Pharmacy Calculation Formula Sheet

Every formula behind the practice problems on RxMath Lab, with one worked example each. Written and checked by Arman Kiledjian, PharmD. Updated October 2026.

rxmathlab.com
Free, unlimited practice
No account needed

Percentage & Ratio Strength

% w/v = grams of drug per 100 mL • 1:X ratio = 1 g in X mL • mg/mL ÷ 10 = % w/v

Example Express 1:2,500 as a percentage. 1:2,500 means 1 g in 2,500 mL, so (1 ÷ 2,500) × 100 = **0.04% w/v**.

Dilution

$C_1 \times V_1 = C_2 \times V_2 \rightarrow V_1 = (C_2 \times V_2) \div C_1$

Example How many mL of a 20% stock are needed to make 120 mL of a 2% solution? V_1 = (2% × 120) ÷ 20% = **12 mL** (then QS to 120 mL with diluent).

Alligation

parts of high = target – low • parts of low = high – target • volume of each = (its parts ÷ total parts) × final volume

Example Make 250 mL of 25% dextrose from 70% and 10% stock. Parts of 70% = 25 – 10 = 15; parts of 10% = 70 – 25 = 45; total = 60. Volume of 70% = (15 ÷ 60) × 250 = **62.5 mL** (and 187.5 mL of the 10%).

Milliequivalent (mEq), Millimole & Milliosmole

mmol = mg ÷ molecular weight • mEq = mmol × valence

mOsm/L = (grams per liter ÷ MW) × number of particles × 1,000

Example How many mEq are in 1 g of KCl (MW 74.5, valence 1)? mmol = 1,000 ÷ 74.5 = 13.4; mEq = 13.4 × 1 = **13.4 mEq**. Osmolarity of 0.9% NaCl = 9 g/L ÷ 58.5 × 2 × 1,000 = **308 mOsm/L**.

IV Infusion & Drip Rate

drops/min = (volume × drops per mL) ÷ time in minutes

mL/hr: bag concentration (mcg/mL) → dose (mcg/min) → × 60 → ÷ concentration

Example Infuse 1,000 mL over 8 hours with a set that gives 15 drops/mL. (1,000 × 15) ÷ (8 × 60) = 15,000 ÷ 480 = 31.25 → **31 drops/min**.

Body Surface Area (BSA) & Chemo Dosing

BSA (m^2) = √(height[cm] × weight[kg] ÷ 3600) • dose = mg/m^2 × BSA

Example A patient is 170 cm and 70 kg. BSA = √(170 × 70 ÷ 3,600) = √3.306 = **1.82 m^2**. A 175 mg/m^2 order → 175 × 1.82 = 318.5 mg.

TPN & Nutrition Calculation

IV: dextrose 3.4 kcal/g • protein 4 kcal/g • 20% lipid = 2 kcal/mL

Oral/enteral: carbohydrate 4 kcal/g • protein 4 kcal/g • fat 9 kcal/g

grams of nitrogen = grams of protein ÷ 6.25

Example Calories from 1,000 mL of dextrose 20%? Grams = 1,000 × 20% = 200 g; 200 × 3.4 = **680 kcal**.

Isotonicity & E-Value

(1) drug in formulation = %×vol ÷ 100 (2) NaCl equivalent = drug g × E (3) NaCl for volume = 0.009 × vol (4) NaCl to add = step 3 – step 2

Example Make 30 mL of 1% pilocarpine HCl (E = 0.24) isotonic. (1) drug = 0.3 g; (2) 0.3 × 0.24 = 0.072 g; (3) 0.009 × 30 = 0.27 g; (4) 0.27 – 0.072 = **0.198 g**.

Creatinine Clearance (Cockcroft-Gault)

CrCl = [(140 – age) × weight] ÷ (72 × SCr) × 0.85 if female

IBW (Devine) = 50 kg male or 45.5 kg female + 2.3 kg per inch over 5 feet

IBW first → actual < IBW use actual; actual > 125% of IBW use AdjBW = IBW + 0.4(actual – IBW); otherwise IBW • some references use 120% or 130%, so follow the cutoff the question gives

Example 70-yr-old male, 5'10" (IBW = 73 kg), weighs 82 kg, SCr 1.2. Since 82 kg is between IBW and 125% of IBW (91.3 kg), use IBW. CrCl = (140 – 70) × 73 ÷ (72 × 1.2) = **59.1 mL/min**.

Pharmacokinetics

$t_{1/2} = 0.693 \div k$ • $V_d = \text{Dose} \div C_0$ • $CL = k \times V_d$

Loading dose = $C_{target} \times V_d$ • $k = \ln(C_1 \div C_2) \div (t_2 - t_1)$

Example Two levels: 40 mg/L at hour 0, 10 mg/L at hour 8. k = ln(40 ÷ 10) ÷ 8 = 1.386 ÷ 8 = **0.173 hr^{-1}**, so $t_{1/2}$ = 0.693 ÷ 0.173 ≈ 4 hr.

Bioavailability (F)

F = (AUC_oral ÷ Dose_oral) × (Dose_IV ÷ AUC_IV)

Example IV 100 mg gives AUC 50; oral 200 mg gives AUC 60. First term: 60 ÷ 200 = 0.30; second term: 100 ÷ 50 = 2; F = 0.30 × 2 = 0.60 = **60%**.

Insulin Day Supply & Switching

Vial = 10 mL = 1,000 units • standard pen = 300 units (box of 5) • Toujeo pen = 450 units (box of 3)

Day supply = total units ÷ daily dose, capped at in-use stability (rapid & glargine 28 d, Humulin 31, Novolin 42, Tresiba/Toujeo 56; mixed pens 10, 14 d). Round DOWN.

Switching (basal → basal) is 1:1 EXCEPT NPH (BID) → glargine and Toujeo → Lantus/Basaglar, both –20%

Example Lantus 10 mL vial at 25 units/day: 1,000 ÷ 25 = 40 days, but an open glargine vial is stable 28 days → **28-day supply**. Switching NPH 30 units BID to glargine: 60 × 0.8 = **48 units** daily.

Opioid Conversion & MME

Proportion from the equianalgesic table (30 mg PO morphine = anchor)

Switching to a different opioid: reduce the calculated dose by 25 to 50% for incomplete cross-tolerance

MME/day = daily dose × (30 ÷ that drug's equianalgesic dose) • MME totals risk; it is not a dose conversion

Example Oxycodone 10 mg three times daily = 30 mg/day. Table: 20 mg oxycodone ≈ 30 mg morphine, so MME = 30 × (30 ÷ 20) = **45 MME/day**.

Days Supply Calculation

days = total quantity (drops, tablets, or puffs) ÷ amount used per day

eye drops assume 20 drops/mL • always round DOWN

Example A 5 mL eye drop bottle (20 drops/mL = 100 drops), 1 drop in each eye twice daily = 4 drops/day. 100 ÷ 4 = **25 days**.

Weight-Based (mg/kg) Dosing

kg = lb ÷ 2.2 • daily dose = mg/kg/day × weight • per dose = daily dose ÷ number of doses

Example A 66 lb child on amoxicillin 45 mg/kg/day divided twice daily. Kg = 66 ÷ 2.2 = 30 kg; daily = 45 × 30 = 1,350 mg; per dose = 1,350 ÷ 2 = **675 mg**.

Reconstitution & Powder Volume

powder (displacement) volume = final reconstituted volume – volume of diluent added

Example A 1 g vial reconstituted to 100 mg/mL needs a final volume of 10 mL. If the label says to add 9.5 mL diluent, the powder volume = 10 – 9.5 = **0.5 mL**.

Specific Gravity

specific gravity = weight (g) ÷ volume (mL), a unitless number because it compares to water at 1 g/mL → weight = volume × SG • volume = weight ÷ SG

Example Glycerin has a specific gravity of 1.25. The weight of 240 mL = 240 × 1.25 = **300 g**.

Clinical Lab Calculation

Corrected Ca = measured Ca + 0.8 × (4.0 – albumin)

Corrected phenytoin = measured ÷ [(0.2 × albumin) + 0.1]

ANC = WBC × (% segs + % bands) ÷ 100 • under 1,500 mild, under 1,000 moderate, under 500 severe neutropenia

Anion gap = $Na^+ – (Cl^- + HCO_3^-)$ • normal about 8 to 12 mEq/L

Example Measured calcium 7.5 mg/dL, albumin 2.5 g/dL. Corrected = 7.5 + 0.8 × (4.0 – 2.5) = 7.5 + 1.2 = **8.7 mg/dL**.

Dispensing Quantity

containers = total amount needed ÷ amount per container, then up to the next whole container

Example An 82 kg patient needs vancomycin 20 mg/kg = 1,640 mg, stocked as 750 mg vials. 1,640 ÷ 750 ≈ 2.19, so you open **3 vials**.

Conventions vary between schools and references. When a question states a cutoff, rounding rule or conversion factor, use the one it gives. Practice any topic above with new numbers every time at rxmathlab.com.