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 September 2026.

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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 • use SCr as given unless the question says to round it

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

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

Loading dose = C_target × Vd • $k = \ln(C_1 \div C_2) \div (t_2 - t_1)$

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.