A Pharmacy Tech's Quick Reference of

Pharmacy Conversions

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Rx TECHEXAM

- Section 1 -

Conversions

Pharmacological Calculations are reliant on specific systems of measure and the Technician's ability to quickly and accurately convert between them. There is a simple equation that can be used to convert between any two types of units.

For example, let's assume you're tasked with converting 7.5mL to units. First, you'll need to know how many units there are in 1mL (100u = 1mL).

Next you set up **the first and last equation that you'll need**:

If I know there are 100u in 1mL how many units are in 7.5mL?

100 units is to 1mL as X units is to 7.5mL

100 units : 1mL = X units : 7.5mL

$$\frac{100\text{units}}{1\text{mL}} = \frac{X\text{ units}}{7.5\text{mL}}$$

To solve the conversion equation that you've set up,

Cross-Multiply and Divide.

7.5mL x 100units = 750 750 / 1mL = 750 units

By utilizing this simple way to set up conversions, you'll have greater success in solving them. Once again, this equation can be adapted to solve most of the conversions you'll be expected to know for the Pharmacy Technician Certification Exam® and while practicing in a Pharmacy.

Many students struggle mightily when trying to grasp the **Metric System.** Honestly, it is not as hard as you might think. In regard to Pharmacological Calculations, we are not concerned with distance. We will, however, need to be able to convert between units of volume and weight.

Volume is defined as the amount of space that a substance occupies. When we refer to volume, we are referring to liquid measure (ex. 5mL).
In the Metric System, Volume has two units:

milliliters (mL) and liters (L).

There are 1000mL in every 1L

Weight is defined as the heaviness of matter of a substance.
When we refer to weight, we are referring to solid measure (ex. 5g).
In the Metric System, Weight has four units:

kilogram (kg), gram (g), milligram (mg), and microgram (mcg or µg)

There are 1000mcg in 1mg, 1000mg in 1g, and 1000g in 1kg

The easiest way to convert between units in the Metric System is to *move the decimal point*. When we go from a larger unit to a smaller unit we will move the decimal 3 units to the right (LSR). When we move from a smaller unit to a larger unit we will move the decimal point 3 units to the left (SLL). Let's take a look at a couple of examples:

4.48357L = ?mL
Larger to Smaller move Right (LSR)

4.483L → 4483.57mL

25.754µg = ?g
Smaller to Larger move Left (SLL)

23.75µg → 0.00002375g
We moved 6 places, µg to mg to g

The **Apothecary System** originates from a Greek system of measure. Much like the Metric System, it concerns itself with both weight and volume however many of the units in the Apothecary System have changed or been phased out.

There is a very small unit of weight known as a grain (gr).
Be sure to note that a gr (grain) ≠ g (gram).
1 grain (gr) = 64.8mg
You might be familiar with 5gr Tylenol® (325mg) or 10gr Tylenol® (650mg).

In respect to volume, there are two units – the fluid dram and the fluid ounce.
1 fluid dram ≈ 5mL and can be represented in the following ways: ʒi or 1fl dr.
1 fluid ounce ≈ 30mL can be shown as follows: ℥i or 1 fl oz.

The number of drams or fluid ounces is reflected by the Roman numeral to the right of the appropriate symbol. 5 drams is shown as: ʒv

The **Avoirdupois System** originates from France and is commonly used today in the United States to describe units of weight. This system, unlike the Metric System and Apothecary System, does not have any units of volume.

There is only one conversion factor that you'll need to know for the Avoirdupois System:

1 pound (lb.) = 16 ounces (oz.)

Be sure to note that an oz. (solid) ≠ fl oz. (liquid).

Common Household Measurements include many measures used in both cooking and everyday life. This system only concerns volume (liquid measure).

- Common Household Measurements -		
Unit	Abbreviation(s)	Conversion Factor
Teaspoonful	t or tsp	1t = 5mL
Tablespoonful	T or Tbsp	1T = 15mL
Fluid Ounce	fl oz.	1fl oz. = 29.57mL ≈ 30mL
Pint	pt	1pt = 473mL ≈ 480mL
Quart	qt	1qt = 2pt
Gallon	gal	1gal = 4qt

There are two systems of measure used to describe **Temperature: Celsius and Fahrenheit.** **Celsius** (centigrade) has been adopted in most countries and is based on the freezing point (0°C) and boiling point of water (100°C). **Fahrenheit** isn't as easily scaled, but for perspective, the freezing point of water is 32°F and the boiling point of water is 212°F.

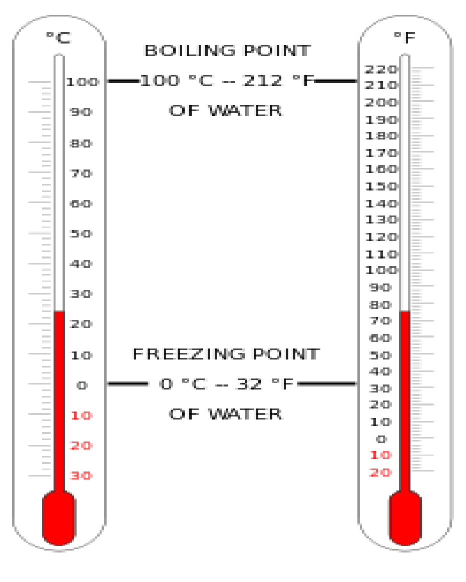
In order to convert between the two systems:

$°F = (°C \times 9/5) + 32$

$°C = °F - 32 \times (5/9)$

If you prefer to only remember one equation:

$9 \times °C = 5 \times °F - 160$



Pharmaceutical Conversion Factors

Exact Liquid Measure	Approximate Liquid Measure (if applicable)
100units = 1mL	n/a
20gtts = 1mL	n/a
1cc or 1cm^3 = 1mL	n/a
1 tsp = 5mL	n/a
1 Tbsp = 15mL	n/a
ʒi = 5mL	n/a
1 fl oz = 29.57ml	1fl oz ≈ 30mL
℥i = 29.57mL	℥i ≈ 30mL
1pt = 473mL	1fl oz ≈ 480mL
1qt = 946mL	n/a
1qt = 2pt	n/a
1L = 1000mL	n/a
1gal = 3784mL	1gal ≈ 4000mL
1gal = 4qt	n/a

Exact Solid Measure	Approximate Solid Measure (if applicable)
1000mcg or 1000µg = 1mg	n/a
64.8mg = 1gr	65mg ≈ 1gr
1000mg = 1g	n/a
28.35g = 1oz	30g ≈ 1oz
454.54g = 1lb	480g ≈ 1lb
1000g = 1kg	n/a
2.2lbs = 1kg	n/a

The ability to **convert between all of the systems** listed so far in this guide is critical.

Example A: if a prescriber writes:

Humalog Insulin
10u sc am x30
Q.S

You'll be tasked with dispensing the correct package size. While the patient and doctor measure insulin in units, pharmacy personnel dispense it in milliliters. Referring to the conversion table on the previous page,

1. You'll find that there are 100units in every 1mL.
   This can be rewritten 100units:1mL.
2. Well we want to know how many mL there are in 10u (per the prescription).
   That can be rewritten 10units:XmL
3. Combine #1 and #2
   100units:1mL::10units:XmL
4. Now let's translate that into something we can solve:

$$\frac{100\text{units}}{1\text{mL}} = \frac{10\text{units}}{X\text{mL}}$$

5. Cross-Multiply and Divide
   1mL x 10units = 10 / 100units = 0.1mL
6. We've determined there are 0.1mL for every 100units
7. So now we know that the patient will administer 0.1mL daily for 30 days (3.0mL)

Example B:

? gtts = 8mL

$$\frac{20\text{gtts}}{1\text{mL}} = \frac{X\text{ gtts}}{8\text{ mL}}$$

1. Set up our conversion factor.
2. Set up our conversion.
3. Cross Multiply and Solve

20gtts x 8mL = 160 / 1mL = 160gtts

Example C:

? lbs = 24kg

$$\frac{1kg}{2.2lbs} = \frac{24kg}{X\ lbs}$$

1. Set up our conversion factor.
2. Set up our conversion.
3. Cross Multiply and Solve

2.2lbs x 24kg = 52.8 / 1kg = 52.8lbs

Example D:

? mL = 2pt

$$\frac{1pt}{473mL} = \frac{2pt}{X\ mL}$$

1. Set up our conversion factor.
2. Set up our conversion.
3. Cross Multiply and Solve

473mL x 2pt = 976 / 1pt = 976mL

Example E:

? mg = 1.5gr

$$\frac{1gr}{64.8mg} = \frac{1.5gr}{X\ mg}$$

1. Set up our conversion factor.
2. Set up our conversion.
3. Cross Multiply and Solve

64.8mg x 1.5gr = 66.3 / 1gr = 66.3gr

Keys to remember when setting up conversions:

- Put the conversion factor on the left
- Notice how the units line up, same units on top, same units on the bottom
- Cross Multiply the only two numbers that are across from one another
- Divide that answer by the last number remaining
- Your answer will be the same unit as your variable (X).

Occasionally, you'll be tasked with converting between two types of measurement that we do not know the conversion factor for. Like if you were asked to find how many pints are in 3 Liters. These are known as **Two Step Conversions**, because you'll have to complete two conversion equations in order to solve the original question.

?pts = 3L

- We know there are 473mL in every pint, and 1000mL in every Liter.
- Milliliters are what is known as our intermediary.
    - An intermediary is a unit we can convert to (in one step) with BOTH the given component of the conversion (3L) and the unknown (?pts).
- Here's how it all plays out:
    1. Convert our known to our intermediary unit.

       3L → mL

       $$\frac{1L}{1000mL} = \frac{3L}{XmL}$$

       We find that 3L = 3000mL.
    2. Now that we know that we have 3000mL as our known, we can do the second step of the conversion:

       $$\frac{1pt}{473mL} = \frac{Xpt}{3000mL}$$

       We find that there are 6.34 pints in 3000mL.
    3. Our Solution: *There are 6.34pts in 3L.*

More information on this topic, as well as EVERYTHING you'll need to know to pass the Pharmacy Technician Certification Exam, can be found at www.RxTechExam.com

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