What is the discount rate offered by Prescriptions R Us?

    $$\frac{\$1.25}{\$5.25} \times 100\% = 24\%$$

18. Medicaid reimburses Small's Pharmacy at 250% of the average acquisition cost of amoxicillin suspension plus a $4.35 professional fee. Small's Pharmacy pays $2.45 for a 100-mL bottle, and the average acquisition cost is $2.75. It costs Bud Small $3.50 to fill the prescription.

    a. What are Bud's total costs?

    $5.95

    b. What does Medicaid pay Bud?

    $11.23

    c. What is Bud's net profit on the amoxicillin prescription?

    $5.28

19. Blue Shield reimburses Small's Pharmacy AWP plus a $7.50 professional fee for filling a generic prescription. The AWP for 100 furosemide 40-mg tablets is $17.80. Bud Small buys 100 furosemide tablets for $14.90, and his cost for filling the prescription is $3.25.

    a. What is Bud's profit when a patient has Blue Shield Insurance?

    Bud's costs = $14.90 + $3.25 = $18.15
    Blue Shield pays $17.80 + $7.50 = $25.30
    Bud's profits = reimbursement – cost = $25.30 – $18.15 = $7.15

    b. Bud usually sells 100 furosemide tablets for $24.50. How much less is Bud's profit than in Part A?

    Bud's costs = $18.15
    Bud's receipts on 100 furosemide 40 mg = $24.50
    Bud's usual profit = $24.50 – $18.15 = $6.35
    Bud's profit is $0.80 less.