Chemistry Section Review 7.3

Multiple Choice
Identify the choice that best completes the statement or answers the question. Put the LETTER of the correct answer in the blank.

____ 1. The molar mass of an element is the mass of one
   a. atom of the element.          c. gram of the element.
   b. crystal of the element.       d. mole of the element.

____ 2. What is the sum of the atomic masses of all the atoms in a formula for a compound?
   a. molecular mass          c. atomic mass
   b. formula mass           d. actual mass

____ 3. What is the formula mass of magnesium chloride, MgCl₂?
   a. 46 amu          c. 95.21 amu
   b. 59.76 amu        d. 106.35 amu

____ 4. What is the formula mass of ethyl alcohol, C₂H₅OH?
   a. 30.33 amu        c. 45.06 amu
   b. 33.27 amu        d. 46.08 amu

____ 5. What is the formula mass of (NH₄)₂SO₄?
   a. 114.09 amu      c. 128.06 amu
   b. 118.34 amu      d. 132.16 amu

____ 6. The molar mass of MgI₂ is
   a. the sum of the masses of 1 mol of Mg and 2 mol of I.
   b. the sum of the masses of 1 mol of Mg and 1 mol of I.
   c. the sum of the masses of 1 atom of Mg and 2 atoms of I.
   d. the sum of the masses of 1 atom of Mg and 1 atom of I.

____ 7. The molar mass of NO₂ is 46.01 g/mol. How many moles of NO₂ are present in 114.95 g?
   a. 0.4003 mol       c. 2.498 mol
   b. 1.000 mol        d. 114.95 mol

____ 8. The molar mass of CCl₄ is 153.81 g/mol. How many grams of CCl₄ are needed to have 5.000 mol?
   a. 5 g             c. 769.0 g
   b. 30.76 g         d. 796.05 g

____ 9. The molar mass of H₂O is 18.02 g/mol. How many grams of H₂O are present in 0.20 mol?
   a. 0.2 g           c. 35.9 g
   b. 3.6 g           d. 89.9 g

____ 10. The molar mass of LiF is 25.94 g/mol. How many moles of LiF are present in 10.37 g?
   a. 0.3998 mol       c. 2.500 mol
   b. 1.333 mol        d. 36.32 mol

____ 11. The molar mass of CS₂ is 76.15 g/mol. How many grams of CS₂ are present in 10.00 mol?
   a. 0.13 g          c. 10.00 g
   b. 7.614 g         d. 761.5 g

____ 12. The molar mass of NH₃ is 17.03 g/mol. How many moles of NH₃ are present in 107.1 g?
13. What is the mass of 0.240 mol glucose, C\textsubscript{6}H\textsubscript{12}O\textsubscript{6}?
   a. 24.0 g  
   b. 43.2 g  
   c. 180.16 g  
   d. 750. g

14. How many Cl\textsuperscript{-} ions are present in 2.00 mol of KCl?
   a. 1.20 \times 10^{24}  
   b. 6.02 \times 10^{24}  
   c. 2.00  
   d. 0.5

15. How many OH\textsuperscript{-} ions are present in 3.00 mol of Ca(OH)\textsubscript{2}?
   a. 3.00  
   b. 6.00  
   c. 3.61 \times 10^{24}  
   d. 2.06 \times 10^{23}

16. How many oxygen atoms are there in 0.500 mol of CO\textsubscript{2}?
   a. 6.02 \times 10^{23}  
   b. 3.01 \times 10^{23}  
   c. 15.9994  
   d. 11.0

17. How many Mg\textsuperscript{2+} ions are found in 1.00 mol of MgO?
   a. 3.01 \times 10^{23}  
   b. 6.02 \times 10^{23}  
   c. 12.04 \times 10^{23}  
   d. 6.02 \times 10^{25}

18. If 0.500 mol of Na\textsuperscript{+} combines with 0.500 mol of Cl\textsuperscript{-} to form NaCl, how many formula units of NaCl are present?
   a. 3.01 \times 10^{23}  
   b. 6.02 \times 10^{23}  
   c. 6.02 \times 10^{24}  
   d. 1

19. How many molecules are there in 5.0 g of methyl alcohol, CH\textsubscript{3}OH?
   a. 9.4 \times 10^{22}  
   b. 3.0 \times 10^{24}  
   c. 3.6 \times 10^{24}  
   d. 3.8 \times 10^{24}

20. What is the percentage composition of CF\textsubscript{4}?
   a. 20% C, 80% F  
   b. 13.6% C, 86.4% F  
   c. 16.8% C, 83.2% F  
   d. 81% C, 19% F

21. What is the percentage composition of CO?
   a. 50% C, 50% O  
   b. 12% C, 88% O  
   c. 25% C, 75% O  
   d. 43% C, 57% O

22. What is the percentage composition of CuCl\textsubscript{2}?
   a. 33% Cu, 66% Cl  
   b. 50% Cu, 50% Cl  
   c. 65.50% Cu, 34.50% Cl  
   d. 47.27% Cu, 52.73% Cl

23. The percentage composition of sulfur in SO\textsubscript{2} is about 50%. What is the percentage of oxygen in this compound?
   a. 25%  
   b. 50%  
   c. 75%  
   d. 90%

24. What is the mass percentage of OH\textsuperscript{-} in Ca(OH)\textsubscript{2}?
   a. 45.9%  
   b. 66.6%  
   c. 75%  
   d. 90.1%

25. What is the mass percentage of chlorine in NaCl?
26. A formula that shows the simplest whole-number ratio of the atoms in a compound is the
a. molecular formula.  
   b. ideal formula.  
   c. experimental formula.  
   d. empirical formula.

27. The empirical formula is always the accepted formula for a(n)
   a. atom.  
   b. molecule.  
   c. molecular compound. 
   d. ionic compound.

28. The empirical formula for a compound shows the symbols of the elements with subscripts indicating the
   a. actual numbers of atoms in a molecule. 
   b. number of moles of the compound in 100 g. 
   c. smallest whole-number ratio of the atoms. 
   d. atomic masses of each element.

29. The empirical formula may not represent the actual composition of a unit of a(n)
   a. ionic compound.  
   b. molecular compound.  
   c. salt.  
   d. crystal.

30. What is the empirical formula for a compound that is 31.9% potassium, 28.9% chlorine, and 39.2% oxygen?
   a. KClO₂ 
   b. KClO₃ 
   c. K₂Cl₃O₃ 
   d. K₃Cl₂O₅ 

31. What is the empirical formula for a compound that is 43.6% phosphorus and 56.4% oxygen?
   a. P₃O₇ 
   b. PO₃ 
   c. P₂O₃ 
   d. P₂O₅

32. What is the empirical formula for a compound that is 53.3% O and 46.7% Si?
   a. SiO 
   b. SiO₂ 
   c. Si₂O 
   d. Si₂O₃

33. A compound contains 259.2 g of F and 40.8 g of C. What is the empirical formula for this compound?
   a. CF₄ 
   b. C₂F 
   c. CF 
   d. CF₂ 

34. A compound contains 64 g of O and 8 g of H. What is the empirical formula for this compound?
   a. H₂O 
   b. H₂O₂ 
   c. HO₂ 
   d. HO 

35. What is the empirical formula for a compound that is 36.1% Ca and 63.9% Cl?
   a. CaCl 
   b. Ca₂Cl 
   c. CaCl₂ 
   d. Ca₃Cl₂ 

36. A compound contains 27.3 g of C and 72.7 g of O. What is the empirical formula for this compound?
   a. CO 
   b. CO₂ 
   c. C₂O 
   d. C₂O₄ 

37. To find the molecular formula from the empirical formula, one must determine the compound's
   a. density.  
   b. formula mass. 
   c. structural formula. 
   d. crystal lattice.
38. A molecular compound has the empirical formula XY\textsubscript{3}. Which of the following is a possible molecular formula?
   a. X\textsubscript{2}Y\textsubscript{3}  
   b. XY\textsubscript{4}  
   c. X\textsubscript{2}Y\textsubscript{5}  
   d. X\textsubscript{2}Y\textsubscript{6}

39. The molecular formula for vitamin C is C\textsubscript{6}H\textsubscript{8}O\textsubscript{6}. What is the empirical formula?
   a. CHO  
   b. CH\textsubscript{3}O  
   c. C\textsubscript{3}H\textsubscript{4}O\textsubscript{3}  
   d. C\textsubscript{2}H\textsubscript{4}O\textsubscript{2}

40. Of the following molecular formulas for hydrocarbons, which is an empirical formula?
   a. CH\textsubscript{4}  
   b. C\textsubscript{2}H\textsubscript{2}  
   c. C\textsubscript{3}H\textsubscript{6}  
   d. C\textsubscript{4}H\textsubscript{10}

41. Which of the following molecular formulas does not have the corresponding empirical formula X\textsubscript{2}Y\textsubscript{2}Z?
   a. X\textsubscript{2}Y\textsubscript{4}Z\textsubscript{2}  
   b. XYZ  
   c. X\textsubscript{3}Y\textsubscript{12}Z\textsubscript{6}  
   d. X\textsubscript{2}Y\textsubscript{2}Z\textsubscript{3}

42. A compound's empirical formula is C\textsubscript{2}H\textsubscript{5}. If the formula mass is 58 amu, what is the molecular formula?
   a. C\textsubscript{3}H\textsubscript{6}  
   b. C\textsubscript{2}H\textsubscript{10}  
   c. C\textsubscript{4}H\textsubscript{8}  
   d. C\textsubscript{3}H\textsubscript{15}

43. A compound's empirical formula is N\textsubscript{2}O\textsubscript{5}. If the formula mass is 108 amu, what is the molecular formula?
   a. N\textsubscript{2}O\textsubscript{5}  
   b. N\textsubscript{4}O\textsubscript{10}  
   c. NO\textsubscript{3}  
   d. N\textsubscript{2}O\textsubscript{4}

44. A compound's empirical formula is CH. If the formula mass is 26 amu, what is the molecular formula?
   a. C\textsubscript{2}H\textsubscript{2}  
   b. CH\textsubscript{3}  
   c. CH\textsubscript{4}  
   d. C\textsubscript{3}H

45. A compound's empirical formula is NO\textsubscript{2}. If the formula mass is 92 amu, what is the molecular formula?
   a. NO  
   b. N\textsubscript{2}O\textsubscript{2}  
   c. NO\textsubscript{4}  
   d. N\textsubscript{2}O\textsubscript{4}

46. A compound's empirical formula is CH\textsubscript{3}. If the formula mass is 30 amu, what is the molecular formula?
   a. CH\textsubscript{3}  
   b. CH\textsubscript{4}  
   c. C\textsubscript{2}H\textsubscript{6}  
   d. C\textsubscript{3}H\textsubscript{9}

47. A compound's empirical formula is HO. If the formula mass is 34 amu, what is the molecular formula?
   a. H\textsubscript{2}O  
   b. H\textsubscript{2}O\textsubscript{2}  
   c. HO\textsubscript{3}  
   d. H\textsubscript{2}O\textsubscript{3}

48. What is the molecular formula of a compound that has a formula mass of 50.48 amu and an empirical formula of CH\textsubscript{3}Cl?
   a. CHCl  
   b. CH\textsubscript{2}Cl  
   c. CH\textsubscript{3}Cl  
   d. CH\textsubscript{2}Cl\textsubscript{2}

**Problem**

49. The molar mass of aluminum is 26.98 g/mol and the molar mass of fluorine is 19.00 g/mol. Calculate the molar mass of aluminum trifluoride, AlF\textsubscript{3}. 

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50. The molar mass of copper is 63.55 g/mol, the molar mass of sulfur is 32.07 g/mol, and the molar mass of oxygen is 16.00 g/mol. Calculate the molar mass of copper(II) sulfate, CuSO₄.

51. The molar mass of iron is 55.85 g/mol, the molar mass of silicon is 28.08 g/mol, and the molar mass of oxygen is 16.00 g/mol. Calculate the molar mass of iron(II) silicate, Fe₂SiO₄.

52. The molar mass of aluminum is 26.98 g/mol and the molar mass of oxygen is 16.00 g/mol. Determine the molar mass of Al₂O₃.

Completion
Complete each statement.

53. The name and formula for the compound formed by strontium ions and sulfite ions are ____________________.

54. The Stock name for the compound P₂O₅ is ____________________.

55. The name for the CrO₄²⁻ ion is ____________________.

56. The oxidation numbers for each atom in NH₄⁺ are ____________________.

57. The oxidation numbers for each atom in H₂CO₃ are ____________________.
Chemistry Section Review 7.3
Answer Section

MULTIPLE CHOICE

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

PROBLEM

49. 83.98 g/mol AlF₃
   Solution:
   26.98 g/mol Al + (3 × 19.00 g/mol F) = 89.3 g/mol AlF₃
50. 159.62 g/mol CuSO₄
   Solution:
   63.55 g/mol Cu + 32.07 g/mol S + (4 × 16.00 g/mol O) = 159.62 g/mol CuSO₄
51. 203.78 g/mol Fe₂SiO₄
   Solution:
   (2 × 55.85 g/mol Fe) + (28.08 g/mol Si) + (4 × 16.00 g/mol O) = 203.78 g/mol Fe₂SiO₄
52. 101.96 g/mol Al₂O₃
   Solution:
   (2 × 26.98 g/mol Al) + (3 × 16.00 g/mol O) = 101.96 g/mol Al₂O₃

COMPLETION

53. strontium sulfite, SrSO₃
54. phosphorus(V) oxide
55. chromate ion
56. N −3, H +1
57. H +1, C +4, O −2