1. What conservation law is stoichiometry based upon – conservation of mass or conservation of energy?
2. Is the mass of the products greater than, less than, or equal to the mass of the reactants?
3. What is conserved in a chemical reaction – mass, molecules, moles, liters, or atoms?
4. Balance the equation and write the mole ratio of CH₄ to O₂: CH₄ + O₂ → CO₂ + H₂O
5. How many moles of carbon dioxide is produced when 4.56 mol of propane (C₃H₈) is burned in excess of oxygen?

   C₃H₈ + 5O₂ → 3CO₂ + 4H₂O

6. How many grams of water are produced when 8.93 mol of oxygen reacts with hydrogen?

   2H₂ + O₂ → 2H₂O

7. What is the mass of potassium chloride when 2.34 g of potassium reacts with excess chlorine gas?

   2K + Cl₂ → 2KCl

8. How many moles of H₃PO₄ are produced when 92.0 g P₂O₁₀ reacts completely to form H₃PO₄?

   P₂O₁₀(s) + 6H₂O(l) → 4H₃PO₄(aq)

9. What is the maximum number of grams of PH₃ that can be formed when 3.5 g of phosphorus (P₄) reacts with 2.0 g of hydrogen to form PH₃?

   P₄(g) + 6H₂(g) → 4 PH₃(g)

10. Why is a gas easier to compress than a liquid?
11. Why does the pressure inside a container of gas increase if more gas is added to the container?
12. If the volume of a container of gas is reduced, what will happen to the pressure inside the container?
13. What happens to the temperature of a gas when it is compressed?
14. What happens to the kinetic energy as the temperature of the gas in a balloon decreases?
15. What happens to the pressure of a gas inside a container if the temperature of the gas decreases?
16. When the Kelvin temperature of an enclosed gas doubles, what happens to the particles of the gas?
17. The volume of a gas is doubled while the temperature is held constant. How does the gas pressure change?
18. If a balloon is heated, what happens to the pressure if the volume remains constant?
19. A sample of gas occupies 35.0 mL at 45.0°C. What volume does the sample occupy at 95.0°C?
20. Convert the pressure 1.35 atm to mm Hg.
21. When using the gas laws – Boyles Law, Charles’s Law, Gay-Lussac Law, and the Combined Gas Law is temperature in Kelvin or degrees Celsius?
22. A 765 mL sample of gas is collected at 765. mm Hg. If the temperature remains constant and the pressure falls to 124. mm Hg, what is the new volume?
23. The pressure of a sample of gas at a constant volume is 3.00 atm at 50.0°C. What is the pressure at 95.0°C?
24. The volume of a sample of oxygen is 250.0 mL when the pressure is 3.4 atm and the temperature is 37.0°C. At what temperature is the volume 2.50L and the pressure 0.750 atm?
25. What is standard temperature and pressure (STP) in kPa and °C
26. At what temperature does the motion of particles theoretically cease?
27. What makes a substance dissolve faster in a solvent?
28. What is the maximum amount of KCl that can dissolve in 300 g of water? The solubility of KCl is 24 g/ 100 g of H₂O?
29. What is the solubility of silver nitrate in 100 grams of water if only 15.1 g can dissolve in 5.0 g of water?
30. What factors affect the solubility of a particular substance?
31. What is the molarity of a solution that contains 5 moles of solute in 2 liters of solution?
32. What is the molarity of 200 mL of solution in which 3.0 moles of sodium bromide is dissolved?
33. What is the number of moles of solute in 350 mL of 0.3 M solution?
34. What mass of sucrose, C₁₂H₂₂O₁₁ is needed to make 600 mL of a 0.200M solution?
35. If 2.0 mL of 6.0M HCl is used to make a 600.0 mL solution, what is the molarity of the dilute solution?
36. If the percent by volume is 3.0% and the volume of solution is 300.0 mL, what is the volume of solute in solution?
37. What is the percent by mass formula?
38. How many milliliters of alcohol are in 177 mL of a 75.0% (v/v) alcohol solution?
39. What is the percent by volume formula?
40. What is the formula for mole fraction?
41. Which is bigger a calorie or a Joule?
42. What would likely happen if you were to touch the flask in which an endothermic reaction was occurring?
43. If heat is released by a chemical system, what will happen to the surroundings?
44. How many joules are in 248 calories?
45. What is the amount of heat required to raise the temperature of 200.0 g of aluminum by 15°C (specific heat of aluminum = 0.21 cal/goC)?

46. When 55 g of an alloy at 35°C is dropped into 150.0 g of water, the alloy absorbs 1056 J of heat. If the final temperature of the alloy is 47°C, what is the specific heat of the alloy?

47. What does the symbol ΔH stand for?

48. What is the standard heat of reaction for the following reaction? Is this reaction endothermic or exothermic?
   \[ \text{Zn} + \text{Cu}^{2+} \rightarrow \text{Zn}^{2+} + \text{Cu} \]
   \[ \Delta H_f \text{ for Cu}^{2+} = 64.4 \text{ kJ/mol}; \Delta H_f \text{ for Zn}^{2+} = -152.4 \text{ kJ/mol} \]

49. What expresses a reaction rate?

50. At what stage of a reaction do atoms have the highest energy?

51. What is activation energy?

52. Why does a higher temperature cause a reaction to go faster?

53. Why does a higher concentration make a reaction faster?

54. Why does a catalyst cause a reaction to proceed faster?

55. What happens to a catalyst in a reaction?

56. Identify the parts of the exothermic graph on the right hand side of the page.

57. In the reaction \( \text{N}_2(g) + 3\text{H}_2(g) \rightleftharpoons 2\text{NH}_3(g) \), what effect does decreasing the volume on the contained gases?

58. What happens to a reaction at equilibrium when more reactant is added to the system?

59. What is the effect of adding more water to the following equilibrium reaction?
   \[ \text{CO}_2(g) + \text{H}_2\text{O}(l) \rightleftharpoons \text{H}_2\text{CO}_3(aq) \]

60. What is the equilibrium constant, \( K_{eq} \) expression for the following reaction?
   \[ \text{C}_3\text{H}_8(g) + 5\text{O}_2(g) \rightleftharpoons 3\text{CO}_2(g) + 4\text{H}_2\text{O}(g) \]

61. If a reaction has an equilibrium constant just greater than 1, what type of reaction is it?

62. If the equilibrium constant is large are the products or reactants favored?

63. When an acid reacts with a base, what compounds are formed? This is a neutralization reaction.

64. What are the properties of an acid?

65. What are the properties of a base?

66. What is an acid according to the Arrhenius?

67. What is a base according to Arrhenius?

68. What is a Bronsted-Lowry acid and base?

69. If the hydrogen ion concentration is \( 10^{-13} \), is the solution acidic, alkaline, or neutral?

70. What is the hydrogen ion concentration of a neutral solution?

71. What is the hydroxide ion concentration if the pH is 7.56?

72. What characterizes a strong acid or base?

73. Would a substance with a \( K_a = 1 \times 10^{-5} \) be a strong or weak acid?

74. In titration, when the number of moles of hydrogen ions equals the number of moles of hydroxide ions, what is said to have happened?

75. In a titration 35.0 mL of 0.225 M \( \text{Ba(OH)}_2 \) solution is added to a 15.0 mL sample of \( \text{HCl} \) solution of unknown concentration. What is the molarity of the acid solution?

76. What type of reaction is involved in titration?

77. Define oxidation-reduction reactions.

78. Identify the oxidation numbers for each element in \( \text{CuNO}_3 \).

79. If an atom is reduced in a redox reaction, what must happen to another atom in the system?

80. In which type of reaction are electrons gained?

81. What is oxidation?

82. What is reduction?

83. In the following unbalanced reaction, which atom is oxidized?
   \[ \text{HNO}_3 + \text{HBr} \rightarrow \text{NO} + \text{Br}_2 + \text{H}_2\text{O} \]

84. Which element increases its oxidation number in the following reaction?
   \[ 2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2 \]