
	INDIAN SCHOOL AL WADI AL KABIR	
Class: XI	Department: SCIENCE (CHEMISTRY)	Date of submission: 18.08.2022
Worksheet No: 01	Chapter: SOME BASIC CONCEPTS OF CHEMISTRY	Note: A4 FILE FORMAT
NAME OF THE STUDENT	CLASS & SEC:	ROLL NO.

- What is the mass percent of C in Glucose?
 - 40%
 - 0.04%
 - 7.2%
 - 18%
- Which of the following statements indicates that law of multiple proportion is being followed.
 - Sample of water taken from any source will always have hydrogen and oxygen in the ratio 2:1.
 - Carbon forms two oxides namely CO_2 and CO , where masses of oxygen which combine with fixed mass of carbon are in the simple ratio 2:1.
 - A 10 g ribbon of Mg burns in oxygen and the entire magnesium converts to its oxide.
 - When two elements combine with a fixed mass of the third element, the ratio in which they do so is simple whole number ratio.
- Match the items in Column I and II.

Column I Physical quantity	Column II Unit
i. Molarity	a. gml^{-1}
ii. Mole fraction	b. Mol
iii. Mole	c. molkg^{-1}
iv. Molality	d. Unitless
	e. molL^{-1}

ii. Molecular formula

15. How many moles of ethane are required to produce 66 g CO₂ after combustion?
16. A solution is prepared by dissolving 150g of NaCl in 900 g of water. Calculate the mole fraction of each component.
17. How many moles of N₂ are required to produce 85g of NH₃? Calculate its mass.

3 Marks

18. What do you mean by limiting reagent?
400 g of N₂ and 150 g of H₂ are mixed together to form NH₃. Identify the limiting reagent and calculate the amount of NH₃ produced.
19. Explain the following:
- Mole fraction
 - Molarity
 - Molality
20. The density of 2M solution of NaCl is 1.25 g ml⁻¹. Calculate molality of the solution.
21. Identify the limiting reagent if 0.6g of magnesium is added to 100 ml solution of 0.4M hydrochloric acid. Also Calculate the mass of hydrogen gas produced.
(Mg = 24u)
22. Caffeine has the following percent composition: carbon 49.48%, hydrogen 5.19%, oxygen 16.48% and nitrogen 28.85%. Its molecular weight is 194.19 g/mol. What is its molecular formula?

5 Marks

23. a. Commercially available conc HCl is in an aqueous solution containing 40% HCl gas by mass. If its density is 1.2 gcm⁻³, calculate the molarity of HCl solution.
- b. Empirical formula of a gaseous compound is CH₂Cl. 0.12 g of the compound occupies a volume of 37.20cc at 105 degree centigrade and 760 mm Hg. Find the molecular formula of the compound.
- c. State Avogadro law.

Answers

- a
- b
- c
- 24.088×10^{23} atoms
- simple whole number ratio
- b

7. a
 8. a
 9. d
 10. b
 11. a. A given compound always contains exactly the same proportion of elements by weight.
 b. If two elements can combine to form more than one compound, the masses of one element that combine with a fixed mass of the other element, are in the ratio of small whole numbers.

12.

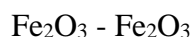
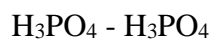
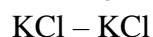
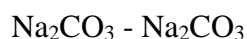
$$\text{Mole fraction of A in solution } (x_A) = \frac{n_A}{n_A + n_B}$$

$$\text{Mole fraction of B in solution } (x_B) = \frac{n_B}{n_A + n_B}$$

So,

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

13. CO – CO



14.

Element	Mass	Moles	Ratio	Simplest ratio
C	144	12	1	1
H	12	12	1	1

Empirical formula = CH

Empirical formula mass = 13

$$n = 78/13 = 6$$

Molecular formula = C₆H₆

15. C₂H₆ + 7/2 O₂ → 2CO₂ + 3H₂O

No: of moles of CO₂ = 66/44 = 1.5 moles

	C ₂ H ₆	CO ₂
As per eqn	1 mol	2 mol
As per qsn	?	1.5 mol

Ans: 0.75 moles of ethane.

16.

$$n_{\text{NaCl}} = 150 / 58.5 = 2.56$$

$$n_{\text{H}_2\text{O}} = 900 / 18 = 50$$

$$\chi_{\text{NaCl}} = 2.56 / 2.56 + 50 = 0.0487$$

$$\chi_{\text{H}_2\text{O}} = 50 / 52.56 = 0.951$$

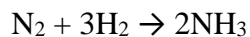


No: of moles of $\text{NH}_3 = 85/17 = 5$ moles

	N_2	NH_3
As per eqn,	1 mol	2 mol
As per qsn,	?	5 moles

Therefore no: of moles of $\text{N}_2 = 2.5$ moles

18. Limiting reagent: The reactant, which gets consumed first, limits the amount of product formed and is, therefore, called the limiting reagent.



No: of moles of $\text{N}_2 = 400/28 = 14.28$ mol

No: of moles of $\text{H}_2 = 150/2 = 75$ mol

	N_2	H_2
As per eqn.	1	3
As per qsn,	14.28	?

No: of moles of H_2 required for 14.28 moles of $\text{N}_2 = 42.84$ mol
Therefore, H_2 is excess reagent i.e N_2 is limiting reagent.

	N_2	NH_3
As per eqn.	1	2
As per qsn,	14.28	?

Therefore no: of moles of $\text{NH}_3 = 28.56$ mol
Mass of $\text{NH}_3 = 28.56 \times 17 = 485.52$ g

19. a. Mole fraction : It is the ratio of number of moles of a particular component to the total number of moles of the solution.

Mole fraction of A

$$\begin{aligned} &= \frac{\text{No. of moles of A}}{\text{No. of moles of solutions}} \\ &= \frac{n_A}{n_A + n_B} \end{aligned}$$

Mole fraction of B

$$\begin{aligned} &= \frac{\text{No. of moles of B}}{\text{No. of moles of solutions}} \\ &= \frac{n_B}{n_A + n_B} \end{aligned}$$

b. Molarity : It is defined as the number of moles of the solute in 1 litre of the solution.

$$\text{Molarity (M)} = \frac{\text{No. of moles of solute}}{\text{Volume of solution in litres}}$$

c. Molality: It is defined as the number of moles of solute present in 1 kg of solvent.

$$\text{Molality (m)} = \frac{\text{No. of moles of solute}}{\text{Mass of solvent in kg}}$$

20. Molarity = 2M

Assume volume of solution = 1 L

Therefore, No of moles of NaCl = 2 mol

Mass of NaCl = $2 \times 58.5 = 117$ g

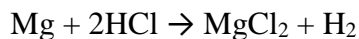
Mass of 1 L of solution = $1.25 \text{ gml}^{-1} \times 1000\text{g} = 1250$ g.
(Since density = 1.25 gml^{-1} and density = mass / volume)

Mass of water = $1250 \text{ g} - 117 \text{ g}$
 $= 1133 \text{ g}$

Molality = No: of moles of solute/ Mass of solvent(kg)
 $= 2/1.133$
 $= 1.765 \text{ molkg}^{-1}$

21. Moles of Mg = $0.6/24 = 0.025$ mol

Moles of HCl = Molarity \times Volume
 $= 0.4 \text{ M} \times 0.1$
 $= 0.04$ mol



	Mg	HCl
As per eqn,	1	2
As per qsn,	0.025	?

No: of moles of HCl = 0.05 mol

HCl is the limiting reagent.

	HCl	H ₂
As per eqn,	2	1
As per qsn,	0.04	?

Moles of H₂ = 0.02 mol

Mass of HCl = 0.02 × 36.5
= 0.73 g

22.

Moles of C = 49.48/12 = 4.12 mol

Moles of H = 5.19/1 = 5.19 mol

Moles of O = 16.48/16 = 1.03 mol

Moles of N = 28.85/14 = 2.06 mol

Empirical formula = C₄H₅N₂O

Molecular formula = C₈H₁₀N₄O₂

23. a. Total mass of solution = 100 g

Mass of HCl = 40g

Moles of HCl = 40/36.5 = 1.09 mol

Density of solution = m/v

1.2 = 100/ V

Vol of solution = 83.3 ml

Molarity = moles of HCl / Vol of solution in L

= 1.09/0.0833

= 13.08 M

b.

$pV = nRT$

$p = 760 \text{ mm Hg} = 1 \text{ atm}$

$V = 37.2 \text{ cm}^3 = 0.0372 \text{ L}$

$R = 0.082 \text{ atm LK}^{-1}\text{mol}^{-1}$

$T = 378 \text{ K}$

$n = 0.0012 \text{ mol}$

$n = m / MM$

$0.0012 = 0.12 / MM$

Molar mass = 100 g mol⁻¹

Molar mass / Empirical formula mass = 100/ 49.5 = 2

Molecular formula = C₂H₄Cl₂

c. Equal volumes of all gases at the same temperature and pressure should contain equal number of molecules.

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