# Back to Basics: Calculations for Pharmacy Technicians

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# Disclosure

No relevant financial relationships to disclose.

# Learning Objectives

By the end of this presentation, participants will be able to:

1. Provide accurate conversions between units of measure
2. Determine common errors that can be made when preparing high-risk medications
3. Calculate dose (including dose conversions), quantity to be dispensed, and/or day supply based on a prescription or medication order
4. Perform calculations necessary for pharmacy compounding (i.e., custom fluids, serial dilutions, final concentration)
5. Formulate the appropriate round answers and report in desired units

# Common Units of Measure

| Weight | | Volume | | Milliequivalents & Millimoles | |
|---|---|---|---|---|---|
| 1 kg | __ lbs | 1 tsp | __ mL | K+, Na+, other monovalent ions | 1 mEq = __ mmol |
| 1 oz | __ g | 1 tbsp | __ mL | Ca2+ & other divalent ions | 1 mEq = __ mmol |
| 1 lb | __ g<br>__ oz | 1 fl oz | __ mL | | |
| 1 grain | __ mg | 1 pint | __ oz<br>__ mL | | |

UWorld RxPrep. UWorld RxPrep's 2025 NAPLEX Course Book for Pharmacist Licensure Exam Preparation. UWorld, LLC, 2024. ISBN 9798989876204

# Common Units of Measure

| Weight | | Volume | | Milliequivalents & Millimoles | |
|---|---|---|---|---|---|
| 1 kg | 2.2 lbs | 1 tsp | 5 mL | K+, Na+, other monovalent ions | 1 mEq = 1 mmol |
| 1 oz | 28.4 g | 1 tbsp | 15 mL | Ca2+ & other divalent ions | 1 mEq = 0.5 mmol |
| 1 lb | 454 g<br>16 oz | 1 fl oz | 30 mL | | |
| 1 grain | 65 mg | 1 pint | 16 oz<br>480 mL | | |

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# Common Conversions - Example #1

You are filling a prescription for promethazine oral solution from a 16 fl oz stock bottle that is full.

**How many mL will remain if you use 60 mL to fill the prescription?**

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**How many mL will remain if you use 60 mL to fill the prescription?**

1 fl oz = 30 mL

16 fl oz x 30 mL/fl oz = 480 mL

480 mL – 60 mL = **420 mL remaining**

# Metric Conversions

**kilogram ↔ gram ↔ milligram ↔ microgram ↔ nanogram**

**liter ↔ deciliter ↔ centiliter ↔ milliliter**

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# Metric Conversions

x 1000 →

kilogram ↔ gram ↔ milligram ↔ microgram ↔ nanogram

← 1000 ÷

x 10 →

liter ↔ deciliter ↔ centiliter ↔ milliliter

← 10 ÷

x 1000 →

liter ↔ milliliter

← 1000 ÷

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# Metric Conversions - Practice

You have a drug solution with a labeled concentration of 10 g/L.

**What is the concentration of this solution in mg/mL?**

# Metric Conversions - Practice

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**What is the concentration of this solution in mg/mL?**

10 g/L = 10,000 mg/1,000 mL = **10 mg/mL**

# Percentage Strength

**% (w/v)** = weight of drug (g) / 100 mL solution

**% (w/w)** = weight of drug (g) / 100 g mixture

**% (v/v)** = volume of drug (mL) / 100 mL solution

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# Percentage Strength - Practice

You are making a batch of dextrose 5% in water using D25% and sterile water.

**What is the concentration of the D25% in g/mL?**

# Percentage Strength - Practice

You are making a batch of dextrose 5% in water using D25% and sterile water.

**What is the concentration of the D25% in g/mL?**

Percent strength (% w/v) = weight of drug (g) / 100 mL solution

25% = 25 g dextrose / 100 mL solution = **0.25 g/mL**

# Paying Attention To Detail

- **Units**
  - %, mL, L, mg, g
  - mg/mL vs mcg/mL
  - mg/kg/dose vs mg/kg/day
- **Concentrations of high-risk medications**
  - Heparin
  - Insulin
  - Look-alike Sound-alikes

# Common Conversion Example #2

You are a pharmacy technician at a local independent community pharmacy. A patient drops off a new prescription for an antibiotic suspension after being seen at the urgent care next door. The directions say to "Take ii tsp PO TID x7 days"

**What is the total volume in mL needed to dispense this prescription?**

# Common Conversion Example #2

You are a pharmacy technician at a local independent community pharmacy. A patient drops off a new prescription for an antibiotic suspension after being seen at the urgent care next door. The directions say to "Take ii tsp PO TID x7 days"

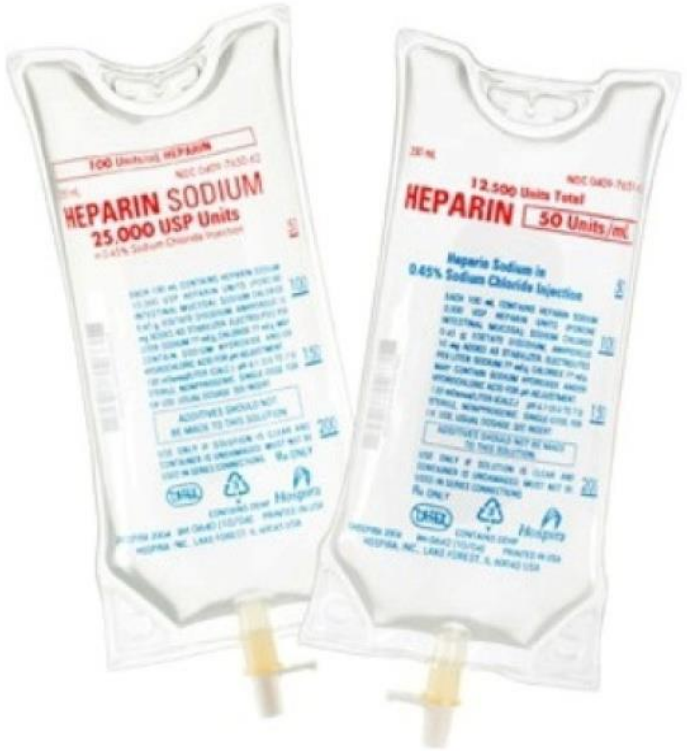
**What is the total volume in mL needed to dispense this prescription?**

ii tsp = 2 x 5 mL/tsp = 10 mL/dose

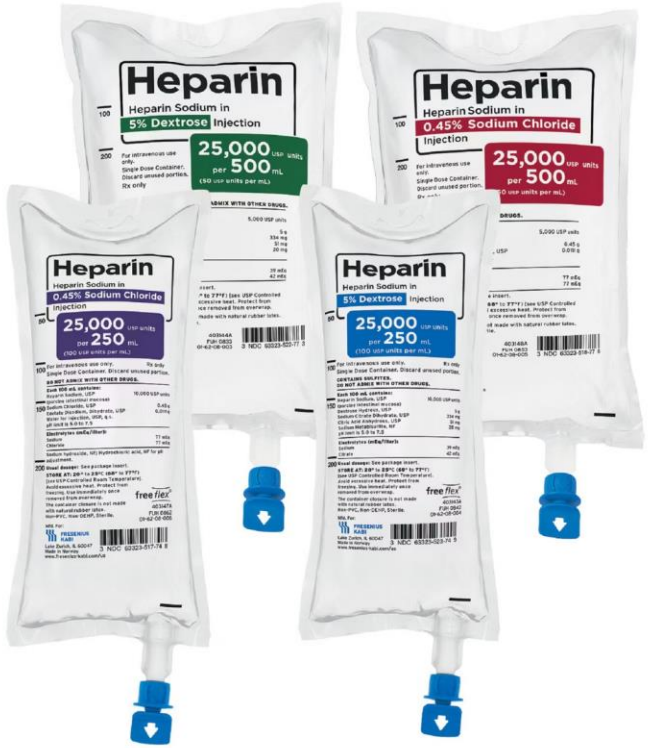
10 mL/dose x 3 doses/day = 30 mL/day

30 mL/day x 15 days = **210 mL**

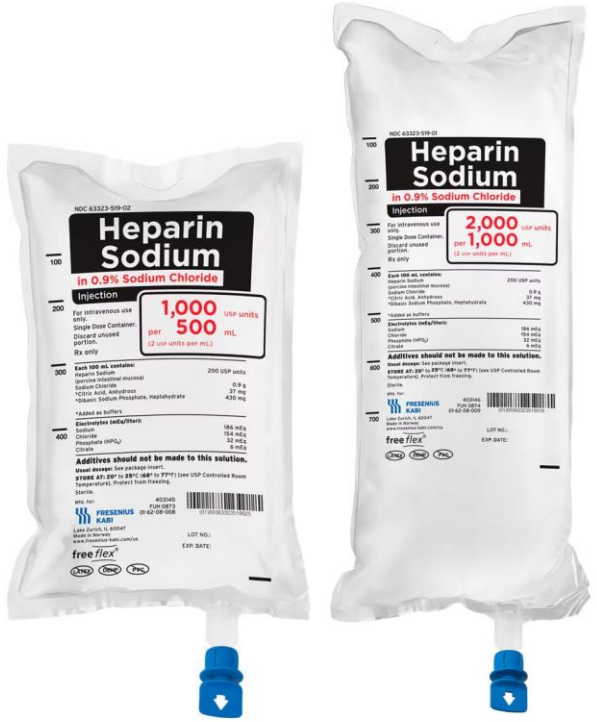
# High-Risk Medications - Heparin




Look-alike products with same volume, but different concentrations



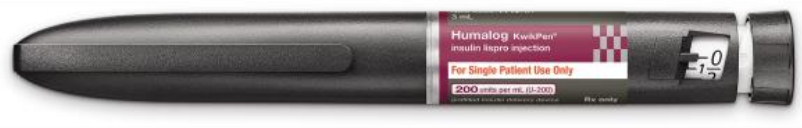

Colors on manufacturer labels are not standardized

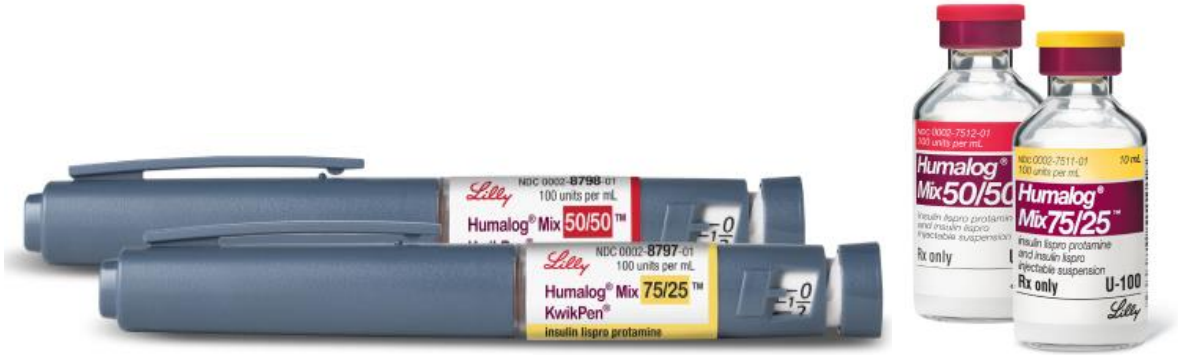



Look-alike products with same concentration, but different volume

Image Sources: SupremeMed.com, Fresenius-Kabi.com, Fresenius-Kabi.com

# High-Risk Medications - Insulin

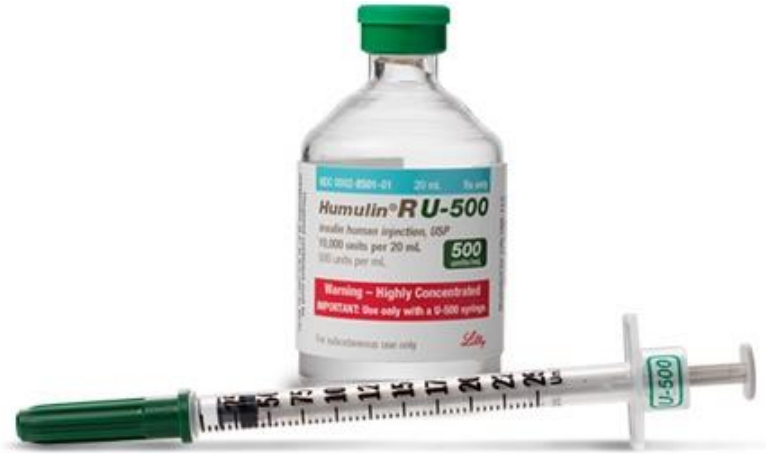
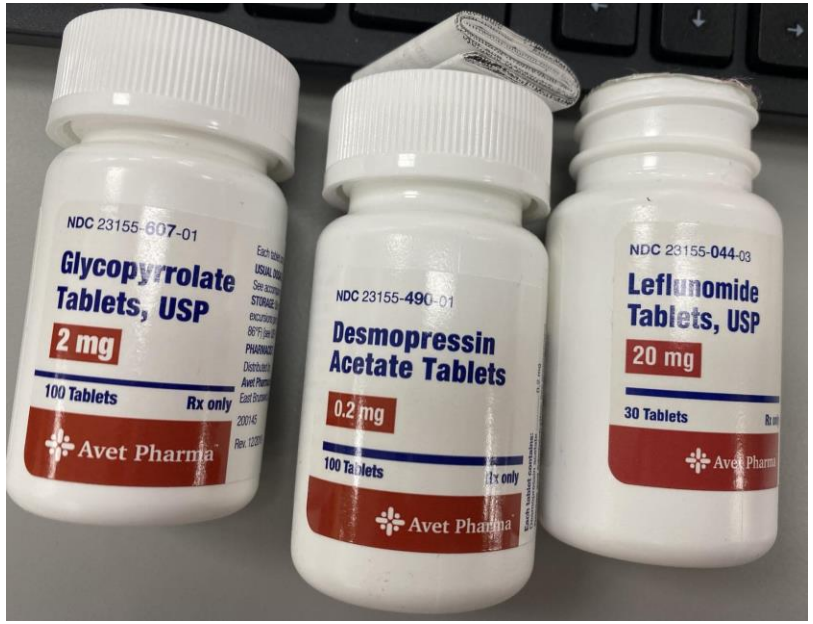
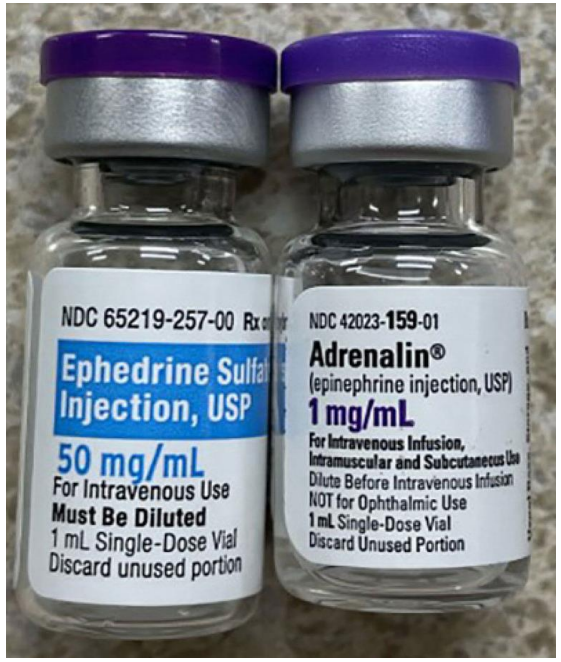




Image Sources: consumermedsafety.org, insulins.lilly.com/humalog

# Look-Alike Sound-Alikes



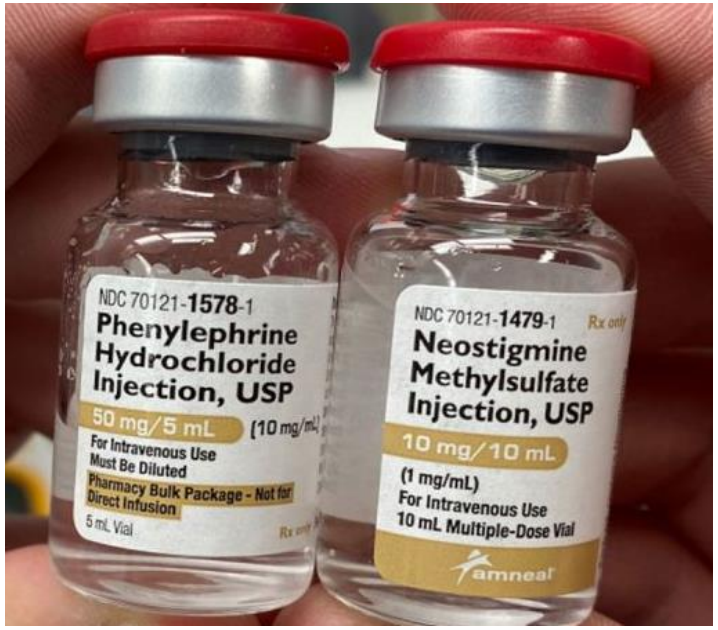




Image Sources: imgur.com, apsf.org, linkedin.com

# Multiple Conversions May Be Needed

You are a pharmacy technician working at a pharmacy located next to a busy emergency department and a mother drops off a prescription for her child.

Rx: Amoxicillin suspension 90 mg/kg/day PO divided BID x5 days
Disp: qs | Pt wt: 70 lbs.

**How many fluid ounces of amoxicillin suspension 400 mg/5mL need to be dispensed? Round to the nearest whole ounce.**

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**How many fluid ounces of amoxicillin suspension 400 mg/5mL need to be dispensed? Round to the nearest whole ounce.**

**Step 1:** Dosing is weight-based (mg/kg/day), convert patient weight from lbs to kg

70 lbs ÷ 2.2 lbs/kg = **31.82 kg**

**Step 2:** Calculate total daily dose (mg)

31.82 kg x 90 mg/kg/day = **2863.8 mg/day**

# Multiple Conversions May Be Needed

Rx: Amoxicillin suspension 90 mg/kg/day PO divided BID x5 days
Disp: qs | Pt wt: 70 lbs.

**How many fluid ounces of amoxicillin suspension 400 mg/5mL need to be dispensed? Round to the nearest whole ounce.**

**Step 3:** Determine total volume to be dispensed (mL)

2863.8 mg/day x 5 days = 14, 319 mg

14,319 mg x 5 mL / 400 mg = 178.98 → **179 mL**

**Step 4:** Convert answer to desired units.

179 mL / 30 mL/fl oz = 5.96 → **6 fl oz**

# Day Supply – Example #1

**How many days of therapy will the prescription provide as written? Assume drop factor of 20.**

Rx: Ciprofloxacin OP sol 0.3%

ii gtts OU 4 times daily x 5 days | Disp: 2.5 mL

# Day Supply – Example #1

**How many days of therapy will the prescription provide as written? Assume drop factor of 20.**

Rx: Ciprofloxacin OP sol 0.3%

ii gtts OU 4 times daily x 5 days | Disp: 2.5 mL

2 drops x 2 eyes x 4 doses/day = 16 drops/day

2.5 mL x 20 drops/mL = 50 drops

50 ÷ 16 = 3.125 → **3 days**

# Day Supply – Example #2

You are working at an inpatient hospital pharmacy and one of the clinical pharmacists asks you to stock the Pyxis with a 48-hour supply of doses for a patient with the following order:

Lacosamide (10 mg/mL) oral solution

5 mg/kg PO BID | Wt: 20 kg

**How many 5 mL unit-dose cups will need to be loaded into the patient-specific drawer?**

# Day Supply – Example #2

You are working at an inpatient hospital pharmacy and one of the clinical pharmacists asks you to stock the Pyxis with a 48-hour supply of doses for a patient with the following order:

Lacosamide (10 mg/mL) oral solution

5 mg/kg PO BID | Wt: 20 kg

**How many 5 mL unit-dose cups will need to be loaded into the patient-specific drawer?**

5 mg/kg x 20 kg = 100 mg | 100 mg ÷ 10 mg/mL = 10 mL/dose

2 cups/dose x 2 doses/day x 2 days = **8 unit-dose cups**

# Inhalers

A patient stops by the pharmacy to refill his albuterol HFA inhaler which he uses for rescue treatment of his asthma. The directions on his prescription state: "Inhale 1-2 puffs into the lungs Q4H PRN SOB" Today is 10/4/25. He last refilled the inhaler on 9/22/25 (13 days ago).

**How many days should his prescription last if used as directed?**

**On average, how many puffs is this patient using per day? Round to the nearest whole number.**

# Inhalers

...The directions on his prescription state: "Inhale 1-2 puffs into the lungs Q4H PRN SOB" Today is 10/4/25. He last refilled the inhaler on 9/22/25 (13 days ago).

**How many days should his prescription last if used as directed?**

200 puffs ÷ (2 puffs x 6 doses/day) = 16.6 → 16 days

**On average, how many puffs is this patient using per day? Round to the nearest whole number.**

200 puffs ÷ 13 days = ~ 15 puffs / day

# Insulin

You are working at a community pharmacy and receive an e-prescription for a new-start insulin for a 40-year-old male with type 2 diabetes (A1c of 14 at diagnosis).

**How many insulin pens must be dispensed?**

Rx: Insulin lispro injection 100 units/mL

Dispense: qs for 28-day supply

Directions for use: Inject 10 units SC three times daily 15 minutes before meals

# Insulin

**How many insulin pens must be dispensed?**

Rx: Insulin lispro injection 100 units/mL

Dispense: qs for 28-day supply

Directions for use: Inject 10 units SC three times daily 15 minutes before meals

10 units x 3 doses/day x 28 days = 840 units insulin

840 units ÷ 100 units/mL = 8.4 mL insulin

8.4 mL ÷ 3 mL/pen = 2.8 pens → **3 pens**

# Dose Conversion - Changing Formulation

A mother comes to the pharmacy to request that her 7 y.o. son's allergy medication be dispensed as an oral liquid instead of a tablet. He is prescribed loratadine 5 mg PO daily. You have loratadine oral solution 5 mg/5 mL in stock.

**How many mL should be given per dose?**

**How many mL are needed to dispense a 30-day supply?**

# Dose Conversion - Changing Formulation

A mother comes to the pharmacy to request that her 7 y.o. son's allergy medication be dispensed as an oral liquid instead of a tablet. He is prescribed loratadine 5 mg PO daily. You have loratadine oral solution 5 mg/5 mL in stock.

**How many mL should be given per dose?**

5 mg x (5 mL / 5 mg) = 5 mL /dose

**How many mL are needed to dispense a 30-day supply?**

5 mL/day x 30 days = 150 mL

# Converting Insulin Doses

Most insulin doses are converted **1:1**

**Exception #1:** when converting from NPH dosed BID → insulin glargine (e.g., Lantus, Toujeo) dosed daily

- **Use 80% of NPH dose**

**Exception #2:** when converting Toujeo U-300 → insulin glargine U-100 (e.g., Lantus, Basaglar) or insulin detemir (e.g., Levemir)

- **Use 80% of Toujeo dose**

American Diabetes Association, 2022

# Converting Insulin Doses

You are refilling an insulin prescription for a patient that receives 30 units of Toujeo every morning. Their insurance changed preferred products and will only cover insulin glargine U-100 pens.

**What dose of insulin glargine U-100 should this patient receive?**

# Converting Insulin Doses

You are refilling an insulin prescription for a patient that receives 30 units of Toujeo every morning. Their insurance changed preferred products and will only cover insulin glargine U-100 pens.

**What dose of insulin glargine U-100 should this patient receive?**

Remember: Toujeo → insulin glargine U-100: Use 80% of Toujeo dose

30 units Toujeo daily x 0.8 = **24 units insulin glargine U-100 daily**

# Warfarin

Rx: Warfarin 5 mg PO once daily MWF, 7.5 mg PO once daily all other days for 28 days | Start date: Sunday, 10/5/25

**How many 5 mg tablets must be dispensed for this prescription?**

# Warfarin

Rx: Warfarin 5 mg PO once daily MWF, 7.5 mg PO once daily all other days for 28 days | Start date: Sunday, 10/5/25

**How many 5 mg tablets must be dispensed for this prescription?**

(5 mg x 3 days) + (7.5 mg x 4 days) = 45 mg/week

45 mg/week x 4 weeks = 180 mg

180 mg ÷ 5 mg/tablet = **36 tablets**

# Dilutions

Many dilutions can be calculated using the simple formula

**C1V1 = C2V2** where...

C1 = concentration of the starting solution

V1 = volume of the starting solution

C2 = concentration of the final solution

V2 = volume of the final solution

# Dilution – Example #1

You have 100 mL of 20% drug solution in a large beaker. You then add 400 mL sterile water to the original drug solution.

**What is the resulting percent concentration of the diluted solution?**

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You have 100 mL of 20% drug solution in a large beaker. You then add 400 mL sterile water to the original drug solution.

**What is the resulting percent concentration of the diluted solution?**

C1V1 = C2V2

C1 = 20%  V1 = 100 mL  V2 = **500 mL**

20% x 100 mL = __% x 500 mL

X = **4%**

# Custom Fluids

There is a shortage of IV fluids including D5W. Currently, you only have D70W in stock.

**How many liters (L) of D5W can you make with 250 mL D70W?**

# Custom Fluids

There is a shortage of IV fluids including D5W. Currently, you only have D70W in stock.

**How many liters (L) of D5W can you make with 250 mL D70W?**

- D70% = (70 g dextrose / 100 mL) x 250 mL = 175 g dextrose
- 175 g dextrose x (100 mL / 5 g dextrose) = 3,500 mL = **3.5 L D5W**

# Serial Dilutions - Insulin

You are a hospital pharmacy technician working in the IV room. The pharmacist asks you to perform serial dilutions to prepare insulin doses for patients in the pediatric ICU.

**What volume (in mL) of each ingredient is needed to prepare a 1:10 dilution that results in a final concentration of 10 units/mL?**

Ingredients:

0.9% sodium chloride

Insulin regular 100 units/mL

# Serial Dilutions - Insulin

**What volume (in mL) of each ingredient is needed to prepare a 1:10 dilution that results in a final concentration of 10 units/mL?**

Ingredients:

0.9% sodium chloride (NS)

Insulin regular 100 units/mL

**1 mL insulin** (100 units/mL) + **9 mL NS** = 100 units/10 mL = 10 mL of **10 units/mL**

# Summary

- When performing multi-step calculations, convert to common units of measure
- Watch out for look-alike sound-alike medications or manufacturer packaging
- Ensure any rounding is appropriate for the clinical situation (i.e., rounding down on day supply of insulin)

# Thank you !

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Questions?

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