	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.**

1. What is the mass percent of C in Glucose?
   a. 40%
   b. 0.04%
   c. 7.2%
   d. 18%

2. Which of the following statements indicates that law of multiple proportion is being followed.
   a. Sample of water taken from any source will always have hydrogen and oxygen in the ratio 2:1.
   b. 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.
   c. A 10 g ribbon of Mg burns in oxygen and the entire magnesium converts to its oxide.
   d. When two elements combine with a fixed mass of the third element, the ratio in which they do so is simple whole number ratio.

3. 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. $molL^{-1}$

a. i – a , ii – e , iii – b , iv - c
b. i – b , ii – e , iii – d , iv – c
c. i – e , ii – d , iii – b , iv – c
d. i – e , ii – a , iii – b , iv – c

4. One mole of H_2SO_4 contains ______________ atoms of oxygen.

5. Under similar conditions, the ratio by volumes of gaseous reactants and gaseous products is ___________

6. Which of the following compounds has same empirical formula as that of glucose?
a. CH_3CHO b. CH_3COOH
c. CH_3OH d. C_2H_6

7. Which has maximum number of atoms?
a. 24 g of C b. 56 g of Fe
c. 27 g of Al d. 108 g of Ag

8. The modern atomic weight scale is based on
a. ^{12}C b. ^{16}O
c. ^{1}H d. ^{13}C

Questions 9- 10 are *Assertion Reason* type questions

a. If both *Assertion* and *Reason* are correct and *Reason* is the correct explanation of *Assertion*.
b. If both *Assertion* and *Reason* are correct but *Reason* is not the correct explanation of *Assertion*.
c. If *Assertion* is correct and *Reason* is wrong.
d. If *Assertion* is wrong and *Reason* is correct.

9. Assertion : 1 g atom of Sulphur contains Avogadro number of molecules.
Reason: Atomicity of S is eight.

10. Assertion: The formula of Calcium carbide is CaC_2.
Reason: 1 mol of CaC_2 contains two moles of C.

2 Marks questions

11. State:
a. Law of definite proportion
b. Law of Multiple proportion

12. Prove that sum of all mole fractions of a solution is unity?

13. Write empirical formula of following:

CO, Na_2CO_3, KCl, H_3PO_4, Fe_2O_3

14. An organic compound contains 144g of carbon and 12 g of hydrogen. If molar mass of this compound is 78 $g mol^{-1}$, calculate:
i. Empirical formula

ii. Molecular formula

15. How many moles of ethane are required to produce 66 g CO_2 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 N_2 are required to produce 85g of NH_3? Calculate its mass.

<u>3 Marks</u>

18. What do you mean by limiting reagent?
400 g of N_2 and 150 g of H_2 are mixed together to form NH_3. Identify the limiting reagent and calculate the amount of NH_3 produced.

19. Explain the following:

a. Mole fraction

b. Molarity

c. 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?

<u>5 Marks</u>

23. a. Commercially available con 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 CH_2Cl. 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

1. a

2. b

3. c

4. 24.088×10^{23} atoms

5. simple whole number ratio

6. 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.

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

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

So,

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

13. CO – CO
Na_2CO_3 - Na_2CO_3
KCl – KCl
H_3PO_4 - H_3PO_4
Fe_2O_3 - Fe_2O_3

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 = C_6H_6

15. $C_2H_6 + 7/2\ O_2 \rightarrow 2CO_2 + 3H_2O$

No: of moles of CO_2 = 66/44 = 1.5 moles

	C_2H_6	CO_2
As per eqn	1 mol	2 mol
As per qsn	?	1.5 mol

Ans: 0.75 moles of ethane.

16.
n_{NaCl} = 150 / 58.5 = 2.56

n_{H2O} = 900 / 18 = 50

χ_{NaCl} = 2.56 / 2.56 + 50 = 0.0487

χ_{H2O} = 50 / 52.56 = 0.951

17. $N_2 + 3H_2 \rightarrow 2NH_3$

No: of moles of 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 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.

$N_2 + 3H_2 \rightarrow 2NH_3$

No: of moles of N_2 = 400/ 28 = 14.28 mol

No: of moles of 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 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 NH_3 = 28.56 mol
Mass of NH_3 = 28.56 × 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

$$= \frac{\text{No. of moles of A}}{\text{No. of moles of solutions}}$$

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

Mole fraction of B

$$= \frac{\text{No. of moles of B}}{\text{No. of moles of solutions}}$$

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

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 × 58.5 = 117 g

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

Mass of water = 1250 g -117 g
= 1133 g
Molality = No: of moles of solute/ Mass of solvent(kg)
= 2/1.133
= 1.765 $molkg^{-1}$

21. Moles of Mg = 0.6/24 = 0.025 mol
Moles of HCl = Molarity × Volume
= 0.4 M× 0.1
= 0.04 mol

$Mg + 2HCl \rightarrow MgCl_2 + H_2$

	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 H_2 = 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 = $C_4H_5N_2O$
Molecular formula = $C_8H_{10}N_4O_2$

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 mm Hg = 1 atm
V = 37.2 cm^3 = 0.0372 L
R = 0.082 atm $LK^{-1}mol^{-1}$
T = 378 K

n = 0.0012 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 = $C_2H_4Cl_2$

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

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