Chemistry, **6e (McMurry/Fay)**
Chapter 3 Formulas, Equations, and Moles

3.1 Multiple-Choice Questions

1) Chemical equations are balanced in order to obey the law of
A) definite proportions.
B) mass action.
C) mass conservation.
D) multiple proportions.
Answer: C
Topic: Section 3.1 Balancing Chemical Equations

2) Which one of the following statements about balanced equations is **false**?
In a balanced reaction
A) atoms must be balanced on both sides of the reaction arrow.
B) mass must be conserved.
C) molecules must be balanced on both sides of the reaction arrow.
D) net charge must be balanced on both sides of the reaction arrow.
Answer: C
Topic: Section 3.1 Balancing Chemical Equations

3) Which one of the following statements about balanced equations is true? A reaction is balanced by
A) changing the charge on an ion.
B) changing the formula of the molecule.
C) multiplying by suitable coefficients.
D) rearranging atoms in a molecule.
Answer: C
Topic: Section 3.1 Balancing Chemical Equations

4) What is the stoichiometric coefficient for oxygen when the following equation is balanced using the lowest whole-number coefficients

$$\_\_\_\_\_ \ C_3H_8O(l) + \_\_\_\_\_ \ O_2(g) \rightarrow \_\_\_\_\_ \ CO_2(g) + \_\_\_\_\_ \ H_2O(l)$$

A) 3
B) 5
C) 7
D) 9
Answer: D
Topic: Section 3.1 Balancing Chemical Equations

5) What is the **sum** of the coefficients when the following equation is balanced using the lowest whole-numbered coefficients?

$$\_\_\_\_\_ \ PH_3(g) + \_\_\_\_\_ \ O_2(g) \rightarrow \_\_\_\_\_ \ P_4O_{10}(s) + \_\_\_\_\_ \ H_2O(g)$$

A) 10
B) 12
C) 19
D) 22
Answer: C
Topic: Section 3.1 Balancing Chemical Equations

6) What is the **sum** of the coefficients when the following equation is balanced using the lowest whole-numbered coefficients?

$$\_\_\_\_\_ \ B_2O_3(s) + \_\_\_\_\_ \ HF(l) \rightarrow \_\_\_\_\_ \ BF_3(g) + \_\_\_\_\_ \ H_2O(l)$$

A) 8
B) 11
C) 15
D) none of these
Answer: D
Topic: Section 3.1 Balancing Chemical Equations

7) Aluminum metal reacts with iron(II) sulfide to form aluminum sulfide and iron metal. What is the stoichiometric coefficient for aluminum when the chemical equation is balanced using the lowest whole-number stoichiometric coefficients?
A) 1
B) 2
C) 3
D) 4
Answer: B
Topic: Section 3.1 Balancing Chemical Equations

8) Calcium phosphate reacts with sulfuric acid to form calcium sulfate and phosphoric acid. What is the stoichiometric coefficient for sulfuric acid when the chemical equation is balanced using the lowest whole-number stoichiometric coefficients?
A) 1
B) 2
C) 3
D) none of these
Answer: C
Topic: Section 3.1 Balancing Chemical Equations

9) Given the chemical equation: $N_2 + 3 H_2 \rightarrow 2 NH_3$. On a **molecular** level, what do the coefficients mean?
A) 1 atom of nitrogen reacts with 3 atoms of hydrogen to give 2 atoms of ammonia.
B) 28 g of nitrogen reacts with 6 grams of hydrogen to give 34 grams of ammonia.
C) 1 mole of nitrogen reacts with 3 moles of hydrogen to give 2 moles of ammonia.
D) 1 molecule of nitrogen reacts with 3 molecules of hydrogen to give 2 molecules of ammonia.
Answer: D
Topic: Section 3.2 Chemical Symbols on Different Levels

10) Given the chemical equation: $N_2 + 3\ H_2 \rightarrow 2\ NH_3$. On a **macroscopic** level, what do the coefficients mean?
A) 1 atom of nitrogen reacts with 3 atoms of hydrogen to give 2 atoms of ammonia.
B) 1 mole of nitrogen reacts with 3 moles of hydrogen to give 2 moles of ammonia.
C) 1 molecule of nitrogen reacts with 3 molecules of hydrogen to give 2 molecules of ammonia.
D) All of these are true.
Answer: B
Topic: Section 3.2 Chemical Symbols on Different Levels

11) Which conducts electricity?
A) A large collection of iron atoms
B) A single iron atom
C) Both a large collection of iron atoms and a single iron atom
D) Neither a large collection of iron atoms nor a single iron atom
Answer: A
Topic: Section 3.2 Chemical Symbols on Different Levels

12) 1.00 mole of O_2 contains the same number of molecules as
A) 0.667 mole of O_3.
B) 1.00 mole of CH_3CO_2H.
C) 2.00 mole of CH_3CH_2OH.
D) All of these
Answer: B
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

13) 1.00 mole of O_2 contains the same number of oxygen atoms as
A) 0.667 mole of O_3.
B) 1.00 mole of CH_3CO_2H.
C) 2.00 mole of CH_3CH_2OH.
D) All of the above
Answer: D
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

14) Which represents one formula unit?
A) One H
B) One H_2
C) One NaH
D) All of these
Answer: D
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

15) Which is a formula mass?
A) 1.0 amu of H
B) 2.0 amu of H_2
C) 24.0 amu of NaH
D) All of these
Answer: D
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

16) Which contains Avogadro's number of formula units?
A) 36.5 g of Cl
B) 36.5 g of Cl_2
C) 36.5 g of HCl
D) All of these
Answer: C
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

17) What is the molar mass of aspartic acid, $C_4O_4H_7N$?
A) 43 g/mol
B) 70 g/mol
C) 133 g/mol
D) 197 g/mol
Answer: C
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

18) What is the molar mass of $Co(NO_3)_2$?
A) 90 g/mol
B) 121 g/mol
C) 152 g/mol
D) 183 g/mol
Answer: D
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

19) What is the molar mass of calcium permanganate?
A) 159 g/mol
B) 199 g/mol
C) 216 g/mol
D) 278 g/mol
Answer: D
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

20) What is the molar mass of hydrogen gas?
A) 1.00 g/mol
B) 2.00 g/mol
C) 6.02×10^{23} g/mol
D) 1.20×10^{23} g/mol
Answer: B
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

21) What is the mass of a single chlorine molecule, Cl_2?
A) 5.887×10^{-23} g
B) 1.177×10^{-22} g
C) 35.45 g
D) 70.90 g
Answer: B
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

22) What is the mass of 0.500 mol of dichlorodifluoromethane, CF_2Cl_2?
A) 4.14×10^{-3} g
B) 60.5 g
C) 121 g
D) 242 g
Answer: B
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

23) How many moles are in 1.50 g of ethanol, CH_3CH_2OH?
A) 0.0145 mol
B) 0.0326 mol
C) 30.7 mol
D) 69.0 mol
Answer: B
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

24) How many iron(II) ions, Fe^{2+} are there in 5.00 g of $FeSO_4$?
A) 5.46×10^{-26} iron (II) ions
B) 1.98×10^{22} iron (II) ions
C) 1.83×10^{25} iron (II) ions
D) 4.58×10^{26} iron (II) ions
Answer: B
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

25) What is the mass of 8.50×10^{22} molecules of NH_3?
A) 0.00830 g
B) 0.417 g
C) 2.40 g
D) 120 g
Answer: C
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

26) How many oxygen atoms are in 3.00 g of sodium dichromate, $Na_2Cr_2O_7$?
A) 0.0801 oxygen atoms
B) 9.85×10^{20} oxygen atoms
C) 6.90×10^{21} oxygen atoms
D) 4.83×10^{22} oxygen atoms
Answer: D
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

27) What is the identity of substance X if 0.380 mol of X weighs 17.5 g?
A) NO_2
B) NO_3
C) N_2O
D) N_2O_4
Answer: A
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

28) What is the molar mass of butane if 5.19×10^{16} molecules of butane weigh 5.00 μg?
A) 58.0 g/mol
B) 172 g/mol
C) 232 g/mol
D) 431 g/mol
Answer: A
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

29) What mass of dinitrogen monoxide, N_2O, contains the same number of molecules as 3.00 g of trichlorofluoromethane, CCl_3F?
A) 0.106 g
B) 0.961 g
C) 1.04 g
D) 9.37 g
Answer: B
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

30) What mass of sulfur hexafluoride, SF_6, has the same number of fluorine atoms as 25.0 g of oxygen difluoride, OF_2?
A) 0.901 g
B) 8.33 g
C) 22.5 g
D) 203 g
Answer: C
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

31) How many chloride ions are in 1.50 mol of aluminum chloride?
A) 3.00 chloride ions
B) 4.50 chloride ions
C) 9.03×10^{23} chloride ions
D) 2.71×10^{24} chloride ions
Answer: D
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

32) How many anions are in 0.500 g of $MgBr_2$?
A) 1.64×10^{21} anions
B) 3.27×10^{21} anions
C) 2.22×10^{26} anions
D) 4.43×10^{26} anions
Answer: B
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

33) How many cations are in 10.0 g of sodium phosphate?
A) 3.67×10^{22} cations
B) 1.10×10^{23} cations
C) 9.87×10^{24} cations
D) 2.96×10^{25} cations
Answer: B
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

34) Which of the following has the greatest mass?
A) 6.0×10^{23} atoms of O
B) 3.0×10^{23} molecules of O_2
C) 2.0×10^{23} molecules of O_3
D) All have the same mass.
Answer: D
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

35) Which of the following has the greatest mass?
A) 6.02×10^{23} molecules of O_2
B) 16.0 g of O_2
C) 0.500 mol of O_2
D) All of these have the same mass.
Answer: A
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

36) Which of the following has the **smallest** mass?
A) 3.50×10^{23} molecules of I_2
B) 85.0 g of Cl_2
C) 2.50 mol of F_2
D) 0.050 kg of Br_2
Answer: D
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

37) How many moles of CuO can be produced from 0.450 mol of Cu_2O in the following reaction?

$$2\ Cu_2O(s) + O_2(g) \rightarrow 4\ CuO(s)$$

A) 0.225 mol
B) 0.450 mol
C) 0.900 mol
D) 1.80 mol
Answer: C
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

38) How many moles of BCl_3 are needed to produce 25.0 g of HCl(*aq*) in the following reaction?

$$BCl_3(g) + 3\ H_2O(l) \rightarrow 3\ HCl(aq) + B(OH)_3(aq)$$

A) 0.229 mol
B) 0.686 mol
C) 2.06 mol
D) 4.38 mol
Answer: A
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

39) How many grams of calcium chloride are needed to produce 10.0 g of potassium chloride?

$$CaCl_2(aq) + K_2CO_3(aq) \rightarrow 2\ KCl(aq) + CaCO_3(aq)$$

A) 0.134 g
B) 7.44 g
C) 14.9 g
D) 29.8 g
Answer: B
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

40) Balance the chemical equation given below, and determine the number of moles of iodine that reacts with 10.0 g of aluminum.

$$\_\_\_\_\_\ Al(s) + \_\_\_\_\_\ I_2(s) \rightarrow \_\_\_\_\_\ Al_2I_6(s)$$

A) 0.247 mol
B) 0.556 mol
C) 0.741 mol
D) 1.11 mol
Answer: B
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

41) Balance the chemical equation given below, and determine the number of grams of MgO needed to produce 15.0 g of Fe_2O_3.

$$\_\_\_\_\_ \ MgO(s) + \_\_\_\_\_ \ Fe(s) \rightarrow \_\_\_\_\_ \ Fe_2O_3(s) + \_\_\_\_\_ \ Mg(s)$$

A) 0.0877 g
B) 1.26 g
C) 3.78 g
D) 11.4 g
Answer: D
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

42) Dinitrogen monoxide gas decomposes to form nitrogen gas and oxygen gas. How many grams of oxygen are formed when 5.00 g of dinitrogen monoxide decomposes?
A) 0.550 g
B) 1.82 g
C) 3.64 g
D) 7.27 g
Answer: B
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

43) The density of ethanol, C_2H_5OH, is 0.789 g/mL. How many milliliters of ethanol are needed to produce 10.0 g of CO_2 according to the following chemical equation?

$$C_2H_5OH(l) + 3\ O_2(g) \rightarrow 2\ CO_2(g) + 3\ H_2O(l)$$

A) 4.12 mL
B) 6.63 mL
C) 13.2 mL
D) 26.5 mL
Answer: B
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

44) When 10.0 g of calcium metal is reacted with water, 5.00 g of calcium hydroxide is produced. Using the following balanced equation, calculate the percent yield for the reaction?

$$Ca(s) + 2\ H_2O(l) \rightarrow Ca(OH)_2(aq) + H_2(g)$$

A) 13.5%
B) 27.1%
C) 50.0%
D) 92.4%
Answer: B
Topic: Section 3.4 Yields of Chemical Reactions

45) If the percent yield for the following reaction is 65.0%, how many grams of $KClO_3$ are needed to produce 42.0 g of O_2?

$$2\ KClO_3(s) \rightarrow 2\ KCl(s) + 3\ O_2(g)$$

A) 69.7 g
B) 107 g
C) 165 g
D) 371 g
Answer: C
Topic: Section 3.4 Yields of Chemical Reactions

46) If the percent yield for the following reaction is 75.0%, and 45.0 g of NO_2 are consumed in the reaction, how many grams of nitric acid, $HNO_3(aq)$, are produced?

$$3\ NO_2(g) + H_2O(l) \rightarrow 2\ HNO_3(aq) + NO(g)$$

A) 30.8 g
B) 41.1 g
C) 54.8 g
D) 69.3 g
Answer: A
Topic: Section 3.4 Yields of Chemical Reactions

47) In the reaction between glucose and oxygen, 10.0 g of glucose reacts and 7.50 L of carbon dioxide is formed. What is the percent yield if the density of CO_2 is 1.26 g/L?

$$C_6H_{12}O_6(s) + 6\ O_2(g) \rightarrow 6\ CO_2(g) + 6\ H_2O(l)$$

A) 26.1%
B) 40.6%
C) 43.1%
D) 64.5%
Answer: D
Topic: Section 3.4 Yields of Chemical Reactions

48) When methane, CH_4, undergoes combustion with oxygen, the usual products are carbon dioxide and water. Carbon monoxide is formed when the limiting reactant is
A) carbon dioxide.
B) methane.
C) oxygen.
D) water.
Answer: C
Topic: Section 3.5 Reactions with Limiting Amounts of Reactants

49) 10 g of nitrogen is reacted with 5.0 g of hydrogen to produce ammonia according to the chemical equation shown below. Which one of the following statements is **false**?

$$N_2(g) + 3\ H_2(g) \rightarrow 2\ NH_3(g)$$

A) 2.8 grams of hydrogen are left over.
B) Hydrogen is the excess reactant.
C) Nitrogen is the limiting reactant.
D) The theoretical yield of ammonia is 15 g.
Answer: D
Topic: Section 3.5 Reactions with Limiting Amounts of Reactants

50) 5.0 g of iron is reacted with 5.0 g of water according to the chemical equation shown below. Which one of the following statements is **false**?

$$3\ Fe(s) + 4\ H_2O(l) \rightarrow Fe_3O_4(s) + 4\ H_2(g)$$

A) 6.91 g of Fe_3O_4 are produced.
B) 2.85 g of H_2O are left over.
C) Mass is conserved in this reaction.
D) Water is the limiting reactant.
Answer: D
Topic: Section 3.5 Reactions with Limiting Amounts of Reactants

51) Which substance is the limiting reactant when 2.0 g of sulfur reacts with 3.0 g of oxygen and 4.0 g of sodium hydroxide according to the following chemical equation:

$$2\ S(s) + 3\ O_2(g) + 4\ NaOH(aq) \rightarrow 2\ Na_2SO_4(aq) + 2\ H_2O(l)$$

A) S(*s*)
B) $O_2(g)$
C) NaOH (*aq*)
D) None of these substances is the limiting reactant.
Answer: C
Topic: Section 3.5 Reactions with Limiting Amounts of Reactants

52) When 5.00×10^{22} molecules of ammonia react with 4.00×10^{22} molecules of oxygen according to the chemical equation shown below, how many grams of nitrogen gas are produced?

$$4\ NH_3(g) + 3\ O_2(g) \rightarrow 2\ N_2(g) + 6\ H_2O(g)$$

A) 1.16 g
B) 1.24 g
C) 2.79 g
D) 4.65 g
Answer: A
Topic: Section 3.5 Reactions with Limiting Amounts of Reactants

53) How many grams of the excess reagent are left over when 6.00 g of CS_2 gas react with 10.0 g of Cl_2 gas in the following reaction:

$$CS_2(g) + 3\ Cl_2(g) \rightarrow CCl_4(l) + S_2Cl_2(l)$$

A) 2.42 g
B) 2.77 g
C) 3.58 g
D) 4.00 g
Answer: A
Topic: Section 3.5 Reactions with Limiting Amounts of Reactants

54) When silver nitrate reacts with barium chloride, silver chloride and barium nitrate are formed. How many grams of silver chloride are formed when 10.0 g of silver nitrate reacts with 15.0 g of barium chloride?
A) 8.44 g
B) 9.40 g
C) 11.9 g
D) 18.8 g
Answer: A
Topic: Section 3.5 Reactions with Limiting Amounts of Reactants

55) When iron(III) oxide reacts with hydrochloric acid, iron(III) chloride and water are formed. How many grams of iron(III) chloride are formed from 10.0 g of iron(III) oxide and 10.0 g of hydrochloric acid?
A) 11.1 g
B) 14.8 g
C) 20.3 g
D) 35.1 g
Answer: B
Topic: Section 3.5 Reactions with Limiting Amounts of Reactants

56) Balance the chemical equation given below, and calculate the volume of nitrogen monoxide gas produced when 8.00 g of ammonia is reacted with 12.0 g of oxygen at 25°C? The density of nitrogen monoxide at 25°C is 1.23 g/L.

$$\_\_\_\_\_ \ NH_3(g) + \_\_\_\_\_ \ O_2(g) \rightarrow \_\_\_\_\_ \ NO(g) + \_\_\_\_\_ \ H_2O(l)$$

A) 7.32 L
B) 11.1 L
C) 11.5 L
D) 18.8 L
Answer: A
Topic: Section 3.5 Reactions with Limiting Amounts of Reactants

57) Molarity is defined as
A) moles of solute per liter of solution.
B) moles of solute per liter of solvent.
C) moles of solvent per liter of solution.
D) moles of solvent per liter of solvent.
Answer: A
Topic: Section 3.6 Concentrations of Reactants in Solution: Molarity

58) What is the concentration of $FeCl_3$ in a solution prepared by dissolving 10.0 g of $FeCl_3$ in enough water to make 275 mL of solution?
A) 2.24×10^{-4} M
B) 0.224 M
C) 4.46 M
D) 4.46×10^{3} M
Answer: B
Topic: Section 3.6 Concentrations of Reactants in Solution: Molarity

59) How many grams of $AgNO_3$ are needed to make 250. mL of a solution that is 0.135 M?
A) 0.0917 g
B) 0.174 g
C) 5.73 g
D) 9.17 g
Answer: C
Topic: Section 3.6 Concentrations of Reactants in Solution: Molarity

60) What volume of a 0.540 M NaOH solution contains 15.5 g of NaOH?
A) 0.209 L
B) 0.718 L
C) 1.39 L
D) 4.78 L
Answer: B
Topic: Section 3.6 Concentrations of Reactants in Solution: Molarity

61) What is the concentration of NO_3^- ions in a solution prepared by dissolving 15.0 g of $Ca(NO_3)_2$ in enough water to produce 300. mL of solution?
A) 0.152 M
B) 0.305 M
C) 0.403 M
D) 0.609 M
Answer: D
Topic: Section 3.6 Concentrations of Reactants in Solution: Molarity

62) If the reaction of phosphate ion with water is ignored, what is the **total** concentration of ions in a solution prepared by dissolving 3.00 g of K_3PO_4 in enough water to make 350. mL of solution?
A) 0.0101 M
B) 0.0404 M
C) 0.162 M
D) 0.323 M
Answer: B
Topic: Section 3.6 Concentrations of Reactants in Solution: Molarity

63) What is the concentration of an $AlCl_3$ solution if 150. mL of the solution contains 250. mg of Cl^- ion?
A) 1.57×10^{-2} M
B) 3.75×10^{-2} M
C) 4.70×10^{-2} M
D) 1.41×10^{-1} M
Answer: A
Topic: Section 3.6 Concentrations of Reactants in Solution: Molarity

64) Which contains the greatest number of chloride ions?
A) 25 mL of 2.0 M $NaCl$
B) 50 mL of 1.0 M $CaCl_2$
C) 10 mL of 2.5 M $FeCl_3$
D) All contain the same number of chloride ions.
Answer: B
Topic: Section 3.6 Concentrations of Reactants in Solution: Molarity

65) When a 1.0 M solution of NaCl at 25°C is heated to 55°C, the
A) density decreases and the molarity decreases.
B) density decreases and the molarity increases.
C) density increases and the molarity decreases.
D) density increases and the molarity increases.
Answer: A
Topic: Section 3.6 Concentrations of Reactants in Solution: Molarity

66) Which statement about diluted solutions is **false**? When a solution is diluted
A) the concentration of the solution decreases.
B) the molarity of the solution decreases.
C) the number of moles of solute remains unchanged.
D) the number of moles of solvent remains unchanged.
Answer: D
Topic: Section 3.7 Diluting Concentrated Solutions

67) What is the concentration of HCl in the **final** solution when 65 mL of a 12 M HCl solution is diluted with pure water to a total volume of 0.15 L?
A) 2.8×10^{-2} M
B) 5.2 M
C) 28 M
D) 5.2×10^{3} M
Answer: B
Topic: Section 3.7 Diluting Concentrated Solutions

68) How many milliliters of a 9.0 M H_2SO_4 solution are needed to make 0.25 L of a 3.5 M H_2SO_4 solution?
A) 0.097 mL
B) 0.64 mL
C) 97 mL
D) 640 mL
Answer: C
Topic: Section 3.7 Diluting Concentrated Solutions

69) How many mL of a 0.175 M $FeCl_3$ solution are needed to make 250. mL of a solution that is 0.300 M in Cl^- ion?
A) 0.429 mL
B) 143 mL
C) 429 mL
D) It is not possible to make a more concentrated solution from a less concentrated solution.
Answer: B
Topic: Section 3.7 Diluting Concentrated Solutions

70) A student dissolved 3.00 g of $Co(NO_3)_2$ in enough water to make 100. mL of stock solution. He took 4.00 mL of the solution then diluted it with water to give 275 mL of a final solution. How many grams of NO_3^- ion are there in the final solution?
A) 0.0148 g
B) 0.0296 g
C) 0.0407 g
D) 0.0813 g
Answer: D
Topic: Section 3.7 Diluting Concentrated Solutions

71) A student prepared a stock solution by dissolving 20.0 g of KOH in enough water to make 150. mL of solution. She then took 15.0 mL of the stock solution and diluted it with enough water to make 65.0 mL of a final solution. What is the concentration of KOH for the final solution?
A) 0.548 M
B) 0.713 M
C) 1.40 M
D) 1.82 M
Answer: A
Topic: Section 3.7 Diluting Concentrated Solutions

72) How many milliliters of 0.260 M Na_2S are needed to react with 25.00 mL of 0.315 M $AgNO_3$?

$$Na_2S(aq) + 2\ AgNO_3(aq) \rightarrow 2\ NaNO_3(aq) + Ag_2S(s)$$

A) 15.1 mL
B) 30.3 mL
C) 41.3 mL
D) 60.6 mL
Answer: A
Topic: Section 3.8 Solution Stoichiometry

73) How many grams of $CaCl_2$ are formed when 35.00 mL of 0.00237 M $Ca(OH)_2$ reacts with excess Cl_2 gas?

$$2\ Ca(OH)_2(aq) + 2\ Cl_2(g) \rightarrow Ca(OCl)_2(aq) + CaCl_2(s) + 2\ H_2O(l)$$

A) 0.00460 g
B) 0.00921 g
C) 0.0184 g
D) 0.0217 g
Answer: A
Topic: Section 3.8 Solution Stoichiometry

74) When 125 mL of 0.500 M $AgNO_3$ is added to 100. mL of 0.300 M NH_4Cl, how many grams of AgCl are formed?

$$AgNO_3(aq) + NH_4Cl(aq) \rightarrow AgCl(s) + NH_4NO_3(aq)$$

A) 4.30 g
B) 8.96 g
C) 13.3 g
D) 25.8 g
Answer: A
Topic: Section 3.8 Solution Stoichiometry

75) How many milliliters of 0.200 M $FeCl_3$ are needed to react with an excess of Na_2S to produce 2.75 g of Fe_2S_3 if the percent yield for the reaction is 65.0%?

$$3\ Na_2S(aq) + 2\ FeCl_3(aq) \rightarrow Fe_2S_3(s) + 6\ NaCl(aq)$$

A) 50.9 mL
B) 86.0 mL
C) 102 mL
D) 203 mL
Answer: D
Topic: Section 3.8 Solution Stoichiometry

76) If 100. mL of 0.100 M Na_2SO_4 is added to 200. mL of 0.150 M NaCl, what is the concentration of Na^+ ions in the final solution? Assume that the volumes are additive.
A) 0.133 M
B) 0.167 M
C) 0.250 M
D) 0.350 M
Answer: B
Topic: Section 3.8 Solution Stoichiometry

77) How many milliliters of 0.550 M hydriodic acid are needed to react with 25.00 mL of 0.217 M CsOH?

$$HI(aq) + CsOH(aq) \rightarrow CsI(aq) + H_2O(l)$$

A) 0.0158 mL
B) 0.101 mL
C) 9.86 mL
D) 63.4 mL
Answer: C
Topic: Section 3.9 Titration

78) In an acid-base neutralization reaction 23.74 mL of 0.500 M potassium hydroxide reacts with 50.00 mL of sulfuric acid solution. What is the concentration of the H_2SO_4 solution?
A) 0.119 M
B) 0.237 M
C) 0.475 M
D) 2.11 M
Answer: A
Topic: Section 3.9 Titration

79) Balance the chemical equation given below, and determine the number of milliliters of 0.0300 M phosphoric acid required to neutralize 25.00 mL of 0.0150 M calcium hydroxide.

$$\_\_\_\_\_ \ Ca(OH)_2(aq) + \_\_\_\_\_ \ H_3PO_4(aq) \rightarrow \_\_\_\_\_ \ Ca_3(PO_4)_2(s) + \_\_\_\_\_ \ H_2O(l)$$

A) 1.69 mL
B) 8.33 mL
C) 12.5 mL
D) 18.8 mL
Answer: B
Topic: Section 3.9 Titration

80) When 200. mL of ç M hydrochloric acid is added to 125 mL of 1.75×10^{-4} M $Mg(OH)_2$, the resulting solution will be
A) acidic.
B) basic.
C) neutral.
D) It is impossible to tell from the information given.
Answer: B
Topic: Section 3.9 Titration

81) Which one of the following compounds contains the **smallest** percent oxygen by mass?
A) CO_2
B) N_2O_4
C) P_4O_{10}
D) SO_2
Answer: D
Topic: Section 3.10 Percent Composition and Empirical Formulas

82) Which one of the following contains 35% carbon by mass?
A) C_2H_2
B) CH_4
C) CH_3F
D) CO_2
Answer: C
Topic: Section 3.10 Percent Composition and Empirical Formulas

83) Which of the following statements is **false** concerning the formula of a compound?
A) The empirical formula is the simplest whole numbered ratio of atoms in a compound.
B) The molecular formula is the true ratio of atoms in a compound.
C) The molecular formula and empirical formula can be identical.
D) The number of atoms in a molecular formula is always greater than the number of atoms in an empirical formula.
Answer: D
Topic: Section 3.10 Percent Composition and Empirical Formulas

84) What is the empirical formula for ethyl fluoride if the compound contains 49.97% carbon, 10.51% hydrogen, and 39.52% fluorine by mass?
A) C_2H_5F
B) $C_4H_{10}F_2$
C) $C_4H_{10}F_4$
D) $C_{25}F_2$
Answer: A
Topic: Section 3.10 Percent Composition and Empirical Formulas

85) What is the empirical formula for perfluoropropane if the compound contains 81% fluorine and 19% carbon by mass?
A) CF_3
B) C_2F_8
C) C_3F_8
D) $C_{19}F_{81}$
Answer: C
Topic: Section 3.10 Percent Composition and Empirical Formulas

86) What is the empirical formula of a substance that contains 2.64 g of C, 0.444 g of H, and 3.52 g of O?
A) CH_2O
B) $C_2H_4O_2$
C) $C_2H_4O_3$
D) $C_3H_4O_4$
Answer: A
Topic: Section 3.10 Percent Composition and Empirical Formulas

87) Which one of the following is **not** an empirical formula?
A) CHO
B) CH_2O
C) C_2H_4O
D) $C_2H_4O_2$
Answer: D
Topic: Section 3.10 Percent Composition and Empirical Formulas

88) Which one of the following is an empirical formula?
A) C_2F_6
B) H_2SO_4
C) N_2H_4
D) P_4O_{10}
Answer: B
Topic: Section 3.10 Percent Composition and Empirical Formulas

89) A compound responsible for the odor of garlic has a molecular weight of 146 g/mol. A 0.650 g sample of the compound contains 0.321 g of carbon, 0.044 g of hydrogen, and 0.285 g of sulfur. What is the molecular formula of the compound?
A) CH_5S
B) C_3H_5S
C) $C_3H_{15}S_3$
D) $C_6H_{10}S_2$
Answer: D
Topic: Section 3.10 Percent Composition and Empirical Formulas

90) Which statement about elemental analysis by combustion is **not** correct?
A) Carbon is determined from the amount of CO_2 formed.
B) Hydrogen is determined from the amount of H_2O formed.
C) Oxygen is determined from the amount of H_2O formed.
D) Only carbon and hydrogen can be determined directly from CO_2 and H_2O.
Answer: C
Topic: Section 3.11 Determining Empirical Formulas: Elemental Analysis

91) In the combustion analysis of an unknown compound containing only carbon, hydrogen, and oxygen, the grams of oxygen are found from the grams of
A) CO_2 only.
B) H_2O only.
C) CO_2 and H_2O only.
D) CO_2, H_2O and unknown compound.
Answer: D
Topic: Section 3.11 Determining Empirical Formulas: Elemental Analysis

92) Combustion analysis of an unknown compound containing only carbon and hydrogen produced 4.554 g of CO_2 and 2.322 g of H_2O. What is the empirical formula of the compound?
A) CH_2
B) C_2H_5
C) C_4H_{10}
D) C_5H_2
Answer: B
Topic: Section 3.11 Determining Empirical Formulas: Elemental Analysis

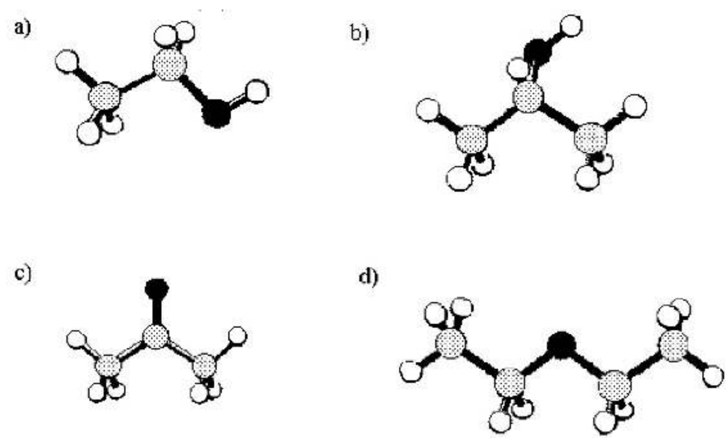
93) Combustion analysis of 2.400 g of an unknown compound containing carbon, hydrogen, and oxygen produced 4.171 g of CO_2 and 2.268 g of H_2O. What is the empirical formula of the compound?
A) C_2H_5O
B) $C_2H_5O_2$
C) $C_2H_{10}O_3$
D) $C_3H_8O_2$
Answer: D
Topic: Section 3.11 Determining Empirical Formulas: Elemental Analysis

94) Combustion analysis of a 0.675 g sample of an unknown compound that contains only carbon, hydrogen, and oxygen gives 0.627 g of CO_2 and 1.534 g of H_2O. The molecular mass of the unknown is
A) C_3H_6O.
B) $C_6H_{12}O_2$.
C) $C_9H_{18}O_3$.
D) unable to be determined from this data.
Answer: D
Topic: Section 3.11 Determining Empirical Formulas: Elemental Analysis

95) Isoeugenol is the compound which gives the characteristic odor to nutmeg and contains carbon, hydrogen, and oxygen. If a 0.500 g sample of isoeugenol is combusted it gives 1.341 g of CO_2 and 0.329 g of H_2O. Isoeugenol has a molecular weight of 164 g/mol. What is the molecular formula of isoeugenol?
A) C_2HO
B) C_5H_6O
C) $C_8H_4O_4$
D) $C_{10}H_{12}O_2$
Answer: D
Topic: Section 3.11 Determining Empirical Formulas: Elemental Analysis

96) Molecular mass can be determined by
A) combustion analysis.
B) mass spectrometry.
C) titration.
D) weighing with an analytical balance.
Answer: B
Topic: Section 3.12 Determining Molecular Masses: Mass Spectrometry

97) Which of the following statements about mass spectrometry is **false**?
A) Mass spectrometry can be used to determine the molecular weight of a compound.
B) The curvature of the path in a magnetic field is determined by the mass of the ion.
C) The paths of heavier ions are deflected more strongly than the paths of lighter ions.
D) The sample is changed into positively charged ions.
Answer: C
Topic: Section 3.12 Determining Molecular Masses: Mass Spectrometry



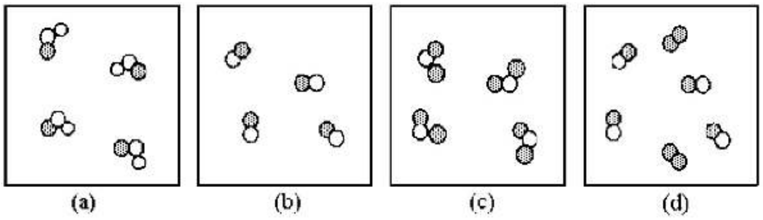
98) Acetone has the formula C_3H_6O. Which ball and stick model shown above represents acetone? [gray spheres = C, black spheres = O, unshaded spheres = H]
A) model a)
B) model b)
C) model c)
D) model d)
Answer: C
Topic: Conceptual Problems

99) Diethyl ether has the molecular formula $C_4H_{10}O$. Which ball and stick model shown above represents diethyl ether? [gray spheres = C, black spheres = O, unshaded spheres = H]
A) model a)
B) model b)
C) model c)
D) model d)
Answer: D
Topic: Conceptual Problems

100) Ethanol has the molecular formula C_2H_6O. Which ball and stick model shown above represents ethanol? [gray spheres = C, black spheres = O, unshaded spheres = H]
A) model a)
B) model b)
C) model c)
D) model d)
Answer: A
Topic: Conceptual Problems

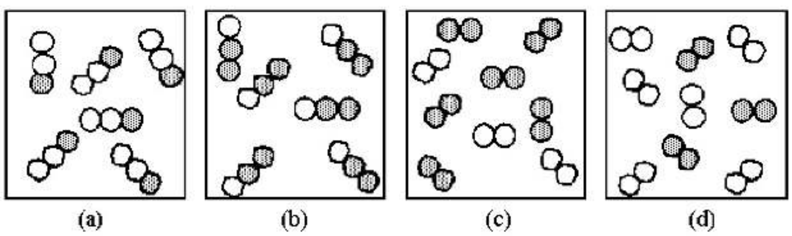
101) 2-Propanol has the molecular formula C_3H_8O. Which ball and stick model shown above represents 2-propanol? [gray spheres = C, black spheres = O, unshaded spheres = H]
A) model a)
B) model b)
C) model c)
D) model d)
Answer: B
Topic: Conceptual Problems

102) If unshaded spheres represent nitrogen atoms and shaded spheres represent oxygen atoms, which box represents reactants and which represents products for the reaction 2 $NO_2(g) \rightarrow$ 2 $NO(g) + O_2(g)$?



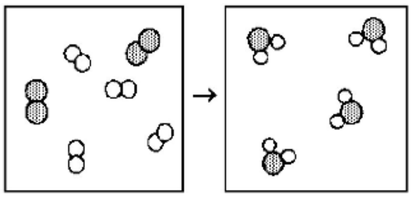
A) box (a) reactants and box (b) products
B) box (a) reactants and box (d) products
C) box (c) reactants and box (b) products
D) box (c) reactants and box (d) products
Answer: D
Topic: Conceptual Problems

103) If unshaded spheres represent nitrogen atoms and shaded spheres represent oxygen atoms, which box represents reactants and which represents products for the reaction 2 $N_2O(g) \rightarrow$ 2 $N_2(g) + O_2(g)$?



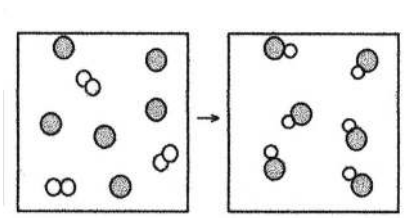
A) box (a) reactants and box (c) products
B) box (a) reactants and box (d) products
C) box (b) reactants and box (c) products
D) box (b) reactants and box (d) products
Answer: B
Topic: Conceptual Problems

104) What is the balanced chemical equation for the reaction of element A (unshaded spheres) with element B (shaded spheres) as represented below?



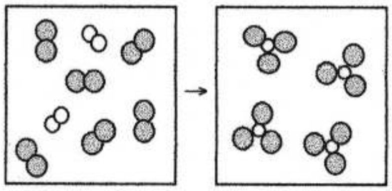
A) $A + B \rightarrow AB$
B) $4A + 2B \rightarrow 4AB$
C) $A_2 + B_2 \rightarrow A_2B$
D) $2A_2 + B_2 \rightarrow 2A_2B$
Answer: D
Topic: Conceptual Problems

105) What is the balanced chemical equation for the reaction of element A (unshaded spheres) with element B (shaded spheres) as represented below?



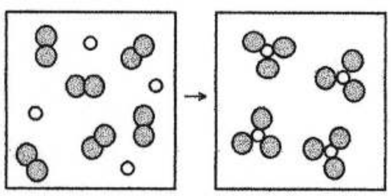
A) $A + B \rightarrow AB$
B) $A + 3B \rightarrow 3AB$
C) $A_2 + B \rightarrow AB$
D) $A_2 + 2B \rightarrow 2AB$
Answer: D
Topic: Conceptual Problems

106) What is the balanced chemical equation for the reaction of element A (unshaded spheres) with element B (shaded spheres) as represented below?



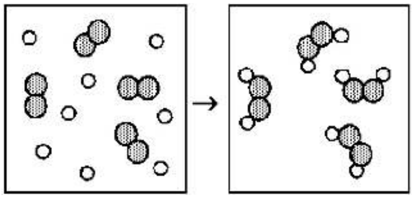
A) $A + B \rightarrow AB$
B) $A + 3B \rightarrow 2AB$
C) $A_2 + B_2 \rightarrow AB_3$
D) $A_2 + 3B_2 \rightarrow 2AB_3$
Answer: D
Topic: Conceptual Problems

107) What is the balanced chemical equation for the reaction of element A (unshaded spheres) with element B (shaded spheres) as represented below?



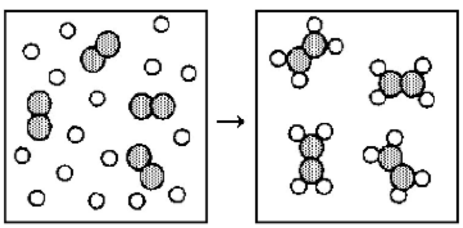
A) $A + B \rightarrow AB$
B) $2A + 3B \rightarrow 2AB$
C) $A + B_2 \rightarrow AB_3$
D) $2A + 3B_2 \rightarrow 2AB_3$
Answer: D
Topic: Conceptual Problems

108) Reaction of A (unshaded spheres) with B_2 (shaded spheres) is shown schematically in the following diagram. Which equation best describes the stoichiometry of the reaction?



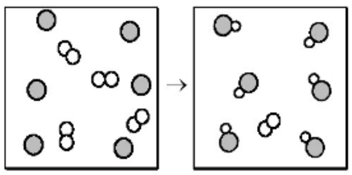
A) $A_2 + 2\ B \rightarrow A_2B_2$
B) $8\ A + 4\ B_2 \rightarrow 4\ A_2B_2$
C) $2\ A + B_2 \rightarrow A_2B_2$
D) $4\ A + 4\ B_2 \rightarrow 4\ A_2B_2$
Answer: C
Topic: Conceptual Problems

109) Reaction of A (unshaded spheres) with B_2 (shaded spheres) is shown schematically in the following diagram. Which equation best describes the stoichiometry of the reaction?



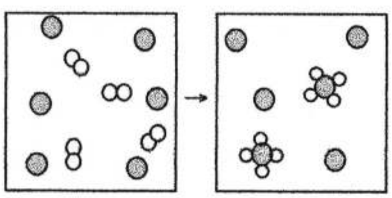
A) $4\ A + B_2 \rightarrow 8\ A_2B$
B) $4\ A + B_2 \rightarrow A_4B_2$
C) $16\ A + 4\ B_2 \rightarrow 8\ A_2B$
D) $16\ A + 4\ B_2 \rightarrow 4\ A_4B_2$
Answer: B
Topic: Conceptual Problems

110) The following diagram represents the reaction of A_2 (unshaded spheres) with B (shaded spheres). What is the balanced chemical equation for this reaction, and what is the limiting reactant?



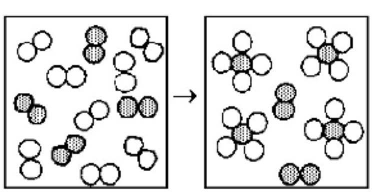
A) $A_2 + 2B \rightarrow 2AB$; A_2 is the limiting reactant.
B) $A_2 + 2B \rightarrow 2AB$; B is the limiting reactant.
C) $4A_2 + 6B \rightarrow 6AB$; A_2 is the limiting reactant.
D) $4A_2 + 6B \rightarrow 6AB$; B is the limiting reactant.
Answer: B
Topic: Conceptual Problems

111) The following diagram represents the reaction of A_2 (unshaded spheres) with B (shaded spheres). What is the balanced chemical equation for this reaction, and what is the limiting reactant?



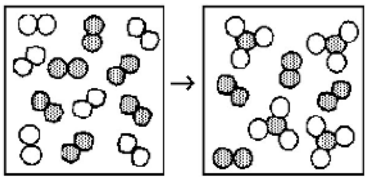
A) $2A_2 + B \rightarrow A_4B$; A_2 is the limiting reactant.
B) $2A_2 + B \rightarrow A_4B$; B is the limiting reactant.
C) $4A_2 + 6B \rightarrow 2A_4B$; A_2 is the limiting reactant.
D) $4A_2 + 6B \rightarrow 2A_4B$; B is the limiting reactant.
Answer: A
Topic: Conceptual Problems

112) The following diagrams represent the reaction of A_2 (shaded spheres) with B_2 (unshaded spheres). Identify the limiting reactant and write a balanced equation for the reaction.



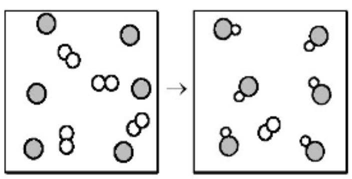
A) A_2 is the limiting reactant; $A + 4\,B \rightarrow AB_4$.
B) A_2 is the limiting reactant; $A_2 + 4\,B_2 \rightarrow 2\,AB_4$.
C) B_2 is the limiting reactant; $A + 4\,B \rightarrow AB_4$.
D) B_2 is the limiting reactant; $A_2 + 4\,B_2 \rightarrow 2\,AB_4$.
Answer: D
Topic: Conceptual Problems

113) The following diagrams represent the reaction of A_2 (shaded spheres) with B_2 (unshaded spheres). Identify the limiting reactant and write a balanced equation for the reaction.



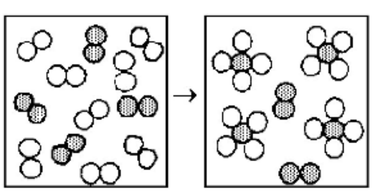
A) A_2 is the limiting reactant; $A + 3\ B \rightarrow AB_3$.
B) A_2 is the limiting reactant; $A_2 + 3\ B_2 \rightarrow 2\ AB_3$.
C) B_2 is the limiting reactant; $A + 3\ B \rightarrow AB_3$.
D) B_2 is the limiting reactant; $A_2 + 3\ B_2 \rightarrow 2\ AB_3$.
Answer: D
Topic: Conceptual Problems

114) The following diagram represents the reaction of A_2 (unshaded spheres) with B (shaded spheres). How many moles of product can be produced from the reaction of 1.0 mol of A_2 and 1.0 mol of B?



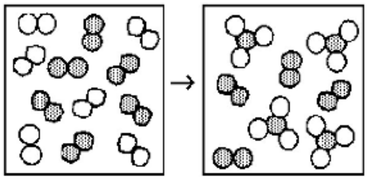
A) 0.5 mol of product
B) 1.0 mol of product
C) 3.0 mol of product
D) 6.0 mol of product
Answer: B
Topic: Conceptual Problems

115) The following diagram represents the reaction of A_2 (unshaded spheres) with B_2 (shaded spheres). How many moles of product can be produced from the reaction of 1.0 mol of A_2 and 1.0 mol of B_2?



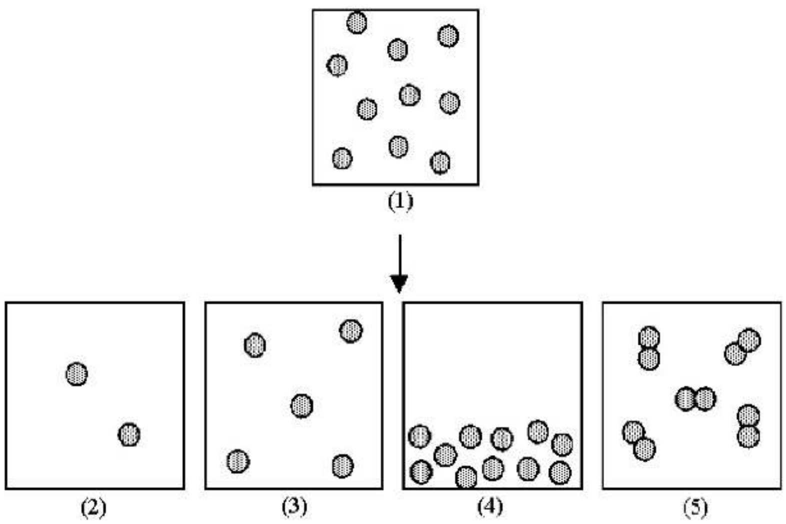
A) 0.5 mol of product
B) 1.0 mol of product
C) 2.0 mol of product
D) 4.0 mol of product
Answer: A
Topic: Conceptual Problems

116) The following diagrams represent the reaction of A_2 (shaded spheres) with B_2 (unshaded spheres). How many moles of product can be made from 1.0 mol of A_2 and 1.0 mol of B_2?



A) 0.67 mol product
B) 1.0 mol product
C) 2.0 mol product
D) 3.0 mol product
Answer: A
Topic: Conceptual Problems

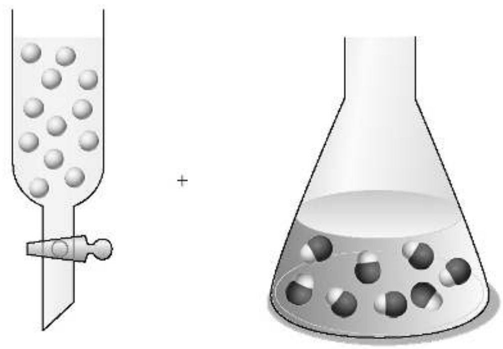
Box (1) represents 1.0 mL of a solution of particles at a given concentration.



117) Which of the boxes (2)-(5) represents 1.0 mL of the solution that results after (1) has been diluted by adding enough solvent to make 2.0 mL of solution?
A) box (2)
B) box (3)
C) box (4)
D) box (5)
Answer: B
Topic: Conceptual Problems

118) Which of the boxes (2)-(5) represents 1.0 mL of the solution that results after (1) has been diluted by adding enough solvent to make 5.0 mL of solution?
A) box (2)
B) box (3)
C) box (4)
D) box (5)
Answer: A
Topic: Conceptual Problems

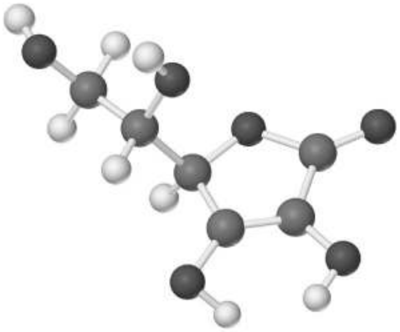
Assume that the unshaded spheres in the buret represent H^+ ions, the shaded spheres in the flask represent OH^- ions, and you are carrying out a titration of the base with the acid.



119) If the volumes in the buret and the flask are identical and the concentration of the acid in the buret is 0.250 M, what is the concentration of the base in the flask?
A) 0.167 M
B) 0.250 M
C) 0.375 M
D) 0.667 M
Answer: A
Topic: Conceptual Problems

120) If the volumes in the buret and the flask are identical and the concentration of the acid in the buret is 0.500 M, what is the concentration of the base in the flask?
A) 0.333 M
B) 0.500 M
C) 0.667 M
D) 0.750 M
Answer: A
Topic: Conceptual Problems

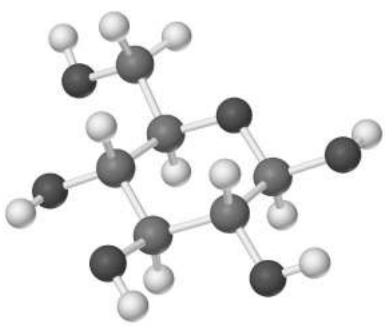
121) Ascorbic acid, $C_6H_8O_6$, can be represented by the molecular model shown below. If 1.00 mol of ascorbic acid is submitted to combustion analysis, how many moles of CO_2 and how many moles of H_2O would be formed?



Ascorbic acid

A) 3.00 mol CO_2 and 2.00 mol H_2O
B) 6.00 mol CO_2 and 4.00 mol H_2O
C) 6.00 mol CO_2 and 8.00 mol H_2O
D) 12.0 mol CO_2 and 10.0 mol H_2O
Answer: B
Topic: Conceptual Problems

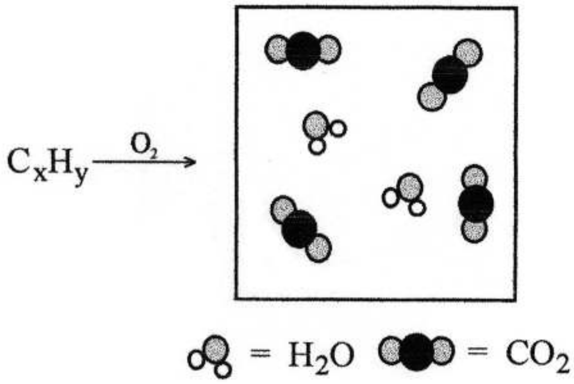
122) Glucose, $C_6H_{12}O_6$, can be represented by the molecular model shown below. If 1.00 mol of glucose is submitted to combustion analysis, how many moles of CO_2 and how many moles of H_2O would be formed?



Glucose

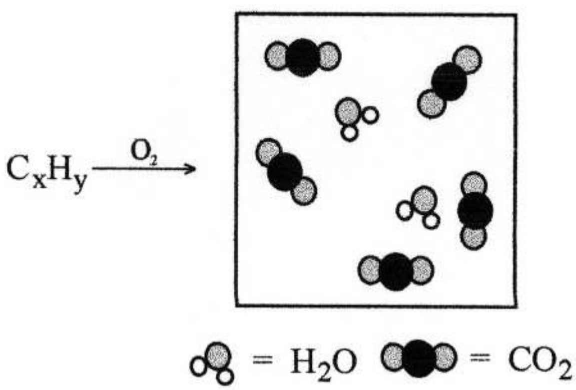
A) 1.00 mol CO_2 and 2.00 mol H_2O
B) 6.00 mol CO_2 and 6.00 mol H_2O
C) 6.00 mol CO_2 and 12.0 mol H_2O
D) 12.0 mol CO_2 and 12.0 mol H_2O
Answer: B
Topic: Conceptual Problems

123) A hydrocarbon of unknown formula C_xH_y was submitted to combustion analysis with the following results. What is the empirical formula of the hydrocarbon?



A) CH
B) C_2H
C) C_2H_4
D) C_4H_4
Answer: A
Topic: Conceptual Problems

124) A hydrocarbon of unknown formula C_xH_y was submitted to combustion analysis with the following results. What is the empirical formula of the hydrocarbon?



A) C_5H_2
B) C_5H_4
C) $C_{10}H_4$
D) $C_{10}H_8$
Answer: B
Topic: Conceptual Problems

3.2 Algorithmic Questions

1) What is the stoichiometric coefficient for oxygen when the following equation is balanced using the lowest whole-number coefficients?
_____ C_2H_6O (l) + _____ O_2(g) → _____ CO_2(g) + _____ H_2O(l)
A) 9
B) 7
C) 5
D) 3
Answer: D
Topic: Section 3.1 Balancing Chemical Equations

2) Aluminum metal reacts with aqueous iron(II) chloride to form aqueous aluminum chloride and iron metal. What is the stoichiometric coefficient for aluminum when the chemical equation is balanced using the lowest whole-number stoichiometric coefficients?
A) 1
B) 2
C) 3
D) 4
Answer: B
Topic: Section 3.1 Balancing Chemical Equations

3) Calcium phosphate reacts with sulfuric acid to form calcium sulfate and phosphoric acid. What is the coefficient for sulfuric acid when the equation is balanced using the lowest whole-numbered coefficients?
A) 1
B) 2
C) 3
D) none of these
Answer: C
Topic: Section 3.1 Balancing Chemical Equations

4) What is the molar mass of fluorine gas?
A) 19.0 g/mol
B) 38.0 g/mol
C) 6.02×10^{23} g/mol
D) 1.20×10^{23} g/mol
Answer: B
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

5) What is the mass of a single fluorine molecule, F_2?
A) 3.155×10^{-23} g
B) 6.310×10^{-23} g
C) 19.00 g
D) 38.00 g
Answer: B
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

6) What is the mass of 0.500 mol of dichlorodifluoro methane, C Cl_2F_2?
A) 4.14×10^{-3} g
B) 60.5 g
C) 121 g
D) 242 g
Answer: B
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

7) How many moles are there in 3.00 g of ethanol, CH_3CH_2OH?
A) 0. 00725 mol
B) 0. 0652 mol
C) 15.3 mol
D) 138 mol
Answer: B
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

8) How many Fe(II) ions are there in 20.0 g of $FeSO_4$?
A) 2.19×10^{-25} iron(II) ions
B) 7.92×10^{22} iron(II) ions
C) 4.57×10^{24} iron(II) ions
D) 1.82×10^{27} iron(II) ions
Answer: B
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

9) What is the mass of 8.50×10^{22} molecules of NH_3?
A) 0.00 829 g
B) 0. 417 g
C) 2. 40 g
D) 121 g
Answer: C
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

10) How many oxygen atoms are there in 7.00 g of sodium dichromate, $Na_2Cr_2O_7$?
A) 0. 187 oxygen atoms
B) 2.30×10^{21} oxygen atoms
C) 1.60×10^{22} oxygen atoms
D) 1.13×10^{23} oxygen atoms
Answer: D
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

11) How many chloride ions are there in 4.50 mol of aluminum chloride?
A) 3.00 chloride ions
B) 13.5 chloride ions
C) 2.71×10^{24} chloride ions
D) 8.13×10^{24} chloride ions
Answer: D
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

12) What is the molar mass of 1-butene if 5.38×10^{16} molecules of 1-butene weigh 5.00 μg?
A) 56.0 g/mol
B) 178 g/mol
C) 224 g/mol
D) 447 g/mol
Answer: A
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

13) What mass of carbon dioxide, CO_2, contains the same number of molecules as 3.00 g of trichlorofluoromethane, CCl_3F?
A) 0.106 g
B) 0.961 g
C) 1.04 g
D) 9.37 g
Answer: B
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

14) What mass of phosphorus pentafluoride, PF_5, has the same number of fluorine atoms as 25.0 g of oxygen difluoride, OF_2?
A) 0.933 g
B) 10.0 g
C) 23.3 g
D) 146 g
Answer: C
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

15) How many anions are there in 2.50 g of $MgBr_2$?
A) 8.18×10^{21} anions
B) 1.64×10^{22} anions
C) 4.43×10^{25} anions
D) 8.87×10^{25} anions
Answer: B
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

16) How many cations are there in 10.0 g of sodium phosphate?
A) 3.67×10^{22} cations
B) 1.10×10^{23} cations
C) 9.87×10^{24} cations
D) 2.96×10^{25} cations
Answer: B
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

17) Which of the following has the greatest mass?
A) 3.88×10^{22} molecules of O_2
B) 1.00 g of O_2
C) 0. 0312 mol of O_2
D) All of these have the same mass.
Answer: A
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

18) Which of the following has the **smallest** mass?
A) 3.50×10^{23} molecules of I_2
B) 85.0 g of Cl_2
C) 2.50 mol of F_2
D) 0. 050 kg of Br_2
Answer: D
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

19) How many moles of CuO can be produced from 0.900 mol of Cu_2O in the following reaction?
$2\ Cu_2O(s) + O_2(g) \rightarrow 4\ CuO(s)$
A) 0.450 mol
B) 0.900 mol
C) 1.80 mol
D) 3.60 mol
Answer: C
Topic: Section 3.4 Yields of Chemical Reactions

20) How many moles of BCl_3 are needed to produce 10.0 g of HCl(*aq*) in the following reaction?
$$BCl_3(g) + 3\ H_2O(l) \rightarrow 3\ HCl(aq) + B(OH)_3(aq)$$
A) 0. 0914 mol
B) 0. 274 mol
C) 0.823 mol
D) 10.9 mol
Answer: A
Topic: Section 3.4 Yields of Chemical Reactions

21) How many grams of calcium chloride are needed to produce 1.50 g of potassium chloride?
$$CaCl_2(aq) + K_2CO_3(aq) \rightarrow 2\ KCl(aq) + CaCO_3(aq)$$
A) 0.896 g
B) 1.12 g
C) 2.23 g
D) 4.47 g
Answer: B
Topic: Section 3.4 Yields of Chemical Reactions

22) Balance the chemical equation given below, and determine the number of moles of iodine that reacts with 30.0 g of aluminum.

$$\_\_\_\_\_ \ Al(s) + \_\_\_\_\_ \ I_2(s) \rightarrow \_\_\_\_\_ \ Al_2I_6(s)$$

A) 0.741 mol
B) 1.67 mol
C) 2.22 mol
D) 3.33 mol
Answer: B
Topic: Section 3.4 Yields of Chemical Reactions

23) Balance the chemical equation given below, and determine the number of grams of MgO are needed to produce 10.0 g of Fe_2O_3.

$$\_\_\_\_\_ \ MgO(s) + \_\_\_\_\_ \ Fe(s) \rightarrow \_\_\_\_\_ \ Fe_2O_3(s) + \_\_\_\_\_ \ Mg(s)$$

A) 0.312 g
B) 0.841 g
C) 2.52 g
D) 7.57 g
Answer: D
Topic: Section 3.4 Yields of Chemical Reactions

24) Dinitrogen monoxide gas decomposes to form nitrogen gas and oxygen gas. How many grams of oxygen are formed when 10.0 g of dinitrogen monoxide decomposes?
A) 0. 275 g
B) 3.64 g
C) 7.27 g
D) 14.5 g
Answer: B
Topic: Section 3.4 Yields of Chemical Reactions

25) If the density of ethanol, C_2H_5OH, is 0.789 g/mL. How many milliliters of ethanol are needed to produce 15.0 g of CO_2 according to the following chemical equation?

$$C_2H_5OH(l) + 3\ O_2(g) \rightarrow 2\ CO_2(g) + 3\ H_2O(l)$$

A) 6.19 mL
B) 9.95 mL
C) 19.9 mL
D) 39.8 mL
Answer: B
Topic: Section 3.4 Yields of Chemical Reactions

26) When 11.0 g of calcium metal is reacted with water, 5.00 g of calcium hydroxide is produced. Using the following balanced equation, calculate the percent yield for the reaction?

$$Ca(s) + 2\ H_2O(l) \rightarrow Ca(OH)_2(aq) + H_2(g)$$

A) 12.3%
B) 24.6%
C) 45.5%
D) 84.0%
Answer: B
Topic: Section 3.4 Yields of Chemical Reactions

27) If the percent yield for the following reaction is 65.0%, how many grams of $KClO_3$ are needed to produce 32.0 g of O_2?

$$2\ KClO_3(s) \rightarrow 2\ KCl(s) + 3\ O_2(g)$$

A) 53.1 g
B) 81.7 g
C) 126 g
D) 283 g
Answer: C
Topic: Section 3.4 Yields of Chemical Reactions

28) If the percent yield for the following reaction is 75.0%, and 45.0 g of NO_2 are consumed in the reaction, how many grams of nitric acid, $HNO_3(aq)$ are produced?

$$3\ NO_2(g) + H_2O(l) \rightarrow 2\ HNO_3(aq) + NO(g)$$

A) 30.8 g
B) 41.1 g
C) 54.8 g
D) 69.3 g
Answer: A
Topic: Section 3.4 Yields of Chemical Reactions

29) 7.0 g of nitrogen is reacted with 5.0 g of hydrogen to produce ammonia according to the chemical equation shown below. Which one of the following statements is **false**?

$$N_2(g) + 3\ H_2(g) \rightarrow 2\ NH_3(g)$$

A) 3.5 g of hydrogen are left over.
B) Hydrogen is the excess reactant.
C) Nitrogen is the limiting reactant.
D) The theoretical yield of ammonia is 15 g.
Answer: D
Topic: Section 3.5 Reactions with Limiting Amounts of Reactants

30) 5.0 g of iron is reacted with 5.0 g of water according to the chemical equation shown below. Which one of the following statements is **false**?

$$3\ Fe(s) + 4\ H_2O(l) \rightarrow Fe_3O_4(s) + 4\ H_2(g)$$

A) 6.91 g of Fe_3O_4 are produced.
B) 2.85 g of H_2O are left over.
C) Mass is conserved in this reaction.
D) Water is the limiting reactant.
Answer: D
Topic: Section 3.5 Reactions with Limiting Amounts of Reactants

31) Which substance is the limiting reactant when 2.0 g of sulfur reacts with 3.0 g of oxygen and 4.0 g of sodium hydroxide according to the following chemical equation:

$$2\ S(s) + 3\ O_2(g) + 4\ NaOH(aq) \rightarrow 2\ Na_2SO_4(aq) + 2\ H_2O(l)$$

A) $S(s)$
B) $O_2(g)$
C) $NaOH(aq)$
D) None of these substances is the limiting reactant.
Answer: C
Topic: Section 3.5 Reactions with Limiting Amounts of Reactants

32) When 7.00×10^{22} molecules of ammonia react with 6.00×10^{22} molecules of oxygen according to the chemical equation shown below, how many grams of nitrogen gas are produced?

$$4\ NH_3(g) + 3\ O_2(g) \rightarrow 2\ N_2(g) + 6\ H_2O(g)$$

A) 1.63 g
B) 1.86 g
C) 4.19 g
D) 6.51 g
Answer: A
Topic: Section 3.5 Reactions with Limiting Amounts of Reactants

33) When silver nitrate reacts with barium chloride, silver chloride and barium nitrate are formed. How many grams of silver chloride are formed when 10.0 g of silver nitrate reacts with 15.0 g of barium chloride?
A) 8.44 g
B) 9.40 g
C) 11.9 g
D) 18.8 g
Answer: A
Topic: Section 3.5 Reactions with Limiting Amounts of Reactants

34) Balance the chemical equation given below, and calculate the volume of nitrogen monoxide gas produced when 8.00 g of ammonia is reacted with 12.0 g of oxygen at 25°C? The density of nitrogen monoxide at 25°C is 1.23 g/L.

$$\_\_\_\_\_\ NH_3(g) + \_\_\_\_\_\ O_2(g) \rightarrow \_\_\_\_\_\ NO(g) + \_\_\_\_\_\ H_2O(l)$$

A) 7.32 L
B) 11.1 L
C) 11.5 L
D) 17.3 L
Answer: A
Topic: Section 3.5 Reactions with Limiting Amounts of Reactants

35) What is the concentration of $FeCl_3$ in a solution prepared by dissolving 20.0 g of $FeCl_3$ in enough water to make 275 mL of solution?
A) 4.48×10^{-4} M
B) 0. 448 M
C) 2.23 M
D) 2.23×10^{3} M
Answer: B
Topic: Section 3.6 Concentrations of Reactants in Solution: Molarity

36) How many grams of $AgNO_3$ are needed to make 250. mL of a solution that is 0. 135 M?
A) 0.0917 g
B) 0.174 g
C) 5.73 g
D) 91.7 g
Answer: C
Topic: Section 3.6 Concentrations of Reactants in Solution: Molarity

37) What volume of a 0.540 M NaOH solution contains 11.5 g of NaOH?
A) 0. 155 L
B) 0. 532 L
C) 1. 88 L
D) 6.44 L
Answer: B
Topic: Section 3.6 Concentrations of Reactants in Solution: Molarity

38) What is the concentration of NO_3^- ions in a solution prepared by dissolving 25.0 g of $Ca(NO_3)_2$ in enough water to produce 300. mL of solution?
A) 0. 254 M
B) 0. 508 M
C) 0. 672 M
D) 1.02 M
Answer: D
Topic: Section 3.6 Concentrations of Reactants in Solution: Molarity

39) If the reaction of phosphate ion with water is ignored, what is the **total** concentration of ions in a solution prepared by dissolving 3.00 g of K_3PO_4 in enough water to make 350. mL of solution?
A) 0.0 101 M
B) 0. 0404 M
C) 0. 162 M
D) 0. 323 M
Answer: B
Topic: Section 3.6 Concentrations of Reactants in Solution: Molarity

40) What is the concentration of an $AlCl_3$ solution if 150. mL of the solution contains 450. mg of Cl^- ion?
A) 2.82×10^{-2} M
B) 6.75×10^{-2} M
C) 8.46×10^{-2} M
D) 2.54×10^{-1} M
Answer: A
Topic: Section 3.6 Concentrations of Reactants in Solution: Molarity

41) What is the concentration of HCl in the **final** solution when 65 mL of a 12 M HCl solution is diluted with pure water to a total volume of 0.15 L?
A) 2.8×10^{-2} M
B) 5.2 M
C) 28 M
D) 5.2×10^{3} M
Answer: B
Topic: Section 3.7 Diluting Concentrated Solutions

42) How many milliliters of a 9.0 M H_2SO_4 solution are needed to make 0. 35 L of a 3.5 M solution?
A) 0. 14 mL
B) 0.90 mL
C) 140 mL
D) 900 mL
Answer: C
Topic: Section 3.7 Diluting Concentrated Solutions

43) A $FeCl_3$ solution is 0.175 M. How many mL of a 0.175 M $FeCl_3$ solution are needed to make 450. mL of a solution that is 0.300 M in Cl^- ion?
A) 0.771 mL
B) 257 mL
C) 771 mL
D) It is not possible to make a more concentrated solution from a less concentrated solution.
Answer: B
Topic: Section 3.7 Diluting Concentrated Solutions

44) A student dissolved 4.00 g of $Co(NO_3)_2$ in enough water to make 100. mL of stock solution. He took 4.00 mL of the stock solution and then diluted it with water to give 275. mL of a final solution. How many grams of NO_3^- ion are there in the final solution?
A) 0.0 197 g
B) 0.0 394 g
C) 0.0 542 g
D) 0. 108 g
Answer: D
Topic: Section 3.7 Diluting Concentrated Solutions

45) A student prepared a stock solution by dissolving 10.0 g of KOH in enough water to make 150. mL of solution. She then took 15.0 mL of the stock solution and diluted it with enough water to make water to make 65.0 mL of a final solution. What is the concentration of KOH for the final solution?
A) 0. 274 M
B) 0. 356 M
C) 2.81 M
D) 3.65 M
Answer: A
Topic: Section 3.7 Diluting Concentrated Solutions

46) How many milliliters of 0.260 M Na_2S are needed to react with 40.00 mL of 0.315 M $AgNO_3$?

$$Na_2S(aq) + 2\ AgNO_3(aq) \rightarrow 2\ NaNO_3(aq) + Ag_2S(s)$$

A) 24.2 mL
B) 48.5 mL
C) 66.0 mL
D) 96.9 mL
Answer: A
Topic: Section 3.8 Solution Stoichiometry

47) How many grams of $CaCl_2$ are formed when 15.00 mL of 0.00237 M $Ca(OH)_2$ reacts with excess Cl_2 gas?

$$2\ Ca(OH)_2(aq) + 2\ Cl_2(g) \rightarrow Ca(OCl)_2(aq) + CaCl_2(s) + 2\ H_2O(l)$$

A) 0.00 197 g
B) 0.00 394 g
C) 0.0 0789 g
D) 0.0 507 g
Answer: A
Topic: Section 3.8 Solution Stoichiometry

48) When 31.2 mL of 0.500 M $AgNO_3$ is added to 25.0 mL of 0.300 M NH_4Cl, how many grams of AgCl are formed?

$$AgNO_3(aq) + NH_4Cl(aq) \rightarrow AgCl(s) + NH_4NO_3(aq)$$

A) 1.07 g
B) 2.24 g
C) 3.31 g
D) 6.44 g
Answer: A
Topic: Section 3.8 Solution Stoichiometry

49) How many milliliters of 0.200 M $FeCl_3$ are needed to react with an excess of Na_2S to produce 1.38 g of Fe_2S_3 if the percent yield for the reaction is 65.0%?

$$3\ Na_2S(aq) + 2\ FeCl_3(aq) \rightarrow Fe_2S_3(s) + 6\ NaCl(aq)$$

A) 25.5 mL
B) 43.1 mL
C) 51.1 mL
D) 102 mL
Answer: D
Topic: Section 3.8 Solution Stoichiometry

50) If 100. mL of 0.400 M Na_2SO_4 is added to 200. mL of 0.600 M NaCl, what is the concentration of Na^+ ions in the final solution? Assume that the volumes are additive.
A) 0.534 M
B) 0.667 M
C) 1.00 M
D) 1.40 M
Answer: B
Topic: Section 3.8 Solution Stoichiometry

51) How many milliliters of 0.550 M hydriodic acid are needed to react with 15.00 mL of 0.217 M CsOH?
$HI(aq) + CsOH(aq) \rightarrow CsI(aq) + H_2O(l)$
A) 0. 0263 mL
B) 0.169 mL
C) 5.92 mL
D) 38.0 mL
Answer: C
Topic: Section 3.9 Titration

52) In an acid-base neutralization reaction 38.74 mL of 0.500 M potassium hydroxide reacts with 50.00 mL of sulfuric acid solution. What is the concentration of the H_2SO_4 solution?
A) 0. 194 M
B) 0. 387 M
C) 0. 775 M
D) 1.29 M
Answer: A
Topic: Section 3.9 Titration

53) Balance the chemical equation given below, and determine the number of milliliters of 0.00300 M phosphoric acid required to neutralize 45.00 mL of 0.00150 M calcium hydroxide.

$$\_\_\_\_\_\ Ca(OH)_2(aq) + \_\_\_\_\_\ H_3PO_4(aq) \rightarrow \_\_\_\_\_\ Ca_3(PO_4)_2(aq) + \_\_\_\_\_\ H_2O(l)$$

A) 3.04 mL
B) 15.0 mL
C) 22.5 mL
D) 33.8 mL
Answer: B
Topic: Section 3.9 Titration

54) When 280. mL of 1.50×10^{-4} M hydrochloric acid is added to 125 mL of 1.75×10^{-4} M $Mg(OH)_2$, the resulting solution will be
A) acidic.
B) basic
C) neutral.
D) It is impossible to tell from the information given.
Answer: B
Topic: Section 3.9 Titration

55) Which one of the following contains 39% carbon by mass?
A) C_2H_2
B) CH_4
C) CH_3NH_2
D) CO_2
Answer: C
Topic: Section 3.10 Percent Composition and Empirical Formulas

56) What is the empirical formula of a substance that contains 2.64 g of C, 0.444 g of H, and 3.52 g of O?
A) CH_2O
B) $C_2H_4O_2$
C) $C_2H_4O_3$
D) $C_3H_4O_4$
Answer: A
Topic: Section 3.10 Percent Composition and Empirical Formulas

57) Which one of the following is **not** an empirical formula?
A) CHO
B) CH_2O
C) C_2H_4O
D) $C_2H_4O_2$
Answer: D
Topic: Section 3.10 Percent Composition and Empirical Formulas

58) Combustion analysis of an unknown compound containing only carbon and hydrogen produced 0.2845 g of CO_2 and 0.1451 g of H_2O. What is the empirical formula of the compound?
A) CH_2
B) C_4H_5
C) C_4H_{10}
D) C_5H_2
Answer: B
Topic: Section 3.11 Determining Empirical Formulas: Elemental Analysis

59) Combustion analysis of 1.200 g of an unknown compound containing carbon, hydrogen, and oxygen produced 2.086 g of CO_2 and 1.134 g of H_2O. What is the empirical formula of the compound?
A) C_2H_5O
B) $C_2H_5O_2$
C) $C_2H_{10}O_3$
D) $C_3H_8O_2$
Answer: D
Topic: Section 3.11 Determining Empirical Formulas: Elemental Analysis

3.3 Short Answer Questions

1) A balanced equation has the same numbers and kinds of ________ on both sides of the reaction arrow.
Answer: atoms
Topic: Section 3.1 Balancing Chemical Equations

2) When the reaction $C_4H_{10} + O_2 \rightarrow CO_2 + H_2O$ is balanced using the smallest whole number coefficients, the coefficient in front of O_2 is ________.
Answer: 13
Topic: Section 3.1 Balancing Chemical Equations

3) When the reaction $C_3H_8 + O_2 \rightarrow CO_2 + H_2O$ is balanced, the total number of oxygen atoms in the balanced equation is ________.
Answer: 40
Topic: Section 3.1 Balancing Chemical Equations

4) The fundamental SI unit for measuring matter is the ________.
Answer: mole
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

5) To the nearest whole number, the molar mass of $Cu(NO_3)_2$ is ________ g/mol.
Answer: 188
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

6) The number of grams in 0.333 mol of urea, $(NH_2)_2CO$, is ________.
Answer: 20.0 g
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

7) How many moles are in 7.8 g of acetamide, CH_3CONH_2?
Answer: 0.13
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

8) The balanced equation for the gaseous state oxidation of ammonia is shown below.

$$4\ NH_3 + 5\ O_2 \rightarrow 4\ NO + 6\ H_2O$$

How many moles of O_2 are required to react with 1.2 mole of NH_3?
Answer: 1.5 mol
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

9) The balanced equation for the reaction of acetylene, C_2H_2, and oxygen in an acetylene torch is

$$2\ C_2H_2 + 5\ O_2 \rightarrow 4\ CO_2 + 2\ H_2O.$$

In this reaction the number of grams of oxygen required to react with 0.13 g of acetylene is ________.
Answer: 0.40 g
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

10) Ozone is unstable, decomposing to dioxygen, as shown in the balanced equation

$$2\ O_3 \rightarrow 3\ O_2.$$

In this reaction, how many grams of dioxygen can be formed from the decomposition of 96 grams of ozone?
Answer: 96 g
Topic: Section 3.3 Chemical Arithmetic: Stoichiometry

11) The balanced equation for the decomposition of water is shown below.

$$2\ H_2O \rightarrow 2\ H_2 + O_2$$

If 0.72 g of water react completely in this reaction, what is the theoretical yield of H_2?
Answer: 0.080 g
Topic: Section 3.4 Yields of Chemical Reactions

12) Oxygen can be produced from the catalytic decomposition of $KClO_3$ as shown in the balanced equation below.

$$2\ KClO_3 \rightarrow 2\ KCl + 3\ O_2$$

What is the percent yield if 3.20 grams of oxygen are formed from the reaction of 12.3 grams of $KClO_3$?
Answer: 66.4%
Topic: Section 3.4 Yields of Chemical Reactions

13) If 4.0 g of H_2 react with 4.0 g of F_2 in the reaction shown below, what is the limiting reactant?

$$H_2 + F_2 \rightarrow 2\ HF$$

Answer: F_2
Topic: Section 3.5 Reactions with Limiting Amounts of Reactants

14) Ozone reacts with iodide ion as shown in the balanced equation below.

$$O_3 + 2\ I^- + H_2O \rightarrow O_2 + I_2 + 2\ OH^-$$

In this reaction, how many grams of dioxygen can be formed from the reaction of 96 grams of ozone?
Answer: 64 g
Topic: Section 3.5 Reactions with Limiting Amounts of Reactants

15) When carbon dioxide dissolves in water, H+ is formed, which makes the solution acidic, as shown in the balanced equation below.

$$CO_2 + H_2O \rightarrow HCO_3^- + H^+$$

What is the percent yield if 0.0088 g of CO_2 reacts with 900 g of H_2O to form 0.000108 g of H^+?
Answer: 50%
Topic: Section 3.5 Reactions with Limiting Amounts of Reactants

16) Hydrazine, N_2H_4, is used as a rocket fuel. In the reaction below, if 80.1 g of N_2H_4 and 92.0 g of N_2O_4 are allowed to react, which is the limiting reactant, and how many grams of excess reactant remain at the end of the reaction?

$$2\ N_2H_4 + N_2O_4 \rightarrow 3\ N_2 + 4\ H_2O$$

Answer: limiting reactant is N_2O_4, 16.0 g N_2H_4 remain
Topic: Section 3.5 Reactions with Limiting Amounts of Reactants

17) What is the molarity of a solution prepared by dissolving 0.80 g of NaOH in enough water to make 250 mL of solution?
Answer: 0.080 M
Topic: Section 3.6 Concentrations of Reactants in Solution: Molarity

18) The number of moles of $CaCl_2$ in 25.0 mL of 0.222 M $CaCl_2$ is ________.
Answer: 0.00555 mol
Topic: Section 3.6 Concentrations of Reactants in Solution: Molarity

19) The number of grams of NaCl required to prepare 500 mL of 0.100 M NaCl is ________.
Answer: 2.92 g
Topic: Section 3.6 Concentrations of Reactants in Solution: Molarity

20) The number of milliliters of 12.0 M HCl required to prepare 250 mL of 0.500 M HCl is ________.
Answer: 10.4 mL
Topic: Section 3.6 Concentrations of Reactants in Solution: Molarity

21) What is the molarity of a solution prepared by diluting 25 mL of 2.0 M HCl with enough water to make 250 mL of solution?
Answer: 0.20 M
Topic: Section 3.7 Diluting Concentrated Solutions

22) The number of milliliters of 0.250 M HCl required to react with 50.00 mL of 0.450 M KOH in the reaction shown below is ________.

$$HCl + KOH \rightarrow H_2O + KCl$$

Answer: 90.0 mL
Topic: Section 3.8 Solution Stoichiometry

23) What is the empirical formula of benzene, C_6H_6?
Answer: CH
Topic: Section 3.10 Percent Composition and Empirical Formulas

24) The empirical formula of a compound that contains 82.66% carbon and 17.34% hydrogen is ________.
Answer: C_2H_5
Topic: Section 3.10 Percent Composition and Empirical Formulas

25) Analysis of a 1.000-g sample of the oral hypoglycemic agent metformin™ yielded 0.3720 g of carbon, 0.0858 g of hydrogen, and 0.5422 g of nitrogen. Metformin™ has a molar mass of 129.16 g/mol. What is the molar mass of Metformin™?
Answer: $C_4H_{11}N_5$
Topic: Section 3.11 Determining Empirical Formulas: Elemental Analysis