Unit 4: Stoichiometry & Chemical Equations

Multiple Choice

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

____ 1. In a chemical reaction, the mass of the products ____.
   a. is less than the mass of the reactants
   b. is greater than the mass of the reactants
   c. is equal to the mass of the reactants
   d. has no relationship to the mass of the reactants

____ 2. In every balanced chemical equation, each side of the equation has the same number of ____.
   a. atoms of each element
   b. molecules
   c. moles
   d. coefficients

____ 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 ____.
   a. actual yield
   b. percent yield
   c. theoretical yield
   d. minimum yield

____ 4. The first step in most stoichiometry problems is to ____.
   a. add the coefficients of the reagents
   b. convert given quantities to moles
   c. convert given quantities to volumes
   d. convert given quantities to masses

____ 5. When two substances react to form products, the reactant which is used up is called the ____.
   a. determining reagent
   b. limiting reagent
   c. excess reagent
   d. catalytic reagent

____ 6. How many hydrogen atoms are in 5 molecules of isopropyl alcohol, C_3H_7O?
   a. $5 \times (6.02 \times 10^{23})$
   b. 5
   c. 35
   d. $35 \times (6.02 \times 10^{23})$

____ 7. How many atoms are in 0.075 mol of titanium?
   a. 1.2×10^{-25}
   b. 2.2×10^{24}
   c. 6.4×10^{2}
   d. 4.5×10^{22}

____ 8. Chemical equations must be balanced to satisfy ____.
   a. the law of definite proportions
   b. the law of multiple proportions
   c. the law of conservation of mass
   d. Avogadro's principle

____ 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?
   a. 1:1
   b. 2:1
   c. 1:2
   d. 2:2

____ 10. What is the empirical formula of a substance that is 53.5% C, 15.5% H, and 31.1% N by weight?
   a. C_3HN_2
   b. $C_4H_{14}N_2$
   c. C_2H_8N
   d. CH_4N_7

____ 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

____ 12. The calculation of quantities in chemical equations is called ____.
a. stoichiometry
b. dimensional analysis
c. percent composition
d. percent yield

____ 13. When potassium hydroxide and barium chloride react, potassium chloride and barium hydroxide are formed. The balanced equation for this reaction is ____.
a. $KH + BaCl \rightarrow KCl + BaH$
b. $KOH + BaCl \rightarrow KCl + BaOH$
c. $2KOH + BaCl_2 \rightarrow 2KCl + Ba(OH)_2$
d. $KOH + BaCl_2 \rightarrow KCl_2 + BaOH$

____ 14. The reaction $2Fe + 3Cl_2 \rightarrow 2FeCl_3$ is an example of which type of reaction?
a. combustion reaction
b. single-replacement reaction
c. combination reaction
d. decomposition reaction

____ 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

____ 16. Use the activity series of metals to complete a balanced chemical equation for the following single replacement reaction.
$Ag(s) + KNO_3(aq) \rightarrow$
a. $AgNO_3 + K$
b. $AgK + NO_3$
c. $AgKNO_3$
d. No reaction takes place because silver is less reactive than potassium.

____ 17. What is the percent composition of carbon, in heptane, C_7H_{16}?
a. 12%
b. 19%
c. 68%
d. 84%

____ 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

____ 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

____ 20. The atomic masses of any two elements contain the same number of ____.
a. atoms
b. grams
c. ions
d. milliliters

____ 21. What is the balanced chemical equation for the reaction that takes place between bromine and sodium iodide?
a. $Br_2 + NaI \rightarrow NaBr_2 + I$
b. $Br_2 + 2NaI \rightarrow 2NaBr + I_2$
c. $Br + NaI_2 \rightarrow NaBrI_2$
d. $Br + NaI_2 \rightarrow NaBr + I_2$

____ 22. What is the molar mass of $(NH_4)_2CO_3$?

a. 144 g
c. 96 g
b. 138 g
d. 78 g

____ 23. Avogadro's number of representative particles is equal to one ____.

a. kilogram
c. kelvin
b. gram
d. mole

____ 24. The molar mass of C_7H_{16} and the molar mass of $CaCO_3$ contain approximately the same number of ____.

a. carbon atoms
c. cations
b. anions
d. grams

____ 25. When the equation $Fe + Cl_2 \rightarrow FeCl_3$ is balanced, what is the coefficient for Cl_2?

a. 1
c. 3
b. 2
d. 4

____ 26. How many moles of aluminum are needed to react completely with 1.2 mol of FeO?
$2Al(s) + 3FeO(s) \rightarrow 3Fe(s) + Al_2O_3(s)$

a. 1.2 mol
c. 1.6 mol
b. 0.8 mol
d. 2.4 mol

____ 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?
$4Fe(s) + 3O_2(g) \rightarrow 2Fe_2O_3(s)$

a. 1.2 mol
c. 2.4 mol
b. 1.8 mol
d. 3.2 mol

____ 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?
$2Al(s) + 3H_2SO_4(aq) \rightarrow Al_2(SO_4)_3(aq) + 3H_2(g)$

a. 0.85 g
c. 450 g
b. 290 g
d. 870 g

____ 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 $CuSO_4$?
$2Al + 3CuSO_4 \rightarrow Al_2(SO_4)_3 + 3Cu$

a. 21.2 g
c. 162 g
b. 127 g
d. 381 g

____ 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?
$Cu + 2AgNO_3 \rightarrow Cu(NO_3)_2 + 2Ag$

a. 56.7%
c. 88.2%
b. 77.3%
d. 176%

Unit 4: Stoichiometry & Chemical Equations
Answer Section

MULTIPLE CHOICE

1. ANS: C DIF: L1 REF: p. 356 OBJ: 12.1.2
   STO: 3.4.10.A.7
2. ANS: A DIF: L1 REF: p. 325, p. 327
   OBJ: 11.1.3 STO: 3.4.10.A.7, 3.4.10.A.7
3. ANS: C DIF: L1 REF: p. 372 OBJ: 12.3.2
4. ANS: B DIF: L1 REF: p. 356 OBJ: 12.1.2
   STO: 3.4.12.B.2
5. ANS: B DIF: L1 REF: p. 369 OBJ: 12.3.1
6. ANS: C DIF: L1 REF: p. 291, p. 292
   OBJ: 10.1.2
7. ANS: D DIF: L2 REF: p. 291, p. 292
   OBJ: 10.1.2
8. ANS: C DIF: L1 REF: p. 325 OBJ: 11.1.3
   STO: 3.4.10.A.7
9. ANS: C DIF: L1 REF: p. 356 OBJ: 12.1.2
10. ANS: C DIF: L2 REF: p. 310 OBJ: 10.3.2
    STO: 3.4.12.A.1
11. ANS: B DIF: L1 REF: p. 334, p. 335
    OBJ: 11.2.1 STO: 3.4.10.A.7
12. ANS: A DIF: L1 REF: p. 354 OBJ: 12.1.1
    STO: 3.4.12.B.2
13. ANS: C DIF: L2 REF: p. 327 OBJ: 11.1.3
    STO: 3.4.10.A.7
14. ANS: C DIF: L1 REF: p. 330, p. 337
    OBJ: 11.2.2 STO: 3.4.10.A.7
15. ANS: A DIF: L1 REF: p. 309 OBJ: 10.3.2
    STO: 3.4.12.A.1
16. ANS: D DIF: L2 REF: p. 333, p. 334
    OBJ: 11.2.1
17. ANS: D DIF: L2 REF: p. 307 OBJ: 10.3.1
    STO: 3.4.12.A.1
18. ANS: D DIF: L2 REF: p. 291, p. 292
    OBJ: 10.1.2
19. ANS: B DIF: L2 REF: p. 290, p. 291
    OBJ: 10.1.2
20. ANS: A DIF: L1 REF: p. 294 OBJ: 10.1.3
    STO: 3.4.10.A.2

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