Principles of pharmacy practice

Lec 2

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Common Systems of Measurement and Intersystem Conversion

Common systems of measurement are divided into two types:

1. **The apothecaries' system of measurement**

It is the traditional system of pharmacy, and although it is now largely of historic significance, components of this system are occasionally found on prescriptions

Apothecaries' Fluid Measure
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60 minims (♏)	=	1 fluidrachm or fluidram (ƒ℥ or ℥)[a]
8 fluidrachms (480 minims)	=	1 fluidounce (ƒ℥ or ℥)[a]
16 fluidounces	=	1 pint (pt)
2 pints (32 fluidounces)	=	1 quart (qt)
4 quarts (8 pints)	=	1 gallon (gal)

Apothecaries' Measure of Weight

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20 grains (gr)	=	1 scruple (℈)
3 scruples (60 grains)	=	1 drachm or dram (ʒ)
8 drachms (480 grains)	=	1 ounce (℥)
12 ounces (5760 grains)	=	1 pound (℔)

2.The avoirdupois system

- is the common system of commerce, employed along with the SI in the United States. It is through this system that items are purchased and sold by the ounce and pound.

Avoirdupois Measure of Weight

437½ or 437.5 grain (gr) = 1 ounce (oz.)

16 ounces (7000 grains) = 1 pound (lb.)

Only one denomination has a value common to the apothecaries' and avoirdupois systems of measuring weight: **the grain.** The other denominations bearing the same name have different values.

If we want to change from one system to another first we need to change to grain then to the other system.

Examples:

Reduce ℨss ʒii ℈i *to grains.*

ℨss = ½ × 480 gr = 240 gr
ʒii = 2 × 60 gr = 120 gr
℈i = 1 × 20 gr = 20 gr

380 gr, *answer.*

Convert ℥ii ℨii to avoirdupois weight.

$$\begin{aligned} ℥ii &= 2 \times 480 \text{ gr} &&= 960 \text{ gr} \\ ℨii &= 2 \times 60 \text{ gr} &&= 120 \text{ gr} \\ \text{Total:} & & & 1080 \text{ gr} \end{aligned}$$

$$1 \text{ oz} = 437.5 \text{ gr}$$

$$\frac{1080}{437.5} \text{ oz} = 2 \text{ oz, } 205 \text{ gr, } \textit{answer.}$$

If a drug costs $8.75 per oz (avoir.), what is the cost of 2 ℨ?

$$1 \text{ oz} = 437.5 \text{ gr, and } 2 ℨ = 120 \text{ gr}$$

$$\frac{437.5 \text{ (gr)}}{120 \text{ (gr)}} = \frac{8.75 \text{ (\$)}}{x \text{ (\$)}}$$

$$x = \$2.40, \textit{ answer.}$$

Intersystem Conversion

On occasion it may be necessary to translate a weight or measurement from units of one system to units of another system.

This translation is called conversion. The translation of a denomination of one system to that of another system requires a conversion factor or conversion equivalent.

Conversion Equivalents of Volume		
1 mL	16.23	♏
1 ♏	0.06	mL
1 ℥	3.69	mL
1 f℥	29.57	mL
1 pt.	473	mL
1 gal. (U.S.)[b]	3785	mL

Conversion Equivalents of Weight		
1 g	15.432	gr
1 kg	2.20	lb (avoir.)
1 gr	0.065	g (65 mg)
1 oz. (avoir.)	28.35	g
1 ℥	31.1	g
1 lb (avoir.)	454	g
1 lb (apoth.)	373	g

Conversion Equivalents of Length	
1 m	39.37 in
1 in	2.54 cm (exact)

Other Useful Equivalents	
1 oz. (avoir.)	437.5 gr (exact)
1 ℥	480 gr (exact)
1 gal. (U.S.)	128 f℥ (exact)

Convert 0.4 mL to minims.

To achieve two-figure precision,

$$0.40 \times 16.23\ \mathfrak{m} = 6.492 \text{ or } 6.5\ \mathfrak{m}, \textit{ answer.}$$

Or, solving by dimensional analysis:

$$0.4\ \text{mL} \times \frac{16.23\ \mathfrak{m}}{1\ \text{mL}} = 6.492 \text{ or } 6.5\ \mathfrak{m}, \textit{ answer.}$$

Convert 2.5 L to fluidounces.

$$2.5\ \text{L} = 2500\ \text{mL}$$

Solving by proportion:

$$\frac{1\ (\mathfrak{f}\overline{3})}{x\ (\mathfrak{f}\overline{3})} = \frac{29.57\ (\text{mL})}{2500\ (\text{mL})}$$

$$x = 84.5\ \mathfrak{f}\overline{3}, \textit{ answer.}$$

Or, solving by dimensional analysis:

$$2.5\ \text{L} \times \frac{1000\ \text{mL}}{1\ \text{L}} \times \frac{1\ \mathfrak{f}\overline{3}}{29.57\ \text{mL}} = 84.5\ \mathfrak{f}\overline{3}, \textit{ answer.}$$

Convert 5 mg to grains.

Solving by proportion:

$$\frac{1\ (\text{gr})}{x\ (\text{gr})} = \frac{65\ (\text{mg})}{5\ (\text{mg})}$$

$$x = {}^{5}\!/_{65}\ \text{gr} = {}^{1}\!/_{13}\ \text{gr},\ \textit{answer.}$$

Convert 15 kg to avoirdupois pounds.

Solving by proportion:

$$\frac{1\ (\text{kg})}{15\ (\text{kg})} = \frac{2.2\ (\text{lb.})}{x\ (\text{lb.})}$$

$$x = 33.0\ \text{lb.},\ \textit{answer.}$$

Convert 6.2 gr to milligrams.

$$6.2 \times 65\ \text{mg} = 403 \text{ or } 400\ \text{mg},\ \textit{answer.}$$

Or, solving by dimensional analysis:

$$6.2\ \text{gr} \times \frac{1\ \text{g}}{15.432\ \text{gr}} \times \frac{1000\ \text{mg}}{1\ \text{g}} = 401.8 \text{ or } 400\ \text{mg},\ \textit{answer.}$$

9. A pharmacist received a prescription calling for 30 capsules, each to contain $\frac{1}{200}$ gr of nitroglycerin. How many 0.4-mg nitroglycerin tablets would supply the amount required?

10. If a physician prescribed 4 grams of aspirin to be taken by a patient daily, about how many 5-grain tablets should the patient take each day?

11. ℞ Codeine Sulfate 30 mg
Acetaminophen 325 mg
M. ft. cap. D.T.D. no. 24
Sig. One capsule t.i.d. for pain.

How many grains each of codeine sulfate and acetaminophen would be contained in the prescription?

12. If a child accidentally swallowed 2 fluid-ounces of FEOSOL Elixir, containing $\frac{2}{3}$ gr of ferrous sulfate per 5 mL, how many milligrams of ferrous sulfate did the child ingest?