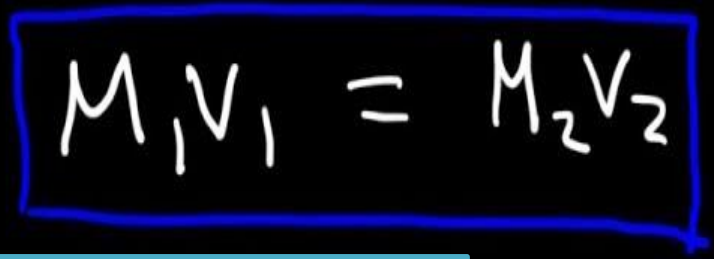
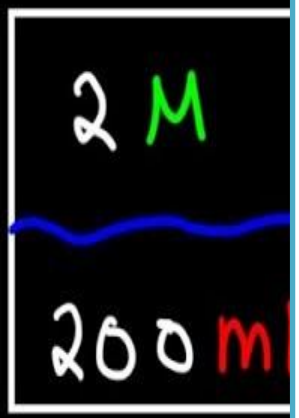
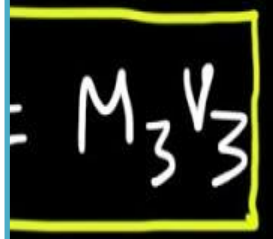
Dilution Problems







Dilution and concentration

Lab 7

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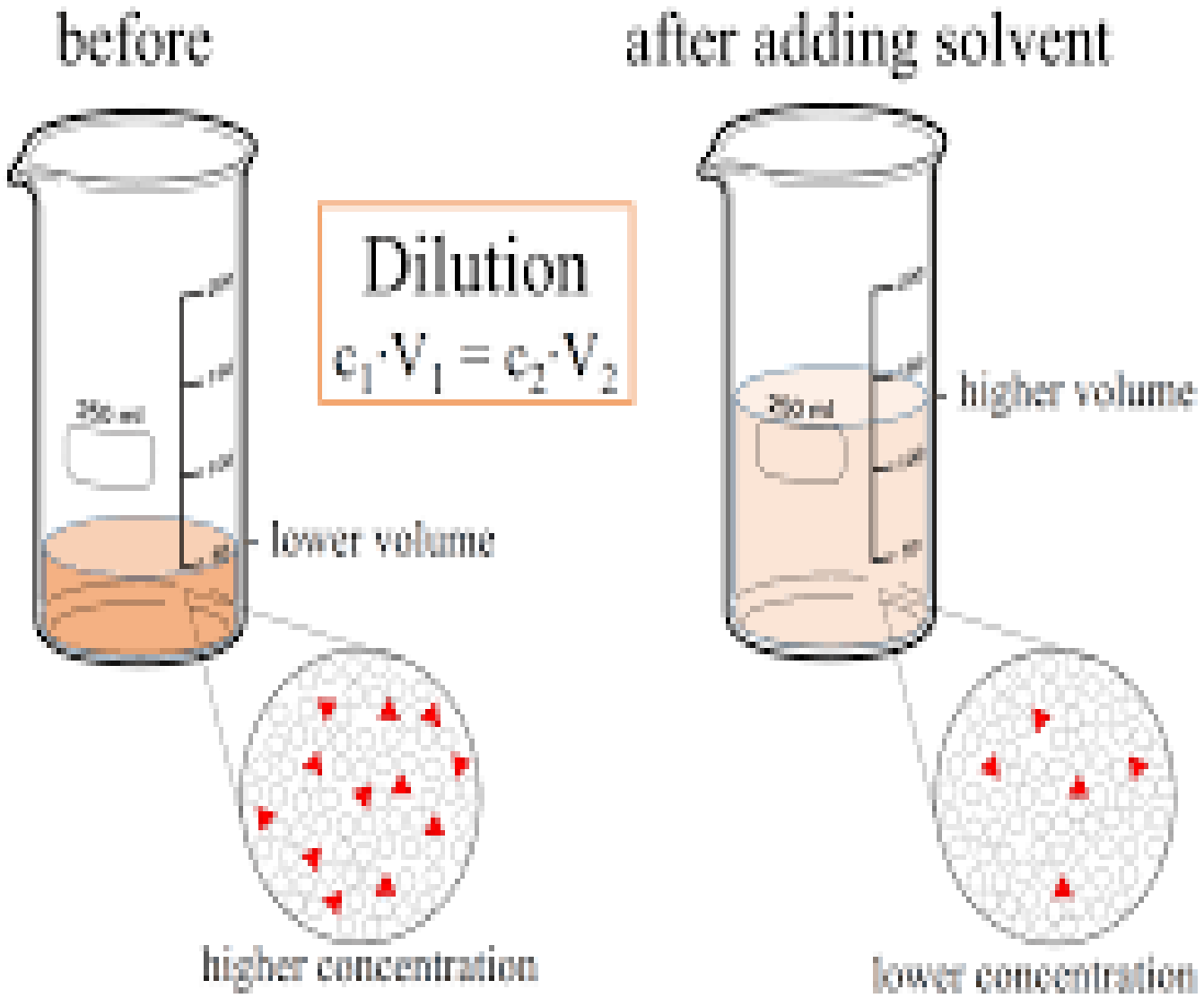
Dilution and Concentration

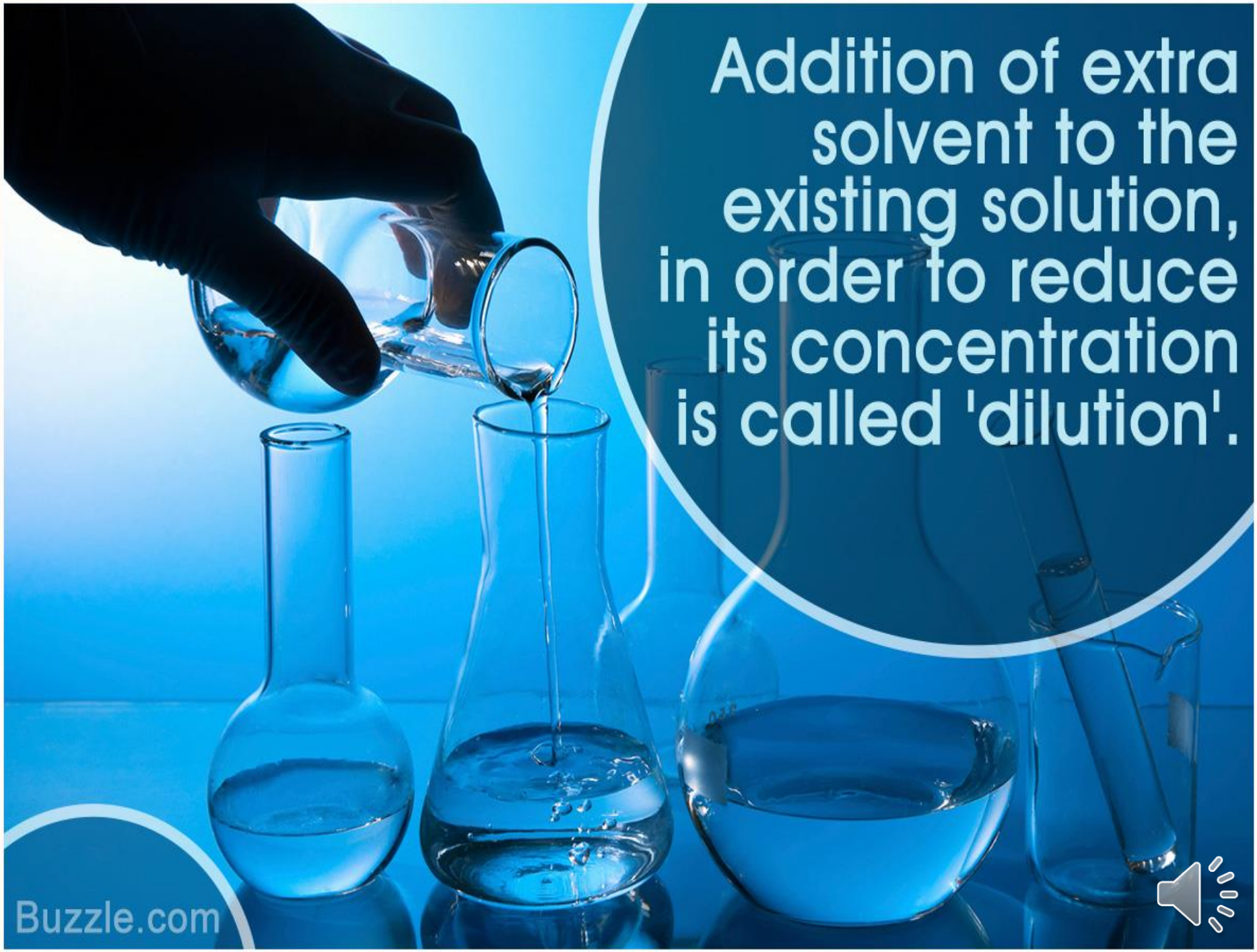
- Dilution means when a given solution of a mixture of high concentration is diluted by addition of the suitable diluents or admixture with solution of lower concentration.

- While concentration means when a given solution of a mixture of low concentration are concentrated either by addition of active ingredient or by admixture with higher strength solution or by evaporation of the diluents.
- We have different types of dilution either of liquids or solids.


before
after adding solvent
Dilution
$c_1 \cdot V_1 = c_2 \cdot V_2$
lower volume
higher volume
higher concentration
lower concentration

Dilution Law

- $C_1 V_1 = C_2 V_2$
- **The concentration is expressed either by normality, molarity or percent (%).**
- **Normality is an expression of the concentration of the solution in terms of equivalent per liter of solution (number of gram eq.wt per 1000ml).**
- **Molarity is the concentration of the solution in terms of moles per liter.**


Addition of extra solvent to the existing solution, in order to reduce its concentration is called 'dilution'.
Buzzle.com

NOTES :

We have two rules wherever they may be applied will simplify the calculation :

- When ratio strength are given, convert them to % before setting.

  Ex: 1:10=10%

- Wherever proportional parts enter into calculation, reduce them to the lowest terms.
- Ex: 75:25 simplify to 3:1

Dilution of alcohol

- When alcohol is diluted with water a noticeable contraction in volume occurs so it is difficult to calculate the amount of water to be add because alcohol interaction with water by bounding (H-bond) and lead to contraction but this contraction of volume not affect the weight of alcohol and water added.
- Examples

Rx Boric acid 10gm
Alcohol 70% 30ml
Alcohol available 90%

- How many mls of 20% alcohol can be used to prepare 25ml of 10% alcohol?

C1V1=C2V2

20% x V1 =10% x 25ml

V1 =12.5ml of 20% alcohol and complete the volume to 25ml.

Problems

- If 500ml of 15% v/v solution are diluted to 1500ml. What will be the percentage strength?

C1V1 = C2V2

15% x 500ml =C2 x 1500ml

C2=5%

- How many mls of a 1:5000 (w/v) solution of potassium permanganate can be made from 50 ml of a 5% solution?

1:5000 = 0.02%

C1V1=C2V2

50ml x 5% = 0.02% x V2

V2= 1250ml

Problems

- How much water should be mixed with 5000ml of 85% alcohol to make 50% (v/v) solution?

C1V1 = C2V2

5000ml x 85% = 50% x V2

V2 = 8500ml

8500 – 5000 = 3500ml of H2O.

- Note
- Standard solution :is a solution of known concentration (normality, molarity and molality) or it's concentration is exactly measured.
- Standardization :is determination of the molarity or normality of the solution.

Reducing and Enlarging Formula

- Pharmacist may have to reduce or enlarge the formula in pharmaceutical preparation. In large manufacturing the official formula must be enlarged, while in the pharmacy or on small products the official formula must be reduced

- **Factor= desired amount/ specified amount**

Examples:

Rx **Codeine phosphate** **gr V**

Amaranth solution **ɱ XV**

Alcohol 10 % **f℥ ss**

D.W. q.s **f℥ I**

1. Mitt f℥ II

2. Mitt f℥ ss

Calculation(1):

5/15= 0.3 g of codeine phosphate

15/15 = 1 ml of amaranth

f℥ ss= 2 ml f℥ = 30 ml f ℥ II= 60 ml

factor= 60/30= 2

0.3×2= 0.6 g of codeine phosphate

1×2= 2 ml of amaranth

2×2= 4 ml of alcohol

60×3/4= 45 ml

45-(4+2)= 39 ml

Procedure(1):

- 1. Weigh 0.6 g of codeine phosphate and put it in a beaker.
- 2. Dissolve the amount of codeine phosphate in 39 ml of D.W.
- 3. Add 2 ml of amaranth and 4 ml of alcohol into the content of the beaker.
- 4. Transfer the content of the beaker into a measuring cylinder and complete the volume to 60 ml by D.W.
- 5. Convert the content of the measuring cylinder into a wide mouth bottle and put a suitable label.

Calculation

- f℥ ss= 15 ml factor= 15/ 30= 0.5
- 0.3 × 0.5= 0.15 g of codeine phosphate
- 1×0.5= 0.5 ml of amaranth
- 2×0.5=1 ml of alcohol
- 30×0.5=15 ml
- 15×3/4=11.25 ml
- 11.25-(0.5+1)=9.75ml
- Procedure

Follow the same of the above procedure.


Thank
you!!