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Pharmaceutical Calculations

Experiment 1 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To calculate formulation quantities by dilution and alligation and verify the units before compounding.

Principle

Dilution changes concentration without changing the amount of solute. Alligation gives the relative quantities of two compatible preparations needed to obtain an intermediate strength. Concentrations must be on the same basis: mass/mass, mass/volume or volume/volume.

Requirements

- Calculator, balance and calibrated volumetric glassware.
- Written formulation problem, notebook and purified water for a simulated dilution.

Procedure

1. Define the units

Write the starting strength, required strength and final amount. Convert all volumes to the same unit. A 1% w/v preparation contains 1 g in 100 mL of final preparation.

2. Calculate a dilution

Use $C_1 \times V_1 = C_2 \times V_2$ for compatible concentrations. Calculate V_1 , measure that amount of stock and add vehicle to the final volume; do not simply add V_2 mL of water.

3. Calculate by alligation

For high strength H, low strength L and target T: $\text{high:low} = (T - L):(H - T)$. Confirm $L < T < H$ before applying the ratio.

4. Scale a formula

Multiply every ingredient by desired batch amount $\div$ master batch amount. Keep the original basis; a mass formula must be scaled by mass.

5. Verify independently

Calculate the amount of solute contributed by each component and divide by final amount. Record significant figures appropriate to the glassware.

Observations and Record

Problem	Starting information	Calculated quantity
Dilution	C1: ____; C2: ____; V2: ____	V1: ____ mL
Alligation	H: ____; L: ____; T: ____	High:low = ____:____
Formula scaling	Master: ____; desired: ____	Scale factor: ____

Worked Example

The numbers below are illustrative; enter your own observations in the record.

- Dilution: prepare 100 mL of 2% w/v from 10% w/v. $V1 = (2 \times 100) \div 10 = 20$ mL; dilute 20 mL of stock to 100 mL.
- Alligation: combine 10% and 2% to make 200 mL of 5%. High:low = $(5 - 2):(10 - 5) = 3:5$. Use 75 mL and 125 mL, if volumes are additive.
- Check: $(10 \times 75 + 2 \times 125) \div 200 = 5\%$. Solute = 7.5 g + 2.5 g = 10 g per 200 mL.

Result

The required stock quantity is ____ mL and the alligation ratio is ____:____. The calculated final concentration is ____ on the stated basis.

Precautions

- Do not mix w/w with w/v without density information.
- Use final volume, not the sum of stock volume and a separately assumed water volume.
- For mixtures with volume contraction, prepare to final volume and verify the concentration by the assigned method.

Viva Questions and Answers

1. What does q.s. mean?

A sufficient quantity to reach the specified final mass or volume.

2. When is alligation unsuitable?

When the target lies outside the two starting strengths, units differ, or the components are incompatible.

3. Is 1:100 the same as 1%?

On an explicitly matching basis, yes; always state whether it is w/w, w/v or v/v.

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