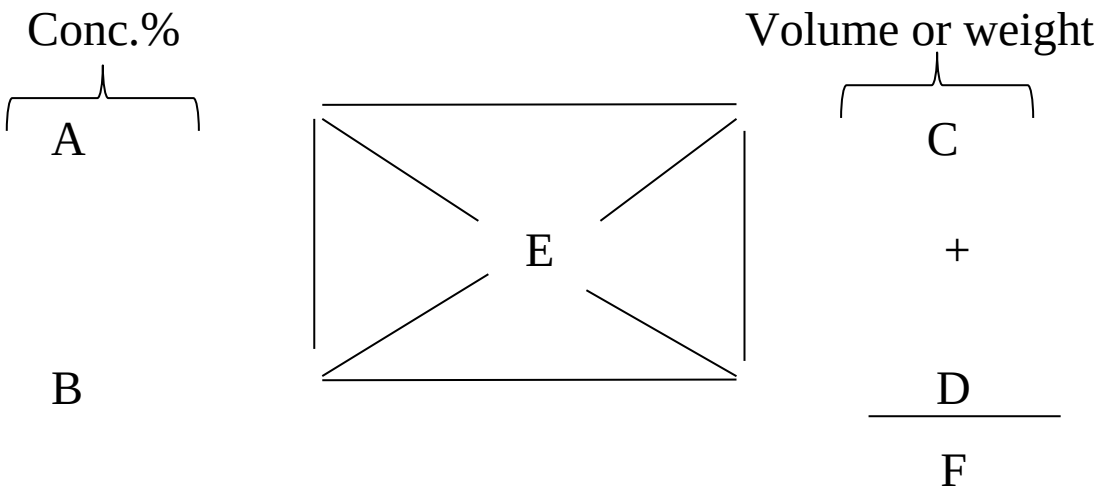
*TSS%:

To prepare the alcoholic solutions from sugary solid substances use a person square method, Then use refractometer apparatus to check of the concentration.



A) Concentration the solids in the tested substance

B) Concentration the water in the tested substance

C, D) The results of the calculation process

E) Wanted concentration

F) Total weight of sugar solution

1. In order to calculate the portion or parts of sugar as a source of carbon in fermentation media, we need to use the Pearson square.

The Pearson square is a simple ration formulation procedure when only two ingredients are to be mixed. It necessary to calculate the amount of two components that need to be mixed together to give final known concentration; several numbers are in and around the square, The value in the middle of the square must be intermediate between the two values that are used on the left side of the square, in order to make the square work consistently there are very important considerations:

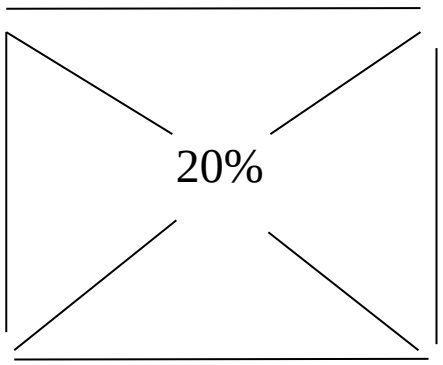
1. Draw a square and insert the target or desired concentration in the middle of the square.
2. Place the two concentrations on the left corners of the square.
3. Calculate the difference between the middle value and the value of the top and bottom left hand corners of the square.
4. Place the result diagonally opposite.
5. Add the two parts figures to give total sugar solution and calculate each as a percentage.
6. Then values represent the parts of each concentration require to produce sugar solution mixture.

Note: disregard the negative or positive value of numbers.

Verify your results using a refractometer. The most commonly used refractrometer scale for measuring solids dissolved in water. Relative density scale used in sugar, it indicates the percent of sugar by weight in a solution in degrees Brix; one Brix equivalent to one gram per 100m solution.

For example of the application the Person square To prepare the sugary solution its concentration =20% & its quantity =3000
grams: We need water and a sugary substance

70%
sugar syrup



20
parts of sugar syrup

0%
water

50
Parts of water
70 total parts sugar solution

Total Weight of S.S — Weight of S.S (Dibbis)

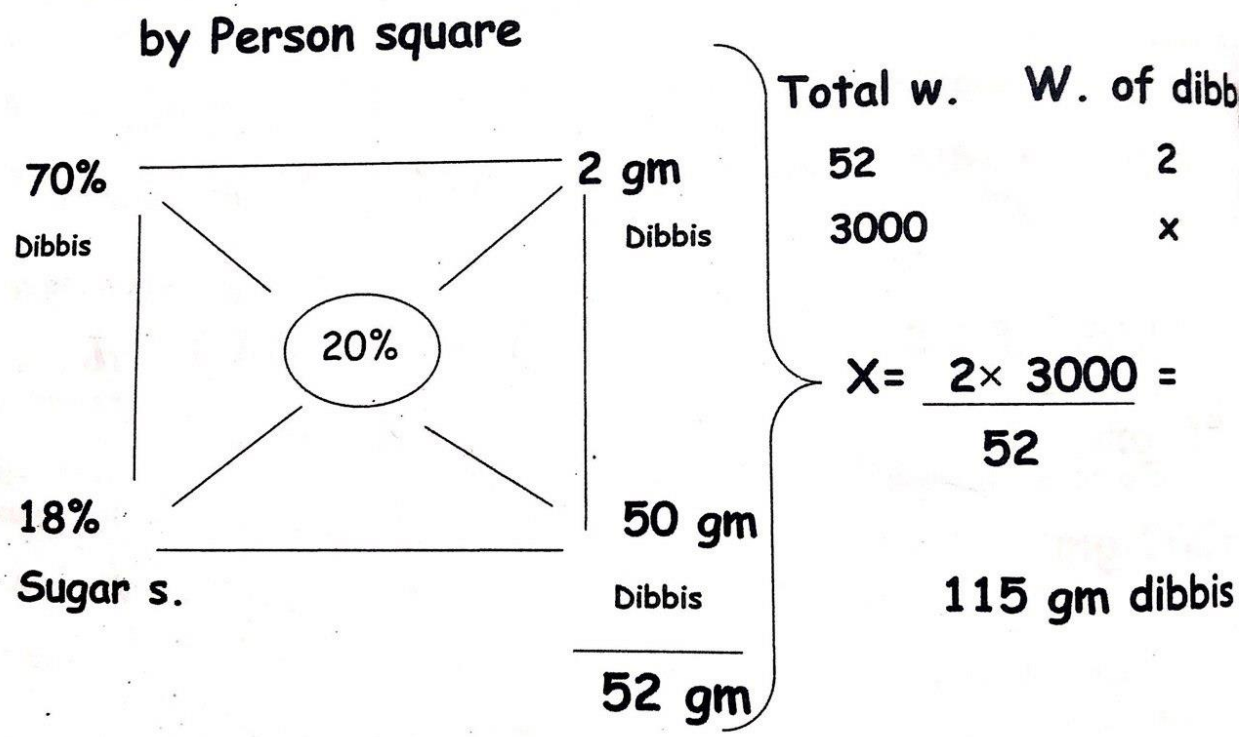
70 gm — 20 gm

3000 gm — X

$$X = \frac{3000 \times 20}{70} = 857 \text{ gm / dibbis}$$

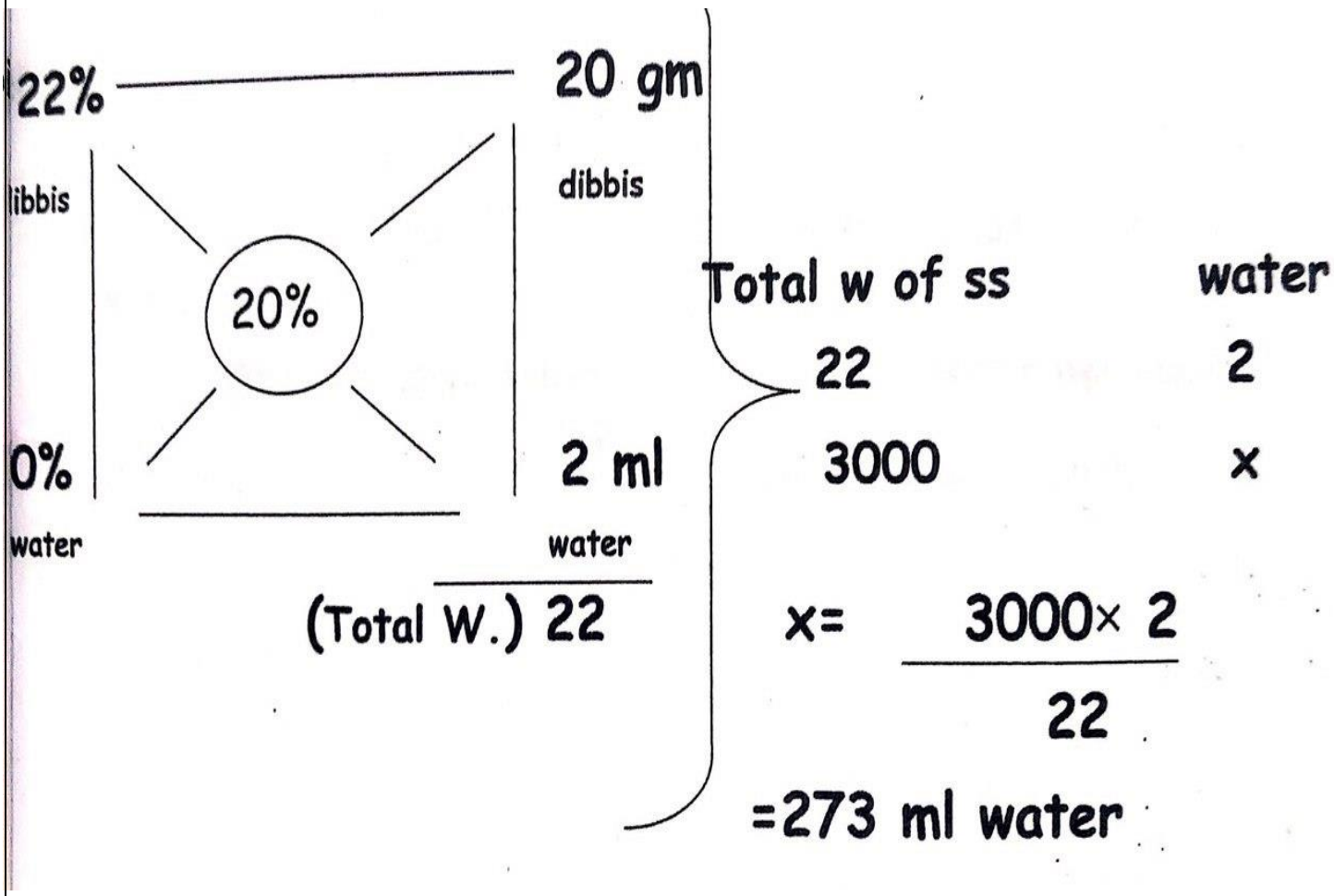
3000 - 857 = 2143 ml (water).

If wanted the solution its concentration 20% of sugar but after examination found its concentration 18%, must be Corrected this Wrong concentration As follows:-



So, The Correction must increase the concentration to 20 by adding 115 gm of dibbis

But in the case the concentration of sugar in solution was Higher than required e.g. 22%, must be Corrected this Wrong concentration as follows: -



So, The Correction must decrease the concentration to 20 by adding 273 ml of water.

Other pearson's Square Problems:

Q1: Using Pearson's Square:

Determines how many Kg of sugar syrup 65% are needed to prepare 100 Kg of sugar solution 18% concentration.

How you correct the concentration of sugar solution if it is 16% when check it by refractometer.

How you correct the concentration of sugar solution if it is 20% when check it by refractometer.

Answer:

Find the portion or parts of each component in the mixture.

Sugar syrup 65 — 18 parts of Sugar syrup 65%

18%

Water 0% — 47 parts of water

65 Total parts sugar solution 18%

This means for every 65 parts of sugar solution18%, you need to added 18 parts of sugar syrup 65%plus 47 parts of water.

The parts of each portion can be expressed as percentage of the total.

To prepare 100 Kg of sugar solution 18%

Total weight of sugar solution 18% weight of sugar syrup 65%

65 Kg 18 Kg

100 Kg X

X= 100 Kg x 18 Kg = 27.7 Kg Weight of Sugar syrup 65%

65 Kg

100 Kg - 27.7 Kg = 72.3 Kg Weight of water

To correct the concentration of sugar solution from 16% to 18%

You must added Sugar syrup 65% to correct the concentration

Sugar syrup 65% 2 parts of Sugar syrup 65%

18%

Sugar solution 16% 47 parts of Sugar solution 16%

solution 18% 49 Total parts sugar

Total weight of sugar solution 18% / weight of sugar syrup 65%

49 Kg — 2 Kg

100 Kg — X

$X = \frac{100\ Kg \times 2\ Kg}{49\ Kg} = 4.1\ Kg$ Weight of Sugar syrup 65%

This means you must added 4.1 Kg of Sugar syrup 65% to the sugar solution 16% to correct the concentration of sugar solution to 18%.

To correct the concentration of sugar solution from 20 % to 18%.

You must added water to correct the concentration

Sugar solution 20% — 18 parts of Sugar solution

20%

18%

Water 0% — 2 parts of water

solution18% — 20 Total parts sugar

Total weight of sugar solution18% / weight of water

20 Kg — 2 Kg

100 Kg — X

$X = \frac{100\ Kg \times 2\ Kg}{20\ Kg}$ = 10 Kg Weight of water

This means you must added 10 Kg of water to the sugar solution 20% to correct the concentration of sugar solution to 18%.

Q_2: Using Pearson's Square:

To prepare 100kg of concentrated orange juice (40%), determines how many Kg of crystal sugar are needed to increase the concentration of fresh orange juice 6%

How you correct the concentration of concentrated orange juice if it is 36% when check it by refractometer.

How you correct the concentration of concentrated orange juice if it is 44% when check it by refractometer.

Answer:

Find the portion or parts of each component in the mixture.

Crystal Sugar 100% — 34 parts of Crystal Sugar

40%

Fresh orange juice 6% — 60 parts of Fresh orange juice 6%

94 Total parts_concentrated orange juice 40%

This means for every 94 parts of concentrated orange juice 40%, you need to added 34 parts of Crystal Sugar plus 60 parts of Fresh orange juice 6%.

The parts of each portion can be expressed as percentage of the total.

To prepare 100 Kg of concentrated orange juice 40%

T. wt. of concentrated orange juice 40%	weight of Crystal Sugar
94 Kg	34 Kg
100 Kg	X

$$X = \frac{100\ Kg \times 34\ Kg}{94\ Kg} = 36.2\ Kg \text{ Weight of Crystal Sugar}$$

100 Kg – 36.2 Kg = 63.8 Kg Weight of Fresh orange juice 6%.

To correct the concentration of concentrated orange juice from 36% to 40%

You must added Crystal Sugar to correct the concentration

Crystal Sugar 100% — 4 parts of Crystal Sugar

40%

Concentrated orange juice 36% 60parts concentrated
orange juice 36%

64 Total parts_concentrated

orange juice 40%

T. wt. of concentrated orange juice 40% weight of Crystal Sugar

64 Kg 4 Kg

100 Kg X

X= 100 Kg x 4 Kg =6.25 Kg Weight of Crystal Sugar

64 Kg

This means you must added 6.25 Kg of Crystal Sugar to concentrated orange juice 36% to correct the to 40%.

To correct the concentration of concentrated orange juice from 44 % to 40%.

You must added fresh orange juice 6% to correct the concentration

Concentrated orange juice 44 % 34 parts concentrated
orange juice 44%

40%

Fresh orange juice 6% 4 parts fresh orange
juice 6%

38 Total parts concentrated orange juice 40%

T. wt. of concentrated orange juice 40% orange juice 6%	weight of fresh
38Kg	4 Kg
100 Kg	X

$$X = \frac{100\ Kg \times 4\ Kg}{38\ Kg} = 10.5\ Kg \text{ fresh orange juice } 6\%$$

This means you must added 10.5 Kg fresh orange juice 6%to correct the concentration of concentrated orange juice to 40%.