

Unit 4: Stoichiometry & Chemical Equations

Multiple Choice

Identify the letter of the choice that best completes the statement or answers the question.

- C 1. In a chemical reaction, the mass of the products ____.
- is less than the mass of the reactants
 - is greater than the mass of the reactants
 - is equal to the mass of the reactants
 - has no relationship to the mass of the reactants
- A 2. In every balanced chemical equation, each side of the equation has the same number of ____.
- atoms of each element
 - molecules
 - moles
 - coefficients
- C 3. When an equation is used to calculate the amount of product that will form during a reaction, then the value obtained is called the ____.
- actual yield
 - percent yield
 - theoretical yield
 - minimum yield
- B 4. The first step in most stoichiometry problems is to ____.
- add the coefficients of the reagents
 - convert given quantities to moles
 - convert given quantities to volumes
 - convert given quantities to masses
- B 5. When two substances react to form products, the reactant which is used up is called the ____.
- determining reagent
 - limiting reagent
 - excess reagent
 - catalytic reagent
- C 6. How many hydrogen atoms are in 5 molecules of isopropyl alcohol, C_3H_7O ?
- $5 \times (6.02 \times 10^{23})$
 - 5
 - 35
 - $35 \times (6.02 \times 10^{23})$
- D 7. How many atoms are in 0.075 mol of titanium?
- 1.2×10^{-25}
 - 2.2×10^{24}
 - 6.4×10^2
 - 4.5×10^{22}
- C 8. Chemical equations must be balanced to satisfy ____.
- the law of definite proportions
 - the law of multiple proportions
 - the law of conservation of mass
 - Avogadro's principle
- C 9. In the reaction $2CO(g) + O_2(g) \rightarrow 2CO_2(g)$, what is the ratio of moles of oxygen used to moles of CO_2 produced?
- 1:1
 - 2:1
 - 1:2
 - 2:2
- C 10. What is the empirical formula of a substance that is 53.5% C, 15.5% H, and 31.1% N by weight?
- C_3HN_2
 - $C_4H_{14}N_2$
 - C_2H_8N
 - CH_4N_7
- B 11. In a double-replacement reaction, the ____.

- a. products are always molecular
- b. reactants are two ionic compounds
- c. reactants are two elements
- d. products are a new element and a new compound

- C 12. The calculation of quantities in chemical equations is called ____.
- a. stoichiometry
 - b. dimensional analysis
 - c. percent composition
 - d. percent yield
- C 13. When potassium hydroxide and barium chloride react, potassium chloride and barium hydroxide are formed. The balanced equation for this reaction is ____.
- a. $\text{KH} + \text{BaCl} \rightarrow \text{KCl} + \text{BaH}$
 - b. $\text{KOH} + \text{BaCl} \rightarrow \text{KCl} + \text{BaOH}$
 - c. $2\text{KOH} + \text{BaCl}_2 \rightarrow 2\text{KCl} + \text{Ba(OH)}_2$
 - d. $\text{KOH} + \text{BaCl}_2 \rightarrow \text{KCl}_2 + \text{BaOH}$
- A 14. The reaction $2\text{Fe} + 3\text{Cl}_2 \rightarrow 2\text{FeCl}_3$ is an example of which type of reaction?
- a. combustion reaction
 - b. single-replacement reaction
 - c. combination reaction
 - d. decomposition reaction
- D 15. The lowest whole-number ratio of the elements in a compound is called the ____.
- a. empirical formula
 - b. molecular formula
 - c. binary formula
 - d. representative formula
- D 16. Use the activity series of metals to complete a balanced chemical equation for the following single replacement reaction.
- $\text{Ag(s)} + \text{KNO}_3(\text{aq}) \rightarrow$
- a. $\text{AgNO}_3 + \text{K}$
 - b. $\text{AgK} + \text{NO}_3$
 - c. AgKNO_3
 - d. No reaction takes place because silver is less reactive than potassium.
- D 17. What is the percent composition of carbon, in heptane, C_7H_{16} ?
- a. 12%
 - b. 19%
 - c. 68%
 - d. 84%
- D 18. How many molecules are in 2.10 mol CO_2 ?
- a. 2.53×10^{24} molecules
 - b. 3.79×10^{24} molecules
 - c. 3.49×10^{-24} molecules
 - d. 1.26×10^{24} molecules
- B 19. How many moles of tungsten atoms are in 4.8×10^{25} atoms of tungsten?
- a. 8.0×10^2 moles
 - b. 8.0×10^1 moles
 - c. 1.3×10^{-1} moles
 - d. 1.3×10^{-2} moles
- A 20. The atomic masses of any two elements contain the same number of ____.
- a. atoms
 - b. grams
 - c. ions
 - d. milliliters
- B 21. What is the balanced chemical equation for the reaction that takes place between bromine and sodium iodide?
- a. $\text{Br}_2 + \text{NaI} \rightarrow \text{NaBr}_2 + \text{I}$
 - b. $\text{Br}_2 + 2\text{NaI} \rightarrow 2\text{NaBr} + \text{I}_2$
 - c. $\text{Br} + \text{NaI}_2 \rightarrow \text{NaBrI}_2$
 - d. $\text{Br} + \text{NaI}_2 \rightarrow \text{NaBr} + \text{I}_2$

- C 22. What is the molar mass of $(\text{NH}_4)_2\text{CO}_3$?
a. 144 g
b. 138 g
c. 96 g
d. 78 g
- D 23. Avogadro's number of representative particles is equal to one _____.
a. kilogram
b. gram
c. kelvin
d. mole
- D 24. The molar mass of C_7H_{16} and the molar mass of CaCO_3 contain approximately the same number of _____.
a. carbon atoms
b. anions
c. cations
d. grams
- C 25. When the equation $\text{Fe} + \text{Cl}_2 \rightarrow \text{FeCl}_3$ is balanced, what is the coefficient for Cl_2 ?
a. 1
b. 2
c. 3
d. 4
- B 26. How many moles of aluminum are needed to react completely with 1.2 mol of FeO ?
 $2\text{Al}(s) + 3\text{FeO}(s) \rightarrow 3\text{Fe}(s) + \text{Al}_2\text{O}_3(s)$
a. 1.2 mol
b. 0.8 mol
c. 1.6 mol
d. 2.4 mol
- B 27. When iron rusts in air, iron(III) oxide is produced. How many moles of oxygen react with 2.4 mol of iron in the rusting reaction?
 $4\text{Fe}(s) + 3\text{O}_2(g) \rightarrow 2\text{Fe}_2\text{O}_3(s)$
a. 1.2 mol
b. 1.8 mol
c. 2.4 mol
d. 3.2 mol
- B 28. Aluminum reacts with sulfuric acid to produce aluminum sulfate and hydrogen gas. How many grams of aluminum sulfate would be formed if 250 g H_2SO_4 completely reacted with aluminum?
 $2\text{Al}(s) + 3\text{H}_2\text{SO}_4(aq) \rightarrow \text{Al}_2(\text{SO}_4)_3(aq) + 3\text{H}_2(g)$
a. 0.85 g
b. 290 g
c. 450 g
d. 870 g
- B 29. Metallic copper is formed when aluminum reacts with copper(II) sulfate. How many grams of metallic copper can be obtained when 54.0 g of Al react with 319 g of CuSO_4 ?
 $2\text{Al} + 3\text{CuSO}_4 \rightarrow \text{Al}_2(\text{SO}_4)_3 + 3\text{Cu}$
a. 21.2 g
b. 127 g
c. 162 g
d. 381 g
- C 30. In a particular reaction between copper metal and silver nitrate, 12.7 g Cu produced 38.1 g Ag . What is the percent yield of silver in this reaction?
 $\text{Cu} + 2\text{AgNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + 2\text{Ag}$
a. 56.7%
b. 77.3%
c. 88.2%
d. 176%

21. ANS: B DIF: L2 REF: p. 333, p. 334
OBJ: 11.2.2 STO: 3.4.10.A.7
22. ANS: C DIF: L2 REF: p. 295, p. 296
OBJ: 10.1.4
23. ANS: D DIF: L1 REF: p. 290 OBJ: 10.1.2
24. ANS: D DIF: L2 REF: p. 295, p. 296
OBJ: 10.1.4
25. ANS: C DIF: L1 REF: p. 327, p. 328
OBJ: 11.1.3 STO: 3.4.10.A.7
26. ANS: B DIF: L1 REF: p. 359, p. 360
OBJ: 12.2.1 STO: 3.4.12.B.2
27. ANS: B DIF: L2 REF: p. 359, p. 360
OBJ: 12.2.1 STO: 3.4.12.B.2
28. ANS: B DIF: L2 REF: p. 360, p. 361, p. 362
OBJ: 12.2.2 STO: 3.4.12.B.2
29. ANS: B DIF: L2 REF: p. 371 OBJ: 12.3.1
STO: 3.4.12.B.2
30. ANS: C DIF: L2 REF: p. 375 OBJ: 12.3.2