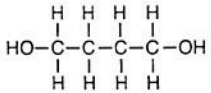
Name: **The Mole and Stoichiometry Review Packet** Date:

1. What is the empirical formula for a compound with the molecular formula $C_6H_{12}C_{12}O_2$?
   (A) CHClO (B) CH_2ClO
   (C) C_3H_6ClO (D) $C_6H_{12}C_{12}O_2$
2. The compounds C_2H_4 and C_4H_8 have the same
   (A) freezing point at standard pressure
   (B) boiling point at standard pressure
   (C) molecular formula
   (D) empirical formula
3. Which statement describes the composition of potassium chlorate, $KClO_3$?
   (A) The proportion by mass of elements combined in potassium chlorate is fixed.
   (B) The proportion by mass of elements combined in potassium chlorate varies.
   (C) Potassium chlorate is composed of four elements.
   (D) Potassium chlorate is composed of five elements.
4. Which pair consists of a molecular formula and its corresponding empirical formula?
   (A) C_2H_2 and CH_3CH (B) C_6H_6 and C_2H_2
   (C) P_4O_{10} and P_2O_5 (D) SO_2 and SO_3
5. Given the structural formula:



   What is the empirical formula of this compound?
   (A) CH_3O (B) C_2H_5O
   (C) $C_4H_{10}O_2$ (D) $C_8H_{20}O_4$
6. Which list consists of types of chemical formulas?
   (A) atoms, ions, molecules
   (B) metals, nonmetals, metalloids
   (C) empirical, molecular, structural
   (D) synthesis, decomposition, neutralization
7. The molecular formula of glucose is $C_6H_{12}O_6$. What is the empirical formula of glucose?
   (A) CHO (B) CH_2O
   (C) $C_6H_{12}O_6$ (D) $C_{12}H_{24}O_{12}$
8. Which pair of compounds has the same empirical formula?
   (A) C_2H_2 and C_6H_6
   (B) C_2H_6 and C_3H_8
   (C) CH_3OH and C_2H_5OH
   (D) CH_3CHO and CH_3COOH
9. What is the empirical formula for the compound $C_6H_{12}O_6$?
   (A) CH_2O (B) $C_2H_4O_2$
   (C) $C_3H_6O_3$ (D) $C_6H_{12}O_6$
10. What is the empirical formula of a compound with the molecular formula N_2O_4?
    (A) NO (B) NO_2
    (C) N_2O (D) N_2O_3
11. Which is an empirical formula?
    (A) P_2O_5 (B) P_4O_6
    (C) C_2H_4 (D) C_3H_6
12. What is the total number of atoms contained in 1 mole of NH_3?
    (A) 1 mole (B) 2 moles
    (C) 3 moles (D) 4 moles
13. Which formula is an empirical formula?
    (A) C_2H_6 (B) C_4H_{10}
    (C) H_2O (D) H_2O_2
14. The formula H_2O_2 is an example of
    (A) a molecular formula (B) an empirical formula
    (C) an ionic formula (D) a structural formula
15. A compound has the empirical formula CH_2O and a gram-formula mass of 60. grams per mole. What is the molecular formula of this compound?
    (A) CH_2O (B) $C_2H_4O_2$
    (C) C_3H_8O (D) $C_4H_8O_4$
16. What is the molecular formula of a compound that has a molecular mass of 54 and the empirical formula C_2H_3?
    (A) C_2H_3 (B) C_4H_6
    (C) C_6H_9 (D) C_8H_{12}
17. A compound whose empirical formula is NO_2 could have a molecular mass of
    (A) 23 (B) 39
    (C) 92 (D) 120
18. What is the total number of moles of atoms represented by the formula $Al(C_2H_3O_2)_3$?
    (A) 22 (B) 11
    (C) 8 (D) 4
19. A compound has a molecular mass of 54 and an empirical formula of C_2H_3. What is the molecular formula of the compound?
    (A) C_2H_3 (B) C_4H_6
    (C) C_5H_8 (D) C_6H_{10}
20. The empirical formula of a compound is CH_2. The molecular formula of this compound could be
    (A) CH_4 (B) C_2H_2
    (C) C_2H_4 (D) C_3H_3
21. The empirical formula of a compound is CH_4. The molecular formula of this compound could be
    (A) CH_4 (B) C_2H_2
    (C) C_2H_4 (D) C_3H_3
22. Which chemical formula is both an empirical formula and a molecular formula?
    (A) CH_4 (B) C_2H_6
    (C) CH_3COOH (D) $CH_3CH_2COOCH_3$

23. Which formulas could represent the empirical formula and the molecular formula of a given compound?
    (A) CH_2O, $C_4H_6O_4$ (B) CHO, $C_6H_{12}O_6$
    (C) CH_4, C_5H_{12} (D) CH_2, C_3H_6
24. A compound contains nitrogen and oxygen in the mole ratio of 1:1. The molecular mass of this compound could be
    (A) 14 (B) 16
    (C) 30 (D) 40
25. The empirical formula of a compound is CH_2. The molecular formula of this compound could be
    (A) CH_4 (B) C_2H_2
    (C) C_2H_4 (D) C_2H_6
26. A 1.0-mole sample of krypton gas has a mass of
    (A) 19 g (B) 36 g
    (C) 39 g (D) 84 g
27. What is the gram-formula mass of $Ca_3(PO_4)_2$?
    (A) 248 g/mol (B) 263 g/mol
    (C) 279 g/mol (D) 310. g/mol
28. The molar mass of $Ba(OH)_2$ is
    (A) 154.3 g (B) 155.3 g
    (C) 171.3 g (D) 308.6 g
29. What is the total number of oxygen atoms in the formula $MgSO_4 \cdot 7\ H_2O$? [The • represents seven units of H_2O attached to one unit of $MgSO_4$.]
    (A) 11 (B) 7
    (C) 5 (D) 4
30. Which quantity of particles is correctly represented by the formula H_2SO_4?
    (A) 1.0 mole of ions (B) 1.0 mole of molecules
    (C) 6.0×10^{23} ions (D) 6.0×10^{23} atoms
31. What is the total number of moles of oxygen atoms in 1 mole of N_2O_3?
    (A) 1 (B) 2
    (C) 3 (D) 5
32. What is the total number of moles of atoms present in 1 gram formula mass of $Pb(C_2H_3O_2)_2$?
    (A) 9 (B) 14
    (C) 3 (D) 15
33. A sample of a compound contains 65.4 grams of zinc, 12.0 grams of carbon, and 48.0 grams of oxygen. What is the mole ratio of zinc to carbon to oxygen in this compound?
    (A) 1:1:2 (B) 1:1:3
    (C) 1:4:6 (D) 5:1:4
34. Which sample contains a mole of atoms?
    (A) 23 g Na (B) 24 g C
    (C) 42 g Kr (D) 78 g K
35. One mole of O_2 has approximately the same mass as one mole of
    (A) CH_4 (B) S
    (C) LiH (D) Cl_2
36. What is the total mass of oxygen in 1.00 mole of $Al_2(CrO_4)_3$?
    (A) 192 g (B) 112 g
    (C) 64.0 g (D) 48.0 g
37. What is the total mass of 2.0 moles of $H_2(g)$?
    (A) 1.0 g (B) 2.0 g
    (C) 3.0 g (D) 4.0 g
38. A compound has a molar mass of 90. grams per mole and the empirical formula CH_2O. What is the molecular formula of this compound?
    (A) CH_2O (B) $C_2H_4O_2$
    (C) $C_3H_6O_3$ (D) $C_4H_8O_4$
39. A substance has an empirical formula of CH_2 and a molar mass of 56 grams per mole. The molecular formula for this compound is
    (A) CH_2 (B) C_4H_6
    (C) C_4H_8 (D) C_8H_4
40. A compound has a gram formula mass of 56 grams per mole. What is the molecular formula for this compound?
    (A) CH_2 (B) C_2H_4
    (C) C_3H_6 (D) C_4H_8
41. If the empirical formula for an organic compound is CH_2O, then the molecular mass of the compound could be
    (A) 135 (B) 60
    (C) 45 (D) 15
42. What is the percent composition by mass of nitrogen in NH_4NO_3 ?
    (A) 17.5% (B) 35.0%
    (C) 52.5% (D) 60.0%
43. What is the percent composition by mass of hydrogen in NH_4HCO_3 (gram-formula mass = 79 grams/mole)?
    (A) 5.1% (B) 6.3%
    (C) 10.% (D) 50.%
44. The percent composition by mass of magnesium in $MgBr_2$ (gram-formula mass = 184 grams/mole) is equal to
    (A) $\frac{24}{184} \times 100$ (B) $\frac{160.}{184} \times 100$
    (C) $\frac{184}{24} \times 100$ (D) $\frac{184}{160.} \times 100$
45. $F_2(g) + CaBr_2(g) \rightarrow CaF_2(g) + Br_2(g)$

    What type of reaction is shown above?
    (A) synthesis (B) decomposition
    (C) single replacement (D) double replacement
46. Which equation represents a decomposition reaction?
    (A) $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$
    (B) $Cu(s) + 2AgNO_3(aq) \rightarrow 2Ag(s) + Cu(NO_3)_2(aq)$
    (C) $2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$
    (D) $KOH(aq) + HCl(aq) \rightarrow KCl(aq) + H_2O(l)$
47. During all chemical reactions, mass, energy, and charge are
    (A) absorbed (B) conserved
    (C) formed (D) released

48. Given the balanced equation representing a reaction:

$$4Al(s) + 3O_2(g) \rightarrow 2Al_2O_3(s)$$

Which type of chemical reaction is represented by this equation?
(A) double replacement (B) single replacement
(C) substitution (D) synthesis

49. Which balanced equation represents a chemical change?
(A) $H_2O(\ell) + \text{energy} \rightarrow H_2O(g)$
(B) $2H_2O(\ell) + \text{energy} \rightarrow 2H_2(g) + O_2(g)$
(C) $H_2O(\ell) \rightarrow H_2O(s) + \text{energy}$
(D) $H_2O(g) \rightarrow H_2O(\ell) + \text{energy}$

50. Given the balanced equation representing a reaction:

$$H^+(aq) + OH^-(aq) \rightarrow H_2O(\ell) + \text{energy}$$

In this reaction there is a conservation of
(A) mass, only
(B) mass and charge, only
(C) charge and energy, only
(D) charge, energy, and mass

51. Which equation shows conservation of atoms?
(A) $H_2 + O_2 \rightarrow H_2O$ (B) $H_2 + O_2 \rightarrow 2H_2O$
(C) $2H_2 + O_2 \rightarrow 2H_2O$ (D) $2H_2 + 2O_2 \rightarrow 2H_2O$

52. Given the balanced equation representing a reaction:

$$H^+(aq) + OH^-(aq) \rightarrow H_2O(\ell) + 55.8\ kJ$$

In this reaction there is conservation of
(A) mass, only
(B) mass and charge, only
(C) mass and energy, only
(D) mass, charge, and energy

53. Which equation shows conservation of mass and charge?
(A) $NH_4Br \rightarrow NH_3 + Br_2$
(B) $2Mg + Fe^{3+} \rightarrow Mg^{2+} + 3Fe$
(C) $H_2SO_4 + LiOH \rightarrow Li_2SO_4 + H_2O$
(D) $Cu + 2Ag^+ \rightarrow Cu^{2+} + 2Ag$

54. Given the balanced equation with an unknown compound represented by X:

$$C_6H_{12}O_6(aq) \xrightarrow{\text{enzyme}} 2X + 2CO_2(g)$$

Which compound is represented by X?
(A) $CH_3OH(aq)$ (B) $CH_2(OH)_4(aq)$
(C) $CH_3CH_2OH(aq)$ (D) $CH_3OHCH_2OH(aq)$

55. Given the incomplete equation for the combustion of ethane:

$$2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6\ \_\_$$

What is the formula of the missing product?
(A) CH_3OH (B) HCOOH
(C) H_2O (D) H_2O_2

56. Given the unbalanced equation:

$$\_Fe_2O_3 + \_CO \rightarrow \_Fe + \_CO_2$$

When the equation is correctly balanced using the *smallest* whole-number coefficients, what is the coefficient of CO?
(A) 1 (B) 2
(C) 3 (D) 4

57. Given the balanced equation representing a reaction:

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

What is the *minimum* number of moles of O_2 that are needed to completely react with 16 moles of NH_3?
(A) 16 mol (B) 20. mol
(C) 64 mol (D) 80. mol

58. Given the incomplete equation:

$$4Fe + 3O_2 \rightarrow 2X$$

Which compound is represented by X?
(A) FeO
(B) Fe_2O_3
(C) Fe_3O_2
(D) Fe_3O_4

59. Given the balanced equation:

$$X + Cl_2 \rightarrow C_2H_5Cl + HCl$$

Which molecule is represented by X?
(A) C_2H_4 (B) C_2H_6
(C) C_3H_6 (D) C_3H_8

60. Given the balanced equation representing a reaction:

$$Mg(s) + Ni^{2+}(aq) \rightarrow Mg^{2+}(aq) + Ni(s)$$

What is the total number of moles of electrons lost by Mg(s) when 2.0 moles of electrons are gained by $Ni^{2+}(aq)$?
(A) 1.0 mol (B) 2.0 mol
(C) 3.0 mol (D) 4.0 mol

The Mole and Stoichiometry

61. Base your answer to the following question on the information below.

A 1.0-gram strip of zinc is reacted with hydrochloric acid in a test tube. The unbalanced equation below represents the reaction.

$$\_\_ Zn(s) + \_\_ HCl(aq) \rightarrow \_\_ H_2(g) + \_\_ ZnCl_2(aq)$$

Balance the equation for the reaction of zinc and hydrochloric acid, using the smallest whole-number coefficients

62. Given the balanced equation representing a reaction:

$$C_3H_8(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(g)$$

What is the total number of moles of $O_2(g)$ required for the complete combustion of 1.5 moles of $C_3H_8(g)$?
(A) .30 mol (B) 1.5 mol
(C) 4.5 mol (D) 7.5 mol

63. Given the balanced equation representing a reaction:

$$2CO(g) + O_2(g) \rightarrow 2CO_2(g)$$

What is the mole ratio of CO(g) to $CO_2(g)$ in this reaction?
(A) 1:1 (B) 1:2
(C) 2:1 (D) 3:2

64. Given the balanced equation:

$$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + H_2O(\ell) + CO_2(g)$$

What is the total number of moles of CO_2 formed when 20. moles of HCl is completely consumed?
(A) 5.0 mol (B) 10. mol
(C) 20. mol (D) 40. mol

65. Given the balanced equation:

$$2C + 3H_2 \rightarrow C_2H_6$$

What is the total number of moles of C that must completely react to produce 2.0 moles of C_2H_6?
(A) 1.0 mol (B) 2.0 mol
(C) 3.0 mol (D) 4.0 mol

1. C
2. D
3. A
4. C
5. B
6. C
7. B
8. A
9. A
10. B
11. A
12. D
13. C
14. A
15. B
16. B
17. C
18. A
19. B
20. C
21. A
22. A
23. D
24. C
25. C
26. D
27. D
28. C
29. A
30. B
31. C
32. D
33. B
34. A
35. B
36. A
37. D
38. C
39. C
40. D
41. B
42. B
43. B
44. A
45. C
46. A
47. B
48. D
49. B
50. D
51. C
52. D
53. D
54. C
55. C
56. C
57. B
58. B
59. B
60. B
61. Answer: ___ Zn(s) + __2__ HCl(aq) → ___ $H_2(g)$ + ___ $ZnCl_2(aq)$
62. D
63. A
64. B
65. D