



تفريغ حساب وتركيب الأشكال الصيدلانية



اسم الموضوع: 
**Pharmaceutical
Calculations**
إعداد الصيدلاني: 

بيان



لجان الرفعات

أبجدها لانه الجهل يا تكتب الوصفات صحه و الاربابان

One of the greatest potentials for error in prescription compounding is in the area of pharmacy math or pharmacy calculations

A misplaced decimal or "estimated" value for a medication can have serious consequences including death

There is no excuse for ignorance in this area and an individual unprepared to do the necessary calculations should not be involved in pharmaceutical compounding

ما نبي خذري للجهل

لا ينبغي للخطمي في وصفه للاربابان
اعتبارها يا تكتب لا ترويه

هتفيع يكتبه عن اعلاط
الاربابابان
(هتفيع يكتبه)

عبارت
تلمه
تفيع
تفيع
تفيع
تفيع

الاصحح
تفيع
تفيع
تفيع
تفيع

ارقام رومانية

Completion of Numerals

Numbers and Numerals

Number: a total quantity or amount

Numeral: a word, sign, or group of words and signs representing a number:

Roman Numerals:

A numeral system of ancient Rome based on letters of the Alphabet

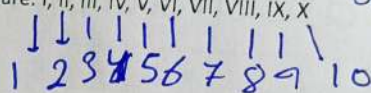
I: one, V: five, X: ten, L:50, C:100, D: 500, M:1000

The first ten Roman numerals are: I, II, III, IV, V, VI, VII, VIII, IX, X

XXX: 30

LX: 60

XL: 40



كلمة
اشارة
مجموعة من الكلمات
واشعار

صفحة

بعض
على الحروف

او صمد لذكى ارازمى سكرى نهو (3) مرات من نفس النوع

I: one X: ten C: 100 m: 1000
V: five L: 50 D: 500

قاعدة (1)
XXXVI (1) $30 + 6 = 36$
قاعدة (2)
صغير قبل كبير طار (1-)

Numbers and Numerals

-Arabic Numerals:

- Most common symbols used to represent numbers
- The basic symbols called digits are: 0,1,2,3,4,5,6,7,8,9
- The position of a digit determines its value

237
[70.237]
[7.237]
موقع ارقام

XXVIII (2)
 $20 + 8 = 28$

DCCC (3)
 $500 + 300 = 800$

XLVI (4)
 $50 + 10 + 5 + 1 = 66$

MLI (5)
 $1000 + 1 = 1001$
 $500 - 40 = 460$

ارقام عربية

Decimals

A decimal is a fraction whose denominator is 10 or a multiple of 10

e.g.:

$$\underline{-0.7} = \frac{7}{10}$$

$$\underline{-0.06} = \frac{6}{100}$$

$$\underline{-0.006} = \frac{6}{1000}$$

$$\bullet \underline{0.3} = \underline{0.30} = \underline{0.300}$$

$$\bullet \underline{0.3} = \frac{3}{10}$$

$$\bullet \underline{0.03} = \frac{3}{100}$$

$$\bullet \underline{0.003} = \frac{3}{1000}$$

عوض مقامه 10 او مضاعفاته

لازم زطلو leading zero

0.30

بعض نفس القيمة
صايناً فرقاً

① نسبة ② تناسب

طرق حساب
الجرعات

Using ratios, proportions, and percentages in dosage calculations: جرعة

Example: a vial of Rociphen contains 100 milligrams per milliliter. How many milliliters should be given to a patient to obtain 650 milligrams?

$$100 \text{ mg} \rightarrow 1 \text{ ml}$$

$$650 \text{ mg} \rightarrow X \text{ ml}$$

$$X = 6.5 \text{ ml}$$

$$100 \text{ mg/mL}$$

نسبة ونسب

$$200 \text{ mg} \rightarrow 1 \text{ mL}$$

$$650 \text{ mg} \rightarrow ?$$

$$\frac{650}{100} = 6.5 \text{ mL}$$

لازم نركز ايشه الوصه المطلوبه
وايشه الوصه المطلوبه
بالسؤال

النسب العكسيه
③

Using ratios, proportions, and percentages in dosage calculations:

Always look for what is being asked:

- Number of doses *عدد جرعات*

- Total amount of drug *كمية الدواء للجراس*

Size of dose *حجم الجرعة*

• Given any two of the above, you can solve for the third

• General Formula:

$$\text{Number of doses} = \frac{\text{Total amount}}{\text{Size of dose}}$$

$$\text{Total amount} = \text{number of doses} \times \text{size of dose}$$

$$\text{Size of dose} = \frac{\text{Total amount}}{\text{number of doses}}$$

لازم نعرف ايشي المطلوب منا؟

←

الجراس

عدد الجرعات

حجم الجرعة

و حفظنا على

الجراس

size or volume or strength

Note: every (6) hours means (4) times daily
 every (8) hours means (3) times daily
 every (12) hours means twice daily

Note: every (6) hours means (4) times daily
 every (8) hours means (3) times daily
 every (12) hours means twice daily

Using ratios, proportions, and percentages in dosage calculations:

Example: how many milligrams of theophylline does a patient receive per day, if the prescription indicates 300mg tid?

X total amount = 3 X 300mg

X = 900 mg total

How much propranolol will a patient receive every 6 hours if he is to receive 160 mg per day?

X dose = 160 mg / 4 doses

X = 40 mg

total amount / number of doses = size of dose

total amount / number of doses = size of dose

المعللين كم زكون
 حبة / جميع الدواء الى
 راح يافتى امره
 باليوم
 اذ اى
 يا فز
 (3) حبات
 باليوم
 كل فيه حباته
 300mg

size of doses = total amount / number of doses

باليوم 24
 (6) يا فز
 (4) حباته
 Number of doses

(3) مرات باليوم
 لا يتم فقط
 و لا حباته

Using ratios, proportions, and percentages in dosage calculations:

Solve by your self:

total volume

size

How many doses are in 120ml of Benadryl Elixir, if one dose is 5ml?
(Answer 24 doses)

total / size
 $120 / 5 = 24$

When erythromycin lactobionate is reconstituted, it yields a concentration of 50 mg/ml. How many milliliters are required to give a 0.9 gm dose? (Answer: 18 ml)... be careful for the unit

~~$120 / 5 = 24$~~ doses

50mg → 1ml

~~50~~mg → (X)

900
X = 18ml

50mg → 1ml

900mg → ?

$\frac{900}{50} = 18 \text{ mL}$

0.9g → 900mg

لا تفركون
الوقت صاير

Percentage

45% ≠ 0.45%

45% = 45/100 = 0.45

It is not correct to divide by 100 and use the percent sign at the same time:

e.g. 25% = 25/100 and not 25%/100

To calculate a percentage of a percentage:

50% of 40% is:

$(50/100) \times (40/100) = 0.5 \times 0.4 = 0.2 = 20/100 = 20\%$

20% = 40% ÷ 50

لم غلط انوا
تقسم على
100 ديفرنا %

توضيح ⇒

طريقة تحضير

استعملان
تصيران
طهقت
توضيح من طي الحاركة

Phenol Glycerin IP

طريقة التحضير
عشانه نزيد زائبة

Method: Phenol and glycerin are mixed in a beaker. The beaker is warmed gently until it becomes a solution.

Use: Local anesthetic and local antiseptic. Phenol glycerin is used to prepare Phenol Gargle and Phenol Glycerin Ear Drop.

Cautions: Phenol Glycerin when diluted with water becomes caustic so it is diluted with glycerin.

Label: FOR EXTERNAL USE ONLY should be displayed in the label.

لا يتم دكره كل طهقت ← فقط بالاستخدام الخارجي

لا يتم تخفيفه من نفسه حاركة سائلة لانه اذا اخفناه بالمبي

عشانه تخفنه بار glycerin

تصير بلات
حاركة يدي
استعملان
مخدر موضعي
وعطري موضعي
كثيري

تصيران

نفسها فكري
ستان اي قبل

Examples:

Prepare 500 ml of sugar solution

Sugar 100 gm

Water 900 gm

Weight per ml of water = 1 gm

The quantity of water required ? (500g)

The quantity of sugar required ? (55 g)

$$\begin{matrix} 1\text{ml} & \rightarrow & 1\text{gm} \\ 500\text{ml} & \rightarrow & x\text{gm} \end{matrix}$$

$$x = 500\text{ gm}$$

✓
water

$$\begin{matrix} 100 & \rightarrow & 900 \\ x & \rightarrow & 500 \end{matrix}$$

$$\text{(gram)} \times = \frac{100 \times 500}{900}$$

sugar 900

كيفية

Mass-volume percentage:

Weight-in-volume (w/v) percentage: expresses the number of grams of a drug or active ingredient in 100 milliliters of a mixture

Often used for solutions made from a solid solute dissolved in a liquid

For example a 40% w/v sugar solution contains 40 gm of sugar per 100 ml of resulting solution

مثال توضیح

نفس فکری
تأخذ
w/w

اضواء

ملاحظة لاجلنا
نخط العنبر

مازكونه قهنا

نقط 100 من صدينا
ml

مثلا "تركيزنا

10% (A)

(w/v)

مثلا يعني بطينا و 10 من

A و 90 ml من الماء

صدينا

total 100

Mass-volume percentage:

Example:

Calculate the quantity of sodium chloride required to prepare 400 ml of 2 (w/v)% solution

مطلوب منا وزننا NaCl

2g NaCl → 100 ml solution

X → 400 ml

X = 8 g of sodium chloride is dissolved in water to produce 400 ml makes 2% w/v solution

تکراری
نفسی ای فصل

Mass-volume percentage:

Solve by yourself:

How much of a 5% will be required to prepare 1000 ml of a 1 in 500 solution?

Strength of concentrate = 5%

Strength of dilute solution = 0.2%

Degree of dilution = 25 times

Volume to be prepared = 1000 ml

Therefore dilute solution is obtained by diluting 40 ml of 5% solution to 1000 ml

$$C_1 V_1 = C_2 V_2$$

$$\frac{5\% \times V_1}{5\%} = \frac{0.2\% \times 1000}{5\%}$$

$$\Rightarrow V_1 = 40 \text{ ml}$$

لازم نفی ایسی
استیجی کن: الازم
از یستی التیگز
النفا فی المصفا
و فیصه
عنا نه نوالع
الربعم لادك
عنا طریق
 $C_1 V_1 = C_2 V_2$
ان حو یسکه الازم
اعتر و صفا سلاسه

Volume-volume percentage:

(v/v) percentage expresses the number of milliliters of a drug or active ingredient in 100 milliliters of a mixture

Most useful when a liquid-liquid solution is being prepared

For example, a 40% v/v ethanol solution contains 40ml ethanol per 100ml total volume

Example:

Prepare 500 ml of 5% solution of chloroform in 50% alcohol

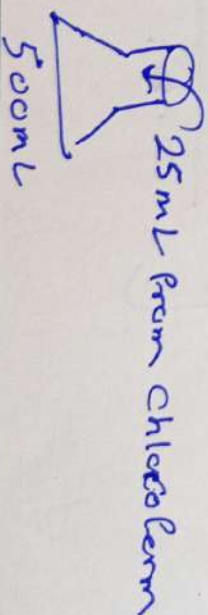
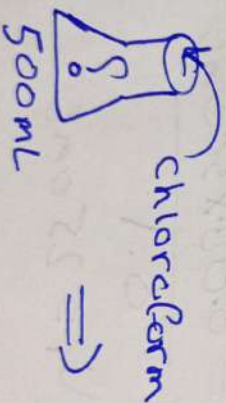
5 ml chloroform → 100 ml of 50% alcohol

X ml → 500 ml of 50% alcohol

X = 25 ml of chloroform dissolved in sufficient quantity of 50% alcohol to make 500 ml of solution

فقط عتامة
Dilution
لا يفرق بالاصحاح
ماتري فينا

50% حلال
Chloroform
100% حلال
solution
حلال
Chloroform
500 ml



Ratio strength (نقارن شغلين بالنسبة لبعض)

Ratio strength (1:N) is one part by weight or volume in N parts by weight or volume

1:200 ratio strength can be

- 1 gm solid to 200 gm solid

- 1 ml liquid to 200 ml liquid

- 1 gm solid to 200 ml liquid

1 : N

(volume : volume)

(weight : weight)

(part : part)

(weight : volume)

Example: ^{كامل} ^{سواء} 25 g

If 2000 gm of ointment contain 75 gm of hydrocortisone, what is the percentage strength (w/w) of the ointment?

2000 gm ointment → 75 gm hydrocortisone

100 gm ointment → X

X = 3.75% (w/w)

percentage

نربطها انوا من عا قسده
total عا 100

total
كامل

كم ان عا
كم ان عا

hydrocortisone

(100 gm) ك

Ratio strength

If 8 ml of phenol were added to 480 ml of lotion what is the percentage of phenol in the lotion?

X = 1.6% of phenol (W/U)

100 ml of lotion contain 1.6 ml of phenol

Phenol 8 ml in 480 ml lotion

$$\begin{array}{l} 480 \rightarrow 8 \\ 100 \rightarrow X \end{array} \quad X = 1.6\%$$

Ratio strength

Solve:

(W/U)

1. If 1.2 gm of menthol is added to 480 ml of lotion, what is the percentage of menthol in the lotion?

Answer = 0.25% of menthol

$$\begin{array}{l} 1.2 \rightarrow 480 \text{ ml} \\ X \rightarrow 100 \text{ ml} \end{array}$$

2. How many milliliters of a 0.1% solution can be made from one gram of atropine sulfate?

Answer: 1000 ml

0.1%

(0.1 g) of atropine sulfate
200 ml of solution

~~$$\begin{array}{l} 0.1 \rightarrow 100 \\ X \rightarrow 1000 \end{array}$$

$$100 = X \cdot 0.1$$~~

0.1 g atropine sulfate → 100 ml of solution

1 g " " → X ml solution

Concentration and Dilution

Stock solutions are concentrated bulk solutions from which more dilute solutions can be quickly prepared

These solutions can be used with a ratio strength or percentage strengths

General formula for solving: $V_1 \times S_1 = V_2 \times S_2$

V_1 = the quantity or the amount of the original preparation

S_1 = the % strength of the original preparation expressed as a decimal or percent

V_2 = the quantity or amount of the wanted preparation

S_2 = the % strength of the wanted preparation expressed as a decimal or percent

مقابلہ کرنا

مکمل کرنے

زادہ (ضعیف)

یکساں

یکساں

یکساں

یکساں

یکساں

یکساں

یکساں

(1)

(2)

ضعیف کرنا
مکمل کرنے

ضعیف

صنع الصيغ والتكبير
Reducing and Enlarging formulas

Determine the total weight or volume of ingredients and convert to the required quantity. The quantity in the original and new formulas will have the same ratio

مثلا

يكون عنا
 200g
 وانسبنا
 يا اكثر او اقل

50ml mixture
 نعمل نسبة ونسبته تكون
 لدينا نعرفنا اننا القيم الحديدية
 نانا كان
 volum
 50ml

Reducing and Enlarging formulas

Calculate the amount needed for 50 ml strong sodium salicylate mixture

- 1 Sodium salicylate 10g
- 2 Sodium metabisulfate 1g
- 3 D.S. chloroform water 525 ml
- 4 Water q.s. 1000 ml

original formulas

Answer:
 Sodium salicylate 0.5g
 Sodium metabisulfate 0.05g
 D.S. chloroform water 26.25 ml
 Water 50 ml

find volume
 ونانا بياك
 50ml

① - (sodium) 10g → 1000 ml (water)
 x → 50 ml

بالقي الاغريغ
 نطالع ونفس
 الفكره

نثبت قيمه (قيمة لقيغ ونفس قيمه اعاد)
 (قيمة بجانة نطالع الحديدية)

Reducing and Enlarging formulas

Calculate the amounts needed for 100 ml peppermint water?

Peppermint water:

Peppermint 2 ml

Talc 15 gm

Purified water q.s. 1000 ml \rightarrow 100 ml

Answer:

Peppermint 0.2 ml

Talc 1.5 gm

Purified water q.s. 100 ml



بناقله
reducing
بناقله
2000ml بناقله
بناقله (2)

$$\begin{array}{l} 4 \rightarrow 100 \\ x \rightarrow 10 \end{array}$$

بناقله

$$\begin{array}{l} 2 \rightarrow 100 \\ x \rightarrow 5 \end{array} \quad x = 0.1$$

What is the percentage of alcohol in the following mixture?

Alcohol 2% 5ml (0.1 ml)

Alcohol 4% 10 ml (0.4 ml)

Answer:

$$0.1 + 0.4 = 0.5$$

$$0.5 / (5 + 10) = 0.0333 \times 100\%$$

$$x = 3.33\%$$

total volume

Alligation

total part up
Desired
% strength



partal-higher
% strength

desired
% strength

% lower
strength

higher
strength
minus
desired
strength

partal-lower
% strength 16

$$\begin{array}{l} 4 \rightarrow 100 \\ x \rightarrow 10 \end{array}$$

$$x = 0.4$$

total

percentage

طريقة المذاج

Alligation method

How many parts of an 20% w/v solution and 8% w/v solution are needed to produce an 10% w/v solution?

- Solution of Highest Concentration: 20% w/v
- Solution of Lowest Concentration: 8% w/v
- Solution of Desired Concentration: 10% w/v
- Subtracting the lower concentration (8 w/v) from the desired concentration (10% w/v) = 2 (higher concentration ratio value)
- Subtract the desired concentration (10 w/v) from the higher concentration (20% w/v) = 10 (lower concentration ratio value)

This gives us a ratio of 2:10 (higher concentration : lower concentration)
 Let's suppose that the question asked us to produce 500mL of 10% w/v solution.
 In this case, we know the ratio - 2:10
 In other words, 2 parts higher concentration to 10 parts lower concentration.
 In other words, there are 12 parts (2 parts + 10 parts):

• $2/12 \times 500\text{mL} = 83.33\text{mL}$
 • $10/12 \times 500\text{mL} = 416.66\text{mL}$

(higher conc) concentration of 20%
 (lower conc) ratio (2:10) of 8%
 higher ↓ lower
 lower

هذا التركيز اعطالون

① نظري التركيز اعطالون (هو قيمة نسبة تركيز اعلى)

② نظري التركيز اعطالون

النسبة اعطالون
 النسبة اعطالون
 (هو قيمة نسبة تركيز اعلى)

(higher conc) concentration of 20%

لوبيتا نعرف كم بيلا higher ml عن 500ml
 $500\text{mL} \times \frac{\text{lower part}}{\text{total part}}$ or $500\text{mL} \times \frac{\text{part of higher}}{\text{total part}}$
 $500 \times \frac{10}{(10+2)}$ or $500 \times \frac{2}{(10+2)}$

higher (8-10) = 2

lower (10-20) = 10

Iso-osmoticity and Isotonicity

Osmosis is a phenomenon that occur when a semipermeable membrane (permeable only to solvent molecules) is used to separate solutions of different solute concentrations

The solvent molecules cross the membrane from lower to higher concentration to establish a concentration equilibrium

The pressure driving this movement called osmotic pressure

Osmotic pressure is governed by the number of particles of solute in solution

Iso-osmotic solutions: solutions containing the same concentration of particles and thus exert equal osmotic pressure

الضغط الاسموزي
 (هو طائل التي نفسها تركيز الجوار 2- يكون ضغط الاسموزي هو متساوي)

Solvent
 ينقل
 من تركيز اعلى الى اقل
 عن طريق غشاء

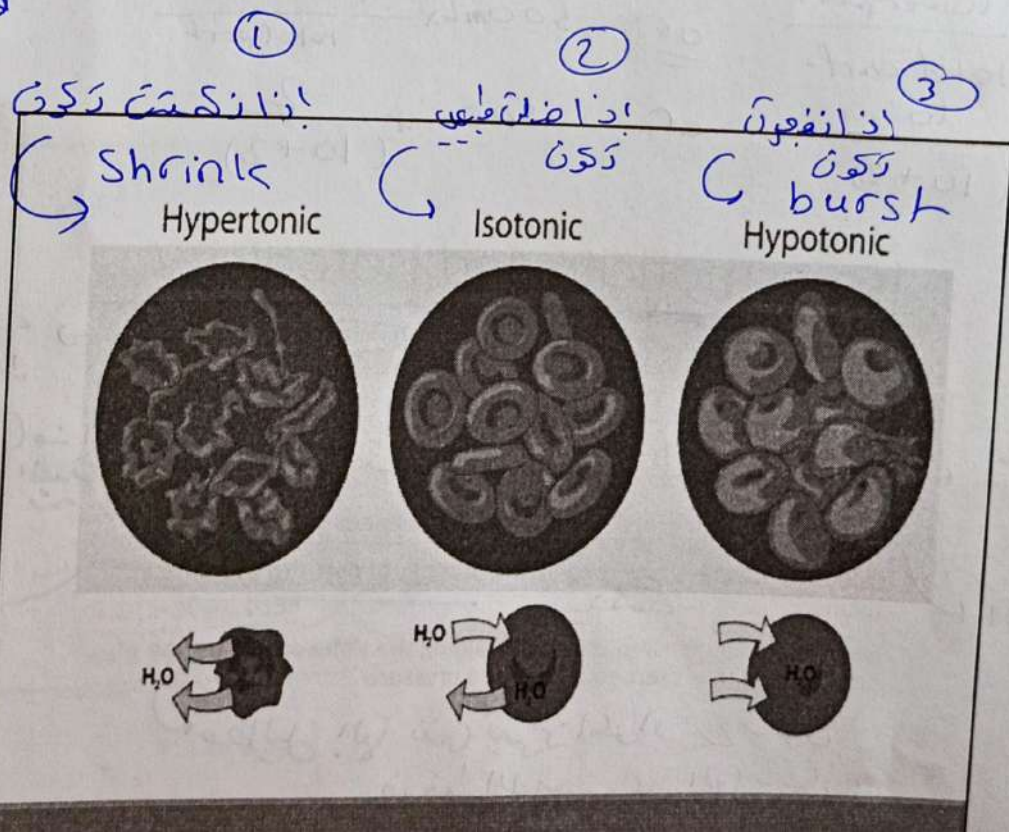
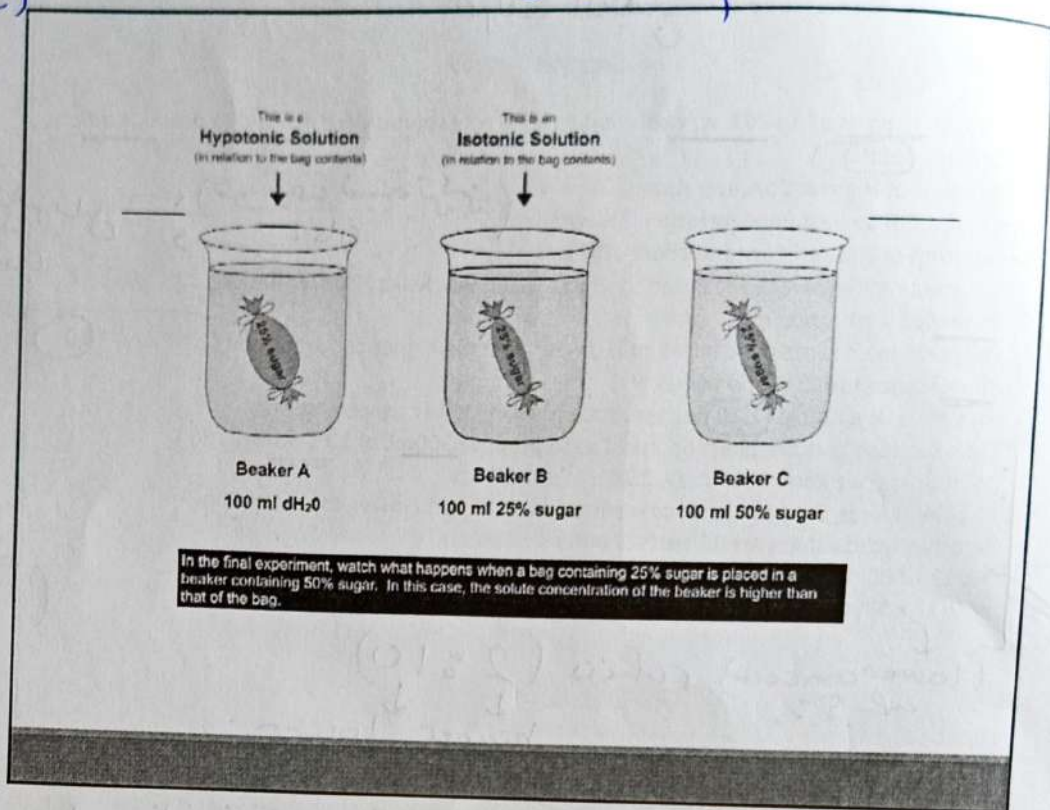
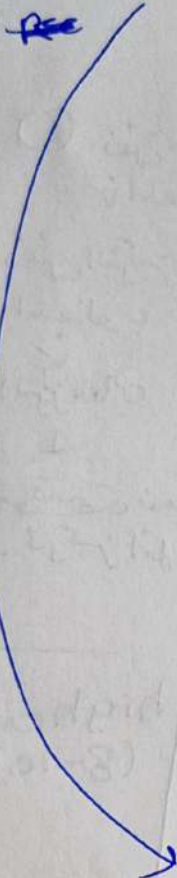
الضغط الاسموزي
 صافي الحركة
 نسبة ضغط الاسموزي

عنا وشبه
 منقذ فقط
 للعاب
 (solvent)
 هذا
 الهدف منه

ضغط الاسموزي
 يدلكه عن
 جزيات
 (Solute)
 الجذاب

1

من طرف الاستفاده في تجربة (RBC) [Isotonic] زهبا



Iso-osmoticity and Isotonicity

A 0.9% solution of sodium chloride (normal saline) is iso-osmotic with blood

(=) Isotonic means equal tone and sometimes is used interchangeably with the term iso-osmotic

The importance of using isotonic or iso-osmotic solutions is to assure that there is no tissue damage or pain when the formulation is administered

Hypotonic solutions produce painful swelling of tissues

Hypertonic solutions produce painful shrinking of tissues

و صا ي من طرف ثابته

بذا كانه عتبا

وطول و بيه

0.9% من NaCl

21 يكون

ISO-Osmotic

لـ RBC

(متساوية)

Isotoin

نفسية

ISO-osmotic

تعمل تورم مودلم

تعمل تقلص مودلم

عتبا

نتاكد

انوا ماعنا اي

ضرر كاي انسيجه او اللم عندما نضبط العرا كيب

من معلق مستخدمة عتبا نضبط (ISO) ؟

Methods used to adjust the isotonicity of compounded solutions:

1. Sodium chloride equivalent method:

- the most widely used
- The NaCl equivalent (E) is the amount of NaCl that has the same osmotic effect (based on the number of particles) as 1gm of drug
- Tables of (E) for various drugs are available in standard references

2. Cryoscopic method

3. Isotonic solution V values

رقتي يكون (ISO)

0.9% → 100 ml
9

(E) equivalent

1g مادة

0.2 قادل

NaCl

بذا كان

(E) equivalent

للمادة (X)

متساوي

0.2

مكونا

الدواء

Sodium Chloride Equivalent Method:

Example: Calculate the amount of NaCl required to make the following ophthalmic solution isotonic:

| | | | |
|--------|----------------------|----------|------------------------|
| (Atro) | Atropine Sulfate | 2% (w/v) | $2g \rightarrow 100ml$ |
| | NaCl | q.s. | $X \rightarrow 30ml$ |
| | Aqua. Dist. q.s. ad. | 30 ml | |

* each gram of atropine sulfate can be replaced by 0.13 g of NaCl

$$X = 0.6g$$

$$\begin{array}{l} 0.6 \rightarrow X \\ 1 \rightarrow 0.13 \end{array}$$

$$X (NaCl) = 0.078g$$

(gram) نطلع
 (Atro) تاع
 بالجيم الوب
 عشان نفون كم
 gram
 (NaCl)
 انو كم ستا دوي
 (NaCl)

Atro يا 1 gram يا
 NaCl يا 0.13

Sodium Chloride Equivalent Method:

- Determine the amount of NaCl to make 30 ml of an isotonic solution:

0.9g of sodium chloride in 100 ml of water will make an isotonic solution

- 0.9gm \rightarrow 100 ml
- X \rightarrow 30 ml
- X = 0.27 gm \rightarrow

ما يسهل
 NaCl
 ازا تا يا عنادوا

ما يسهل
 فقنا

Sodium Chloride Equivalent Method:

به نافرین عم
بنا
gram
(atro)
بال 30ml
ازا کا زتر کمیز
2% (w/v)

2. Calculate the contribution of atropine sulfate to the osmotic pressure of the solution (the sodium chloride equivalent for atropine sulfate (E)= 0.13):

- 30 ml X 2g/100 ml = 0.6 g atropine sulfate will be present in the formulation

- 0.6g X 0.13 = 0.078 gm will be the sodium chloride equivalent contribution of atropine sulfate

~~0.13~~

$$U = (w_1 \times E_1) + (w_2 \times E_2) \times 111.1$$

isotonic solution U value

Sodium Chloride Equivalent Method:

3. Determine the amount of NaCl to add to the formulation:

- The sodium chloride needed to make the final solution isotonic is calculated by:

$$0.27 \text{ gm} - 0.078 \text{ g} = 0.192 \text{ gm}$$

حفظاً
به نافرین عم
total

NaCl
بال 30ml

4. What if boric acid is used to adjust isotonicity in ophthalmic solution because of its buffering and anti-infective properties:

- E for boric acid = 0.5

$$0.192 \text{ g NaCl} \rightarrow X \text{ g boric acid}$$

$$- 0.5 \text{ g NaCl} \rightarrow 1 \text{ g boric acid}$$

$$- X = 0.38 \text{ g}$$

استخدم
boric acid
عشان فعل
(iso) بس بدهانه الحار
للدوى

ازا کار عینا
ها ی کمه
NaCl
کم بزم
نظف فی
boric
acid
عشان فعل
نفسه الحار

مطلوب من ا به ل کمه NaCl ای به ای اضیف
بال boric acid
عشان فعل نفس
الحار

Isotonic Solution V Values

The V value of a drug is the volume of water to be added to a specified weight of drug to prepare an isotonic solution

The V values are given in tables constructed for 0.3g and 1.0 g of drug
The basic principle is to prepare an isotonic solution of the prescribed drug and then dilute this solution to a final volume with a suitable isotonic vehicle

كم كمية (مجم)
الماء لاداء الحقنة
عناينة يكون
(V) (V)

المفكرة من انوار بهل ما يعني كمية الدواء (والمادة)
نفس حجم الماء الى نصفه