Chemistry Test 3: Moles, Stoichiometry, Balancing, Percent Composition, Empirical & Molecular Formulas

1. An 8.24-gram sample of a hydrated salt is heated until it has a constant mass of 6.20 grams. What was the percent by mass of water contained in the original sample?
   A) 24.8% C) 75.2%
   B) 14.1% D) 32.9%

2. A substance was found to be a soft, non-conducting solid at room temperature. The substance is most likely
   A) a molecular solid C) an ionic solid
   B) a network solid D) a metallic solid

3. The Group 17 element with the highest electronegativity is
   A) iodine C) chlorine
   B) fluorine D) bromine

4. Which atom has the strongest attraction for electrons?
   A) Cl C) F
   B) I D) Br

5. Given the balanced equation:

   $NaOH + HCl \rightarrow NaCl + H_2O$

   What is the total number of grams of H_2O produced when 116 grams of the product, NaCl, is formed?
   A) 18 g C) 36 g
   B) 54 g D) 9.0 g

6. Which is a property of network solids but *not* molecular solids?
   A) water soluble C) electrical insulators
   B) high malleability D) high melting points

7. What is the total mass in grams of 0.75 mole of SO_2?
   A) 16 g C) 32 g
   B) 24 g D) 48 g

8. $Ba(NO_3)_2(aq) + Na_2SO_4(aq) \rightarrow 2\ NaNO_3(aq) + BaSO_4(s)$

   What type of reaction is shown above?
   A) double replacement C) single replacement
   B) decomposition D) synthesis

9. Given the reaction:

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

   What is the total number of moles of $KClO_3(s)$ needed to produce 6 moles of $O_2(g)$?
   A) 1 C) 3
   B) 2 D) 4

10. The percent by mass of aluminum in Al_2O_3 is approximately
    A) 47.1 C) 35.4
    B) 52.9 D) 18.9

11. $2\ SO_3(g) \leftrightarrow 2\ SO_2(g) + O_2(g)$

    What type of reaction is shown above?
    A) synthesis C) single replacement
    B) double replacement D) decomposition

12. A compound consists of 40.% sulfur and 60.% oxygen by mass. What is the empirical formula of this compound?
    A) SO C) SO_3
    B) SO_2 D) SO_4

13. 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_4H_6 C) C_2H_3
    B) C_6H_{10} D) C_5H_8

14. What is the gram formula mass of $Na_2CO_3 \cdot 10H_2O$?
    A) 106 g C) 286 g
    B) 266 g D) 142 g

15. Given the reaction:

    $Mg + 2\ HCl \rightarrow MgCl_2 + H_2$

    What is the total number of grams of Mg consumed when 0.50 mole of H_2 is produced?
    A) 6.0 g C) 3.0 g
    B) 12 g D) 24 g

16. The electrons in a bond between two iodine atoms (I_2) are shared
    A) equally, and the resulting bond is polar
    B) unequally, and the resulting bond is polar
    C) equally, and the resulting bond is nonpolar
    D) unequally, and the resulting bond is nonpolar

17. What is the total number of moles of atoms represented by the formula $Al(C_2H_3O_2)_3$?
    A) 22 C) 8
    B) 11 D) 4

18. Which sample of O_2 contains a total of 3.01×10^{23} molecules at STP?
    A) 1.00 mole C) 16.0 grams
    B) 2.00 moles D) 32.0 grams

19. Which compound has the empirical formula CH?
    A) CH_4 C) C_2H_4
    B) C_6H_6 D) C_3H_8

20. What is the empirical formula of a compound that contains 28% iron, 24% sulfur, and 48% oxygen by mass?
    A) $FeSO_4$ C) $Fe_2(SO_4)_3$
    B) $FeSO_3$ D) $Fe_2(SO_3)_3$

21. When the equation

    $$\_\_\ C_2H_4 + \_\_\ O_2 \rightarrow \_\_\ CO_2 + \_\_\ H_2O$$

    is balanced using smallest whole numbers, what is the coefficient of the O_2?
    A) 1 C) 3
    B) 2 D) 4

22. Which element forms a diatomic molecule containing a triple covalent bond?
    A) O_3 C) H_2
    B) Cl_2 D) N_2

23. When the equation

    $$\_\_Al(s) + \_\_O_2(g) \rightarrow \_\_Al_2O_3(s)$$

    is correctly balanced using the smallest whole numbers, the coefficient of Al(s) is
    A) 1 C) 3
    B) 2 D) 4

24. Given the unbalanced equation:

    $$\_\_Al_2(SO_4)_3 + \_\_Ca(OH)_2 \rightarrow \_\_Al(OH)_3 + \_\_CaSO_4$$

    What is the coefficient in front of the $CaSO_4$ when the equation is completely balanced with the smallest whole-number coefficients?
    A) 1 C) 3
    B) 2 D) 4

25. $Mg(s) + 2\ HCl(aq) \leftrightarrow MgCl_2(aq) + H_2(g)$

    What type of reaction is shown above?
    A) single replacement C) double replacement
    B) decomposition D) synthesis

26. What is the empirical formula of a compound with the molecular formula $C_6H_{12}O_6$?
    A) $C_3H_6O_3$ C) $C_2H_4O_2$
    B) CH_2O D) $C_4H_8O_4$

27. A sample of a compound contains 24 grams of carbon and 64 grams of oxygen. What is the empirical formula of this compound?
    A) C_2O_2 C) C_2O_4
    B) CO D) CO_2

28. When a sodium atom becomes an ion, the size of the atom
    A) decreases by losing an electron
    B) increases by gaining an electron
    C) decreases by gaining an electron
    D) increases by losing an electron

29. What is the mass number of an atom that contains 19 protons, 19 electrons, and 20 neutrons?
    A) 20 C) 39
    B) 19 D) 58

30. Given the reaction:

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

At STP, what is the total number of liters of CO_2 produced when 5.0 liters of $C_3H_8(g)$ burns completely?

A) 1.0 L C) 3.0 L

B) 5.0 L D) 15 L

31. Compared to an atom of $^{12}_{6}C$, an atom of $^{14}_{6}C$ has

A) more protons C) fewer protons

B) more neutrons D) fewer neutrons

32. A compound consists of 25.9% nitrogen and 74.1% oxygen by mass. What is the empirical formula of the compound?

A) N_2O C) NO

B) NO_2 D) N_2O_5

33. Which sample contains the same number of atoms as 24 grams of carbon?

A) 24 g Mg C) 10. g Ne

B) 4.0 g He D) 80. g Ar

34. A 4.4 gram sample of a hydrate was heated until the water of hydration was driven off. The anhydrous compound remaining had a mass of 3.3 grams. What is the percentage by mass of water in the hydrate?

A) 25% C) 33%

B) 75% D) 67%

35. Which quantity is equivalent to 39 grams of LiF?

A) 1.0 mole C) 0.50 mole

B) 2.0 moles D) 1.5 moles

36. Which is the formula for the compound that forms when magnesium bonds with phosphorus?

A) Mg_3P_2 C) Mg_2P_3

B) MgP_2 D) Mg_2P

37. In the reaction

$$Fe_2O_3 + 3\ CO \rightarrow 2\ Fe + 3\ CO_2,$$

what is the total number of moles of CO used to produce 112 grams of iron?

A) 1.0 C) 3.0

B) 2.0 D) 4.0

38. The percent by mass of oxygen in $H_2C_2O_4$ is equal to

A) $\frac{90}{64}\times 100$ C) $\frac{64}{90}\times 100$

B) $\frac{8}{90}\times 100$ D) $\frac{4}{8}\times 100$

39. Given the reaction:

$$Mg(s) + 2\ AgNO_3(aq) \rightarrow Mg(NO_3)_2(aq) + 2\ Ag(s)$$

Which type of reaction is represented?

A) single replacement C) double replacement

B) synthesis D) decomposition

40. What type of bonding is found in the molecule HBr?

A) polar covalent C) metallic

B) ionic D) nonpolar covalent

41. What is the gram formula mass of $(NH_4)_2SO_4$?

A) 132 g C) 114 g

B) 94.0 g D) 66.0 g

42. Given the reaction:

$$2\ Al + 3\ H_2SO_4 \rightarrow 3\ H_2 + Al_2(SO_4)_3$$

The total number of moles of H_2SO_4 needed to react completely with 5.0 moles of Al is

A) 7.5 moles C) 5.0 moles

B) 2.5 moles D) 9.0 moles

43. What is the mass of 3.0×10^{23} atoms of neon?

A) 20. g C) 0.50 g

B) 10. g D) 1.0 g

44. Given the reaction

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

How many liters of ammonia, measured at STP, are produced when 28.0 grams of nitrogen is completely consumed?

A) 5.60 C) 11.2
B) 44.8 D) 22.4

45. What is the percent by mass of hydrogen in NH_3 (formula mass = 17.0)?

A) 21.4% C) 17.6%
B) 82.4% D) 5.9%

46. $$N_2(g) + 3\ H_2(g) \leftrightarrow 2\ NH_3(g)$$

What type of reaction is shown above?

A) synthesis C) decomposition
B) double replacement D) single replacement

47. Which sequence of elements is arranged in order of decreasing atomic radii?

A) Al, Si, P C) Li, Na, K
B) N, C, B D) Cl, Br, I

48. One atomic mass unit (1 amu) is equal to the mass of a carbon-12 atom multiplied by the quantity

A) $\frac{1}{12}$
B) 1836
C) 12
D) $\frac{1}{1836}$

49. Which equation is correctly balanced?

A) $NH_3 + 2O_2 \rightarrow HNO_3 + H_2O$
B) $Cu + H_2SO_4 \rightarrow CuSO_4 + H_2O + SO_2$
C) $CaO + 2H_2O \rightarrow Ca(OH)_2$
D) $Ca(OH)_2 + 2H_3PO_4 \rightarrow Ca_3(PO_4)_2 + 3H_2O$

50. Which equation illustrates conservation of mass?

A) $H_2 + Cl_2 \rightarrow 2\ HCl$ C) $H_2 + Cl_2 \rightarrow HCl$
B) $H_2 + O_2 \rightarrow H_2O$ D) $H_2 + O_2 \rightarrow 2\ H_2O$

51. An atom that contains 8 protons, 8 electrons, and 9 neutrons has

A) an atomic number of 9
B) a mass number of 25
C) a mass number of 17
D) an atomic number of 16

52. Given the reaction:

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

The total number of grams of O_2 needed to produce 54 grams of water is

A) 36 C) 61
B) 75 D) 48

53. A compound whose empirical formula is NO_2 could have a molecular mass of

A) 23 C) 120
B) 92 D) 39

54. Given the unbalanced equation:

$$\_\_C_3H_8(g) + \_\_O_2(g) \rightarrow \_\_H_2O(g) + \_\_CO_2(g)$$

When the equation is completely balanced using smallest whole numbers, the coefficient of O_2 is

A) 5 C) 3
B) 2 D) 10

55. A compound contains 53% Al and 47% O by mass. What is the empirical formula of this compound?

A) AlO_2 C) Al_3O_2
B) Al_2O_3 D) AlO

56. Which formula represents a substance that contains covalent bonds?

A) CO_2 C) $LiCl$
B) K_2O D) $CaCl_2$

57. A compound contains 40% calcium, 12% carbon, and 48% oxygen by mass. What is the empirical formula of this compound?

A) CaC_2O_4 C) $CaCO_3$
B) CaC_3O_6 D) $CaCO_2$

58. Which substance will conduct electricity in both the solid phase and the liquid phase?

A) $AgCl$ C) HCl
B) H_2 D) Ag

59. What is the percent by mass of sulfur in sulfur dioxide?

A) 67
C) 50
B) 33
D) 32

60. Given the unbalanced equation:

$$\_\_Al_2(SO_4)_3 + \_\_Ca(OH)_2 \rightarrow \_\_Al(OH)_3 + \_\_CaSO_4$$

When the equation is completely balanced using the smallest whole number coefficients the sum of the coefficients is

A) 5
C) 3
B) 9
D) 4

61. Which type of bonding involves positive ions immersed in a sea of mobile electrons?

A) polar covalent
C) nonpolar covalent
B) ionic
D) metallic

Answer Key
Chem T3 mole, stoi, balan [Apr 02, 2014]

1. A	26. B	51. C
2. A	27. D	52. D
3. B	28. A	53. B
4. C	29. C	54. A
5. C	30. D	55. B
6. D	31. B	56. A
7. D	32. D	57. C
8. A	33. D	58. D
9. D	34. A	59. C
10. B	35. D	60. B
11. D	36. A	61. D
12. C	37. C	
13. A	38. C	
14. C	39. A	
15. B	40. A	
16. C	41. A	
17. A	42. A	
18. C	43. B	
19. B	44. B	
20. C	45. C	
21. C	46. A	
22. D	47. A	
23. D	48. A	
24. C	49. A	
25. A	50. A	

Version B