Pharmaceutical Calculations

Systems of Weight & Measures

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Systems of weights and measures

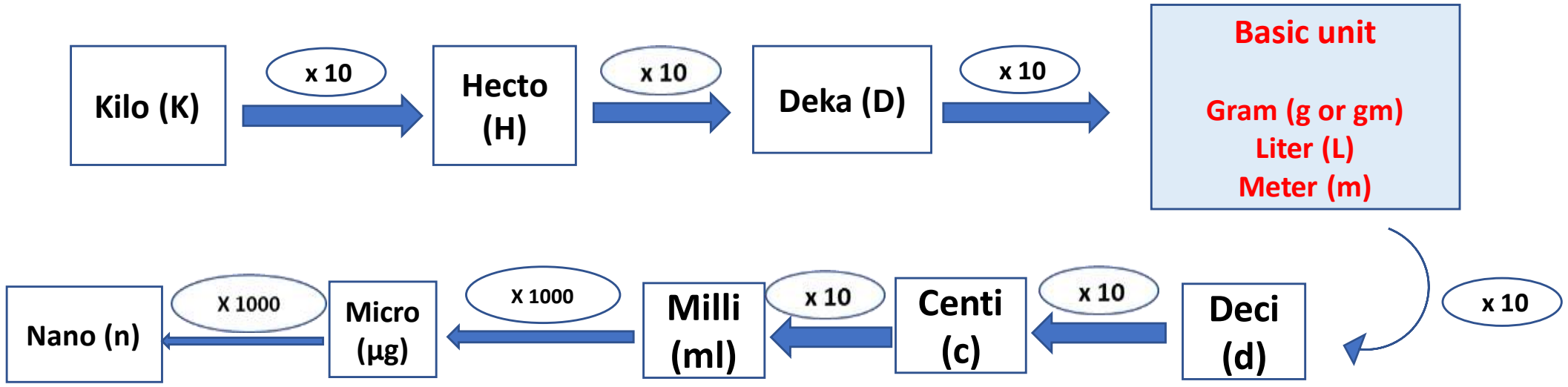
1. Official systems (e.g Metric system)

Fundamental units of metric system

Basic unit of weight → Gram (g or gm)

Basic unit of volume → Liter (L)

Basic unit of length → Meter (m)

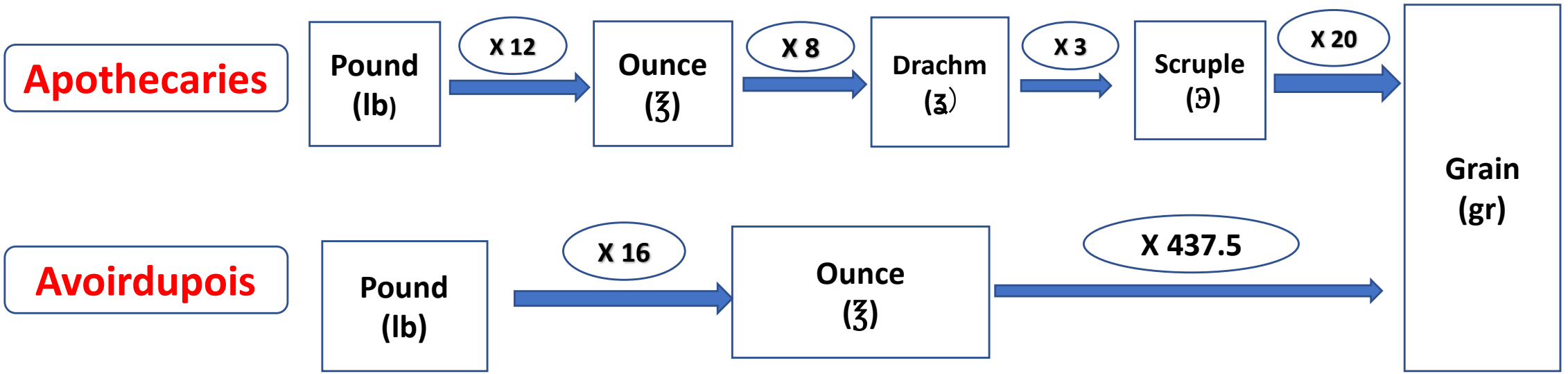


"King Harry Died By Drinking Chocolate Mixed Milk at Night"

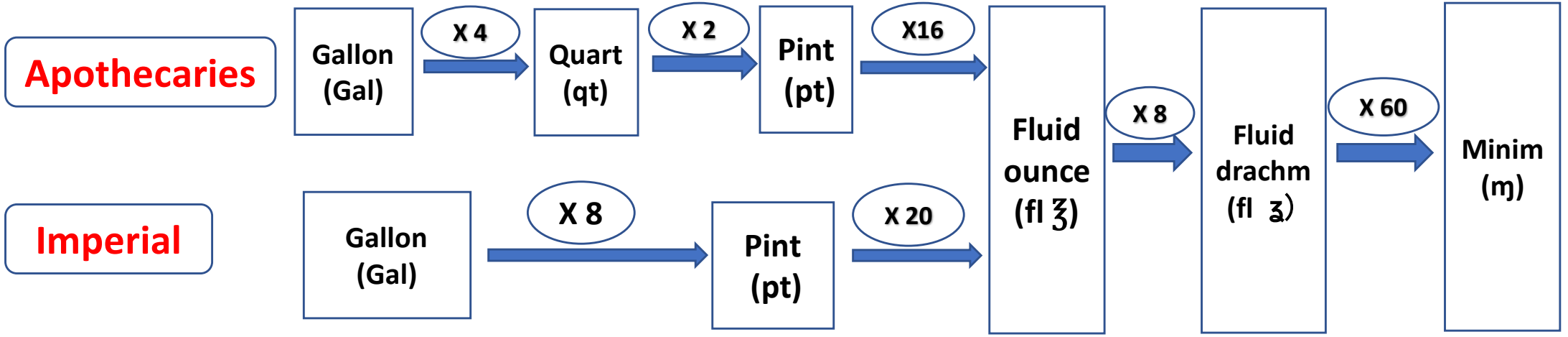
2. Common systems

Apothecaries, Avoirdupois and imperial systems

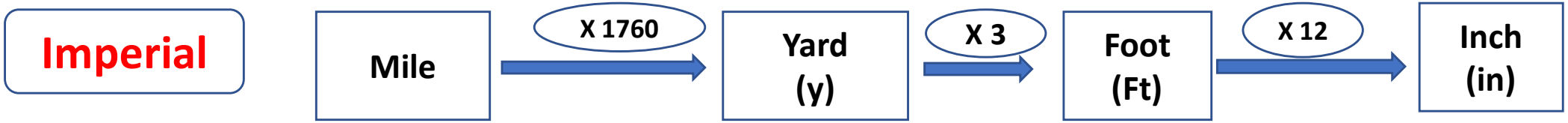
1) For weight



2) For volume

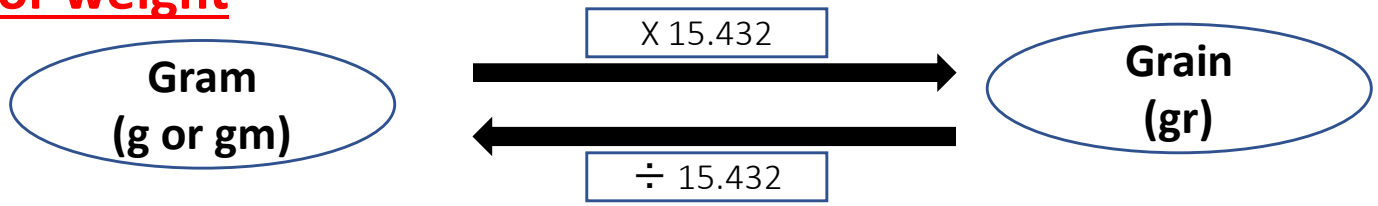


3) For length

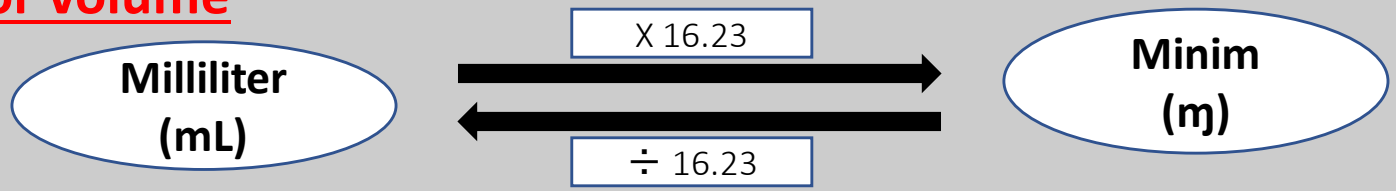


Conversion between metric system and common systems

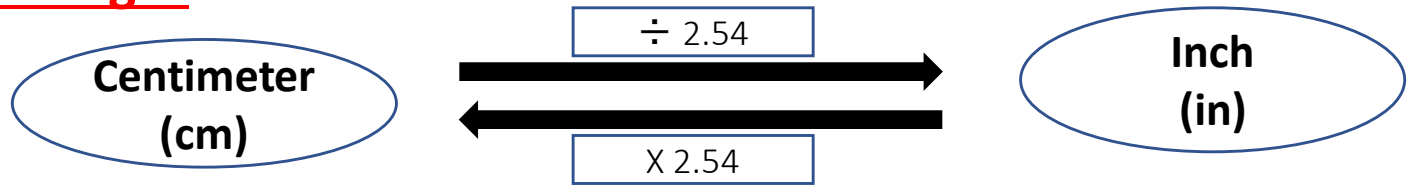
1) For weight



2) For volume



3) For length



❑ **Example 1: Calculate the metric equivalents of weights and measures in the following prescription:**

Rx

Ammonium carbonate	**gr V**
Menthol	**gr i**
Eucalyptol	**fl℥ ii**
Thymol	**gr iss**
Oil of lavender	**fl ℥ss**
Alcohol	**fl ℥ii**

- Ammonium carbonate = 5 gr / 15.432 = 0.324 g
- Menthol = 1 gr / 15.432 = 0.065 g
- Eucalyptol = 2 fl℥ x 60 = 120 ɱ / 16.23 = 7.394 ml
- Thymol = 1.5 gr / 15.432 = 0.097 g
- Oil of lavender = 0.5 fl℥ x 60 = 30 ɱ / 16.23 = 1.848 ml
- Alcohol = 2 fl ℥ x 8 x 60 = 960 ɱ / 16.23 = 59.15 ml

Example 2: Rewrite the following prescription with the amounts indicated in the metric system.

Rx

Bismuth subnitrate	**ʒ iiss**
Oil of peppermint	**ɱ v**
Dry extract of belladonna	**gr iii**
Sodium bicarbonate	**ʒ ss**
Water to	**fl ℥ xvi**

Example 3: Rewrite the following prescription with the amounts indicated in the metric system.

Rx

Aluminum hydroxide	**ʒ iiiss**
Dry Extract of Hyoscyamus	**gr vi**
Magnesium trisilicate	**ʒ iss**
Peppermint oil	**ɱ xv**
Chloroform water to	**fl ℥ xvii**

Percentage of error (% error)

- Error = Sensitivity = Maximum potential of error in a balance
- If 50 mg is required to be weighed on a balance sensitive to 2 mg:
  - The maximum potential error in this case = ±2 mg.
  - The actual weighed amount will be between 48 and 52 mg.
- To calculate the percentage off error:

$$\% \text{ of Error} = \frac{\text{Maximum potential Error x100}}{\text{Quantity desired}}$$

- Example 1: When the maximum potential error is ± 2 mg in a total of 50 mg, what is % of error ?

% of error = ± 2 x 100 / 50 = ± 4 mg

❑ Example 2: A prescription calls for 800 mg of a substance, after weighing this amount on a balance, the pharmacist decided to check by weighing it on another balance (more sensitive). Now he found that he has only 750 mg. What was the % of error?

- Error = 800 – 750 = ±50 mg
- Desired quantity = 800 mg
- % of error = ±50 x 100 / 800 = ±6.25 mg

❑ Calculating the smallest (minimum) quantity that can be weighed with a known error and % of error

$$\text{The smallest quantity} = \frac{\text{Error} \times 100}{\text{\% of error}}$$

- The smallest quantity = 2 mg x 100 / 4 = 50 mg

Ratio and proportion

❑ If 3 tablets contain 15 grains (gr.) of active ingredient, how many grains should be contained in 12 tablets?

3 tablets → 15 gr

12 tablets → X gr

- X = 15 gr x 12 tablets / 3 tablets = 60 gr

❑ If 3 tablets contains 15 gr. Of active ingredient, how many tablets should contain 60 gr.?

3 tablets → 15 gr

X tablets → 60 gr

- X = 60 gr x 3 tablets / 15 gr = 12 tablets

❑ If 5 Kg of a chemical cost 78.75 dollars, how much will 8 Kg cost?

5 Kg → 78.75 dollars

8 Kg → X dollars

- X = 8 Kg x 78.75 dollars / 5 Kg = 126 dollars

❑ If 1.5 g of a drug represent 18 doses , how many doses are represented in 0.25 g?

1.5 g → 18 doses

0.25 g → X doses

- X = 18 doses x 0.25 g / 1.5 g = 3 doses

❑ If 30 ml represent 1/6 of the volume of a prescription, how many ml represent ¼ of the volume?

30 ml → 1/6 volume

X ml → 1/4 volume

- X = 30 ml x ¼ volume / 1/6 volume = 45 ml

Calculation of doses

❑ **Table of equivalents:**

Household meaures	Metric measure
1 Teaspoonful	5 ml
1 Dessertspoonful	10 ml
1 Tablespoonful	15 ml
1 Coffeecupful	30 ml
1 Teacupful	120 ml

❑ Calibration of the droppers:

1. Frequently the drop is used as a measure for medicines for small age patients.

2. Drops of different liquids vary greatly and the drop should not be used as a measure until the volume that it represents has been determined for each specific liquid.

3. This is done by “calibrating” the dispensing dropper by counting the drops of liquid as they fall into a graduate until a measurable volume is obtained.

4. It is common practice for pharmacist to employ calibrated droppers for measuring small volumes.

❑ Example 1: How many drops would be prescribed in each dose of a medicine if 15 ml contained 60 doses? The dispensing dropper calibrates 32 drops/ml?

15 ml → 60 doses

X ml → 1 dose

- X = 15 ml x 1 dose / 60 doses = 0.25 ml

1 ml → 32 drops

0.25 ml → X drops

- X = 0.25 ml x 32 drops / 1 ml = 8 drops

❑ How may ml of a medicine would provide a patient with 2 tablespoonfuls twice a day for 8 days?

Day	Number of doses	Dose in household measure	Tablespoonful in ml	Total volume
8	2	2 tablespoonful	15 ml	480 ml

- Total volume = 8 x 2x 2 x 15 = 480 ml

❑ Example 2: If 0.05 g of a substance is used in preparing 125 tablets, how many micrograms are represented in each tablet?

1 g = 1000000 mcg

0.05 g = X mcg

- X = 0.05 g x 1000000 mcg / 1 = 50000 mcg

50000 mcg → 125 tablets

X mcg → 1 tablets

- X = 50000 mcg x 1 tab / 125 tablets = 400 mcg

❑ Example 3: If a preparation contains 5 g of a drug in 500 ml, how many grams are contained in each tablespoonful dose?

Dose = tablespoonful = 15 ml

5 g → 500 ml

X g → 15 ml

- X = 5 g x 15 ml / 500 ml = 0.15 g

❑ Example 4: The dose of a drug is 0.65 mg /Kg of body weight; how many mg should be given to a person weighing 70 Kg?

$$0.65 \text{ mg} \rightarrow 1 \text{ Kg}$$
$$X \text{ mg} \rightarrow 70 \text{ Kg}$$

- $X = 45.5$ mg

❑ Example 5: How many tablets of paracetamol can be used to provide with paracetamol elixir (125 mg/5ml) prescribed as one dessertspoonful twice daily for five days? You are provided with paracetamol tablets (500 mg / tablet)

Day	Number of doses	Dose in household measure	Dessertspoonful in ml	Total volume
5	2	1 dessertspoonful	10 ml	100 ml

125 mg → 5 ml
X mg → 100 ml

- X = 125 mg x 100 ml / 5 ml = 2500 mg

500 mg → 1 tablet
2500 mg → X tablets

- X = 2500 mg x 1 tablet / 500 mg = 5 tablets


Thank you