	INDIAN SCHOOL AL WADI AL KABIR	
Class: XI	**Department: SCIENCE 2024 – 25** **SUBJECT: CHEMISTRY**	**Date: 30-04-2024**
Worksheet No: 1 **WITH ANSWERS**	**CHAPTER: 1; SOME BASIC CONCEPTS OF CHEMISTRY**	**Note:** **A4 FILE FORMAT**
NAME OF THE STUDENT	**CLASS & SEC:**	**ROLL NO.**

Objective Type Questions

1. 1 mol O_2 will be equal to:
   (a) 4 g equivalent oxygen (b) 2 g equivalent oxygen
   (c) 32 g equivalent oxygen (d) 8 g equivalent oxygen

2. What will be the molality of solution containing 18.25 grams of HCl in 500ml of water
   (a) 0.1 m (b) 1 M (c) 1m (d) 0.5 m

3. The number of atoms present in 16 g of oxygen is
   (a) $6.02 \times 10^{11.5}$ (b) 3.01×10^{23}
   (c) $3.01 \times 10^{11.5}$ (d) 6.02×10^{23}

4. The empirical formula and Molar mass of a compound are CH_2O and 180 grams respectively What will be the molecular formula of the compound?

   (a) $C_9H_{18}O_9$ (b) CH_2O (c) $C_6H_{12}O_6$ (d) $C_2H_4O_2$

5. Which of the following contains the maximum number of oxygen atoms?

   (a) 1 g of O (b) 1 g of O_2
   (c) 1 g of O_3 (d) all have the same number of atoms

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. On analysis, a certain compound was found to contain iodine and oxygen in the ratio of 254:80. The formula of the compound is: (At mass I = 127, O = 16)
   (a) IO (b) I_2O (c) I_5O_2 (d) I_2O_5

8. 10 mol of Zn mixed with 10 mol of HCl. Calculate the number of moles of H_2 produced
   (a) 5 mol (b) 10 mol (c) 20 mol (d) 2.5 mol

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 (A): Number of moles of H_2 in 0.224 L of hydrogen is 0.01 mole.
Reason(R): 22.4 L of H_2 at STP contains 6.023×10^{23}moles.

10. Assertion (A): The empirical mass of ethene is half of its molecular mass.
Reason (R) The empirical formula represents the simplest whole number ratio of various atoms present in a compound.

2 Marks questions

11. Calculate the number of molecules and number of atoms present in 1.2 g of ozone.

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

13. Write 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.

3 Marks Questions

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 the 2M solution of NaCl is 1.25 g ml^{-1}. Calculate molality of the solution.

21. Zinc and hydrochloric acid react according to the reaction:

$Zn(s) + 2HCl(aq) \rightarrow ZnCl_2(aq) + H_2(g)$

If 0.30 mol Zn are added to hydrochloric acid containing 0.52 mol of HCl, how many moles of H_2 are produced?

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?

Case study-based Questions (4 marks)

23.The identity of a substance is defined not only by the types of atoms or ions it contains but by the quantity of each type of atom or ion. The experimental approach required the introduction of a new unit for the number of substances, the mole, which remains indispensable in modern chemical science. A mole is an amount unit similar to familiar units like pair, dozen, gross, etc. It provides a specific measure of the number of atoms or molecules in a bulk sample of matter. A mole is defined as the amount of substance containing the same number of discrete entities (atoms, molecules, ions, etc.) as the number of atoms in a sample of pure 12C weighing exactly 12g.. The number of entities composing a mole has been experimentally determined to be 6.02214179 × 1023. The molar mass of an element (or compound) is the mass in grams of 1 mole of that substance, a property expressed in units of grams per mole (g/mol).

(a) The mass of oxygen gas which occupies 5.6 liters at STP could be
(1 mol of gas occupier 22.4 litres of gas at STP)
(b) What is the mass of one molecule of yellow phosphorus? (Atomic mass of phosphorus = 31 u)
(c) How many Oxygen atoms are present in 6.025 g of Barium phosphate $Ba_3(PO_4)_2$ (atomic mass of Ba = 137.5 U, P=31 U, O= 16u)

5 Marks Questions

24. Calcium carbonate reacts with aqueous HCl to produce $CaCl_2$ and CO_2. According to the reaction given Below

$$CaCO_3 + 2HCl \longrightarrow CaCl_2 + H_2O$$

What mass of calcium chloride will be formed when 0.19 mole of HCl reacts with 1000 grams of Calcium carbonate Name the limiting reagent.

25. Calculate the molality and molarity of 93 % H_2SO_4(mass/volume). The density of the solution is 1.84 gram per ml

Answers

1.	c
2.	c
3.	d
4.	c
5.	a
6.	b
7.	d
8.	a
9.	c
10	a
11	number of molecules of O_3 (N) = 1.2/48 x 6.022X10 ^{23}= 0.15 x 10 ^{23} 1 molecule of O_3 contain = 3 atoms No Of atoms = .45 x 10 ^{23}

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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

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

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

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

	C_2H_6	CO_2
As per equation	1 mol	2 mol
As per question	?	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 qn,	?	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 qn, 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 question, 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. $$\text{Mole fraction of A} = \frac{\text{No. of moles of A}}{\text{No. of moles of solutions}} = \frac{n_A}{n_A + n_B}$$ $$\text{Mole fraction of B} = \frac{\text{No. of moles of B}}{\text{No. of moles of solutions}} = \frac{n_B}{n_A + n_B}$$ 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	HCl is limiting reagent; H_2 formed = 0.36 mol
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) 5.6 litres of O_2 gas = 5.6/22.4 moles of O_2 = ¼ mole = 8g of O_2 (b) Mass in grams = 31/6.022 x 10^{23} =5.14 x 10^{-23} g (c) No of moles of $Ba_3(PO_4)_2$ = 6.025/602.5= 10^{-2} 1 molecule of $Ba_3(PO_4)_2$ contains 8 O atoms Hence No of Oxygen atoms in 10^{-2} moles = 10^{-2} x 6.022 10-23 x 8 = 4.82 x 10^{22} atoms
24	HCl is the limiting reagent 10.54 grams of calcium chloride is formed
25	Molarity = 9.49 M, molality = 10.43 m

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