DISPENSING AND HOSPITAL PHARMACY

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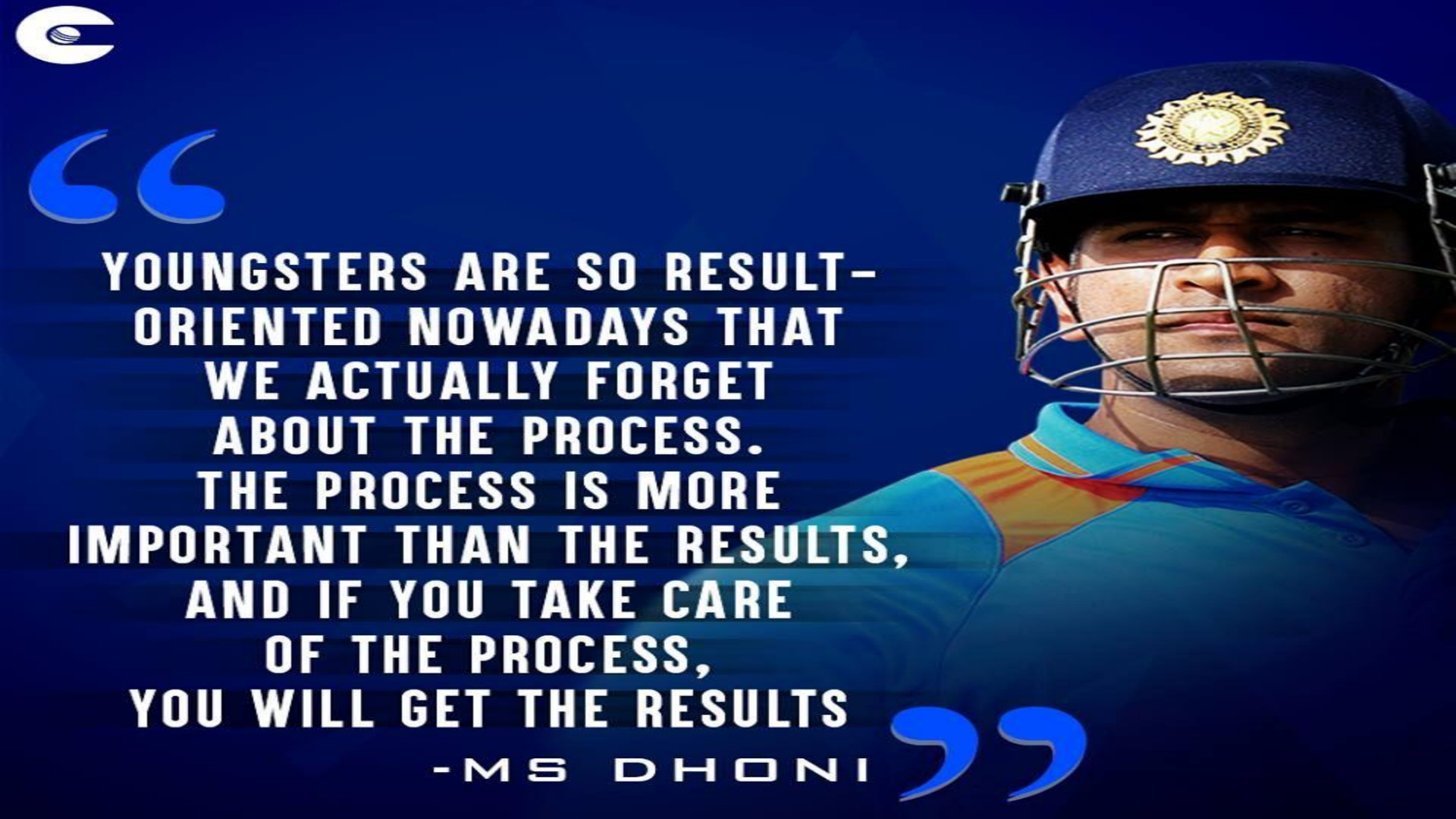
HOW TO START GPAT PREPARATION


YOUNGSTERS ARE SO RESULT-
ORIENTED NOWADAYS THAT
WE ACTUALLY FORGET
ABOUT THE PROCESS.
THE PROCESS IS MORE
IMPORTANT THAN THE RESULTS,
AND IF YOU TAKE CARE
OF THE PROCESS,
YOU WILL GET THE RESULTS
-MS DHONI

HOW TO START GPAT PREPARATION

PROCESS INVOVLED IN GPAT PREPARTION

Unit operations involved in GPAT preparations

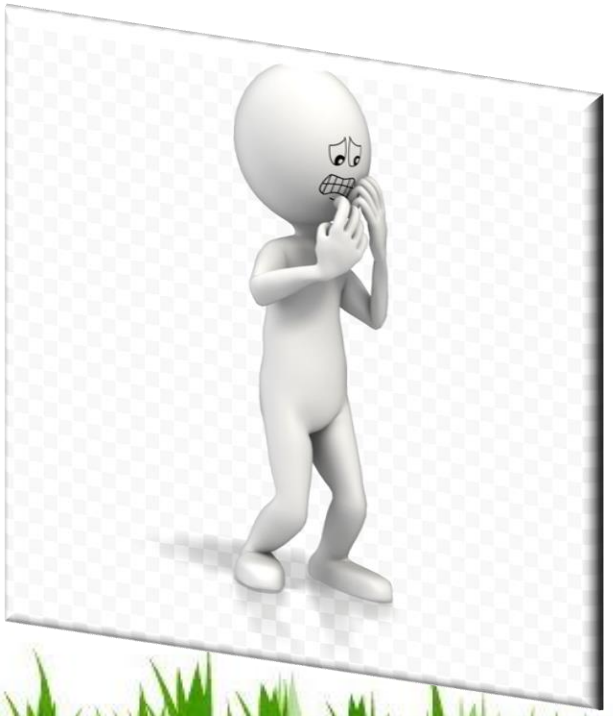
1. Fixing the Aim
2. Attending GPAT Classes
3. Understanding the Concepts
4. Preparation
5. Assessing yourself
6. Clearing your doubts
7. Application of what you learn
8. Getting result

The combination of unit operation is called process which gives you the product (result)If your process is validated time to time by assessments and rectify your mistakes than finally you will get a good and useful product.

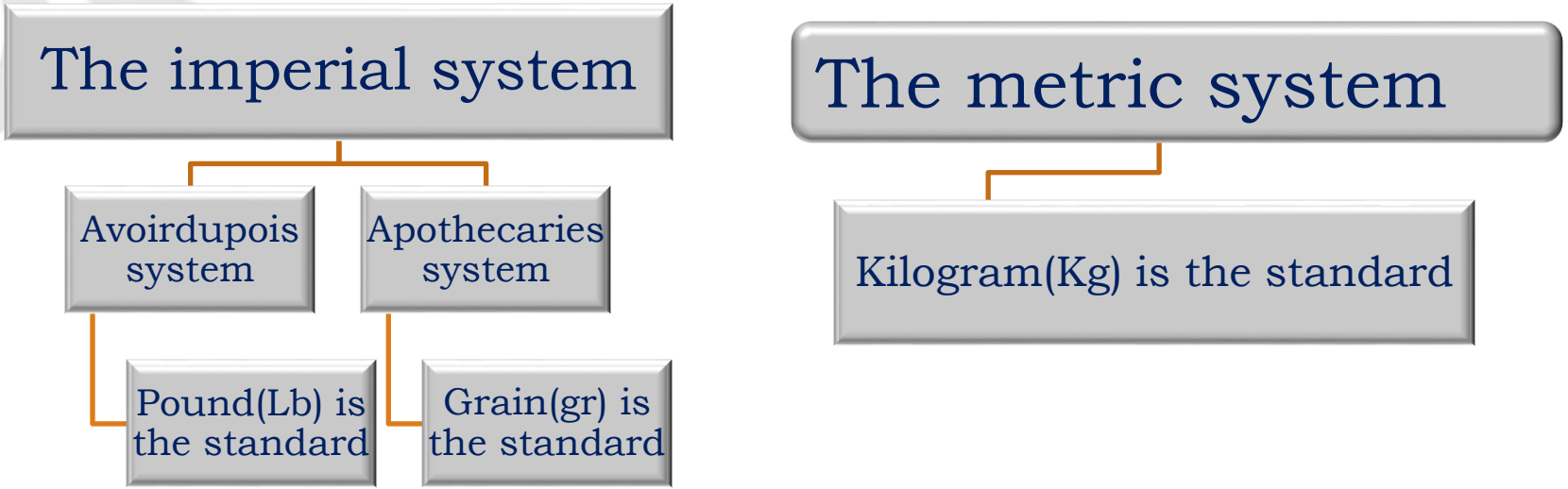
PHARMACEUTICAL CALCULATIONS

DONT FEAR ABOUT MATHAMATICS

- ADDITIONS
- SUBSTRACTIONS
- MULTIPLICATIONS
- DIVISIONS



Two systems of Weights and Measures



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REDUCING & ENLARGING CALCULATIONS

The pharmacist is often required to reduce or enlarge a formula

Example for reducing calculations:

What quantities should be used to prepare 100g of paste from the fallowing formula

R_x

Mineral oil -	6 parts
Nystatin powder-	1 part
Hydrocortisone powder-	2parts
Zinc oxide Ointment -	200 parts

Formula for 100g

Mineral oil -	02.87g
Nystatin powder-	00.48g
Hydrocortisone powder-	00.96g
Zinc oxide Ointment -	95.69g

Total parts of ingredients in the formulation
= 6+1+2+200 = 209 Parts

Need to prepare for 100g than

Mineral oil – 6 parts in 209 parts
x g in 100 grams
x=6/209*100 = 2.87g of mineral oil in 100g of paste

Nystatin– 1 parts in 209 parts
x g in 100 grams
x=1/209*100 = 0.48g of Nystatin in 100g of paste

Hydrocortisone powder– 2 parts in 209 parts
x g in 100 grams
x= 2/209*100 = 0.96g of Nystatin in 100gof paste

Zinc oxide ointment – 200 parts in 209 parts
x g in 100 grams
x= 200/209*100 = 95.69g of Nystatin in 100g of paste

REDUCING & ENLARGING CALCULATIONS

Example for Enlarging calculations:

What quantities should be used to prepare 300g of paste from the fallowing formula

R_x

Mineral oil -	6 parts
Nystatin powder-	1 part
Hydrocortisone powder-	2parts
Zinc oxide Ointment -	200 parts

Formula for 300g

Mineral oil -	008.61g
Nystatin powder-	001.44g
Hydrocortisone powder-	002.87g
Zinc oxide Ointment -	287.08g

Total parts of ingredients in the formulation
= 6+1+2+200 = 209 Parts

Need to prepare for 300g than

Mineral oil – 6 parts in 209 parts
x g in 300 grams
x=6/209*300 = 8.61g of mineral oil in 300g of paste

Nystatin– 1 parts in 209 parts
x g in 300 grams
x=1/209*300 = 1.44g of Nystatin in 300g of paste

Hydrocortisone powder– 2 parts in 209 parts
x g in 300 grams
x= 2/209*300 = 2.87g of Nystatin in 100g of paste

Zinc oxide ointment – 200 parts in 209 parts
x g in 300 grams
x= 200/209*300 = 287.08g of Nystatin in 300g of paste

PERCENTAGE CALCULATIONS

- % W/V (Percentage Weight in Volume)
- % V/V (Percentage Volume in Volume)
- % V/W (Percentage Volume in Weight)
- % W/W (Percentage Weight in Weight)

Preparation of 1% Solution

Preparation of 1% W/V Solution in Imperial system

1 gr solid in solvent to produce 110 minim
4.375 gr solid in solvent to produce 1 fluid ounce
35 gr solid in solvent to produce 1 fluid ounce

Preparation of 1% Solution in Metric system

1g solid in solvent to produce 100ml -1% w/v
1g solid in solvent to produce 100g -1% w/w
1ml solid in solvent to produce 100ml -1% v/v
1ml solid in solvent to produce 100g -1% v/w

% W/V (Percentage Weight in Volume)

Example for percentage calculations:

Calculate the quantity of sodium chloride required to prepare 400ml of a 0.9% solution

Calculation

1g with solvent to produce 100ml makes 1% w/v solution

1 × 0.9 g with solvent to produce 100ml makes 0.9% w/v solution

(0.9 × 400)/100 g with solvent to produce 400ml makes 0.9% w/v of solution

(0.9 × 400)/100 g

=3.6 g

Hence 3.6g of sodium chloride is dissolved in water to produce 400ml makes 0.9% w/v solution

1g in 100ml-1%
0.9 g in 100ml -x

1g -1%
0.9 g -x
X = (1 × 0.9)/1
= 0.9%

% V/V (Percentage Volume in Volume)

Example for percentage calculations:

Prepare 600ml of 60% alcohol from 95% alcohol

Calculation

Volume of 95% alcohol to be taken

$$= \frac{\text{Volume required} \times \text{Percentage required}}{\text{Percentage used}}$$

Volume Required = 600 ml

Percentage required = 95%

Percentage used = 60 %

Than

= (600 × 60)/95

= 379 ml

% W/W (Percentage Weight in Weight)

Example for percentage calculations:

How many grams of drug substance should be used to prepare 240g of a 5% w/w solution in water

Calculation

Drug substance to be taken

$$= \frac{\text{weight required} \times \text{Percentage required}}{\text{Percentage used}}$$

Volume Required = 240 g

Percentage required = 5%

Percentage used = 100 %

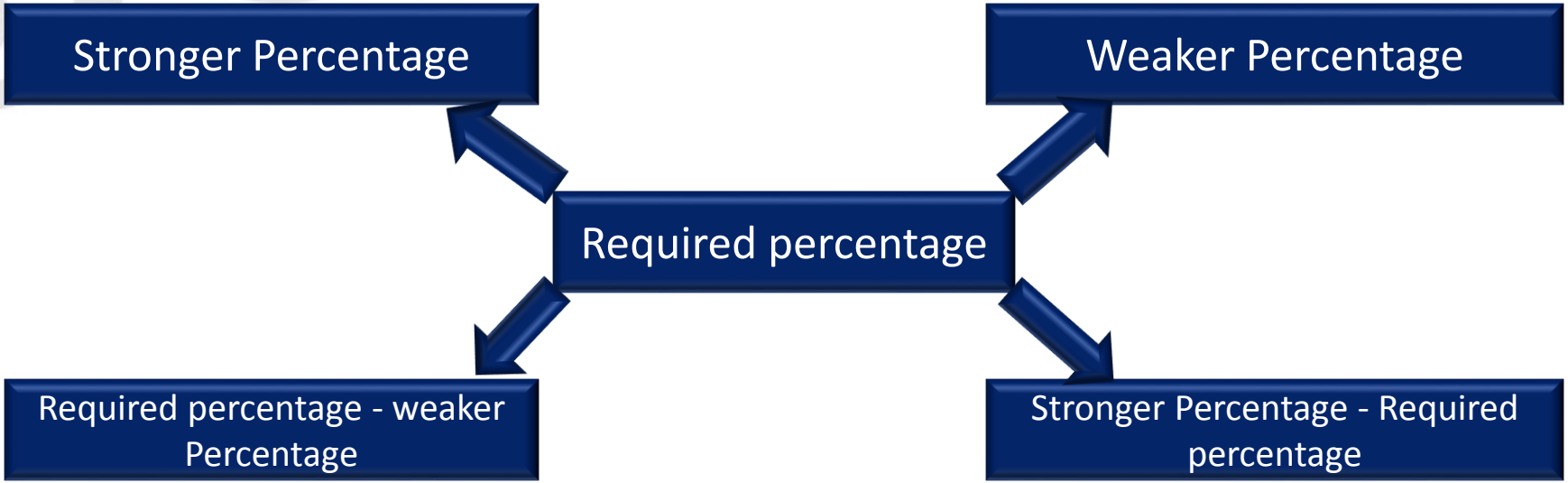
Than

= (240 × 5)/100

= 12g

ALLIGATION METHOD

When the calculation involves mixing of two similar preparations of different strength to produce a preparation of intermediate strength, the allegation method is used



ALLIGATION METHOD

When the calculation involves mixing of two similar preparations of different strength to produce a preparation of intermediate strength, the allegation method is used

MODEL 1 – Preparation from 1 concentration and water

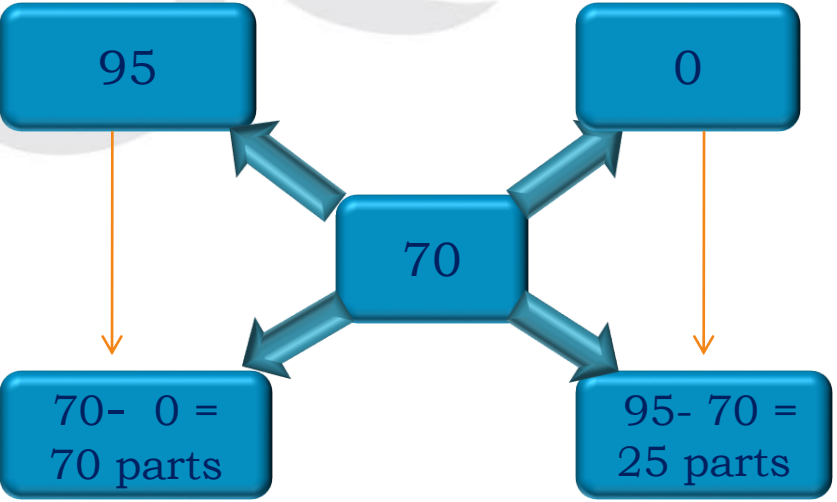
MODEL 2 – Preparation from 2 concentration

MODEL 3 – Preparation from 3 concentration

MODEL 4 – Preparation from 4 concentration

ALLIGATION METHOD-MODEL 1

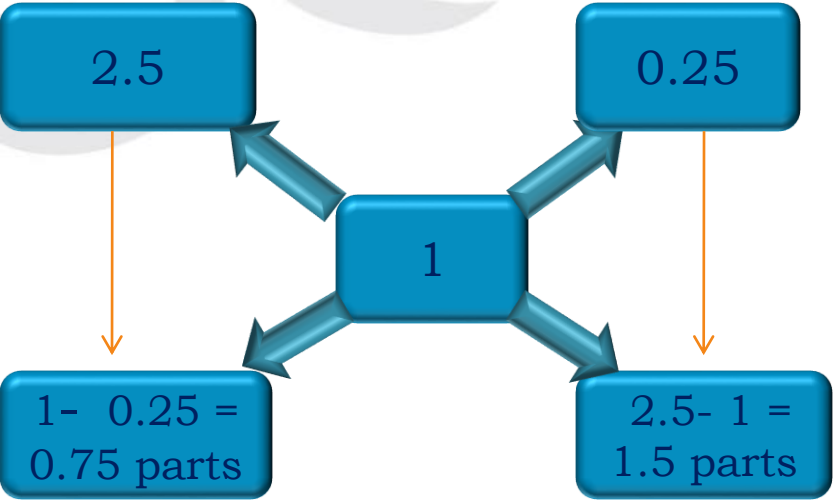
Calculate the volume of 95% alcohol required to prepare 600ml of 70percent alcohol



Stronger percentage = 95 %
Weaker percentage = 0 %
Required percentage = 70 %
Required volume = 600ml
No of parts of 95% alcohol = 25 parts
No of parts of water = 70 parts
Total parts = 25+70 = 95 parts
Amount of Alcohol should be taken from 95%
= (70×600)/95 = 442.10ml
Amount of Water should be taken
= (25×600)/95 = 157.90ml

ALLIGATION METHOD-MODEL 2

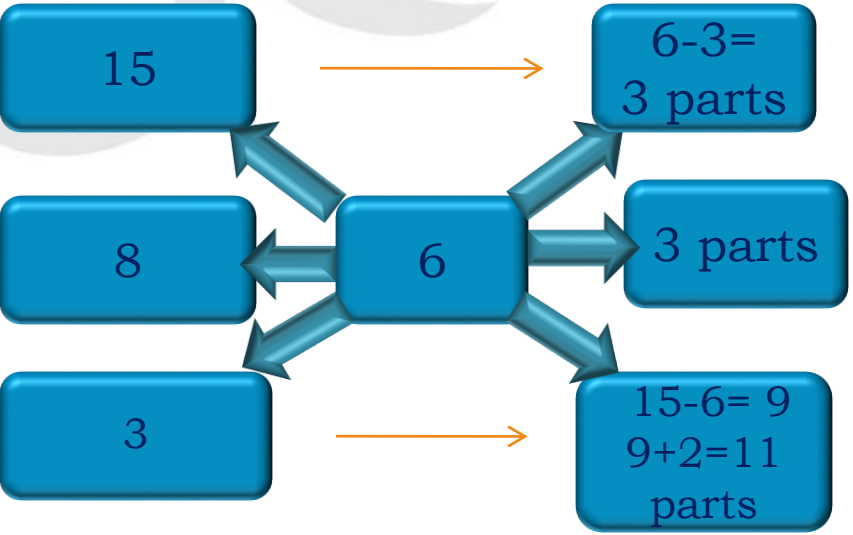
How many grams of 2.5 % hydrocortisone cream should be mixed with 360g of 0.25% cream to take a 1% hydrocortisone cream ?



Stronger percentage = 2.5 %
Weaker percentage = 0.25 %
Required percentage = 1 %
Required volume = 360g
No of parts of 2.5% cream = 0.75 parts
No of parts of 0.25% cream = 1.5 parts
Total parts = 0.75+1.5 =2.25 parts
Cream should take from 2.5%
= (0.75×360)/2.25 = 120 g
Cream should take from 0.25%
= (1.5×360)/2.25 = 240 g

ALLIGATION METHOD-MODEL 3

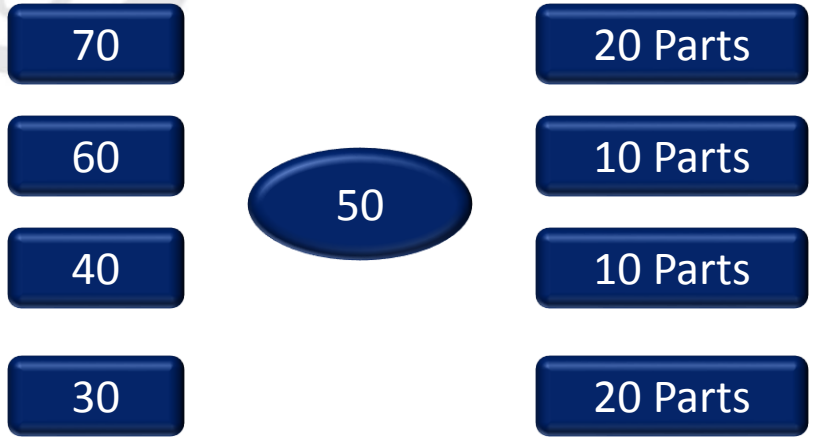
Calculate the proportion of 15%, 8%, 3% alcohol required to make 6% of alcohol 500ml



Stronger percentage = 15%
Stronger percentage = 8 %
Weaker percentage = 3 %
Required percentage = 6%
Required volume = 500ml
No of parts of 15% alcohol = 3 parts
No of parts of 8% alcohol = 3 parts
No of parts of 3 % alcohol = 11 parts
Total parts = 3+3+11 = 17 parts
Amount of Alcohol should be taken from 15% & 8% alcohol = (3×500)/17 = 88.24ml
Amount of Alcohol should be taken from 3% = (11×500)/17 = 323.52ml

ALLIGATION METHOD-MODEL 4

Calculate the amount of 70%, 60%, 40%, and 30% should be mixed to get 50% alcohol of 500ml.



Required percentage = 50%
Required volume = 500ml
No of parts of 70% & 30% alcohol = 20 parts
No of parts of 60% & 40% alcohol = 10 parts
Total parts = 20+10+10+20 = 60 parts
Amount of Alcohol should be taken from 70% & 30% alcohol = (20×500)/60 = 166.67ml
Amount of Alcohol should be taken from 60% & 40% = (10×500)/60 = 83.33ml
Total = 166.67ml + 166.67ml+ 83.33ml+83.33ml
= 500ml

ISOTONICITY CALCULATIONS

Isotonicity pertains to the state of being isotonic, or having equal tension or tonicity. At the cellular level, isotonicity may pertain to a property of a solution in which its solute concentration is the same as the solute concentration of another

- Freezing point depression or cryoscopic method
- Molecular concentration method
- Sodium chloride equivalent method
- White Vincet method

Freezing point depression or cryoscopic method

% of adjusting substance needed = (0.52-PSM*a)/b

PSM= Percentage strength of medicament
a= freezing point of unadjusted solution
b= freezing point of 1% w/v of adjusting solution

Molecular concentration method

% of adjusting substance needed = 0.03 M/N
M = Gram Molecular weight
N = No of ions into which the substance is ionized

Sodium chloride equivalent method

% of adjusting substance needed = 0.9-PSM*E

PSM= Percentage strength of medicament
E= Sodium chloride equivalent
(quantity of Nacl i.e equivalent to 1 g of drug)

White Vincet method

V=W × E × 111.1
V= Volume of isotonic solution in ml that can be prepared by dissolving drug in water
W= Weight of the drug
E= Sodium chloride equivalent

Freezing point depression or cryoscopic method

% of adjusting substance needed = (0.52-PSM*a)/b

PSM= Percentage strength of medicament

a= freezing point of unadjusted solution

b= freezing point of 1% w/v of adjusting solution

Find out the concentration of sodium chloride required to make a 1 percent solution of boric acid, isotonic with blood plasma

Given: The freezing point of 1%w/v solution of boric acid is -288° C

The freezing point of 1%w/v solution of Sodium chloride is -0.576° C

Apply formula

$= (0.52 - 0.288 \times 1)/0.576$

$= 0.403\%$ w/v

Molecular concentration method

% of adjusting substance needed = 0.03 M/N
M = Gram Molecular weight
N = No of ions into which the substance is ionized

Find the proportion of dextrose needed to form a solution isotonic with blood plasma

Molecular weight of dextrose =180
Dextrose is nonionising substance (N=1)
Than 0.03 ×180/1
= 5.4g/100ml

Sodium chloride equivalent method

Calculate the gram of sodium chloride needed to make 30 ml of a 2% isotonic physostigmine salicilate solution using sodium chloride method.

E value of physostigmine salicilate = 0.16

PSM =2.0 %

Volume of preparation required = 30 ml

For equation PSM = 0.9 – (PSM E of medicament)

= 0.9 – (2 × 0.16) = 0.9 - 0.32 = 0.58 %

The above strength is valid for 100 ml since is expressed in percent. It should be prepared from 30 ml of solution For 100 ml of solution, sodium chloride required = 0.58

For 30 ml of solution, sodium chloride required =?

30 × 0.58/100 = 17.4/100 =0.174 g of sodium chloride

POSOLOGY

Posology refers to the calculation of doses for children.

1. Proportion to Age :-

(a) Young's formula:

$$\text{Dose for a child} = \frac{Age\ (years)}{Age + 12}\ x\ Adult\ dose$$

The above formula is used for calculating the doses for children 12 years of age.

- Example problem for young's formula

What will be the dose for a child of 5 years if the adult dose of a drug is 400 mg.

$$\text{Dose of the child} = \frac{Age\ (years)}{Age + 12}\ x\ Adult\ dose$$

$$= \frac{5}{5+12} X\ 400$$

$$= 117 \text{ mg (approximately)}$$

(b) Dilling's formula:

$$\text{Dose of a child} = \frac{Age(years)}{20} \; x \; Adult\ dose$$

The above formula is used for calculating the doses of a children in between 4 to 20 years of age.

Example problem:

- What will be the dose for a child of 10 years if the adult dose of a drug is 600mg

$$\text{Dose of a child} = \frac{10}{20} X\ 600$$

$$= 300 \text{ mg}$$

(c) Freid's formula:

$$\text{Dose for a child} = \frac{Age\ in\ months}{150}\ x\ Adult\ dose$$

The above formula is applicable only for infants.

Example problem:

- What is the dose for an 8months old infant if the average adult dose of a drug is 250mg

$$\text{Dose for the child} = \frac{8}{150} X250$$

$$= 13.3\text{mg}$$

(2) Calculations based on body weight:

Catzel rule:

$$\text{Dose for the child} = \frac{Surface\ area\ of\ child}{Surface\ area\ of\ Adult} x\ Adult\ dose$$

The average body surface area for an adult $= 1.73 m^2$

Hence

$$\text{Dose for the child} = \frac{Surface\ area\ of\ child}{1.73 m^2} x\ Adult\ dose$$

Example problem for calculations based on body weight

- Calculate the dose for a child that has a body surface area of $0.57m^2$, when the adult dose of a drug is 50mg.

$$\text{Child dose} = \frac{Surface\ area\ of\ child}{1.73m^2}\ x\ Adult\ dose$$

$$= \frac{0.57}{1.73} X50$$

$$= 1.65\ mg$$

Calculations based on body weight:

❖ Clarke's rule:-

- $\text{Dose} = \frac{wt\ in\ lb}{150}\ X\ Adult\ dose(mg)$
- $\text{Dose} = \frac{wt\ in\ kg}{70}\ X\ Adult\ dose(mg)$

Rule is applicable only when child dose is less than 150 lb or 70kg.

- Example problem for calculations based on body weight

The dose of a drug is 5mg/kg body weight. How much of drug required for a boy of 12 years weighing 21kg.

$$\text{Dose} = \frac{21}{70} X\ 5mg$$
$$= 1.5\text{mg}$$

(3) Calculations based on body surface area:

Most accurate method commonly used in onchology department

Mosteller rule:

$$\text{BSA}\ (\text{M}^2) = \sqrt{ht\ (cm) x\ wt(kg)/3600}$$

Example problem for calculations based on body surface area

- Calculate the BSA of a boy of height 165 cm and weighing 65kg.

$$BSA = \sqrt{160\ X\ 65/3600}$$

$$= \sqrt{2.979}$$

$$= 1.726$$

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 under proof spirit.

(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 30^0 O.P and 40^0 U.P

30^0 OVER PROOF = 100 + 30 = 130

40^0 Under proof = 100 – 40 = 60

(Problem Contd....)

$$\text{Alcohol strength} = \frac{100 + 30}{1.753}$$

$$= \frac{130}{1.753}$$

$$= 74.15\%\text{v/v}$$

$$\text{Alcohol strength} = \frac{100 - 40}{1.753}$$

$$= \frac{60}{1.753}$$

$$= 34.23\%\text{v/v}$$

Check :

If strength is 74.15%v/v

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

If strength is 34.23 %v/v

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

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

By applying the formula:

percentage strength of alcohol x 1.753 – 100

$= 95 \times 1.753 - 100$

$= 166.53 - 100$

$= +66.53^{0}$ O.P

THANK YOU

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