



# 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  
•  $\text{mg/mL} \div 10 = \% \text{ w/v}$

**Example** Express 1:2,500 as a percentage. 1:2,500 means 1 g in 2,500 mL, so  $(1 \div 2,500) \times 100 = \mathbf{0.04\% \text{ w/v}}$ .

## 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?  $V_1 = (2\% \times 120) \div 20\% = \mathbf{12 \text{ mL}}$  (then QS to 120 mL with diluent).

## Alligation

parts of high = target – low • parts of low = high – target •  
volume of each = (its parts  $\div$  total parts)  $\times$  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% =  $(15 \div 60) \times 250 = \mathbf{62.5 \text{ mL}}$  (and 187.5 mL of the 10%).

## Milliequivalent (mEq), Millimole & Milliosmole

$\text{mmol} = \text{mg} \div \text{molecular weight}$  •  $\text{mEq} = \text{mmol} \times \text{valence}$   
 $\text{mOsm/L} = (\text{grams per liter} \div \text{MW}) \times \text{number of particles} \times 1,000$

**Example** How many mEq are in 1 g of KCl (MW 74.5, valence 1)?  
 $\text{mmol} = 1,000 \div 74.5 = 13.4$ ;  $\text{mEq} = 13.4 \times 1 = \mathbf{13.4 \text{ mEq}}$ . Osmolarity of 0.9% NaCl =  $9 \text{ g/L} \div 58.5 \times 2 \times 1,000 = \mathbf{308 \text{ mOsm/L}}$ .

## IV Infusion & Drip Rate

$\text{drops/min} = (\text{volume} \times \text{drops per mL}) \div \text{time in minutes}$   
 $\text{mL/hr: bag concentration (mcg/mL)} \rightarrow \text{dose (mcg/min)} \rightarrow \times 60$   
 $\rightarrow \div \text{concentration}$

**Example** Infuse 1,000 mL over 8 hours with a set that gives 15 drops/mL.  $(1,000 \times 15) \div (8 \times 60) = 15,000 \div 480 = 31.25 \rightarrow \mathbf{31 \text{ drops/min}}$ .

## Body Surface Area (BSA) & Chemo Dosing

$\text{BSA (m}^2) = \sqrt{(\text{height[cm]} \times \text{weight[kg]} \div 3600)}$  •  $\text{dose} = \text{mg/m}^2 \times \text{BSA}$

**Example** A patient is 170 cm and 70 kg.  $\text{BSA} = \sqrt{(170 \times 70 \div 3,600)} = \sqrt{3.306} = \mathbf{1.82 \text{ m}^2}$ . A 175 mg/m<sup>2</sup> order  $\rightarrow 175 \times 1.82 = 318.5 \text{ mg}$ .

## 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  $\div 6.25$

**Example** Calories from 1,000 mL of dextrose 20%? Grams =  $1,000 \times 20\% = 200 \text{ g}$ ;  $200 \times 3.4 = \mathbf{680 \text{ kcal}}$ .

## Isotonicity & E-Value

(1) drug in formulation =  $\% \times \text{vol} \div 100$  (2) NaCl equivalent =  $\text{drug g} \times E$  (3) NaCl for volume =  $0.009 \times \text{vol}$  (4) NaCl to add =  $\text{step 3} - \text{step 2}$

**Example** Make 30 mL of 1% pilocarpine HCl ( $E = 0.24$ ) isotonic. (1) drug = 0.3 g; (2)  $0.3 \times 0.24 = 0.072 \text{ g}$ ; (3)  $0.009 \times 30 = 0.27 \text{ g}$ ; (4)  $0.27 - 0.072 = \mathbf{0.198 \text{ g}}$ .

## Creatinine Clearance (Cockcroft-Gault)

$\text{CrCl} = [(140 - \text{age}) \times \text{weight}] \div (72 \times \text{SCr}) \times 0.85$  if female

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

IBW first  $\rightarrow$  actual < IBW use actual; actual > 125% of IBW use AdjBW =  $\text{IBW} + 0.4(\text{actual} - \text{IBW})$ ; 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.  $\text{CrCl} = (140 - 70) \times 73 \div (72 \times 1.2) = \mathbf{59.1 \text{ mL/min}}$ .

## Pharmacokinetics

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

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

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

## Bioavailability (F)

$F = (\text{AUC}_{\text{oral}} \div \text{Dose}_{\text{oral}}) \times (\text{Dose}_{\text{IV}} \div \text{AUC}_{\text{IV}})$

**Example** IV 100 mg gives AUC 50; oral 200 mg gives AUC 60. First term:  $60 \div 200 = 0.30$ ; second term:  $100 \div 50 = 2$ ;  $F = 0.30 \times 2 = 0.60 = \mathbf{60\%}$ .

### 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:  $1,000 \div 25 = 40$  days, but an open glargine vial is stable 28 days → **28-day supply**. Switching NPH 30 units BID to glargine:  $60 \times 0.8 = 48$  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 =  $30 \times (30 \div 20) = 45$  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.  $100 \div 4 = 25$  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 =  $66 \div 2.2 = 30$  kg; daily =  $45 \times 30 = 1,350$  mg; per dose =  $1,350 \div 2 = 675$  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 =  $240 \times 1.25 = 300$  g.

### Clinical Lab Calculation

Corrected Ca = measured Ca +  $0.8 \times (4.0 - \text{albumin})$

Corrected phenytoin = measured ÷  $[(0.2 \times \text{albumin}) + 0.1]$

ANC =  $\text{WBC} \times (\% \text{ segs} + \% \text{ bands}) \div 100$  • under 1,500 mild, under 1,000 moderate, under 500 severe neutropenia

Anion gap =  $\text{Na}^+ - (\text{Cl}^- + \text{HCO}_3^-)$  • normal about 8 to 12 mEq/L

**Example** Measured calcium 7.5 mg/dL, albumin 2.5 g/dL. Corrected =  $7.5 + 0.8 \times (4.0 - 2.5) = 7.5 + 1.2 = 8.7$  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.  $1,640 \div 750 \approx 2.19$ , 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](http://rxmathlab.com).