

Proof spirit calculations

Introduction

- The strength of alcohol is calculated in **proof degrees**. The Indian standards of 100% proof spirit is equal to 57%v/v of ethyl alcohol.

i.e., 100% p.s = 57%v/v ethyl alcohol

- If the value is more than 57% then it is said to be as **over proof spirit**.



If the value is less than 57% then it is said to be as

(Introduction contd....)

- In **India**, the exercise duty is calculated in terms of rupees per liter of proof alcohol. So, any percentage volume in volume of alcohol can be converted into proof strength and vice versa by using the following method.

i. Multiply the percentage strength of alcohol by 1.753 and deduct 100 from the product.

ii. If the **result is positive**, it is known as **over proof**

iii. If the **result is negative**, it is known as **under proof**.



- **1.753 is obtained as follows:**

57.1 volume of ethyl alcohol = 100 ml of proof spirit.

1 volume of ethyl alcohol = $100 / 57.1$

= 1.753 volume of proof spirit

Example problems for Proof Spirit calculations

Calculate the strength of 30⁰ O.P and 40⁰ U.P

30⁰ OVER PROOF = $100 + 30 = 130$

40⁰ Under proof = $100 - 40 = 60$

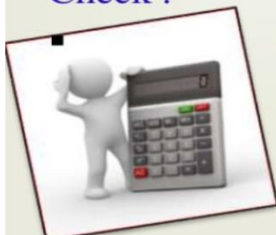


(Problem Contd....)

$$\begin{aligned} \text{Alcohol strength} &= \frac{100 + 30}{1.753} \\ &= \frac{130}{1.753} \\ &= 74.15\%v/v \end{aligned}$$

$$\begin{aligned} \text{Alcohol strength} &= \frac{100 - 40}{1.753} \\ &= \frac{60}{1.753} \\ &= 34.23\%v/v \end{aligned}$$

Check :



If strength is 74.15%v/v

$$74.15 \times 1.753 - 100 = 129.9 - 100 = +29.9^0 \text{ or } 30^0 \text{ O.P}$$

If strength is 34.23 %v/v

$$34.23 \times 1.753 - 100 = 60.00 - 100 = - 40^0 \text{ U.P}$$

2. What is the proof strength of 95% v/v alcohol.

By applying the formula:

$$\text{percentage strength of alcohol} \times 1.753 - 100$$

$$= 95 \times 1.753 - 100$$

$$= 166.53 - 100$$

$$= +66.53^{\circ} \text{ O.P}$$

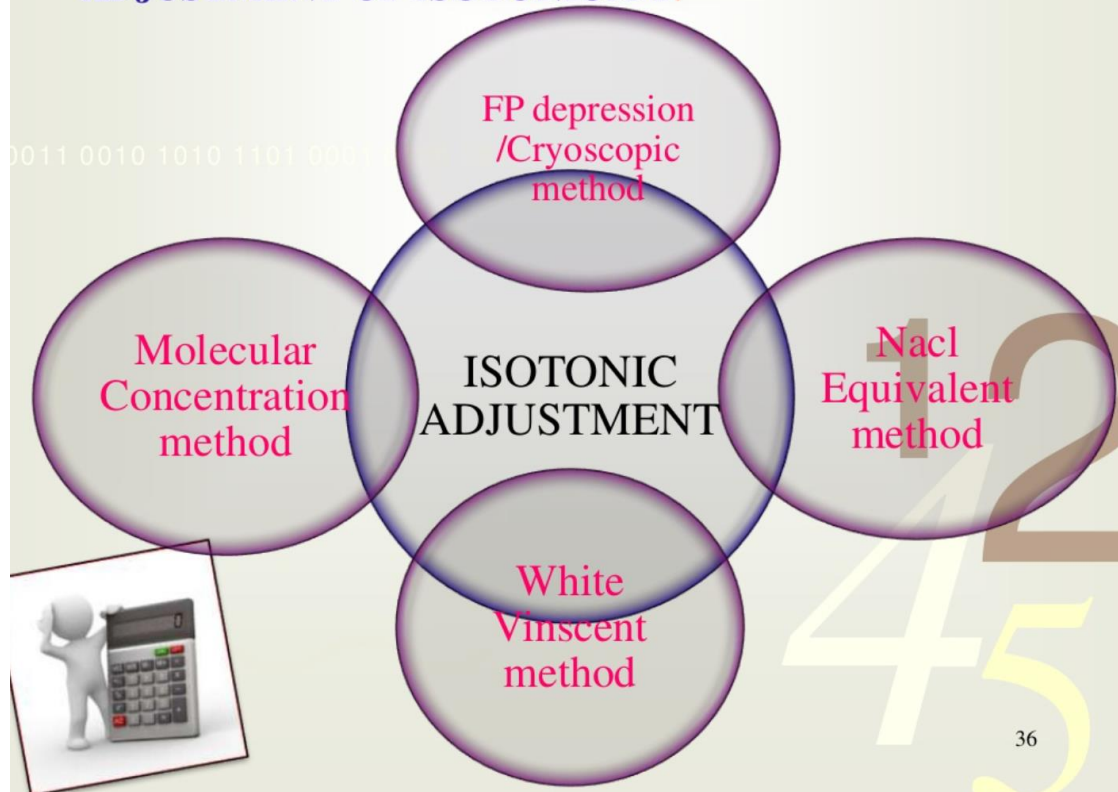


Isotonic solutions

- Isotonic solutions are which have same osmotic pressure or equal solute concentrations.
- 0.9% sodium chloride solution is considered to pass the same osmotic pressure and hence it is a standard solution which is isotonic with blood plasma.
- Any concentration **above this (0.9%)** is considered as **hypertonic** and **below this (0.9%)** is considered as **hypotonic**.



ADJUSTMENT OF ISOTONICITY:



I. Freezing point method/ Cryoscopic method

$$\% \text{ w/v of adjusting substance needed} = \frac{0.52 - \text{PSM} * a}{b}$$

Where

PSM = percentage strength of medicament

a = Freezing point of the unadjusted solution

b = Freezing point of a 1% w/v solution of a adjusting substance



2. Nacl Equivalent method:

$$\text{Quantity of Nacl required to adjust tonicity} = 0.9 - (\text{PSM} \times \text{E})$$

Where

PSM = Percentage strength of medicament.

E = Nacl equivalent (quantity of Nacl i.e., equivalent to 1gm of drug)

3. White Vincet method :

$$V = W \times E \times 111.1$$

Where

V = volume of isotonic solution in ml that can be prepared by dissolving drug in water

W = weight of the drug.

E = Nacl equivalent .



4 . Molar (or) Molecular concentration :

$$\%W/V \text{ of adjusting substance required} = \frac{0.03M}{N}$$

Where

M = gram molecular weight.

N = no.of ions into which the substance is ionised.

Problem:

- How to prepare an iso osmotic solution using dextrose.

[Hint: mol.wgt of dextrose = 180

[dextrose is non ionising substance]

$$W = 0.03 M$$

$$W = 0.03 \times 180 = 5.4 \text{ g/100ml}$$

