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Isotonicity by Sodium Chloride Equivalent and White-Vincent Methods

Experiment 5 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To calculate an isotonicity adjustment for an educational formulation.

Principle

A sodium chloride equivalent E is the mass of NaCl osmotically equivalent to 1 g of a solute under the stated assumptions. The calculations estimate tonicity contributions; they do not establish sterility, compatibility or clinical suitability.

Requirements

- Teacher-provided hypothetical formulation, final volume and verified E values.
- Calculator, calculation sheet and, if demonstrated, labelled non-clinical teaching materials.

Procedure

1. List components

Record each solute mass in grams and its applicable E value. Include every relevant solute and check concentration-dependent assumptions.

2. NaCl target

For a 0.9% w/v NaCl target, calculate 0.009 × final volume in mL, expressed in grams.

3. Subtract contribution

Calculate ΣwE and subtract it from the NaCl target. A negative result indicates the formulation is already above that target; adding salt cannot correct it.

4. White-Vincent volume

Calculate the approximate volume made isotonic by the solutes: Viso = 111.1 ΣwE mL.

5. Completion

For the White-Vincent approach, conceptually add water to Viso and then the appropriate isotonic vehicle to final volume. The method and vehicle must be approved for the actual formulation.

6. Check

Confirm units, final volume and arithmetic. State that these are teaching calculations rather than preparation instructions for patient use.

Observations and Record

Component	Mass w (g)	E and wE (g NaCl equivalent)
Assigned drug	_____	_____
Other solutes	_____	_____
Final volume / target / adjustment	_____	_____

Worked Example

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

- For 0.200 g drug with E = 0.18 in 20.0 mL: wE = 0.0360 g.
- NaCl needed = 0.009 × 20.0 - 0.0360 = 0.1440 g.
- White-Vincent volume = 111.1 × 0.0360 = 4.00 mL, followed by approved isotonic vehicle to 20.0 mL.

Result

Record the observed outcome and calculated value, with units. State whether the stated laboratory specification was met; do not copy the worked example as your result.

Precautions

- Use E values applicable to the actual chemical form and method.
- Keep grams and millilitres consistent and do not treat a negative salt requirement as permission to use a negative mass.
- Educational calculations alone do not authorise sterile product preparation or dispensing.

Viva Questions and Answers

1. What does E = 0.18 mean?

One gram of that solute has an approximate NaCl-equivalent contribution of 0.18 g under the stated method.

2. Why sum all solutes?

Each relevant solute contributes to osmotic effects.

3. What if the NaCl requirement is negative?

The composition requires reconsideration; adding NaCl would increase the excess.

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