YAKEEN 2.0 NEET 2024

- Subject – Physical Chemistry
- Chapter – Mole Concept

Lecture No.-10

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Today's Targets

1. Revision of Last Class
2. Molarity, Molality, Mole Fraction
3. Home work Discussion
4. Home Work

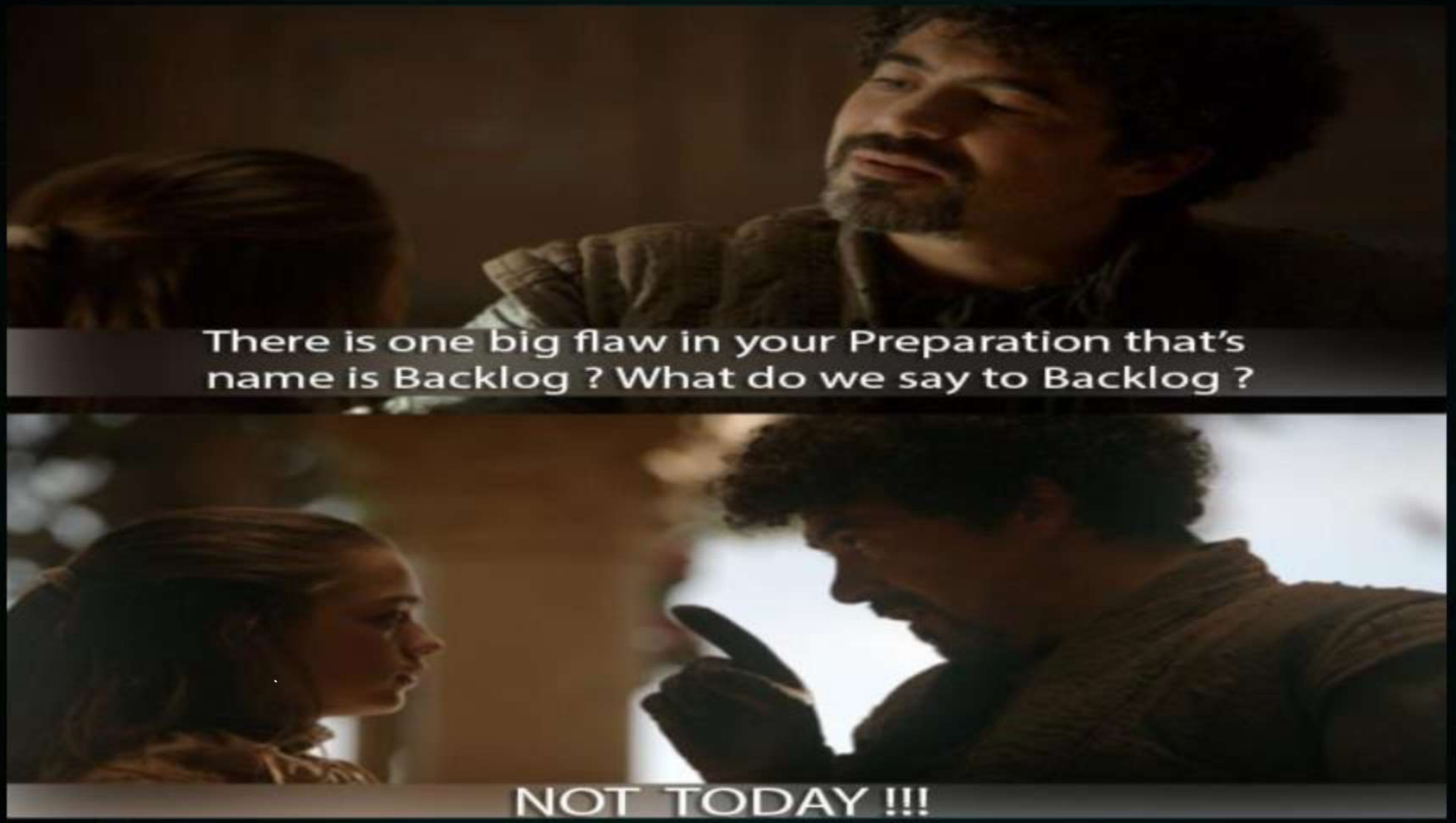
Rules to attend class

→ Key to NEET 2024

1. Always sit in a peaceful environment with headphone and be ready with your copy and pen.
2. Never ever attend a class from in between or don't join a live class in the middle of the chapter.
3. Make sure to revise the last class before attending the next class & always complete your home work along with DPP.
4. Never ever engage in chat whether live or recorded on the topic which is not being discussed in current class as by doing so u can be blocked by the admin team or your subscription can be cancelled.

Rules to attend class

5. Try to make maximum notes during the class if something is left then u can use the notes pdf after the class to complete the remaining class.
6. Always ask your doubts in doubt section to get answer from faculty. Before asking any doubt please check whether same doubt has been asked by someone or not.
7. Don't watch the videos in high speed if you want to understand better.


There is one big flaw in your Preparation that's name is Backlog ? What do we say to Backlog ?
NOT TODAY !!!

Revision of Last Class

① Gay Lussac's law

$$1H_2(g) + 1Cl_2(g) \rightarrow 2HCl(g)$$

1L 1L 2L at same T & P

② Avogadro's law.

$$\frac{\text{Vol. of gas A}}{R} = \frac{\text{moles of gas A}}{R} = \frac{\text{Molecules of gas A}}{R}$$

(3) Empirical formula. C_2H_4

E.F. → CH_2

(4) Molecular formula

M.F. C_2H_4

(5) Relation b/w E.F. & M.F.

$M.F. = (E.F.)_x$

$x = \frac{\text{M.F. mass}}{\text{E.F. mass}}$

Find E.F.

(1) $\frac{A\text{-}\%age}{\text{at. mass}} = m$ B $\frac{\%age}{\text{at. mass}} = n$

(2) Divide it by smallest $n < n$.

$A_{\frac{m}{m}}$ $B_{\frac{n}{m}}$

$A B_{\frac{n}{m}}$ Convert into integer

Solutions

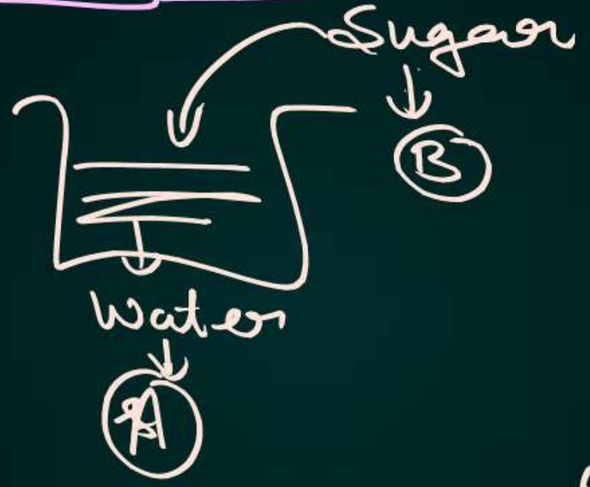
Binary solution → 2 Component solution

Solvent → A

W_A = mass or weight of solvent (A)

M_A = Molar mass (Gr. M. M.) of solvent (A)

n_A = moles of solvent $= \frac{W_A}{M_A}$



Solute → B

W_B = mass or weight of solute (B)

M_B = Molar mass (Gr. M. M.) of solute (B)

n_B = moles of solute (B) $= \frac{W_B}{M_B}$

two liquids mix → ethanol + water

↓

quantity more → solvent → A

less → solute → B

Molarity (M)

#MIT

$$M = \frac{\text{moles of solute}(n_B)}{\text{Volume of solution (L)}}$$

$$M = \frac{w_B \times 1000}{M_B \times \text{Vol. of soln}^n (ml)}$$

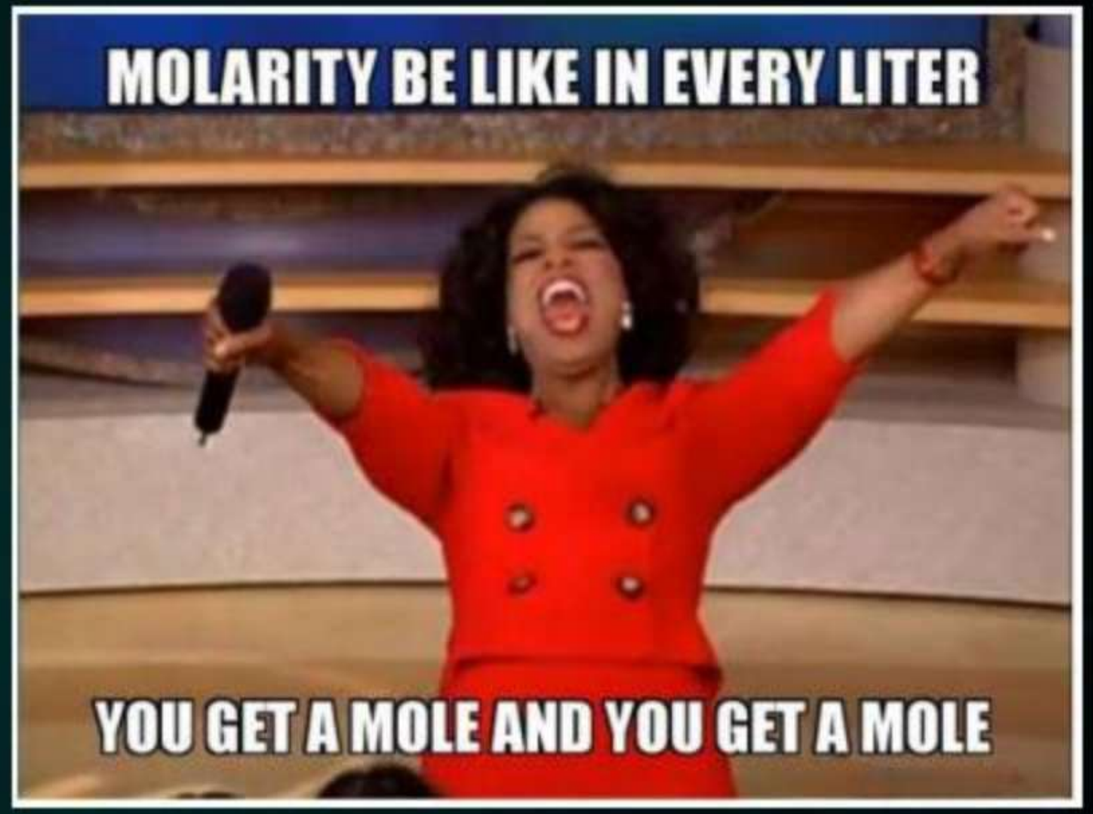
4 L of solution → 20 moles of solute

1 L ⟶ $\frac{20}{4} = 5\ M$

1 L = 1000 ml = 1000 cm^3 = 1000 c.c. = 1 dm^3

1 ml = 1 cm^3 = 1 c.c.

Unit of molarity = mol L^{-1} or mol/L or molar



Moles of Solute (n_B)	Volume of solution (in L)	Molarity
4	1	$\frac{4}{1} = 4$
12 ✓	2 ✓	$\frac{12}{2} = 6$
27	9	$\frac{27}{9} = 3$

Question

Calculate the molarity of NaOH in the solution prepared by dissolving its 4 g in enough water to form 250 mL of the solution. If molar mass of NaOH is 40 g.

Ans 0.4 M

NaOH → solute → B

$W_B = 4\,g$

$M_B = 40\,g$

$n_B = \frac{4}{40} = \frac{1}{10}$

V of sol^n = 250 ml

$= \frac{250}{1000} = \frac{1}{4}\,L$

$M = \frac{1 \times 4}{10 \times 1} = 0.4\,M$

Question

If the concentration of glucose ($C_6H_{12}O_6$) in blood is 0.72 gL^{-1}, the molarity of glucose in blood is ..... × 10^{-3} M. (Nearest integer) [Given: Atomic mass of C = 12, H = 1, O = 16 u]

Ans glucose is 0.72 g/L

0.72 g of glucose is present in 1 L of Blood

glucose → Solute → B

$w_B = 0.72$

$M_B = 6\times12 + 12\times1 + 6\times16 = 180\,g$

$M_B \downarrow$

$C_6H_{12}O_6$

$M = \frac{0.72}{180 \times 1} = \frac{72}{18 \times 1000} = \frac{4}{250}$

$M = \frac{1}{250} = \frac{1}{25 \times 10}$

$M = 0.04 \times 10^{-1}\ M$

$= 4 \times 10^{-3}\ M$

Question

6.02×10^{20} molecules of urea are present in 100 mL of its solution. The concentration of urea solution is : (NEET PYQ)

A. 0.001 M

B. 0.01 M

C. 0.02 M

D. 0.1 M

$$n_B = \frac{6.02 \times 10^{20}}{6.02 \times 10^{23}} = \frac{1}{1000}$$

$$V \text{ of sol}^n \text{ in L} = \frac{100}{1000} = \frac{1}{10} \text{ L}$$

$$M = \frac{1 \times 10}{100 \times 1} = 10^{-2} \text{ M}$$

$$= 0.01 \text{ M}$$

Formality (F)

↓

Ionic Compounds → solute

Molarity = Formality

$$F = \frac{\text{mass of solute}}{\text{Gr. F.M. of solute} \times \text{Vol. of sol}^{n}\text{ (in L)}}$$

Sugar → $C_{12}H_{22}O_{11}$ → Covalent Cmpd. → solute

↓

Water → solvent

↓ Molarity.

$Na^{+}Cl^{-}$ → Ionic Cmpd. → solute → Molarity = Formality.

↓

Water → solvent

Q If 117 g of NaCl is dissolved in 500 ml of soln.
find Formality or Molarity. If Gr. A.M. of Na = 23 g
Cl = 35.5 g

Ans $F = \frac{\overset{2}{\cancel{117}} \times \overset{2}{\cancel{1000}}}{\cancel{58.5} \times \cancel{500}} = 4$ (F)

Gr. F.M. of Na^+Cl^- = 1x23 + 1x35.5
= 58.5 g.

Question

How many grams of NaOH (B) should be dissolved to make 100 cm^3 of 0.15 M NaOH solution? If gram formula mass of NaOH is 40 g.

Ans $W_B = ?$ V of soln = 100 ml

M = 0.15 M

G.F.M. of NaOH

or

Molar mass of NaOH = 40 g

$$M = \frac{W_B \times 1000}{40 \times 100} = 0.15$$

$$W_B = 0.15 \times 4 = 0.6\ g$$

Molality (m)

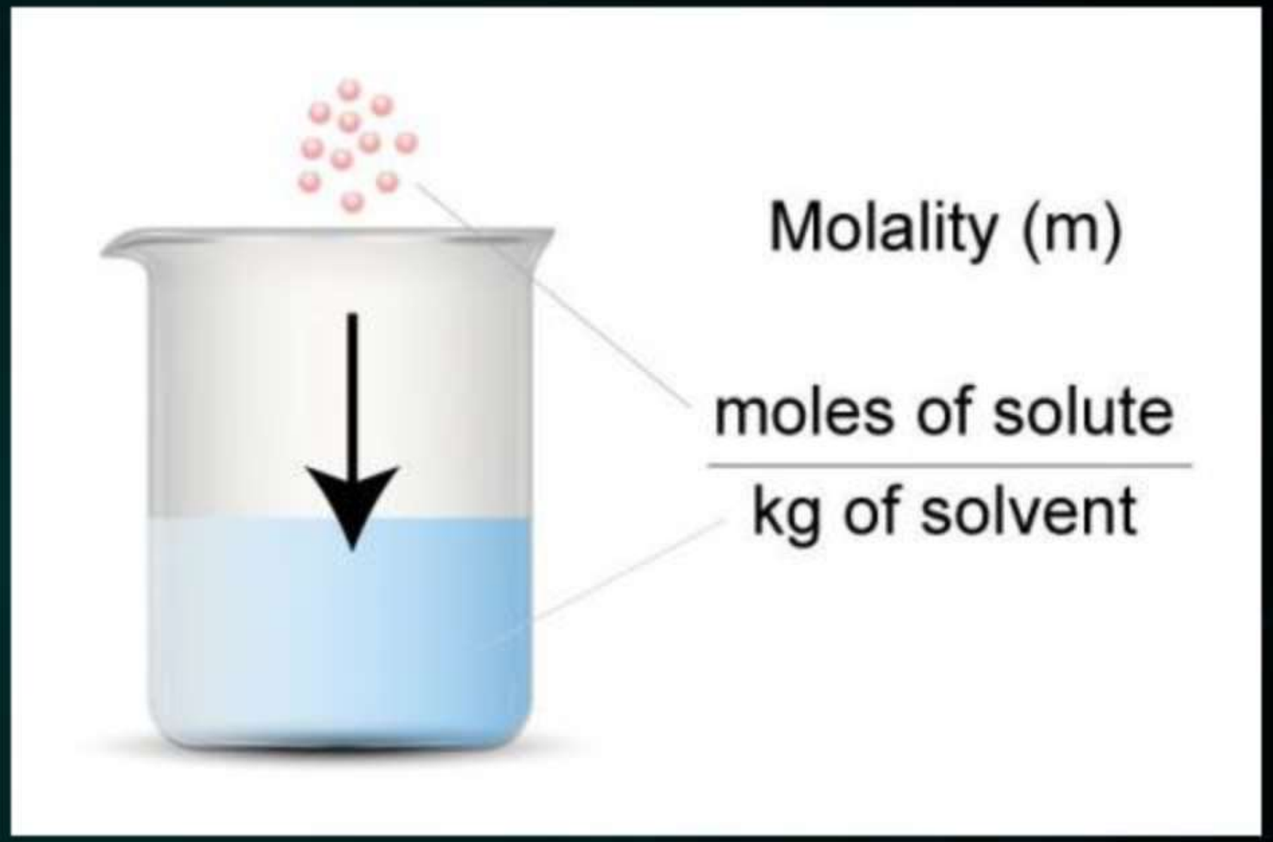
#NIT

$$m = \frac{\text{moles of solute } (n_B)}{\text{mass of solvent in kg } (w_A)}$$

$$m = \frac{w_B \times 1000}{M_B \times w_A (\text{in g})}$$

Unit of molality (m) = mol/kg or $mol\ kg^{-1}$ or molal

$1\ Kg = 1000\ g$




Tumne mujhe bataya kyu nai ki..
crazy freind*
@jyotiyadav73
Molarity and Molality dono different meaning word h...

Question

If 160 g of NaOH is present in 500 ml of water find molality if Molar mass of NaOH is 40 g.

Ans

NaOH → solute → (B) | Water → Liquid → solvent ⇒ A

$w_B = 160\,g$ | $n_B = \frac{160}{40} = 4$

$M_B = 40\,g$ |

Vol. of water = 500 ml

d of water = 1 g/ml

$w_A = 500 \times 1 = 500\,g$

$w_A = \frac{500}{1000} = \frac{5}{10} = \frac{1}{2}\,Kg$

$m = \frac{4 \times 2}{1} = 8\,m$

Question

The molality of a urea solution in which 0.0100 g of urea, $[(NH_2)_2CO]$ is added to 0.3000 dm^3 of water at STP is

A. 5.55×10^{-4} m

B. 33.3 m

C. 3.33×10^{-2} m

D. 0.555 m

Urea → solute → B

$w_B = 0.01\ g$

$M_B = 60\ g$

V of water $= 0.3\ dm^3 = 0.3\ L = 0.3 \times 1000\ ml = 300\ ml$

d of water $= 1\ g/ml$

$w_A = 300 \times 1 = 300\ g$

$w_A = \frac{300}{1000} = \frac{3}{10}\ kg$

$n_B = \frac{0.01}{60} = \frac{1}{6000}$

$m = \frac{1}{6000 \times 3} = \frac{1}{18} \times 10^{-2}$

$18 \overline{)100}\ (.05$, 90

$m = 0.05 \times 10^{-2}\ m$

$= 5.55 \times 10^{-4}\ m$

Mole fraction (χ) → Chi

$$\frac{\chi_B}{\chi_A} = \frac{n_B \times (n_A + n_B)}{n_A + n_B \times (n_A)} = \frac{n_B}{n_A}$$

#MIT

Mole fraction of solute $(\chi_B) = \frac{n_B}{n_A + n_B}$

mole fraction of solvent $(\chi_A) = \frac{n_A}{n_A + n_B}$

Mole fraction ⇒ No unit as it is ratio

$$\chi_A + \chi_B = 1$$

$$\frac{n_A}{n_A + n_B} + \frac{n_B}{n_A + n_B} = 1$$

$$\frac{n_A + n_B}{n_A + n_B} = 1$$

mole-fraction = moles / ratio

$$\frac{\chi_B}{\chi_A} = \frac{n_B}{n_A}$$

$$\chi_A = 1 - \chi_B$$

Question

Solvant

If 3 moles of water is mixed with 1 mole of sugar. Find mole fraction of water and sugar?

Solute

Ans $n_A = 3$

$n_B = 1$

$$\chi_A = \frac{3}{3+1} = \frac{3}{4}$$

$$\chi_B = 1 - \chi_A = 1 - \frac{3}{4}$$

$$= \frac{4-3}{4} = \frac{1}{4}$$

$$\chi_B = \frac{1}{1+3} = \frac{1}{4}$$

Question

138 g of ethyl alcohol is mixed with 72 g of water. The ratio of mole fraction of ethyl alcohol to water is if molar mass of ethyl alcohol is 46 g and of water is 18 g.

A 3 : 4

B 1 : 2

C 1 : 4

D 1 : 1

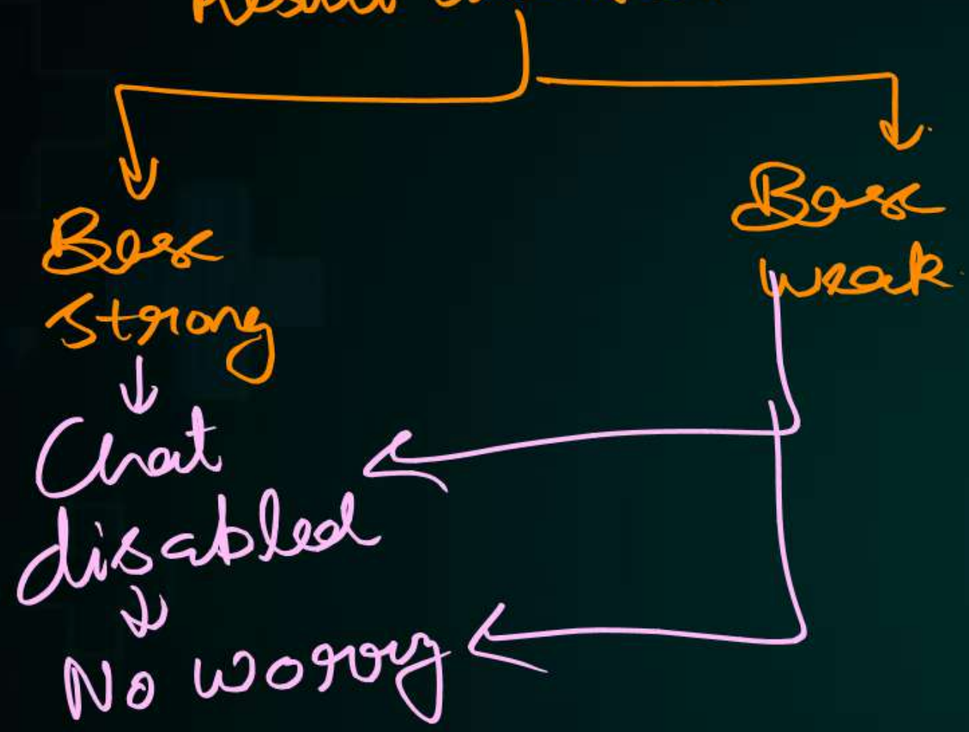
mass of ethyl alcohol = 138 g | mass of water = 72 g

Molar ~~~~~ = 46 g | Molar ~~~~~ = 18 g

moles of ethyl alcohol $= \frac{138}{46} = 3$

~~~~~ water $= \frac{72}{18} = 4$

$$\frac{\text{mole fraction of ethyl alcohol}}{\text{water}} = \frac{\text{moles of Ethyl alcohol}}{\text{water}} = \frac{3}{4}$$
~~~~~



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Dopamine oriented
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Chat disable for 5 min.

Mass Percent or Weight Percent (w/w%)

w / w

w → Solute unit → g

w → Solution unit → g

30 g of solute is present in

100 g of solution

$$\text{mass \% ge of solute} = \frac{\text{mass of solute}}{\text{Total mass of solution}} \times 100$$

Chemical → HNO_3 → solute

30% by mass

weight

(w/w)

Question

Relationship between % by mass and Molarity (M) and d of solution (g/ml)

#MIT

$$M = \frac{\%\text{ by mass} \times d \times 10}{M_B}$$

% by mass

d = density of solution in g/ml

M_B = Molar mass of solute in g.

Question

The molarity of HNO_3 in a sample which has density 1.4 g/mL and mass percentage of 63% is ..... (Molacular weight of HNO_3 = 63)

Ans $M = \frac{63 \times 1.4 \times 10}{63} = 14\,M$

$M_B = 63\,g$

% Age by Volume

#MIT

V/V

unit of solute / unit of solution

20 ml of solute (acetic acid) is present in 100 ml of solution

$$\text{Volume \%-ge of solute} = \frac{\text{Volume of solute}}{\text{Volume of solution}} \times 100$$

% Age by Strength

↓

W/V

W / V

↓ unit of Solute

↓ unit of solution

10 g of solute present in

100 ml of solution

10% W/V
or
10% by strength

10 Kg of solute
1000 m^3 of solution

% age by strength of solute = $\frac{\text{mass of solute}}{\text{Volume of solution}} \times 100$

Question

Find molality of 20% w/v of glucose if density of solution is 2g/ml.

Ans $m = ?$

density (d) of solution $= 2\,g/ml$

20 g of solute present in 100 ml of solution

$W_B = 20g$ (glucose) $C_6H_{12}O_6$

Volume of soln $= 100ml$

$$m = \frac{n_B}{W_A(\text{in kg})}$$

$$M_B = 6\times12 + 12\times1 + 6\times16 = 180g$$

$$m = \frac{100}{9 \times 18} = \frac{100}{162}\,m$$

mass of soln $= W_A + W_B$

mass of soln $= 100 \times 2 = 200g$

$200 = W_A + 20$

$200 - 20 = 180g = W_A$

$$n_B = \frac{W_B}{M_B} = \frac{20}{180}$$

$$n_B = \frac{1}{9}$$

$$W_A = \frac{18}{1009}\,kg$$

$$W_A = \frac{18}{100}\,kg$$

Effect of Temperature on Concentration Terms

#MIT

Concentration terms involving mass does not change with temp and conc. Terms involving volume change with temperature.

$M = \frac{n_B}{V(L)}$ → will Change with Temp → not a good method to represent Conc.

$m = \frac{n_B}{\text{mass (in Kg)}}$ → will not Change with Temp → Better method to represent Conc. it does not Change with Temp

Mole fraction → ~~~~~~~~~~

Question

A gas is found to contain 2.34 grams of nitrogen and 5.34 grams of oxygen. Simplest formula of the compound is:

E.F

A N_2O

B NO

C N_2O_3

D NO_2

$N_{\frac{30.5}{14}}$ $O_{\frac{69.5}{16}}$

$N_{\frac{2.17}{2.17}}$ $O_{\frac{4.34}{2.17}}$

NO_2

% age of N $= \frac{2.34}{2.34+5.34} \times 100$

% age of oxygen $= 100 - 30.5 = 69.5$

$= \frac{234}{768} \times 100$

$= \frac{2340}{768} \times 10$

$= 3.05 \times 10$

$= 30.5$

Question

If 1 L of CH_4 undergoes combustion find the volume of contraction.

$1CH_4(g) + 2O_2(g) \rightarrow 1CO_2(g) + 2H_2O(l)$

Vol. Contraction for 1L = (1L + 2L) − (1L)

= 3L − 1L = 2L

Question

If 5 L of C_2H_4 undergoes combustion, find volume contraction.

$$C_2H_4(g) + 3O_2(g) \rightarrow 2CO_2(g) + 2H_2O(l)$$

1 L 3 L 2 L

Vol. contraction for 1 L of C_2H_4 = (1 + 3) − (2)

= 4 − 2 = 2 L

5 L ⟹ 2 L × 5 = 10 L

Home Work

Question

The density of a solution prepared by dissolving 120 g of urea (mol. mass = 60 u) in 1000 g of water is 1.15 g/mL. The molarity of this solution is

A 0.50 M

B 1.78 M

C 1.02 M

D 2.05 M

Question

Assertion: Molecular formula shows the exact number of different types of atoms present in a molecule of a compound.

Reason: Molecular formula can be obtained directly from empirical formula which represents the simplest whole number ratio of various atoms present in a compounds.

A. If both assertion and reason are ture and reason is the correct explanation of assertion.

B. If both assertion and reason are ture and reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false

Question

Assertion: The reactant which is present in larger amount limits the amount of product formed is called limiting reagent.

Reason: Amount of product formed does not depend upon the amount of reactants taken.

A. If both assertion and reason are ture and reason is the correct explanation of assertion.

B. If both assertion and reason are ture and reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false

Question

A solution is made by dissolving 49 g of H_2SO_4 (molar mass of Sulphuric acid is 98 g) in 250 mL of water. The molarity of the solution prepared is:

A 2 M

B 1 M

C 4 M

D 5 M

Question

What is the concentration of copper sulphate (in mol L^{-1}) if 80 g of it is dissolved in enough water to make a final volume of 3 L? (molar mass of copper sulphate is 159.5 g)

A 0.0167

B 0.167

C 1.067

D 10.67

Question

Assertion: Molarity of a solution does not depend upon temperature whereas molality depends.

Reason: Molarity and molality both depend only on the number of moles of solute particles.

A. If both assertion and reason are ture and reason is the correct explanation of assertion.

B. If both assertion and reason are ture and reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false

How to increase Your Focus ?

- 1 Use Pen Technique - discussed in chapter 1 Lecture 2
- 2 Use Ear Plugs while Studying - discussed in chapter 1 Lecture 3

How to increase Your Efficiency ?

- Use Pomodoro technique - discussed in chapter 1 Lecture 5

How to stop Overthinking ?

- **Use appointment method - discussed in chapter 1 Lecture 10**

Sofa ⇒ 10 p.m. to 10:15 p.m. ⇒ appointment → overthinking

Thank You