YAKEEN NEET 2.0

2026

Some Basic Concept of Chemistry

Physical Chemistry | Lecture -08

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Topics to be covered

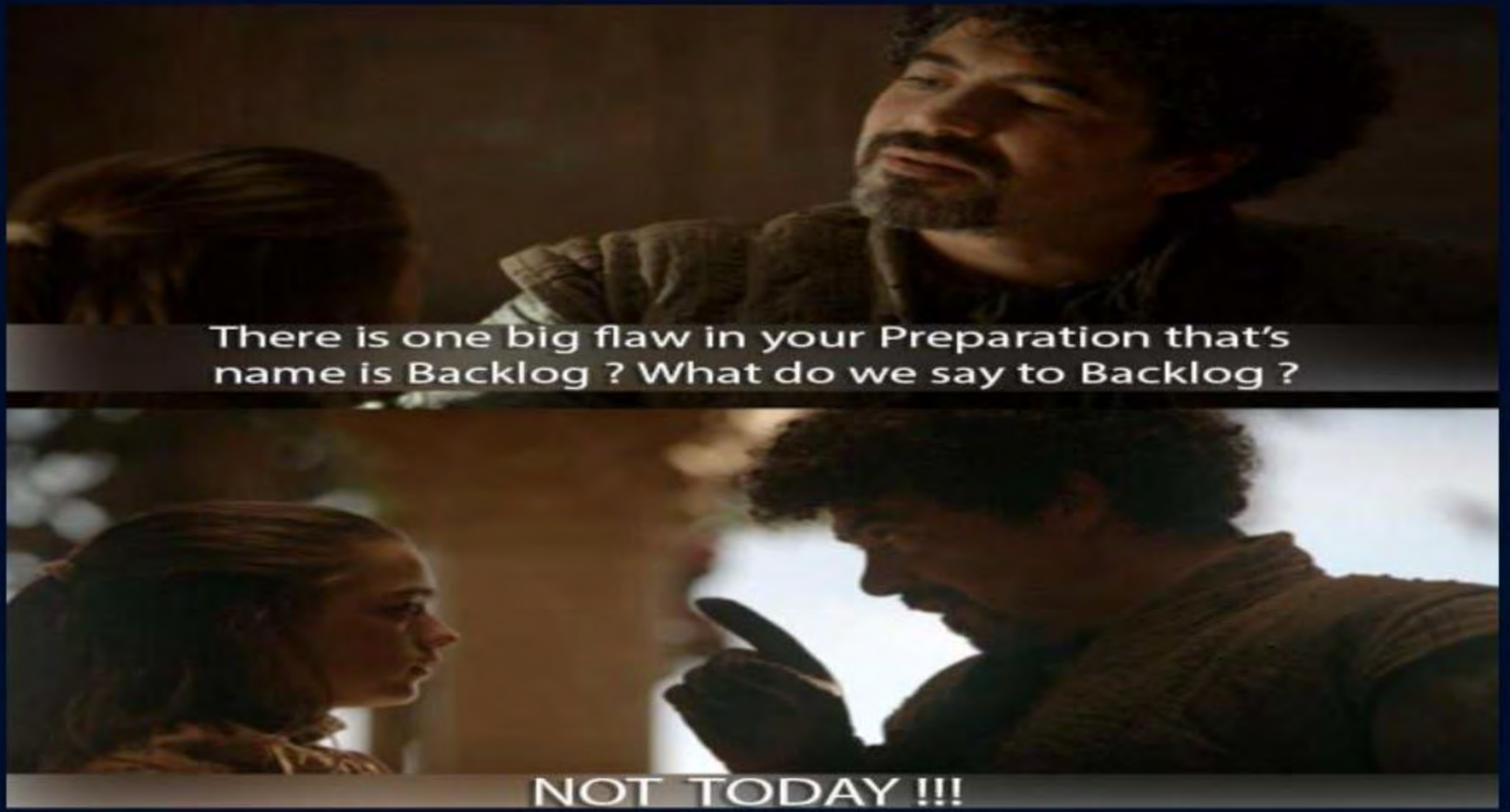
1. Revision of Last Class
2. Limiting reagent Numericals
3. Laws of Chemical Combination
4. ★★★★★ Trick for fast calculation
5. MPQ (Magarmach Practice Questions) & Home work from Modules

Rules to Attend Class

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.
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.


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

% age purity → amount of pure substance present in impure sample

10g of 50% pure $CaCO_3$ present.

Mass of pure $CaCO_3 = \frac{50}{100} \times 10 = 5g$

% age yield → amount of product formed

$$\% \text{ age yield} = \frac{\text{Actual yield}}{\text{Theotrical yield}} \times 100$$

↓

S.C.

Q. If 7g product formed instead of 10g find % age yield $= \frac{7}{10} \times 100$

$= 70\%$

Limiting Reagent

#MIT

① substance which is finished

② $L.R. = \frac{n}{S.C.} = \frac{\text{lowest}}{} = \frac{\text{Vol. of gas}}{S.C.}$

③ all Calc. done acc. to L.R.

$$\frac{\text{S.C.Y}}{\text{S.C}\downarrow_{\text{L.R.}}} = \frac{n_f}{n\downarrow_{\text{L.R.}}}$$

Question

1 mole each of N_2 and H_2 react to form NH_3. Calculate moles of NH_3 formed.

[NCERT Exemplar]

Ans $n_{N_2} = 1 = n_{H_2}$ $n_{NH_3} = ?$

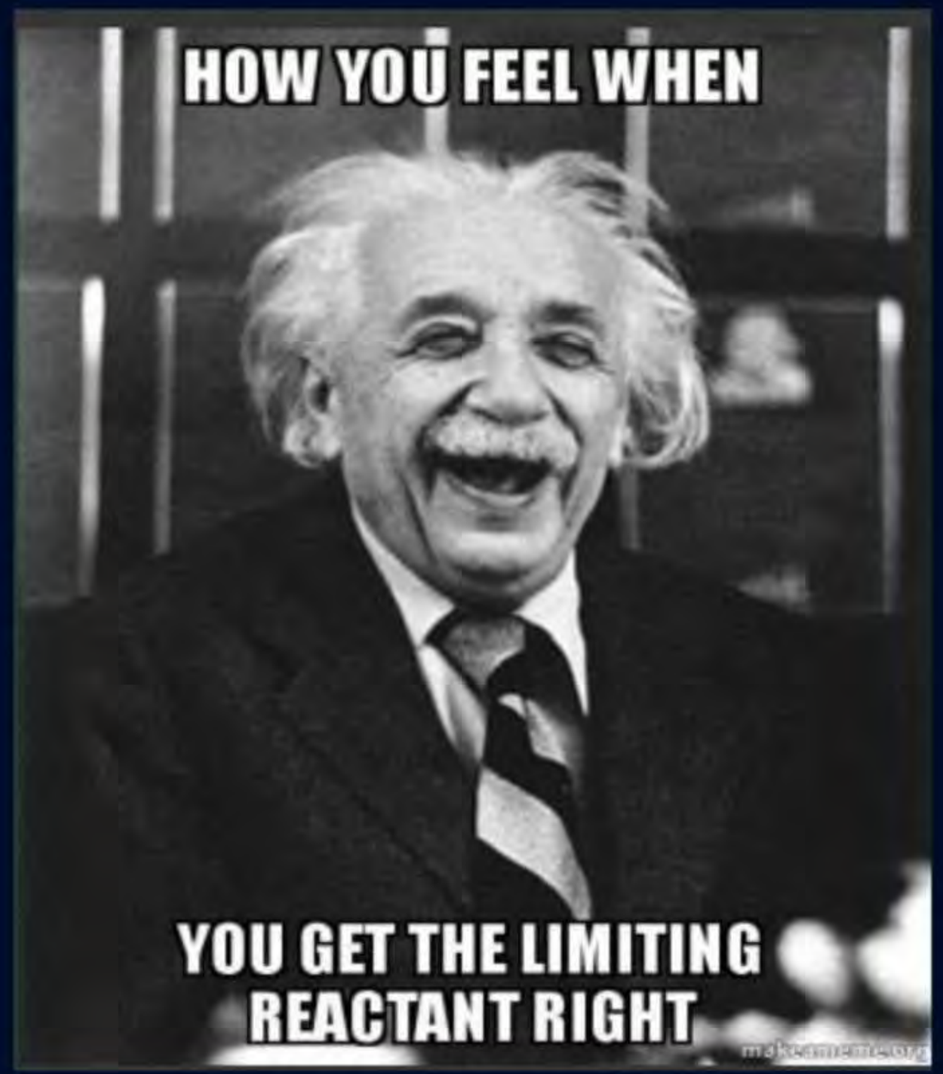
$$1\,N_2(g) + 3\,H_2(g) \longrightarrow 2\,NH_3(g)$$

(L.R. under H_2; f under NH_3)

L.R $\quad \frac{1}{1} \quad \frac{1}{3}$

$$\frac{2}{3} = \frac{n_f}{1}$$

$$n_f = \frac{2}{3} = n_{NH_3}$$



QUESTION – (AIPMT 2014)

When 22.4 litres of $H_2(g)$ is mixed with 11.2 litres of $Cl_2(g)$, each at STP, the moles of HCl(g) formed is equal to:

$V_{H_2(g)} = 22.4\,L$ $\quad n_{HCl} = ?$

$V_{Cl_2(g)} = 11.2\,L$

$1\,H_2(g) + 1\,Cl_2(g) \xrightarrow{\text{L.R.}} 2\,HCl(g)$ (f)

L.R. $\quad \frac{22.4}{1} \quad \frac{11.2}{1}$

$n_{Cl_2(g)} = \frac{11.2}{22.4} = \frac{1}{2} = 0.5$

$\frac{2}{1} = \frac{n_{HCl}}{0.5}$

$n_{HCl} = 2 \times 0.5 = 1$

A. 0.5 mol of HCl(g)

B. 1.5 mol of HCl(g)

C. 1 mol of HCl(g) ✓

D. 2 mol of HCl(g)

Question

The reaction $2C + O_2 \longrightarrow 2CO$. Is carried out by taking 24 g of carbon and 96 g O_2. Find out Limiting Reagent & [NCERT Exemplar]

(a) Which reactant is left in excess? → O_2

(b) How many moles of CO are formed? → $n_{CO} = 2$

(c) How many grams of other reactant is left ?

^{12}C, ^{16}O

① $n_C = \frac{24}{12} = 2$

$n_{O_2} = \frac{96}{32} = 3$

② $2C + 1O_2 \rightarrow 2CO$ (L.R. C, excess O_2, product CO)

L.R. $\frac{2}{2} = 1$ $\quad \frac{3}{1} = 3$

$\frac{2}{2} = \frac{n_{CO}}{2}$

$n_{CO} = 2$

③

$\frac{1}{2} = \frac{n_{O_2}\ \text{react}}{2}$

$n_{O_2}\ \text{react} = 1$

$n_{O_2}\ \text{total} = 3$

$n_{O_2}\ \text{left} = 3 - 1 = 2$

mass of O_2 left

$= 2 \times 32\,g = 64\,g$

QUESTION – (AIPMT 2014)

^{24}Mg, ^{16}O

1.0 g of magnesium is burnt with 0.56 g O_2 in a closed vessel. Which reactant is left in excess and how much:

(At. Wt. Mg = 24; O = 16)

$n_{Mg} = \frac{1}{24} = 0.042$

$2Mg + 1O_2 \rightarrow 2MgO$ ✓

$n_{O_2} = \frac{0.56}{32}$

L.R. $\frac{1}{24 \times 2} \rightarrow$ small $\quad \frac{0.56}{32 \times 1}$

$\frac{1}{48} \lessapprox 0.02 \quad \frac{56}{3200} = \frac{14}{800} = \frac{7}{400} \approx 0.017$

(A) Mg, 0.44 g

(B) O_2, 0.28 g

(C) Mg, 0.16 g

(D) O_2, 0.16 g

O_2 is L.R.

$$\frac{2}{1} = \frac{n_{Mg\ react}}{0.017}$$

$$n_{Mg\ react} = 0.034.$$

$$n_{Mg\ left} = 0.042 - 0.034$$
$$= 0.008$$

Mass Mg left $= 0.008 \times 24\ g$

Question (NCERT: PL-20 | NV, JEE Main Jan. 24, 2025 (I))

Consider the following reaction occurring in the blast furnace.

$$Fe_3O_{4(s)} + 4CO_{(g)} \rightarrow 3Fe_{(l)} + 4CO_{2(g)}$$

'x' kg of iron is produced when 2.32×10^3 kg Fe_3O_4 and 2.8×10^2 kg CO are brought together in the furnace. The value of 'x' is _____ (nearest integer)

{Given : Molar mass of $Fe_3O_4 = 232$ g mol^{-1}
Molar mass of CO = 28 g mol^{-1}
Molar mass of Fe = 56 g mol^{-1}}

$m_{Fe_3O_4} = 2.32 \times 10^3$ kg $= 2320 \times 10^3$ g

$n_{Fe_3O_4} = \frac{2320}{232} \times 10^4 = 10^4$ moles

$m_{CO} = 2.8 \times 10^2$ kg $= 28 \times 10^4$ g

$n_{CO} = \frac{28 \times 10^4}{28} = 10^4$

L.R Fe_3O_4 $= \frac{10^4}{1}$

L.R. CO $= \frac{10^4}{4} =$ lowest

CO is L.R.

$$\frac{3}{4} = \frac{n_{Fe}}{10^4}$$

$$\frac{3}{4} \times 10^4 = n_{Fe}$$

$$\text{Mass Fe} = \frac{3 \times \cancel{10}^{\cancel{4}} \times \cancel{56}^{1.4}}{\cancel{4} \times \cancel{1000}} \text{ Kg}$$

$$= 420 \text{ Kg}$$

Question (NCERT: PL-19 | NV, JEE Main July 28, 2022 (I))

In the given reaction, $X + Y + 3Z \rightleftarrows XYZ_3$ if one mole of each of X and Y with 0.05 mol of Z gives compound XYZ_3. (Given : Atomic masses of X, Y and Z are 10, 20 and 30 amu, respectively). The yield of XYZ_3 is _____ g. (Nearest integer)

Ans. 20

L.R.

$$X + Y + 3Z \rightleftharpoons XYZ_3$$

n	1	1	0.05	
L.R	$\frac{1}{1}$	$\frac{1}{1}$	$\frac{0.05}{3} = \frac{5}{300} = \frac{1}{60}$	

$$\frac{1}{3} = \frac{n_{XYZ_3}}{0.05}$$

$$n_{XYZ_3} = \frac{0.05}{3} = \frac{5}{300} = \frac{1}{60}$$

$$\text{mass } XYZ_3 = \frac{1}{60}(10+20+3\times30)$$

$$= \frac{120}{60} = 2g$$

NO Revision = NO selection

Mass Percentage (%age)

$$\text{mass \%age of A} = \frac{\text{mass of A}}{\text{Total mass}} \times 100$$

Q: find mass %age of Na in NaCl

(G.A.M of Cl = 35.5g
G.A.M Na = 23g
G.M.M Na^+Cl^- = 58.5g)

Ans: mass %age of $Na = \frac{23}{58.5} \times 100$

$Cl = \frac{35.5}{58.5} \times 100$

Question

Find mass % age of Ca in $CaBr_2$?

40 Ca, 80 Br

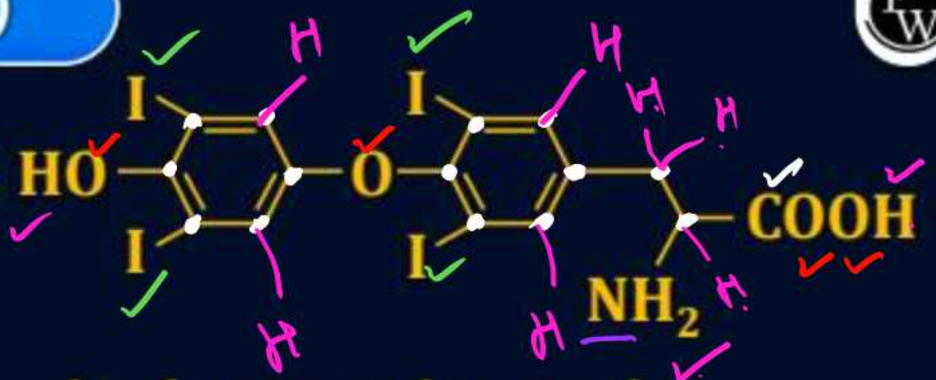
Ans Mass % age of Ca $= \frac{40}{40+2\times80} \times 100$

$= \frac{40}{200} \times 100$

$= 20\%$

Question (NCERT: PL-23 | NV, JEE Main April 07, 2025 (I))

Thyroxine, the hormone has given below structure



The percentage of iodine in thyroxine is _____ %. (nearest integer)
(Given molar mass in g mol^{-1} C : 12, H : 1, O : 16, N : 14, I : 127)

$$\%\text{age of I} = \frac{\text{mass of I}}{\text{mass of Thyroxine}} \times 100$$

$$= \frac{4 \times 127}{779} \times 100$$

$$= \frac{508}{779} \times 100 \approx 65\%$$

Molar mass Thyroxine

$= 4 \times 127 + 15 \times 12 + 16 \times 4 + 1 \times 14 + 11 \times 1 = 508 + 180 + 64 + 27$

$= 779$ g

Question (NV, JEE Main Jan. 24, 2023 (I))

Uracil is base present in RNA with the following structure. % of N in uracil is _____.

$$\%\text{age } N = \frac{2\times14}{2\times14 + 4\times12 + 2\times16 + 4\times1} \times 100$$

$$= \frac{28}{112} \times 100 = 25\%$$

Given : Molar mass N = 14 g mol^{-1}; O = 16 g mol^{-1}; C = 12 g mol^{-1}; H = 1 g mol^{-1}

Question (NCERT: PL-19 | NV, JEE Main April 11, 2023 (I))

A solution of sugar is obtained by mixing 200 g of its 25% solution and 500 g of its 40% solution (both by mass). The mass percentage of the resulting sugar solution is __36%__. (Nearest integer)

Ans

200g of 25% soln
Sugar $= \frac{25}{100} \times 200 = 50g$

+

500g of 40% soln
Sugar $= \frac{40}{100} \times 500 = 200g$

$\Rightarrow$ mass % age Sugar in resulting soln $= \frac{\text{Total mass Sugar}}{\text{Total mass soln}} \times 100$

$= \frac{200+50}{200+500} \times 100$

$= \frac{250}{700} \times 100$

$\approx 35.7\%$

Volume Percentage (% age)

$$\text{Volume \% age of } A = \frac{\text{Volume of } A}{\text{Total Volume}} \times 100$$

Question

If 11.2 L of $CO_2(g)$ & 5.6 L of $CO(g)$ is present in gaseous mixture at N.T.P. find volume % of $CO_2(g)$?

Ans Vol. % of $CO_2 = \frac{11.2}{16.8} \times 100$

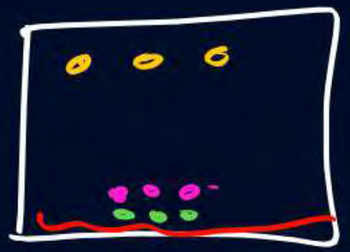
$= \frac{200}{3} = 66.67\%$

Laws of Chemical Combination

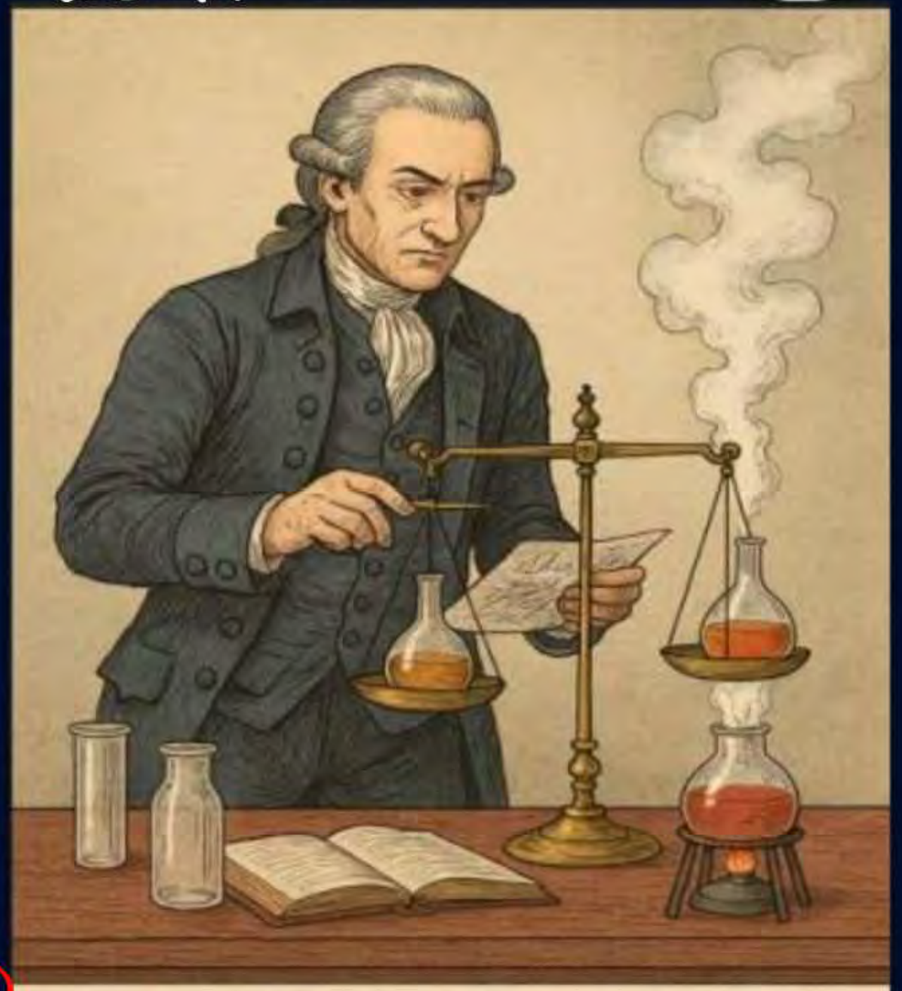
Law of Conservation of Mass

Phlogiston theory
↓
disapproove.

In all physical and chemical changes, the total mass of the reactants is equal to that of the products



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



PROVING THE LAW OF CONSERVATION OF MASS

$$CH_3COOH + NaHCO_3 \rightarrow CH_3COONa + H_2O + CO_2\uparrow$$

Limitations of Law of Conservation of Mass

- **This law is not applicable in case of Nuclear Reaction.**

$$E = mc^2$$

Mass reactants > Mass products → Nuclear reaction

Assertion (A): Antoine Lavoisier's experiments on combustion led to the formulation of the Law of Conservation of Mass.

Reason (R): In a chemical reaction, total mass of products is always greater than total mass of reactants due to mass of heat released.

- (A) Both A and R are true, and R is the correct explanation of A.
- (B) Both A and R are true, but R is not the correct explanation of A.
- (C) A is true, but R is false.
- (D) A is false, but R is true.

Antoine Lavoisier emphasized **careful measurement** in chemical changes. Which of the following instruments or techniques would have been crucial to validate the law?

- (A) pH meter
- (B) Analytical balance → weighing balance
- (C) Calorimeter
- (D) Titration burette

Question

What mass of silver nitrate will react with 5.85g of sodium chloride to produce 14.35 g of silver chloride and 8.5 g of sodium nitrate, if the law of conservation of mass is true ?

Ans

Silver nitrate + Sodium Chloride → Silver Chloride + Sodium Nitrate.

$x\,g + 5.85\,g = 14.35\,g + 8.5\,g$

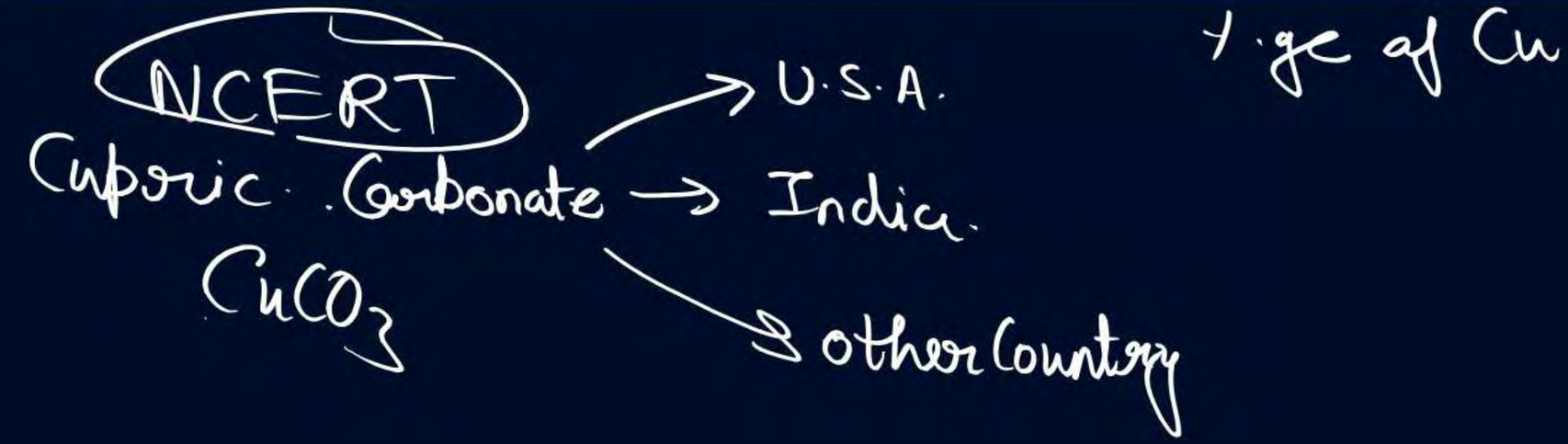
$x = (22.85 - 5.85)\,g$

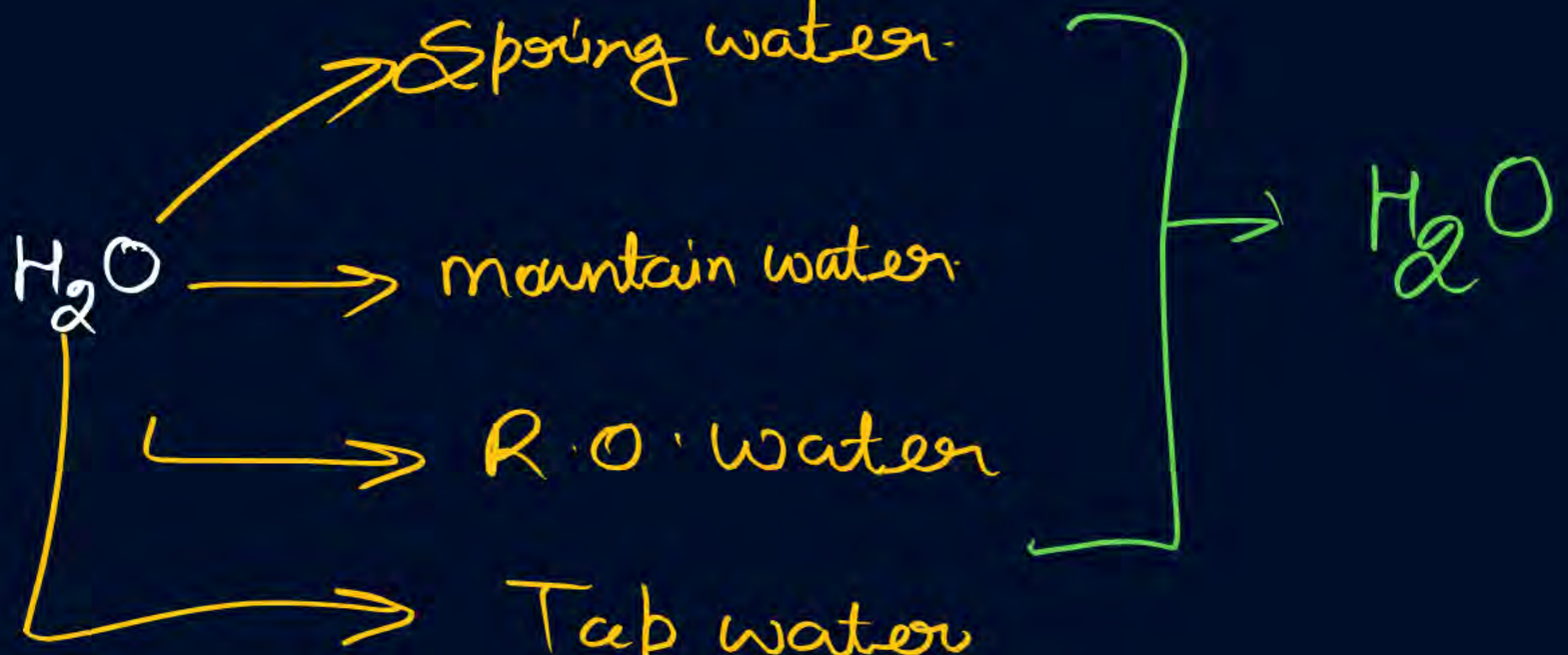
$x = 17\,g$

Law of Constant Composition or Definite Proportions

- **This law was discovered by a French chemist J.L. Proust in 1799 and deals with the composition of elements present in a given compound. It states that**

> ***A chemical compound is always found to be made up of the same elements combined together in the same fixed proportion by mass.***




Spring water.
H_2O
mountain water.
R.O. water
Tap water
H_2O

Limitations of Law of Constant Composition

- The law is not applicable if an element exists in different isotopes which may be involved in the formation of the compound. For example, in the formation of the compound CO_2, if C-12 isotope combines, the ratio of C : O is 12 : 32, but if C-14 isotope combines, the ratio of C : O is 14: 32.

Limitations of Law of Constant Composition

- The elements may combine in the same ratio but the compounds formed may be different. For example, in the compounds, C_2H_5OH and CH_3OCH_3 (both having same molecular formula viz. C_2H_6O) the ratio of C : H : = 24 : 6 : 16 = 12 : 3 : 8 by mass.

Which of the following are true about the Law of Definite Proportions?

(A) It applies only to compounds made from non-metals.

(B) The mass ratio of elements in a pure compound is constant.

(C) Cupric carbonate from any source will always show the same % of copper, carbon, and oxygen.

(D) Joseph Proust gave the law using cuprous chloride.

Column I	Column II
(A) Joseph Proust	(P) Law of Multiple Proportions
(B) Fixed elemental ratio	(Q) Cupric Carbonate
(C) Natural sample	(R) Law of Definite Composition
(D) Different composition	(S) Mixtures

Choose the correct matching:

Mark the following statements True or False:

- (i) The law holds even when samples are obtained from different geographical regions.
- (ii) It contradicts Dalton's Atomic Theory.
- (iii) It applies only to ionic compounds.
- (iv) Cupric carbonate has different composition when made in lab.

Question

2.16 g of copper metal when treated with nitric acid followed by ignition of the nitrate gave 2.70 g of copper oxide. In another experiment 1.15 g of copper oxide upon reduction with hydrogen gave 0.92 g of copper. Show that the above data illustrate the Law of Definite Proportions.

Question

6.488 g of lead combine directly with 1.002 g of oxygen to form lead peroxide PbO_2). Lead peroxide is also produced by heating lead nitrate and it was found that the percentage of oxygen present in lead peroxide is 13-38 percent. Use these data to illustrate the law of constant composition.

Home work from modules

Prarambh → Q 7, 9, 10, 55 to 60

Prabal → Q 8

Parikshit → Q 2, 3, 4, 6, 7, 8, 9, 12, 14, 15, 16

PYQ → Q 3, 4, 15

Tricks for fast Calculations

Square root of perfect square

number	square
1	1
2	4
3	9
4	16
5	25
6	36
7	49
8	64
9	81
10	100

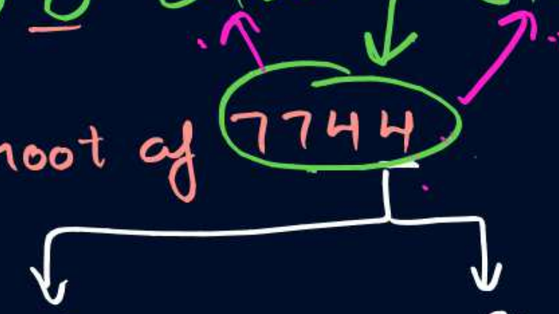
number	square
10	100
20	400
30	900
40	1600
50	2500
60	3600
70	4900
80	6400
90	8100
100	10000

perfect sq. → never ends with

2, 3, 7, 8

6400 8100

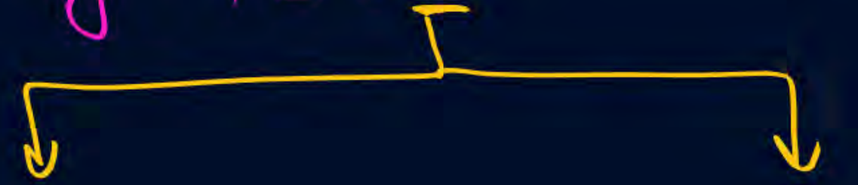
find sq. root of 7744



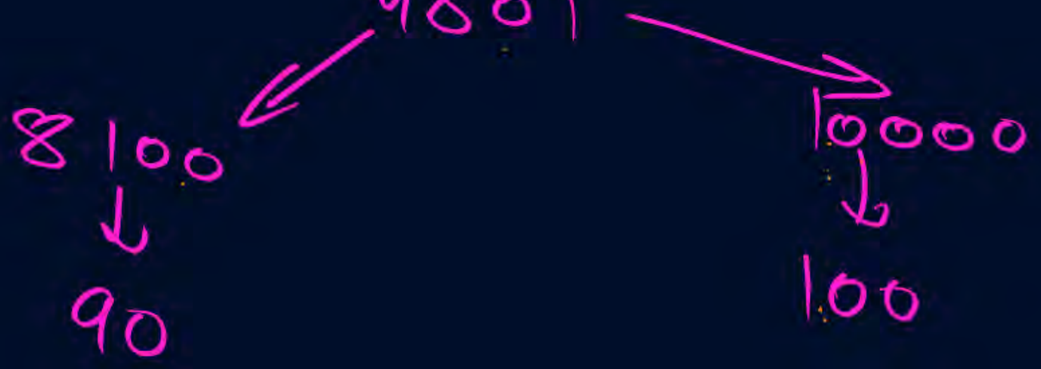
sq. b/w 80 & 90

82 Ans 88

Sq. root of 9801



last digit → 1 | 9



91 | Ans 99

Sq. root of 5184

2 | 8

70 | 80

Ans 72 | 78

Sq. root of 65

49 | 64

7 | 8

Magarmach Practice Questions (MPQ)

QUESTION – (AIPMT 2009)

10 g of hydrogen and 64 g of oxygen were filled in a steel vessel and exploded. Amount of water produced in this reaction will be:

A. 2 mole

B. 3 mole

C. 4 mole

D. 1 mole

QUESTION – (Karnataka CET (Med.) 2012)

20.0 kg of $N_{2(g)}$ and 3.0 kg of $H_{2(g)}$ are mixed to produce $NH_{3(g)}$. The amount of $NH_{3(g)}$ formed is:

A. 17 kg

B. 34 kg

C. 20 kg

D. 3 kg

E. 23 kg

Question

For the reaction: $N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)$

Identify dihydrogen (H_2) as a limiting reagent in the following reaction mixtures.

Molar mass of H_2 = 2 g & Molar mass of N_2 = 28 g

A. 56 g of N_2 + 10 g of H_2

B. 35 g of N_2 + 8 g of H_2

C. 14 g of N_2 + 4 g of H_2

D. 28 g of N_2 + 6 g of H_2

Question (NCERT: PL-19 | JEE Main April 08, 2019 (I)

The percentage composition of carbon by mole in methane is :

CH_4

(MPG)

(A) 75 %

(B) 80 %

(C) 25 %

(D) 20 %

Question (Online JEE Main April 09, 2016

5 L of an alkane requires 25 L of oxygen for its complete combustion. If all volumes are measured at constant temperature and pressure, the alkane is :

(A) Isobutane

(B) Ethane

(C) Butane

(D) Propane

Question (NCERT: PL-20 | NV, JEE Main Jan. 27, 2025 (I))

When 81.0 g of alumonium is allowed to react with 128.0 g of oxygen gas, the mass of aluminium oxide produced in grams is _____. (Nearest integer)

Given :

Molar mass of Al is 27.0 g mol^{-1}

Molar mass of O is 16.0 g mol^{-1}

Question (NCERT: PL-20 | NV, JEE Main Feb. 01, 2024 (I))

Consider the following reaction :

$3PbCl_2 + 2(NH_4)_3 PO_4 \rightarrow Pb_3(PO_4)_2 + 6NH_4Cl$

If 72 mmol of $PbCl_2$ is mixed with 50 mmol of $(NH_4)_3 PO_4$, then the amount of $Pb_3(PO_4)_2$ formed is _____ mmol (nearest integer)

Question

If 6.3 g of $NaHCO_3$ are added to 15.0 g of CH_3COOH solution, the residue is found to weigh 18.0 g. What is the mass of CO_2 released in the reaction ?

Which of the following statements align with the Law of Conservation of Mass?

- (A) In a chemical reaction, atoms can disappear.
- (B) The total mass of a closed system remains constant.
- (C) Combustion reactions often lead to increase in system mass.
- (D) Mass is neither created nor destroyed during chemical reactions.

Why was Lavoisier's conclusion revolutionary for chemistry at the time?

- (A) It opposed the then-dominant "phlogiston" theory.
- (B) It introduced the idea of atoms for the first time.
- (C) It used qualitative observations only.
- (D) It dismissed the role of oxygen in combustion.

Q1. Assertion & Reason

Assertion (A): A natural and a synthetic sample of cupric carbonate have different elemental compositions by mass.

Reason (R): The source of a compound affects its chemical composition.

Options:

(A) Both A and R are true, and R is the correct explanation of A.

(B) Both A and R are true, but R is not the correct explanation of A.

(C) A is false, but R is true.

(D) Both A and R are false.

THANK YOU