Calculations of Density

1. If 250 mL of alcohol weighs 203 g, what is its density?

2. A piece of copper metal weighs 53.6 g, and has a volume of 6 mL. Calculate its density.

Calculations of Specific Gravity

3. If 150 mL of a sorbitol solution weigh 170 g, what is its specific gravity?

4. If a liter of a cough syrup weighs 1285 g, what is its specific gravity?

5. If 500 mL of ferric chloride solution weighs 650 g, what is its specific gravity?

6. If 2 fl. oz. of glycerol weighs 74.1 g, what is its specific gravity?

7. Five pints of diluted hydrochloric acid weighs 2.79 kg. Calculate its specific gravity.

8. A pycnometer weighs 21.62 g. Filled with water, it weighs 46.71 g; filled with another liquid, it weighs 43.28 g. Calculate the specific gravity of the liquid.

9. A modified Ringer's Irrigation has the following formula:

Sodium chloride	8.6 g
Potassium chloride	0.3 g
Calcium chloride	0.33 g
PEG 3350	60 g
Water for injection ad	1000 mL

Assuming that 980 mL of water is used in preparing the irrigation, calculate its specific gravity.

Calculations of Weight or Volume Using Specific Gravity

Note: Use the information in Table 5.1 if necessary.

10. Calculate the weight, in grams, of 100 mL of each of the following:
   (a) acetone
   (b) liquid petrolatum
   (c) syrup
   (d) nitroglycerin
   (e) mercury

11. What is the weight, in kilograms, of 5 liters of sulfuric acid with a specific gravity of 1.84?

12. What is the weight, in pounds, of 5 pints of nitric acid?

13. What is the weight, in kilograms, of 1 gallon of sorbitol solution having a specific gravity of 1.285?

14. If 500 mL of mineral oil are used to prepare a liter of mineral oil emulsion, how many grams of the oil, having a specific gravity of 0.87, would be used in the preparation of 1 gallon of the emulsion?

15. Calculate the volume, in milliliters, of 100 g of each of the following:
   (a) peanut oil
   (b) castor oil
   (c) polysorbate 80
   (d) phosphoric acid
   (e) mercury

16. What is the volume, in milliliters, of 1 lb of benzyl benzoate having a specific gravity of 1.12?

17. What is the volume, in milliliters, of 1 kg of sulfuric acid with a specific gravity of 1.83?

18. Calculate the corresponding weights of liquefied phenol and propylene glycol needed to prepare 24 15-mL bottles of the following formula for a cold sore topical liquid:

Liquefied phenol	0.4 mL
Camphor	0.5 g
Benzocaine	2.2 g
Ethanol	65 mL
Propylene glycol	17 mL
Purified water ad	100 mL

19. Calculate the total weight of the following formula for a pediatric chewable gummy gel base for medication.[7]

Gelatin	43.4 g
Glycerin	155 mL
Purified Water	21.6 mL

20. Calculate the number of milliliters of polysorbate 80 required to prepare 48 100-g tubes of the following formula for a progesterone vaginal cream.[8]

Progesterone, micronized	3 g
Polysorbate 80	1 g
Methylcellulose 2% Gel	96 g

21. If fifty glycerin suppositories are made from the following formula, how many milliliters of glycerin, having a specific gravity of 1.25, would be used in the preparation of 96 suppositories?

Glycerin	91 g
Sodium stearate	9 g
Purified water	5 g

22. Two 10-mL samples of urine have specific gravities of 1.003 and 1.030. What is the difference in weight, in milligrams, between the two samples?

23. R[9] Testosterone propionate 2 g
    Mineral Oil, light 10 g
    Polysorbate 80 1 g
    Methylcellulose 2% gel 87 g

The specific gravity of light mineral oil is 0.85 and that of polysorbate 80 is 1.08. Calculate the milliliters of each needed to fill the prescription.

24. A formula for an anesthetic ointment is:

Benzocaine	200 g
Polyethylene glycol 400	600 g
Polyethylene glycol 3350	ad 1000 g

Polyethylene glycol 400 is a liquid, sp.gr. 1.13, benzocaine and polyethylene glycol 3350 are powders. How many milliliters of polyethylene glycol would be used in the formula?

Calculations of Drug Costs Using Specific Gravity

25. The formula for 1000 g of polyethylene glycol ointment calls for 600 g polyethylene glycol 400. At $19.15 per pint, what is the cost of the polyethylene glycol 400, specific gravity 1.140, needed to prepare 4000 g of the ointment?

CALCQUIZ

5.A. Syrup, USP is prepared by dissolving 850 g of sucrose in sufficient purified water to make 1000 mL of syrup. Syrup has a specific gravity of 1.31. How many milliliters of water are used to prepare a liter of syrup?

5.B. A saturated solution of potassium iodide contains, in each 100 mL, 100 g of potassium iodide. The solubility of potassium iodide is 1 g in 0.7 mL of water. Calculate the specific gravity of the saturated solution.

5.C. Cocoa butter (theobroma oil) is used as a suppository base. It is a solid at room temperature, melts at 34°C, and has a specific gravity of 0.86. If a formula for medicated suppositories calls for 48 mL of theobroma oil, how many grams are equivalent?

Case in Point 5.1

Quantity of lactic acid needed to fill ℞:
1.5 g
Source of lactic acid: liquid containing 85 g/100 g; or, by using specific gravity:

100 g ÷ 1.21 = 82.64 mL

Thus, 85 g of lactic acid are in 82.64 mL of the source liquid.
By proportion:

$$\frac{85\ g}{82.64\ mL} = \frac{1.5\ g}{x\ mL}; x = 1.46\ mL, \textit{answer.}$$

Practice Problems

1. 0.812 g/mL
2. 8.933 g/mL
3. 1.133
4. 1.285
5. 1.30
6. 1.25
7. 1.18
8. 0.86
9. 1.05
10. (a) 79 g acetone
    (b) 87 g liquid petrolatum
    (c) 131 g syrup
    (d) 159 g nitroglycerin
    (e) 1360 g mercury
11. 9.2 kg sulfuric acid
12. 7.397 or 7.4 lb nitric acid
13. 4.86 kg sorbitol solution
14. 1646.5 g mineral oil
15. (a) 108.7 mL peanut oil
    (b) 104.17 mL castor oil
    (c) 92.59 mL polysorbate 80
    (d) 58.82 mL phosphoric acid
    (e) 7.35 mL mercury
16. 405.36 mL benzyl benzoate
17. 546.45 mL sulfuric acid
18. 1.54 g liquefied phenol
    63.04 g camphor
19. 258.75 g
20. 44.44 mL polysorbate 80
21. 139.78 mL glycerin
22. 270 mg
23. 11.76 mL light mineral oil
    0.93 mL polysorbate 80
24. 530.97 mL polyethylene glycol 400
25. $85.23