	INDIAN SCHOOL AL WADI AL KABIR	
Class: XI	**Department: SCIENCE 2023 – 24** **SUBJECT: CHEMISTRY**	**Date of submission:** **30.04.2023**
Worksheet No: 01 **WITH ANSWERS**	**CHAPTER / UNIT: SOME BASIC CONCEPTS OF CHEMISTRY**	**Note:** **A4 FILE FORMAT**
NAME OF THE STUDENT	**CLASS & SEC:**	**ROLL NO.**

<u>Multiple Choice Questions (1 M)</u>

1. Which of the following reactions is not correct according to the law of conservation of mass?
   a. $2Mg(s) + O_2(g) \rightarrow 2MgO(s)$
   b. $C_3H_8(g) + O_2(g) \rightarrow CO_2(g) + H_2O(g)$
   c. $P_4(s) + 5O_2(g) \rightarrow P_4O_{10}(s)$
   d. $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$

2. Which of the following statements indicates that the law of multiple proportions 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 that combine with a 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 a simple whole number ratio.

3. Match the items in Columns 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 atomic mass unit stands for
a. One C^{12} atom
b. One H-atom
c. 1/12th of the mass of H-atom
d. 1/12th of the mass of C^{12}-atom
.
5. Under similar conditions, the ratio by volumes of gaseous reactants and gaseous products is __________

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

7. One mole of NaCl contains 6.022×10^{23}
a. Ions
b. Atoms
c. Molecules
d. Formula Unit

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

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.

Very Short answer type (2 M)

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

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

13. Write the empirical formula of the 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 $gmol^{-1}$, 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.

Short answer type (3 M)

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 (Answer any three)
    a. Mole fraction
    b. Molarity
    c. Molality
    d. Atomic mass

20. The density of the 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 a 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?

Passage based questions (4 M)

23.
Passage based question
One mole is the amount of a substance that contains as many particles or entities as there are atoms in exactly 12 g (or 0.012 kg) of the 12C isotope

This number of entities in 1 mol is so important that it is given a separate name and symbol. It is known as the 'Avogadro constant', or Avogadro number denoted by NA in honour of Amedeo Avogadro

Information regarding the number of particles as well as the percentage of a particular element present in a compound is essential.

Mass percent of elements in a compound provides a check whether the given sample contains the same percentage of elements as present in a pure sample. In other words, one can check the purity of a given sample by analysing this data.

a. Calculate the number of moles present in 44 g of CO_2.
b. Define the term molar mass.

c. Calculate the no of Oxygen atoms in 100 g of $CaCO_3$.

OR

c. Calculate the mass percentage of all the elements in Glucose.

Long answer type (5 M)

24. 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	b. $C_3H_8(g) + O_2(g) \rightarrow CO_2(g) + H_2O(g)$
2	b. Carbon forms two oxides namely CO_2 and CO, where masses of oxygen that combine with a fixed mass of carbon are in the simple ratio 2:1.
3	c. i – e , ii – d , iii – b , iv – c
4	d. 1/12th of the mass of C^{12}-atom
5	the simple whole number ratio
6	b. CH_3COOH
7	d. Formula Unit
8	a
9	d *Assertion* is wrong and *Reason* is correct
10	b. Both *Assertion* and *Reason* are correct but *Reason* is not the correct explanation of *Assertion*.
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	Mole fraction of A in solution $(x_A) = \frac{n_A}{n_A + n_B}$ 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	<table><tr><td>Element</td><td>Mass</td><td>Moles</td><td>Ratio</td><td>Simplest ratio</td></tr><tr><td>C</td><td>144</td><td>12</td><td>1</td><td>1</td></tr><tr><td>H</td><td>12</td><td>12</td><td>1</td><td>1</td></tr></table> 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 H_2 = 0.02 × 2 = 0.04 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. 1 mole b. The mass of one mole of a substance expressed in grams. c. No of moles = 1mol No of molecules = 6.022×10^{23} No of O atoms = $3 \times 6.022 \times 10^{23} = 18.066 \times 10^{23}$ atoms OR c. Molar mass of Glucose = 180 g Mass % of an element = $\frac{\text{mass of that element in the compound} \times 100}{\text{molar mass of the compound}}$ Mass% of C = 12 × 6 / 180 ×100 = 40 % Mass% of H = 1 × 12 / 180 ×100 = 6.66 % Mass% of O = 16 × 6 / 180 ×100 = 53.3 %

24	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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