Chapter 2
MULTIPLE CHOICE

Choose the one alternative that best completes the statement or answers the question.

1. A patient with a tidal volume of 400 milliliters has a tidal volume of how many liters?
   a. 40
   b. 4
   c. .400
   d. .04

2. A patient who weighs 55 kilograms is to receive a drug dosage of 10mg/kg. How much drug should be administered?
   a. 550 mg
   b. 250 mg
   c 25 mg
   d. 5.5 mg

3. A patient's height is reported as 5 feet 6 inches. What is the patient's height in centimeters?
   a. 26 cm
   b. 30 cm
   c. 145 cm
   d. 167 cm

4. A solution of drug contains 80 units/ml. How many milliliters would you need to deliver 320 units of the drug?
   a. 0.4 ml
   b. 4 ml
   c. 14 ml
   d. 40 ml

5. A newborn's length at birth is measured as 45.7 centimeters. What is the newborn's length in inches?
   a. 17 in
   b. 18 in
   c. 19 in
   d. 20 in

6. While preparing an aerosol bronchodilator for a patient, you place 0.5 ml of a 1% drug solution into a small-volume nebulizer. If you add 5 ml of saline instead of 2 ml of saline, the delivered dose of drug will:
   a. Increase
   b. Decrease
   c. Remain the same
   d. Weaken the drug response

7. What is the percentage strength of 20 mg of cromolyn sodium in 2 ml of normal saline?

a. 1%
b. 2%
c. 10%
d. 20%

8. If a drug order is written for 0.25 mg/kg of body weight, what dosage would be administered to a patient weighing 88 lb?
a. 10 mg
b. 22 mg
c. 40 mg
d. 44 mg

9. A dosage of 4 mg of morphine sulfate is ordered for a patient. How many milliliters will be administered from a vial containing 10 mg/ml?
a. 0.1 ml
b. 0.4 ml
c. 1 ml
d. 4 ml

10. An adult female patient weighs 125 lb. In order to determine a mechanical tidal volume, you must convert her weight to kilograms. What is her weight in kilograms?
a. 275 kg
b. 63 kg
c. 57 kg
d. 28 kg

11. You have just assisted in the care of a premature infant who weighs 600 g. The baby's mother asks you what the weight is in pounds. You calculate the baby's weight as:
a. 4.1 lb
b. 3.5 lb
c. 2.7 lb
d. 1.3 lb

12. A medication bag contains 0.03 liters. This is equal to how many milliliters?
a. 3
b. 30
c. 300
d. 3,000

13. A patient who is 5-feet-10 inches tall is how many centimeters tall?
a. 286 cm
b. 32 cm
c. 154 cm
d. 178 cm

14. A homogeneous mixture of two or more substances is referred to as:
a. Dissolved.

b. A solvent.
c. A solute.
d. A solution.

15. Virazole is supplied in a powder form that must be mixed with normal saline or sterile water prior to nebulization. This type of solution represents a:
a. Solid/solvent
b. Weight/volume
c. Liquid/solute
d. Volume/volume

16. How much solute is in 3 ml of a 1:100 weight/volume solution?
a. 10 ml
b. 10 mg
c. 20 ml
d. 30 mg

17. Which of the following terms is a synonym for "active ingredient"?
a. Solution
b. Solute
c. Solvent
d. Saline

18. What would the new concentration be, in percentage, of 1.5 ml of a 10% solution that has been increased to 3.0 ml with normal saline?
a. 0.05%
b. 0.5%
c. 5%
d. 20%

19. How much active drug is in 3 ml of a 10% solution?
a. 0.3 g
b. 1 g
c. 0.3 mg
d. 1 mg

20. A rescue dosage of surfactant calls for 3 ml/kg body weight. If a premature infant weighs 1,500 g, how many milliliters are needed?
a. 5.0 ml
b. 9.0 ml
c. 0.45 ml
d. 4.5 ml

21. If a drug contains 6% active ingredient, how many grams of the active ingredient would you need in a 30-ml dose?
a. 18 g
b. 36 g

c. 1.8 g
d. 3.6 g

22. Promazine comes in a 550-mg/10-ml liquid solution. How many milliliters are needed to give a 200-mg dose?
a. 3.6 ml
b. 30 ml
c. 0.3 ml
d. 3 ml

23. Terbutaline sulfate is available as 1 mg/1 ml in an ampule. How many milliliters are needed to administer a 0.75 dose?
a. 1.5 ml
b. 0.75 ml
c. 0.15 ml
d. 0.30 ml

24. What strength of drug would be administered if 6 g of active ingredient is reconstituted with sterile water to a total volume of 300 ml?
a. 2% strength
b. 0.5% strength
c. 20% strength
d. 50% strength

25. You receive an order for 16 gtt of Mucomyst. How many milliliters of drug would you be administering to the patient?
a. 0.5 ml
b. 1 ml
c. 1.5 ml
d. 5 ml

TRUE/FALSE

Write 'T' if the statement is true and 'F' if the statement is false.

_____ 1. The Joint Commission recommends that a zero always be placed after the decimal point when referring to drug dosage.

_____ 2. The method used to convert between the English and metric systems is referred to as the factor-label method.

_____ 3. Normal saline in solution with albuterol is known as the solvent.

_____ 4. When a solute is being dissolved in a powder, the solution is termed a volume/volume solution.

_____ 5. When calculating drug dosages based on a patient's weight in kilograms, a respiratory therapist can use the BSA nomogram to convert from pounds to kilograms.

_____ 6. The International System is the system of measure used in health care.

_____ 7. Converting a measure from milliliters to liters is accomplished by moving the decimal point three places to the right.

_____ 8. A solute can either be a liquid or a solid that is dissolved in a liquid.

_____ 9. A weight/volume solution is representative of the amount of liquid solute in a volume of solution.

_____10. The use of body surface area (BSA) is an appropriate method to determine a patient's overall size.

FILL-IN-THE-BLANK

Write the word or phrase that best completes each statement.

1. The metric unit of measurement for length is _____, and the metric measurement for volume is _____.
2. One kilogram equals _____ pounds.
3. A liquid or solid that is dissolved in a solution is known as a _____.
4. A 1:200 solution of a drug would contain _____ ml of the solute dissolved in _____ ml of solution.
5. The strength of a 5-g/100-ml solution expressed as a ratio is 1:_____.
6. The metric system of measurement is based on the _____.
7. The United States Customary System of Measurement is based on the _____.
8. Weight is measured as _____ or _____ in the metric system.
9. To convert from liters to milliliters the decimal point is moved _____ places to the _____.
10. The Joint Commission standards recommend the use of _____ rather than centimeters (cc) to avoid misinterpretation of the ordered amount.

SHORT ANSWER

Answer the following questions or statements.

1. What do Joint Commission standards recommend for abbreviating cubic centimeter volume?
2. Give an example of converting between the English and metric systems using the factor-label method.
3. Explain the difference between a weight/volume solution and a volume/volume solution.
4. How can you express the strength of a drug in solution?
5. How can you determine how much drug to administer if the drug available is not supplied in the prescribed amount?

Rationale:
Drugs must be water soluble in order to be excreted from the body as urine, feces, or sweat.
8. False
Rationale:
Liver function does not correlate with the body's ability to metabolize a drug and therefore would not be helpful in determining elimination of the drug through the liver.
9. True
Rationale:
Emetics are agents used to induce vomiting in the case of an overdose of ingested drugs.
10. True
Rationale:
Formularies are used by health care systems to list drugs that are available for dispensing in their facility.

FILL-IN-THE-BLANK

1. anaphylactic shock
2. inhalation route
3. bloodstream
4. tolerance
5. therapeutic range
6. generic
7. depot
8. rectally
9. water-soluble
10. therapeutic range

SHORT ANSWER

1. An endogenous chemical is one that is produced physiologically, while an exogenous chemical is pharmacologically administered.
2. Agonists are drugs that activate a specific receptor once they bind, whereas an antagonist does not cause activation but results in very little or no response once it combines with a receptor site. This action of the antagonist is responsible for lessening or blocking another drug's effect.
3. Patient's with liver disease may experience greater than expected effects from a drug due to an increase in the drug's half-life. Because drugs are metabolized by the liver, if the liver is not capable of breaking down or metabolizing the drug, it is able to remain in the body longer and continue to elicit a response.
4. The "do not use" list was designed to eliminate medical errors and misinterpretation when using common abbreviations.
5. Basic safeguards to prevent errors in medication administration include the six "rights." They are described as: making sure you identify the right drug, administer the right dose to the right patient at the right time via the right route, and complete the right documentation.

Chapter 2
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1. C
Rationale:
To convert from milliliters to liters, move the decimal point three places to the left.
2. A

Rationale:
To determine the dosage to administer, simply multiply 55 kg by 10 mg (55 kg × 10 mg = 550 mg).
3. D
Rationale:
Using the factor-label method and example calculation 5 in the textbook, you can convert from feet and inches to centimeters.
4. B
Rationale:
Refer to example calculation 8 in the textbook to set up your calculation and solve for X.
5. B
Rationale:
Using the factor-label method and example calculation 5 in the textbook, you can convert from centimeters to inches.
6. C
Rationale:
When you mix a drug with a diluent such as normal saline, the diluent does not decrease or weaken the amount of drug given to the patient, whether you are using 2 ml or 5 ml. Only the delivery time is increased.
7. A
Rationale:
To determine the percentage strength of 20 mg in a 2 ml solution, you should recognize that it is equivalent to 10 mg in 1 ml, or 1 g in 100 ml, which represents 1%. You can solve this by setting up an equation with the known values and solving for X by cross-multiplying.
8. A
Rationale:
The first step is to convert the patient's weight to kilograms using the factor-label method (88 lb = 40 kg). The next step is to determine the dosage to administer. If the order calls for 0.25 mg/kg, simply multiply 40 kg by 0.25 mg (40 kg × 0.25 mg = 10 mg).
9. B
Rationale:
Using example calculation 8 from the textbook, you can set up this problem with your known values in the following way:

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

10. C
Rationale:
You convert the patient's weight to kilograms by using the factor-label method, where 2.2 lb = 1 kg.
11. D
Rationale:
You first convert the baby's weight from grams to kilograms (.6 kg) and then use the factor-label method to convert from kilograms to pounds, where 2.2 lb = 1 kg.
12. B
Rationale:
Refer to Table 2–2 to convert from liters to milliliters.
13. D

Rationale:
Using the factor-label method and example calculation 5 in the textbook, you can convert from feet and inches to centimeters.
14. D
Rationale:
A solution is a chemical and physical homogeneous mixture of two or more substances that contains a solute and a solvent.
15. B
Rationale:
A drug solution that consists of the active drug in solid (or powder) form mixed with a liquid solvent is considered a weight/volume solution.
16. D
Rationale:
The ratio becomes: X = .03 g or 30 mg

$$\frac{1\,\text{g}}{100\,\text{ml}} = \frac{X\,\text{g}}{3\,\text{ml}}$$

17. B
Rationale:
The active ingredient or drug in a solution is referred to as the solute.
18. C
Rationale:
If 1.5 ml represents a 10% solution and the volume has been doubled to 3 ml, the percentage of the solution is now half the original strength.
19. A
Rationale:
A 10% solution represents 10 g/100 ml of solution, or 1 g per 10 ml of solution, or 0.1 g per 1 ml of solution. If you know that there is 0.1 g per 1 ml, you can multiply this by 3 ml to find the correct answer (0.3 g, or 300 mg).
20. D
Rationale:
You first convert the baby's weight from grams to kilograms. Then you determine how many milliliters are needed if the required dosage is 3 ml per kilogram by multiplying 3 by the weight in kg (3 ml × 1.5 kg).
21. C
Rationale:
Knowing that 6% represents 6 g for every 100 ml, you can calculate the grams needed by using example calculation 11 in the textbook.
22. A
Rationale:
If you recognize the relationship between the dose on hand and the desired dose, you can eliminate B and C immediately. You can then solve this problem by setting up an equation and cross-multiplying to solve for X.
23. B
Rationale:
You can solve this problem by setting up an equation and cross-multiplying to solve for X.
24. A
Rationale:
6 g of active ingredient in 300 ml represents 2 g for every 100 ml, which is a 2% solution.
25. B
Rationale:
16 gtt is equal to 1 ml.

True/False

1. False

Rationale:
The Joint Commission recommends that a zero be placed before the decimal point (e.g., 0.1 mg) but never after the decimal point by itself (e.g., 1 mg *not* 1.0 mg).

2. True

Rationale:
The factor-label method, or fraction method, allows you to convert between the English and metric systems.

3. True

Rationale:
A solution contains an active drug, which is the solute dissolved in a solvent, such as sterile water or normal saline.

4. False

Rationale:
If a solute is a powder that is dissolved in a liquid, the resulting solution is termed a weight/volume solution. Weight represents the weight or amount of solute, and volume represents the total amount of solution.

5. False

Rationale:
The nomogram used to determine body surface area (BSA) combines height and weight in a single measurement to determine a patient's overall body size. If a drug dosage requires a specific number of units per patient weight in kilograms, the factor-label method should be used to convert the patient's weight from the English system to the metric system.

6. True

Rationale:
The International System is also known as the metric system and is used in health care and by drug manufacturers.

7. False

Rationale:
To convert from milliliters to liters, the decimal point must be moved three places to the left.

8. True

Rationale:
Solutes can be either solid particles such as powders or liquids.

9. False

Rationale:
Weight/volume solutions represent the weight of the solute, which is a solid, dissolved in a liquid solution.

10. True

Rationale:
Using BSA to determine a patient's overall size is appropriate, especially if the patient is not within his or her ideal body weight due to disease or malnutrition.

FILL-IN-THE-BLANK

1. meter/liter
2. 2.2
3. solute
4. 1/200
5. 20
6. powers of 10
7. British Imperial System
8. grams or kilograms
9. three/right
10. milliliters (ml)

SHORT ANSWER

1. When using measurements involving cubic centimeters, The Joint Commission recommends using “ml” for milliliter because 1 ml = 1 cc and cc can be misread in a number of ways.
2. Examples may include conversions used for length (e.g., 1 inch = 2.54 cm), weight (e.g., 2.2 lb = 1 kg), or volume (e.g., 1.06 qt = 1 liter).
3. If a solid solute is mixed with a solvent, the resulting solution is termed a weight/volume (w/v) solution, where *w* represents the weight of the solute and *v* represents the total amount of solution. If a liquid solute is mixed with a solvent, the resulting solution is termed a volume/volume (v/v) solution, where the first v represents the volume of the solution and the second v represents the total amount of solution.
4. A drug strength can be expressed as a percent solution and as a ratio solution.
5. You can use a proportion of the dose on hand related to the desired dose to set up an equation and solve for the correct amount. Refer to Figure 2–4, which illustrates the steps in the equation.