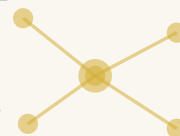


CHAPTER 04



STOICHIOMETRY

Mastering Moles, Formulas & Balanced Equations



82

MCQs

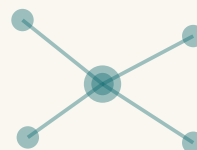
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Sections

100%

Explained

✓ Correct Answers Highlighted | Step-by-Step Explanations



Instructions: Each question below has one correct option highlighted in green with a tick, followed by a clear explanation. Read every explanation carefully — understanding the "why" is what turns practice into mastery.

Section 1

Introduction & Basic Concepts

Q1. What is the primary purpose of stoichiometry in chemistry?

- A) To determine the colors of chemical compounds.
- ☒ B) To calculate the amounts of reactants and products using a balanced chemical equation.
- C) To measure the temperature of chemical reactions.
- D) To separate mixtures into their components.

Explanation: *Stoichiometry is the branch of chemistry that deals with the quantitative relationships between reactants and products in a chemical reaction, based on the balanced equation.*

Q2. Stoichiometry is fundamentally based on which law?

A) Law of definite proportions

✓ B) Law of conservation of mass

C) Law of multiple proportions

D) Law of gaseous volumes

Explanation: The law of conservation of mass states that matter cannot be created or destroyed. Therefore, the total mass of reactants must equal the total mass of products, which is the core principle allowing us to balance equations and calculate masses.

Q3. The stoichiometric coefficients used to balance a chemical equation provide the:

A) Mass ratio between elements

✓ B) Mole ratio between reactants and products

C) Volume ratio of gases only

D) Temperature conditions of the reaction

Explanation: The coefficients in front of chemical formulas in a balanced equation represent the number of moles (or molecules/atoms) of each substance involved in the reaction, establishing the mole ratio.

Q4. In the industry, stoichiometry is heavily used to:

- ☒ **A) Determine the exact amount of raw materials required to produce a desired amount of product.**
- ☐ B) Predict the color of the final product.
- ☐ C) Determine the melting point of the product.
- ☐ D) Measure the pressure of the reaction vessel.

Explanation: Industrial chemistry relies on stoichiometric calculations to minimize waste and maximize efficiency by calculating exactly how much of each reactant is needed to produce a specific amount of the desired product.

Q5. The total mass of reactants in a chemical reaction is always:

- ☐ A) Greater than the mass of the products
- ☐ B) Less than the mass of the products
- ☒ **C) Equal to the mass of the products**
- ☐ D) Independent of the mass of the products

Explanation: According to the law of conservation of mass, atoms are neither created nor destroyed in a chemical reaction, so the total mass remains constant.

Section 2

Chemical Formula & Empirical Formula

Q6. Which of the following exists as a discrete molecule?

A) NaCl

✓ B) H₂O

C) CaCl₂

D) KBr

Explanation: Covalent compounds like water (H₂O) exist as discrete molecules where atoms are bonded together. Ionic compounds like NaCl, CaCl₂, and KBr exist as formula units in a crystal lattice.

Q7. The chemical formula of ozone is:

A) O₂

✓ B) O₃

C) O

D) O₄

Explanation: Oxygen exists in different forms. Ozone is an allotrope of oxygen consisting of three oxygen atoms bonded together, hence its formula is O₃.

Q8. What does the molecular formula of a compound represent?

A) The simplest whole-number ratio of atoms

☒ B) The actual number and type of atoms in one molecule

C) The arrangement of atoms in space

D) The mass of one molecule

Explanation: The molecular formula gives the exact number of each type of atom present in a single molecule of a covalent compound.

Q9. Which of the following is an example of a covalent compound?

A) NaCl

B) CaCl_2

☒ C) CH_4

D) KBr

Explanation: CH_4 (methane) is formed by sharing electrons between carbon and hydrogen, making it a covalent compound. The others are ionic.

Q10. The empirical formula of a compound shows:

- A) The actual number of atoms in a molecule
- ☒ B) The simplest whole-number ratio of different atoms in a compound
- C) The structural arrangement of atoms
- D) The molar mass of the compound

Explanation: The empirical formula is the simplest integer ratio of the atoms present in a compound. For example, the empirical formula of hydrogen peroxide (H_2O_2) is HO .

Q11. If the molecular formula of a compound is C_6H_6 , what is its empirical formula?

- A) C_6H_6
- ☒ B) CH
- C) C_2H_2
- D) C_3H_3

Explanation: To find the empirical formula, divide the subscripts by their greatest common divisor (which is 6 for C_6H_6). $6/6 = 1$ for Carbon and $6/6 = 1$ for Hydrogen, giving CH .

Q12. Which compound has the same empirical and molecular formula?

A) Benzene (C_6H_6)

B) Hydrogen peroxide (H_2O_2)

✓ C) Water (H_2O)

D) Acetylene (C_2H_2)

Explanation: Water (H_2O) cannot be simplified further, so its empirical and molecular formulas are the same. The others can be simplified.

Q13. What is the empirical formula of calcium fluoride?

A) CaF

✓ B) CaF_2

C) Ca_2F

D) Ca_2F_2

Explanation: Calcium has a +2 charge (Ca^{2+}) and fluoride has a -1 charge (F^-). To balance the charges, we need two fluoride ions for every calcium ion, giving CaF_2 . This is the simplest ratio.

Q14. The empirical formula of hydrogen peroxide is HO. Its molecular formula is:

A) HO

B) H_2O

✓ C) H_2O_2

D) HO_2

Explanation: The molar mass of HO is 17 g/mol. The given molar mass of hydrogen peroxide is 34 g/mol. $n = 34/17 = 2$. Therefore, the molecular formula is $(\text{HO})_2 = \text{H}_2\text{O}_2$.

Q15. Which of the following pairs have the same empirical formula?

A) C_2H_4 and C_2H_6

✓ B) C_6H_6 and C_2H_2

C) H_2O and H_2O_2

D) CO and CO_2

Explanation: C_6H_6 (benzene) simplifies to CH. C_2H_2 (acetylene) also simplifies to CH. They share the same empirical formula.

Q16. All ionic compounds are represented by their:

A) Molecular formulas

✓ B) Empirical formulas

C) Structural formulas

D) Condensed formulas

Explanation: Ionic compounds do not exist as discrete molecules. They exist as a continuous lattice of ions. Therefore, their formulas represent the simplest ratio of ions, which is their empirical formula.

Section 3

Chemical Formulas of Binary Ionic Compounds

Q17. When writing the formula of an ionic compound, the cation is always written:

A) Second

✓ B) First

C) In the middle

D) With a negative charge

Explanation: By convention, the positively charged ion (cation) is always written first, followed by the negatively charged ion (anion).

Q18. What is the charge on the aluminum ion?

A) +1

B) +2

✓ C) +3

D) -3

Explanation: Aluminum is in Group 13 of the periodic table and loses 3 electrons to achieve a stable noble gas configuration, forming an Al^{3+} ion.

Q19. Using the criss-cross method, what is the formula for aluminum oxide?

A) AlO

✓ B) Al_2O_3

C) Al_3O_2

D) AlO_2

Explanation: Aluminum forms Al^{3+} and oxygen forms O^{2-} . Criss-crossing the numerical values of the charges gives Al_2O_3 .

Q20. What is the formula of magnesium nitride?

A) MgN

B) Mg_2N_3

✓ C) Mg_3N_2

D) MgN_2

Explanation: Magnesium forms Mg^{2+} and nitride forms N^{3-} . Criss-crossing the charges gives Mg_3N_2 .

Q21. The chemical formula for lithium oxide is:

A) LiO

✓ B) Li_2O

C) LiO_2

D) Li_2O_2

Explanation: Lithium forms Li^+ and oxygen forms O^{2-} . To balance the charges, two lithium ions are needed for every oxide ion, resulting in Li_2O .

Q22. Which of the following is the correct formula for calcium chloride?

A) CaCl

B) Ca_2Cl

✓ C) CaCl_2

D) Ca_2Cl_2

Explanation: Calcium is Ca^{2+} and chloride is Cl^- . Two chloride ions are needed to balance the +2 charge of calcium, giving CaCl_2 .

Q23. What is the charge on the nitride ion?

A) -1

B) -2

✓ C) -3

D) +3

Explanation: Nitrogen is in Group 15 and gains 3 electrons to complete its octet, forming the N^{3-} ion.

Q24. The formula for zinc chloride is ZnCl_2 . What is the charge on the zinc ion?

A) +1

✓ B) +2

C) +3

D) -2

Explanation: Since each chloride ion has a -1 charge and there are two of them, the total negative charge is -2. To make the compound neutral, zinc must have a +2 charge.

Q25. Which of the following pairs correctly matches the ion with its charge?

A) Na^{2+} , O^{2-}

✓ B) Mg^{2+} , Cl^-

C) Al^+ , N^{3-}

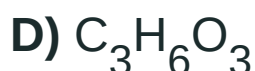
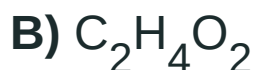
D) Ca^+ , Br^-

Explanation: Magnesium forms a +2 ion (Mg^{2+}) and chlorine forms a -1 ion (Cl^-). The others have incorrect charges based on common valency.

Section 4

Molecular Formula & Structural Formula

Q26. If the empirical formula of a compound is CH_2O and its molar mass is 180 g/mol, what is its molecular formula?



Explanation: Empirical formula mass = $12 + 2(1) + 16 = 30$ g/mol. $n = \text{Molar mass} / \text{Empirical formula mass} = 180 / 30 = 6$. Molecular formula = $n \times (\text{CH}_2\text{O}) = \text{C}_6\text{H}_{12}\text{O}_6$.

Q27. The relationship between molecular formula and empirical formula is:

✓ A) Molecular Formula = $n \times$ Empirical Formula

B) Empirical Formula = $n \times$ Molecular Formula

C) Molecular Formula = Empirical Formula / n

D) They are always identical

Explanation: The molecular formula is a whole-number multiple (n) of the empirical formula. $n = \text{Molar Mass} / \text{Empirical Formula Mass}$.

Q28. If 'n' in the formula Molecular Formula = n x Empirical Formula is equal to 1, then:

A) The molecular formula is twice the empirical formula



B) The molecular and empirical formulas are the same

C) The compound is an ionic compound

D) The molar mass is 1 g/mol

Explanation: If $n=1$, multiplying the empirical formula by 1 gives the same formula, meaning the molecular and empirical formulas are identical (e.g., H_2O).

Q29. What is the molecular formula of acetic acid based on its structural formula CH_3COOH ?

A) CH_2O



B) $C_2H_4O_2$

C) C_2H_6O

D) CH_4O_2

Explanation: Counting the atoms in CH_3COOH : Carbon = 1 (in CH_3) + 1 (in $COOH$) = 2. Hydrogen = 3 (in CH_3) + 1 (in $COOH$) = 4. Oxygen = 2. So, $C_2H_4O_2$.

Q30. The structural formula of sulphuric acid is $\text{H-O-S(=O)}_2\text{-O-H}$. What is its molecular formula?

A) HSO_4

✓ B) H_2SO_4

C) H_2SO_3

D) HSO_3

Explanation: Counting the atoms: Hydrogen = 2, Sulphur = 1, Oxygen = 4. Therefore, the molecular formula is H_2SO_4 .

Q31. How many atoms of oxygen are present in one molecule of phosphoric acid (H_3PO_4)?

A) 1

B) 2

C) 3

✓ D) 4

Explanation: The subscript '4' after the oxygen symbol in H_3PO_4 indicates there are 4 oxygen atoms.

Q32. What is the molecular formula of n-propyl alcohol whose structural formula is $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-OH}$?

☒ A) $\text{C}_3\text{H}_8\text{O}$

B) $\text{C}_3\text{H}_6\text{O}$

C) $\text{C}_3\text{H}_7\text{O}$

D) CH_4O

Explanation: Counting atoms: Carbon = 3, Hydrogen = 8 (3+2+2+1), Oxygen = 1. Therefore, $\text{C}_3\text{H}_8\text{O}$.

Q33. In the formula $\text{C}_6\text{H}_{12}\text{O}_6$, how many atoms are present in total in one molecule?

A) 3

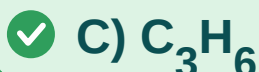
B) 12

☒ C) 24

D) 6

Explanation: Total atoms = 6 (Carbon) + 12 (Hydrogen) + 6 (Oxygen) = 24 atoms.

Q34. If the empirical formula of a compound is CH_2 and its molar mass is 42 g/mol, what is the molecular formula?



Explanation: Empirical formula mass = $12 + 2(1) = 14$.
 $n = 42 / 14 = 3$. Molecular formula = $n \times (\text{CH}_2) = \text{C}_3\text{H}_6$.

Q35. Which of the following is NOT a step in deducing the molecular formula from a structural formula?

A) Count the number of atoms of each type

B) Write the symbols of all elements

✓ C) Calculate the molar mass using a periodic table

D) Remove the subscript 1

Explanation: While you can calculate the molar mass from the formula, the direct steps to deduce the molecular formula from a structure involve counting atoms, writing symbols, assigning subscripts, and removing the subscript 1. Calculating molar mass is a separate step (often done later, not during the deduction process).

Avogadro's Number, Mole, and Molar Mass

Q36. Avogadro's number is approximately equal to:

☒ A) 6.022×10^{23}

☐ B) 6.022×10^{22}

☐ C) 3.011×10^{23}

☐ D) 1.66×10^{-24}

Explanation: Avogadro's number (N_A) is defined as exactly $6.02214076 \times 10^{23}$ particles per mole.

Q37. Avogadro's number represents the number of particles in:

☐ A) 1 gram of a substance

☒ B) 1 mole of a substance

☐ C) 1 liter of a gas

☐ D) 1 molecule of a substance

Explanation: A mole is the amount of substance that contains exactly Avogadro's number (6.022×10^{23}) of particles (atoms, molecules, or ions).

Q38. The mass of one mole of a substance is called its:

- A) Atomic mass
- B) Molecular mass
- ✓ C) Molar mass
- D) Formula mass

Explanation: Molar mass is defined as the mass of one mole of a substance, usually expressed in grams per mole (g/mol).

Q39. What is the molar mass of water (H_2O)?

- ✓ A) 18 g/mol
- B) 20 g/mol
- C) 16 g/mol
- D) 22 g/mol

Explanation: Molar mass = $2(\text{Atomic mass of H}) + 1(\text{Atomic mass of O}) = 2(1) + 16 = 18 \text{ g/mol}$.

Q40. The mass of one mole of carbon atoms is:

A) 6 g

✓ B) 12 g

C) 12 amu

D) 6.022×10^{23} g

Explanation: The atomic mass of carbon is 12 amu. Therefore, the molar mass (mass of 1 mole) is 12 grams.

Q41. How many molecules are present in 1 mole of oxygen gas (O_2)?

✓ A) 6.022×10^{23}

B) 3.011×10^{23}

C) 1.204×10^{24}

D) 12.044×10^{23}

Explanation: One mole of any substance contains Avogadro's number of particles, which is 6.022×10^{23} molecules.

Q42. What is the molar mass of glucose ($\text{C}_6\text{H}_{12}\text{O}_6$)?

☒ A) 180 g/mol

B) 150 g/mol

C) 160 g/mol

D) 200 g/mol

Explanation: $C = 12 \times 6 = 72$. $H = 1 \times 12 = 12$. $O = 16 \times 6 = 96$. $Total = 72 + 12 + 96 = 180 \text{ g/mol}$.

Q43. The mass of a single atom of hydrogen is approximately:

A) 1 g

☒ B) 1 amu

C) $1.66 \times 10^{-24} \text{ g}$

D) Both B and C

Explanation: The atomic mass of hydrogen is 1 amu. In grams, $1 \text{ amu} = 1.66 \times 10^{-24} \text{ g}$. So, both B and C are correct representations.

Q44. 1 gram is equal to how many amu?

✓ A) 6.022×10^{23} amu

B) 1 amu

C) 1.66×10^{-24} amu

D) 12 amu

Explanation: By definition, 1 gram = 6.022×10^{23} amu (Avogadro's number).

Q45. What is the mass of 1 mole of sodium chloride (NaCl)?

✓ A) 58.5 g

B) 35.5 g

C) 23 g

D) 50 g

Explanation: Molar mass = Atomic mass of Na + Atomic mass of Cl = $23 + 35.5 = 58.5$ g/mol.

Q46. The number of moles in 36 g of water (H_2O) is:

A) 1

✓ B) 2

C) 3

D) 4

Explanation: $\text{Moles} = \text{Mass} / \text{Molar Mass} = 36 \text{ g} / 18 \text{ g/mol} = 2 \text{ moles}.$

Q47. Which of the following contains the greatest number of particles?

A) 1 mole of H_2

B) 1 mole of O_2

C) 1 mole of CO_2

✓ D) All contain the same number of particles

Explanation: Avogadro's law states that equal moles of any substance contain the same number of representative particles (6.022×10^{23}).

Q48. The molar mass of H_2SO_4 is:

☒ A) 98 g/mol

B) 100 g/mol

C) 96 g/mol

D) 108 g/mol

Explanation: $H = 2(1) = 2$, $S = 32$, $O = 4(16) = 64$. Total = $2 + 32 + 64 = 98 \text{ g/mol}$.

Q49. How many moles are there in 4 grams of helium (He)?

☒ A) 1

B) 2

C) 4

D) 0.5

Explanation: Moles = Mass / Molar mass. Molar mass of He = 4 g/mol. Moles = $4 \text{ g} / 4 \text{ g/mol} = 1 \text{ mole}$.

Q50. The relationship between mass, moles, and molar mass is:

A) Moles = Mass x Molar Mass

✓ B) Moles = Mass / Molar Mass

C) Moles = Molar Mass / Mass

D) Mass = Moles / Molar Mass

Explanation: The number of moles is calculated by dividing the given mass of the substance by its molar mass.

Section 6

Chemical Equations and Reactions

Q51. In a chemical equation, the substances written on the left-hand side are called:

A) Products

✓ B) Reactants

C) Catalysts

D) Intermediates

Explanation: Reactants are the starting substances that undergo a chemical change, and they are conventionally written on the left side of the arrow.

Q52. What does the symbol '(aq)' represent in a chemical equation?

- A) A gaseous substance
- B) A solid substance
- C) A liquid substance
- ✓ D) An aqueous solution (dissolved in water)

Explanation: (aq) stands for aqueous, meaning the substance is dissolved in water. (s) is solid, (l) is liquid, and (g) is gas.

Q53. A chemical equation must be balanced to obey the:

- A) Law of definite proportions
- ✓ B) Law of conservation of mass
- C) Law of multiple proportions
- D) Law of thermodynamics

Explanation: Balancing ensures that the number of atoms of each element is the same on both sides of the equation, upholding the law of conservation of mass.

Q54. The arrow ($\rightarrow$) in a chemical equation indicates:

- ☒ A) The direction of the reaction from reactants to products
- ☐ B) That the reaction is reversible
- ☐ C) That a catalyst is present
- ☐ D) That heat is applied

Explanation: The arrow points from the reactants to the products, showing the direction in which the chemical change proceeds.

Q55. Which symbol is used to indicate a reversible reaction?

- ☐ A) $\rightarrow$
- ☒ B) $\leftrightarrow$
- ☐ C) $=$
- ☐ D) up arrow

Explanation: A double arrow is used to show that a reaction can proceed in both forward and backward directions.

Q56. In the reaction $\text{Zn(s)} + \text{H}_2\text{SO}_4\text{(aq)} \rightarrow \text{ZnSO}_4\text{(aq)} + \text{H}_2\text{(g)}$, what is the physical state of zinc?

☒ A) Solid

B) Liquid

C) Gas

D) Aqueous

Explanation: The subscript (s) after Zn indicates that zinc is in the solid state.

Q57. When $\text{AgNO}_3\text{(aq)}$ and NaCl(aq) are mixed, a white precipitate of AgCl is formed. What is the state of AgCl in this reaction?

A) (aq)

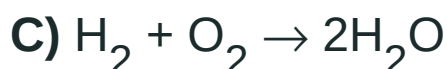
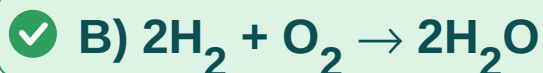
☒ B) (s)

C) (l)

D) (g)

Explanation: A precipitate is an insoluble solid that forms from a solution. Therefore, AgCl is solid, represented by (s).

Q58. Which of the following is an example of a balanced chemical equation?



Explanation: Option B has 4 hydrogen atoms and 2 oxygen atoms on both sides, satisfying the law of conservation of mass.

Q59. In the chemical equation $4\text{Al}(\text{s}) + 3\text{O}_2(\text{g}) \rightarrow 2\text{Al}_2\text{O}_3(\text{s})$, the coefficient '3' represents:

A) 3 grams of oxygen

✓ B) 3 moles of oxygen molecules

C) 3 atoms of oxygen

D) 3 liters of oxygen

Explanation: The coefficients in a balanced chemical equation represent the number of moles (or molecules) of each substance involved in the reaction.

Q60. What is the correct way to write the state symbol for a substance dissolved in water?

A) (s)

B) (l)

C) (g)

☒ D) (aq)

Explanation: 'aq' stands for aqueous, indicating a substance dissolved in water.

Q61. Which of the following is NOT a physical state symbol used in chemical equations?

A) (s)

B) (l)

C) (aq)

☒ D) (m)

Explanation: The standard state symbols are (s) for solid, (l) for liquid, (g) for gas, and (aq) for aqueous. (m) is not used.

Q62. In the reaction $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \leftrightarrow 2\text{NH}_3(\text{g})$, the $\leftrightarrow$ symbol indicates that:

A) The reaction goes to completion

✓ B) The reaction is reversible

C) The reaction is exothermic

D) A catalyst is required

Explanation: The double arrow signifies a reversible reaction where reactants form products and products can react to re-form reactants.

Q63. The equation $\text{CaCO}_3(\text{s}) \rightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$ represents a:

A) Reversible reaction

✓ B) Decomposition reaction

C) Combination reaction

D) Displacement reaction

Explanation: A single compound (CaCO_3) breaks down into two simpler substances (CaO and CO_2), making it a decomposition reaction.

Q64. How many oxygen atoms are on the product side of the balanced equation $2\text{C}_2\text{H}_6 + 7\text{O}_2 \rightarrow 4\text{CO}_2 + 6\text{H}_2\text{O}$?

A) 7

✓ B) 14

C) 4

D) 6

Explanation: On the product side, there are 4 molecules of CO_2 ($4 \times 2 = 8$ O atoms) and 6 molecules of H_2O ($6 \times 1 = 6$ O atoms). Total = $8 + 6 = 14$ oxygen atoms.

Q65. In the ionic equation $\text{Ag}^+(\text{aq}) + \text{Cl}^-(\text{aq}) \rightarrow \text{AgCl}(\text{s})$, the spectator ions are:

A) Ag^+ and Cl^-

✓ B) Na^+ and NO_3^-

C) Ag^+ and NO_3^-

D) Na^+ and Cl^-

Explanation: Spectator ions are ions that do not participate in the chemical reaction. In the reaction between AgNO_3 and NaCl , Na^+ and NO_3^- remain in the solution and are not part of the precipitate.

Section 7

Calculations Based on Chemical Equations

Q66. In the reaction $\text{CaCO}_3 + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2$, how many moles of HCl are required to react completely with 1 mole of CaCO_3 ?

A) 1 mole

✓ B) 2 moles

C) 3 moles

D) 0.5 moles

Explanation: The balanced equation shows a 1:2 mole ratio between CaCO_3 and HCl. Therefore, 1 mole of CaCO_3 requires 2 moles of HCl.

Q67. For the reaction $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$, how many moles of water are produced when 4 moles of H_2 react completely?

A) 2 moles

✓ B) 4 moles

C) 6 moles

D) 8 moles

Explanation: The mole ratio of H_2 to H_2O is 2:2 (or 1:1). Therefore, 4 moles of H_2 will produce 4 moles of H_2O .

Q68. If 100 g of CaCO_3 reacts completely, what mass of CaO is produced? (Molar masses: $\text{CaCO}_3 = 100$ g/mol, $\text{CaO} = 56$ g/mol)

A) 100 g

✓ B) 56 g

C) 44 g

D) 156 g

Explanation: According to the equation $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$, 1 mole of CaCO_3 (100g) produces 1 mole of CaO (56g). So, 100g of CaCO_3 produces 56g of CaO .

Q69. Calculate the mass of oxygen required to react completely with 0.3 moles of aluminum. ($4\text{Al} + 3\text{O}_2 \rightarrow 2\text{Al}_2\text{O}_3$)

✓ A) 7.2 g

B) 3.2 g

C) 9.6 g

D) 12.8 g

Explanation: From the equation, 4 moles Al require 3 moles O_2 . So, 0.3 moles Al require $(3/4) \times 0.3 = 0.225$ moles O_2 . Mass = 0.225 moles $\times$ 32 g/mol = 7.2 g.

Q70. In the reaction $2\text{C}_2\text{H}_5\text{OH} + 6\text{O}_2 \rightarrow 4\text{CO}_2 + 6\text{H}_2\text{O}$, how many moles of CO_2 are produced from 1.8 moles of ethanol?

A) 1.8 moles

✓ B) 3.6 moles

C) 5.4 moles

D) 7.2 moles

Explanation: The mole ratio of ethanol to CO_2 is 2:4 (or 1:2). So, 1.8 moles of ethanol will produce $1.8 \times 2 = 3.6$ moles of CO_2 .

Q71. How many molecules of water are produced when 5 g of H_2 reacts with excess O_2 ? ($2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$)

✓ A) 1.505×10^{24}

B) 6.022×10^{23}

C) 3.011×10^{23}

D) 12.044×10^{23}

Explanation: 4g H_2 produces 36g H_2O . 5g H_2 produces $(36/4) \times 5 = 45\text{g } \text{H}_2\text{O}$. Moles of $\text{H}_2\text{O} = 45/18 = 2.5$ moles. Molecules = $2.5 \times 6.022 \times 10^{23} = 1.505 \times 10^{24}$.

Q72. What is the mole ratio of CaCO_3 to HCl in the reaction $\text{CaCO}_3 + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2$?

A) 1:1

✓ B) 1:2

C) 2:1

D) 1:3

Explanation: The coefficients in the balanced equation are 1 for CaCO_3 and 2 for HCl , giving a mole ratio of 1:2.

Q73. If 25 g of limestone (CaCO_3) reacts with excess HCl , what mass of CaCl_2 is produced? (Molar mass $\text{CaCO}_3 = 100$, $\text{CaCl}_2 = 111$)

✓ A) 27.75 g

B) 25 g

C) 111 g

D) 55.5 g

Explanation: 100g CaCO_3 produces 111g CaCl_2 . So, 25g CaCO_3 will produce $(111/100) \times 25 = 27.75$ g.

Q74. In the reaction $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$, if 1 mole of N_2 reacts completely, how many moles of NH_3 are produced?

A) 1

✓ B) 2

C) 3

D) 4

Explanation: The balanced equation shows 1 mole of N_2 produces 2 moles of NH_3 .

Q75. What is the mass of 1 mole of CO_2 ?

✓ A) 44 g

B) 28 g

C) 32 g

D) 12 g

Explanation: Molar mass of $\text{CO}_2 = 12 \text{ (C)} + 2 \times 16 \text{ (O)} = 44 \text{ g/mol}$.

Q76. How many moles are present in 9 g of H_2O ?

✓ A) 0.5

B) 1

C) 2

D) 18

Explanation: $\text{Moles} = \text{Mass} / \text{Molar mass} = 9 \text{ g} / 18 \text{ g/mol} = 0.5 \text{ moles.}$

Q77. In the equation $2\text{KClO}_3 \rightarrow 2\text{KCl} + 3\text{O}_2$, what is the mole ratio of KClO_3 to O_2 ?

✓ A) 2:3

B) 3:2

C) 1:1

D) 2:2

Explanation: The coefficients are 2 for KClO_3 and 3 for O_2 , giving a ratio of 2:3.

Q78. How many grams of oxygen are produced from 2 moles of KClO_3 ? ($2\text{KClO}_3 \rightarrow 2\text{KCl} + 3\text{O}_2$)

A) 32 g

B) 48 g

✓ C) 96 g

D) 64 g

Explanation: 2 moles of KClO_3 produce 3 moles of O_2 .
Mass of 3 moles $\text{O}_2 = 3 \times 32 = 96 \text{ g}$.

Q79. If 1.8 moles of ethyl alcohol produce 3.6 moles of CO_2 , how many moles of O_2 are consumed?

A) 3.6

✓ B) 5.4

C) 1.8

D) 7.2

Explanation: The ratio of ethanol to O_2 is 2:6 (or 1:3).
So, 1.8 moles of ethanol will consume $1.8 \times 3 = 5.4$ moles of O_2 .

Q80. The molar mass of a compound is 78 g/mol and its empirical formula is CH. What is the molecular formula?

A) CH

B) C₂H₂

✓ C) C₆H₆

D) C₄H₄

Explanation: $n = 78 / (12+1) = 78 / 13 = 6$. Molecular formula = $n \times (CH) = 6 \times CH = C_6H_6$.

Q81. What is the mass of 0.225 moles of O₂?

✓ A) 7.2 g

B) 3.6 g

C) 32 g

D) 14.4 g

Explanation: Mass = Moles x Molar Mass = 0.225 moles x 32 g/mol = 7.2 g.

Q82. In the reaction $4\text{Al} + 3\text{O}_2 \rightarrow 2\text{Al}_2\text{O}_3$, how many moles of Al_2O_3 are produced from 0.3 moles of Al?

✓ A) 0.15

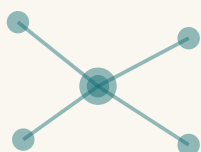
B) 0.3

C) 0.6

D) 0.9

Explanation: The mole ratio of Al to Al_2O_3 is 4:2 (or 2:1). So, 0.3 moles of Al will produce $0.3 / 2 = 0.15$ moles of Al_2O_3 .

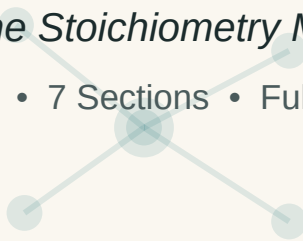
END OF CHAPTER 04



Well Done!

You've completed the Stoichiometry MCQ practice bank.

82 Questions • 7 Sections • Fully Explained



Before Your Exam, Revise:

- Mole $\leftrightarrow$ Mass $\leftrightarrow$ Particles conversions
- Empirical vs. Molecular formula relationship ($n = M / \text{EFM}$)
- Balancing equations & mole-ratio calculations



Believe in your preparation — you've got this!