

Pharmacy calculations

Formulas, definitions and use notes

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Units and the prescription

Unit relationships

1 g = 1,000 mg; 1 mg = 1,000 mcg; 1 L = 1,000 mL

g = gram; mg = milligram; mcg = microgram; L = liter; mL = milliliter. Use the question's stated conversion: 1 kg (kilogram) is approximately 2.2 lb (pounds).

Volume for a dose

Volume (mL) = ordered dose (mg) / strength (mg/mL)

Find the liquid amount needed for an order. mg/mL means milligrams in each milliliter. Use the final prepared concentration and match dose units first.

Weight-based dosing

Dose (mg) = prescribed mg/kg x weight (kg)

mg/kg means milligrams per kilogram. mg/kg/day is a daily amount: divide it into the ordered number of doses. Use the drug- or question-specific dosing weight.

Concentration and amount

Percent strength

% w/v = g per 100 mL; mg/mL = 10 x numeric % w/v

w/v = weight per volume; w/w = weight per weight (g per 100 g); v/v = volume per volume (mL per 100 mL). Identify the basis before converting.

Ratio strength

1:X w/v = 1 g in X mL; numeric % w/v = 100 / X

X is the number of mL containing 1 g of solute for this w/v expression. Other ratio bases differ. Communicate medicine strengths in explicit units such as mg/mL.

Amount of substance

mmol = mass (mg) / molecular weight (mg/mmol)

mmol = millimole; mol = mole. Molar mass in mg/mmol has the same numeric value as g/mol. Molarity means moles per liter of final solution.

Mixtures and electrolytes

Dilution

C1 x V1 = C2 x V2

C = concentration; V = volume; 1 = starting stock; 2 = final product. Use conserved solute and concentration per volume. For w/w use masses instead of volumes.

Two-strength blending

Fraction of high strength = (target - low) / (high - low)

Fractions describe how much of each stock to use. Requires lower < target < higher, compatible strength bases and additive quantities.

Ionic equivalents

mEq of an ion = mmol of that ion x absolute charge

mEq = milliequivalent. From salt mass: mmol ion = mg salt / molar mass (mg/mmol) x ions per formula unit. Use the requested ion's absolute charge; identify any hydrate.

Infusion and osmotic particles

Pump rate

mL/hour = volume (mL) / time (hours)

h = hour; min = minute; gtt = drop. Gravity rate (gtt/min) = volume (mL) x tubing drop factor (gtt/mL) / time (min). Round drops only as directed.

Weight-based infusion

mL/hour = [mcg/kg/min x kg x 60] / [mcg/mL]

Convert a weight-based ordered dose rate into a pump rate. mcg/kg/min = micrograms per kilogram per minute. The factor 60 converts minutes to hours.

Ideal osmolarity

mOsm/L = mmol/L x ideal particles per formula unit

mOsm/L = milliosmoles per liter. Particle factor = particles per formula unit (e.g., 2 for sodium chloride, NaCl). Assumes complete ideal dissociation; not osmolality in mOsm/kg.

Carry units through each step. Use the stated assumptions. Round only at the end.

Linked sources and 10 free questions: pharmaste.com/naplex/formulas

Original educational aid. Not a dosing protocol. September 2026 / v5

Pharmacy calculations

From patient data to interpretation

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Patient measurements

Body mass index

$$\text{BMI (kg/m}^2\text{)} = \text{weight (kg)} / \text{height (m)}^2$$

BMI = body mass index; m = meter. Divide body weight by height squared. A screening measure, not a direct body-fat measure or automatic dosing weight.

Mosteller body surface area

$$\text{BSA (m}^2\text{)} = \text{square root of } [\text{height (cm)} \times \text{weight (kg)}] / 3,600$$

BSA = body surface area; cm = centimeter; m² = square meter. For a stated BSA-based order: dose (mg) = mg/m² x BSA. Apply dose caps and rounding as directed.

Cockcroft-Gault

$$\text{CrCl (mL/min)} = [(140 - \text{age in years}) \times \text{weight (kg)}] / [72 \times \text{SCr (mg/dL)}]$$

CrCl = creatinine clearance; SCr = serum creatinine; dL = deciliter (100 mL). Historical adult equation: multiply by 0.85 for females when directed. Weight choice matters; unreliable with changing kidney function. Not interchangeable with indexed eGFR (estimated glomerular filtration rate).

Parenteral nutrition

Parenteral energy estimate

$$\text{kcal} = 3.4 \times \text{hydrous dextrose g} + 4 \times \text{amino acid g} + \text{lipid kcal}$$

PN = parenteral nutrition; kcal = kilocalorie. Use hydrous dextrose and the product's lipid energy: CLINOLIPID 20% provides 2 kcal/mL. Calories alone do not establish a safe PN prescription.

Approximate nitrogen

$$\text{Nitrogen (g)} = \text{protein-equivalent g} / 6.25$$

N = nitrogen. This conventional approximation assumes 16% nitrogen in protein-equivalent mass. Actual amino acid products differ; prefer the labeled nitrogen amount.

Nonprotein calorie ratio

$$\text{NPC:N} = \text{nonprotein kcal} / \text{nitrogen (g)}$$

NPC = nonprotein calories; N = nitrogen. Include dextrose and lipid energy in NPC, not amino acid calories. A calculated ratio alone does not determine nutritional requirements.

Pharmacokinetics

First-order elimination

$$k = 0.693 / \text{half-life; half-life} = 0.693 / k$$

k = elimination rate constant (inverse time). Half-life is time to halve concentration. With no further input: $C(t) = C_0 \times (1/2)^{(t / \text{half-life})}$. C(t) is concentration at time t; C₀ is initial concentration. First-order model; match time units.

Clearance and distribution

$$\text{Systemic clearance} = k \times \text{volume of distribution}$$

Clearance = volume of plasma cleared per time; V_d = apparent volume of distribution; k = elimination constant. Use model-consistent parameters and compatible units (e.g., L and h).

Loading and maintenance

$$\text{Loading dose} = V_d \times \text{target C} / F$$

V_d = volume of distribution; target C = model-specific target concentration; F = bioavailable fraction (1 for intravenous). Maintenance dose per interval = clearance x target average steady-state concentration x interval / F. Simplified linear model; match units.

Interpreting treatment effects

Relative effects

$$\text{RR} = \text{event risk with treatment} / \text{event risk with control}$$

RR = relative risk; RRR = relative risk reduction. For an undesirable event, $\text{RRR} = 1 - \text{RR}$. Each group's risk = events / group total. Use the same follow-up time.

Absolute benefit or harm

$$\text{ARR} = \text{control risk} - \text{treatment risk; NNT} = 1 / \text{ARR}$$

ARR = absolute risk reduction; NNT = number needed to treat. If undesirable-event risk rises, NNH (number needed to harm) = 1 / absolute increase. Use proportions; round positive estimates up; state follow-up time. Zero difference has no finite NNT.

Odds ratio

$$\text{OR} = (a \times d) / (b \times c)$$

OR = odds ratio. a = treated/event; b = treated/no event; c = control/event; d = control/no event. OR is not generally equal to relative risk.

Carry units through each step. Use the stated assumptions. Round only at the end.

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