



Compounding and Manufacturing (2)

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Basics of Pharmaceutical Calculations

- Basics of Mathematics
 - ROMAN
 - ss
 - I or i
 - V or v
 - X or x
 - L or l
 - C or c
 - D or d
 - M or m
 - ARABIC
 - 0.5 or $\frac{1}{2}$
 - 1 (one)
 - 5
 - 10
 - 50
 - 100
 - 500
 - 1000

Conversion of Arabic numbers to Roman Numerals

- Caps # xiv

- Gtts ix

- Tabs # XLVIII

- Tabs # xxi

- Gms xlv

- ii tsps

- 14 capsules

- 9 drops

- 48 tablets

- 21 tablets

- 45 grams

- 2 teaspoonfuls

- **Positional Notation:**

Position of the number carries a mathematical significance.

- **Value of letters is:**

Smaller — ADD

Larger — SUBTRACT

Conversion of Arabic numbers to Roman Numerals

- Basics of Fractions
 - Whole Numbers (9=IX, 220=CCXX, 6=VI, 19=IXX)
 - Fractions
 - Parts of whole numbers (1/4, 2/7, 11/13)



Numerator

Denominator

- Decimal Numbers
 - Another means of writing fractions
(1/2 =0.5, 1&3/4 = 1.75)

Pharmacy Measuring System

- **Metric System**

- **Liquids (Volume)**

- Liter $1\text{L} = 10\text{ dL} = 1000\text{mL}$

- Milliliter $1\text{mL} = 0.001\text{ L}$

- Milliliters = cubic centimeters (cc)

- **Solids (Weight)**

- Kilogram $1\text{kg} = 1000\text{g}$

- Gram $1\text{g (gm)} = 0.001\text{kg}=1000\text{mG}$

- Milligram $1\text{mG}= 0.001\text{g}=1000\text{mcg}$

- Microgram $1\text{ mcg}= 0.001\text{mG} =0.000001\text{g}$

Pharmacy Measuring System

- **Avoirdupois System**

- Pound **lb** i lb=16oz
- Ounce **oz** i oz=437.5g
- Grain **gr** i gr= 60mg

- **Apothecary System**

- | | | (Metric) |
|---------------------------|---------------------|----------|
| – Gallon gal | i gal = iv qt | 4000mL |
| – Quart qt | i qt = ii pt | 1000mL |
| – Pint pt | i pt = xvi fl oz | 500mL |
| – Fluid Ounce fl ℥ | i fl oz = vii fl dr | 30mL |
| – Fluid dram f℥ | i fl dr = iv min | 4 mL |
| – Minims/Drop gtt | i min | 1 mL |

Pharmacy Measuring System

- **Household units**

- Teaspoon 1 tsp=5mL
- Tablespoon
1tbsp=3tsp=15mL
 - 2 tbsp = 30ml = 1 fl oz
- Cup 1cup=8 fl oz

- **Temperature** ~ ~ ~

- Centigrade (Celsius) C
- Fahrenheit, F
 - $9C=5F-160$

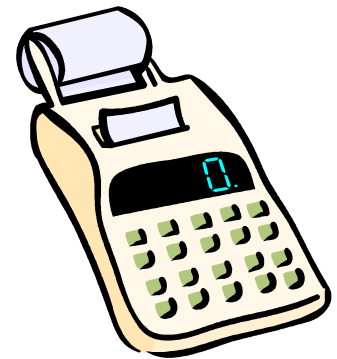


- **International Units**

- IU
- Measures the amount of drug in units
- Penicillin, heparin, insulin, vitamin E

- **Milliequivalents**

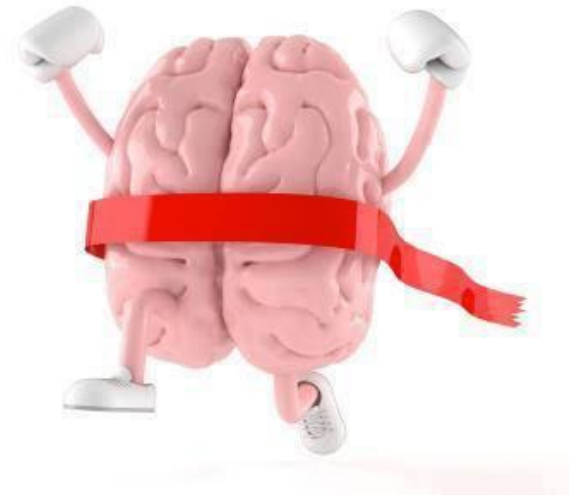
- mEq
- Refer to positively charged ions per liter of salt solution
- Klor-con 8mEq



Strategies for drug calculation

- Take care of the **UNITS**
- Use the following **formula**:
- Take care of the logic of the result.
- **Prescribe the medication correctly.**

$$\frac{\text{Dosage available}}{\text{Amount available}} = \frac{\text{Dosage Desired}}{\text{Amount desired}}$$



Calculation of the Oral medication

NDC 68850-001-08

DEXAMETHASONE ELIXIR USP

Each 5 mL (one teaspoonful) contains:
Dexamethasone, USP 0.5 mg

Also contains:
Benzoic Acid, USP 0.1%
Alcohol 5%

0.5 mg/5 mL

Manufactured for: STI Pharma LLC, Langhorne, PA 19047
L88101 Rev 00 09/09

USUAL ADULT DOSAGE: See accompanying package insert.


WARNINGS: KEEP THIS AND ALL DRUGS OUT OF THE REACH OF CHILDREN.
In case of accidental overdose, seek professional assistance or contact a Poison Control Center immediately.

Store at 25°C (77°F); excursions permitted from 15° to 30°C (59° to 86°F). [see USP Controlled Room Temperature].
KEEP TIGHTLY CLOSED. AVOID FREEZING.


Dispense in a tight, light-resistant container as defined in the USP.

Rx Only

8 FL OZ (237 mL)



Lot:
Exp.:



Mrs Tompkins has a nocturnal asthma. The physician ordered Dexamethazone 1.5 mg b.i.d. You have the above Dexamethazone Elixir. You need to calculate the correct dosage for your patient.

Calculation

- **Formula:**

$$\frac{\text{Dosage available}}{\text{Amount available}} = \frac{\text{Dosage Desired}}{\text{Amount desired}}$$

- **Calculation:**

$$\frac{0.5 \text{ mg}}{5 \text{ ml}} = \frac{1.5 \text{ mg}}{X}$$

- $X = (1.5 * 5) / 0.5 = 15 \text{ ml}$

- **Take 1 table spoonful (15 ml) of the Elixir twice a day**



Take care



Be smart.... Sometimes you can find very high dose results such as 30 tablets & 500 ml or too small such as 0.21 tablet & 0.5 capsule!!!

So, check the unit before judging that there is a mistake from the doctor and advise the patient to recheck the physician.

i.e the answer will be 0.5 capsule. Please recheck the physician.



Calculation of the Oral medication

- A liquid medicine is supplied in a concentration of 10 mg/ 5mL. A patient requires 400 mg three times daily for 5 days, then 300 mg three times daily for 5 days, then 200 mg once daily for 5 days. Calculate the total volume of the liquid med.?

Calculation

- **Formula:**

$$\frac{\text{Dosage available}}{\text{Amount available}} = \frac{\text{Dosage Desired}}{\text{Amount desired}}$$

- **Calculation:** For 400 mg: $\frac{10 \text{ mg}}{5 \text{ mL}} = \frac{400 \text{ mg}}{X \text{ mL}}$

- $X = (400 * 5) / 10 = 200 \text{ mL}$

For 300 mg: $\frac{10 \text{ mg}}{5 \text{ mL}} = \frac{300 \text{ mg}}{X \text{ mL}}$

Calculation of the Oral medication (cont.)

- $X = (300 * 5) / 10 = 150 \text{ mL}$

For 200 mg:
$$\frac{10 \text{ mg}}{5 \text{ mL}} = \frac{200 \text{ mg}}{X \text{ mL}}$$

- $X = (200 * 5) / 10 = 100 \text{ mL}$

• Take 200 mL of the preparation three times daily for 5 days, then take 150 mL three times daily for 5 days, then take 100 mL once daily for 5 days! Recheck the Physician!!!

Calculations of parenteral medication

- The physician ordered Synthroid 0.2 mg IM once daily. The available medication is supplied as 1000 mcg/mL. What shall you do?

Calculation

- **Unit conversion:** 1000 mcg = 1 mg

- **Formula:**
$$\frac{\text{Dosage available}}{\text{Amount available}} = \frac{\text{Dosage Desired}}{\text{Amount desired}}$$

- **Calculation:**
$$\frac{1 \text{ mg}}{1 \text{ ml}} = \frac{0.2 \text{ mg}}{X}$$

- $X = (0.2 * 1) / 1 = 0.2 \text{ ml}$

- Take 0.2 mL of Synthroid in the syringe to be given intramuscularly.

Calculations of parenteral medication

•The physician ordered Codeine SO_4 gr ss IM every 4 hrs prn. The available medication is supplied as Codeine SO_4 60 mg/mL. What shall you do?

Calculation

• **Unit conversion:** gr ss = $1/2$ gr = $1/2 * 60 = 30$ mg

• **Formula:**
$$\frac{\text{Dosage available}}{\text{Amount available}} = \frac{\text{Dosage Desired}}{\text{Amount desired}}$$

• **Calculation:**
$$\frac{60 \text{ mg}}{1 \text{ ml}} = \frac{30 \text{ mg}}{X}$$

• $X = (30 * 1) / 60 = 0.5 \text{ ml}$

• Take 0.5 mL of Codeine in the syringe to be given intramuscularly every 4 hr.

Calculations of parenteral medication

- The physician ordered Phenobarbital gr iii ss every 8 hrs IM. The available medication is supplied as Phenobarbital 1 mg/mL. What shall you do?

Calculation

- **Unit conversion:** gr iii ss = $\frac{3}{2}$ gr = $\frac{3}{2} * 60 = 90$ mg

- **Formula:**
$$\frac{\text{Dosage available}}{\text{Amount available}} = \frac{\text{Dosage Desired}}{\text{Amount desired}}$$

- **Calculation:**
$$\frac{1 \text{ mg}}{1 \text{ ml}} = \frac{90 \text{ mg}}{X}$$

- $X = (90 * 1) / 1 = 90$ ml

- Take 90 ml of Phenobarbital in syringe and to be give intramuscularly. **Re-consult the PHYSICIAN.**

Calculations of infusion rate

- Calculate the flow rate of Aminophyllin 1 g in 500 ml of 5% Dextrose to infuse at 20 mg/hr.

Calculation

- **Formula:**
$$\frac{\text{Dosage in mg/hr desired}}{\text{Total mg available}} \times \text{Total volume (mL)} = \text{ml/hr}$$
- **Calculation:** Amount of Aminophyllin = 1000 mg
- $$\frac{20 \text{ mg/hr}}{1000 \text{ mg}} \times 500 = 10 \text{ mL/hr}$$
- **Adjust the flow rate to 10 mL/hr**

