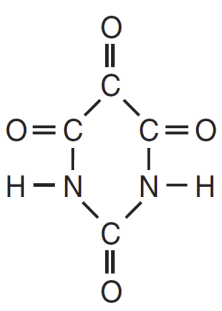
1. Which formula is an empirical formula?

   A) CH_4 B) C_2H_6
   C) C_3H_6 D) C_4H_{10}

2. Given the formula for a compound:



   Which molecular formula and empirical formula represent this compound?

   A) C_2HNO_2 and CHNO
   B) C_2HNO_2 and C_2HNO_2
   C) $C_4H_2N_2O_4$ and CHNO
   D) $C_4H_2N_2O_4$ and C_2HNO_2

3. An example of an empirical formula is

   A) C_4H_{10} B) $C_6H_{12}O_6$
   C) $HC_2H_3O_2$ D) CH_2O

4. 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}

5. What is the mass of 1.5 moles of CO_2?

   A) 66 g B) 44 g C) 33 g D) 29 g

6. What is the gram-formula mass of $Fe(NO_3)_3$?

   A) 146 g/mol B) 194 g/mol
   C) 214 g/mol D) 242 g/mol

7. The gram-formula mass of NO_2 is defined as the mass of

   A) one mole of NO_2
   B) one molecule of NO_2
   C) two moles of NO
   D) two molecules of NO

8. The gram-formula mass of $(NH_4)_2CO_3$ is

   A) 46.0 g B) 64.0 g
   C) 78.0 g D) 96.0 g

9. What is the total number of moles of sulfur atoms in 1 mole of $Fe_2(SO_4)_3$?

   A) 1 B) 15 C) 3 D) 17

10. What is the total mass in grams of 0.75 mole of SO_2 ?

    A) 16 g B) 24 g C) 32 g D) 48 g

11. What is the total mass of iron in 1.0 mole of Fe_2O_3?

    A) 160 g B) 112 g
    C) 72 g D) 56 g

12. A compound has an empirical formula of HCO_2 and a molecular mass of 90. grams per mole. What is the molecular formula of this compound?

    A) HCO B) $H_2C_2O_4$
    C) $H_4C_4O_8$ D) $H_6C_6O_{12}$

13. What is the molecular formula of a compound that has a molecular mass of 92 and an empirical formula of NO_2?

    A) NO_2 B) N_2O_4 C) N_3O_6 D) N_4O_8

14. 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.%

15. 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) $\frac{184}{160.} \times 100$

16. Given the balanced equation representing a reaction:

$$K_2CO_3(aq) + BaCl_2(aq) \rightarrow 2KCl(aq) + BaCO_3(s)$$

Which type of reaction is represented by this equation?

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

17. Given the balanced equation representing a reaction:

$$Zn(s) + H_2SO_4(aq) \rightarrow ZnSO_4(aq) + H_2(g)$$

Which type of reaction is represented by this equation?

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

18. In which type of reaction do two or more substances combine to produce a single substance?

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

19. Given the balanced equation:

$2KClO_3 \rightarrow 2KCl + 3O_2$

Which type of reaction is represented by this equation?

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

20. 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.

21. Which chemical equation is correctly balanced?

A) $H_2(g) + O_2(g) \rightarrow H_2O(g)$
B) $N_2(g) + H_2(g) \rightarrow NH_3(g)$
C) $2NaCl(s) \rightarrow Na(s) + Cl_2(g)$
D) $2KCl(s) \rightarrow 2K(s) + Cl_2(g)$

22. 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

23. Given the unbalanced equation:

$$\_\_ Mg(ClO_3)_2(s) \rightarrow \_\_ MgCl_2(s) + \_\_ O_2(g)$$

What is the coefficient of O_2 when the equation is balanced correctly using the *smallest* whole number coefficients?

A) 1 B) 2 C) 3 D) 4

24. Given the unbalanced equation:

$$\_\_ Al(s) + \_\_ O_2(g) \rightarrow \_\_ Al_2O_3(s)$$

When this equation is correctly balanced using smallest whole numbers, what is the coefficient of $O_2(g)$?

A) 6 B) 2 C) 3 D) 4

25. Given the balanced equation representing the reaction between methane and oxygen:

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

According to this equation, what is the mole ratio of oxygen to methane?

A) $\frac{1 \text{ gram } O_2}{2 \text{ grams } CH_4}$ B) $\frac{1 \text{ mole } O_2}{2 \text{ moles } CH_4}$

C) $\frac{2 \text{ grams } O_2}{1 \text{ gram } CH_4}$ D) $\frac{2 \text{ moles } O_2}{1 \text{ mole } CH_4}$

26. Given the balanced equation representing a reaction:

$F_2(g) + H_2(g) \rightarrow 2HF(g)$

What is the mole ratio of $H_2(g)$ to $HF(g)$ in this reaction?

A) 1:1 B) 1:2 C) 2:1 D) 2:3

27. 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

28. Given the balanced equation:

$2\ C_4H_{10}(g) + 13\ O_2(g) \rightarrow 8\ CO_2(g) + 10\ H_2O(g)$

What is the total number of moles of $O_2(g)$ that must react completely with 5.00 moles of $C_4H_{10}(g)$?

A) 10.0 B) 20.0 C) 26.5 D) 32.5

29. Given the reaction:

$$2\ C_2H_6 + 7\ O_2 \rightarrow 4\ CO_2 + 6\ H_2O$$

What is the total number of moles of CO_2 produced by the complete combustion of 5.0 moles of C_2H_6?

A) 1.0 mole B) 2.0 moles

C) 5.0 moles D) 10. moles

30. Given the equation:

$$H_2(g) + Cl_2(g) \rightarrow 2\ HCl(g)$$

What is the total number of moles of HCl(g) produced when 3 moles of $H_2(g)$ is completely consumed?

A) 5 moles B) 2 moles

C) 3 moles D) 6 moles

31. What is the chemical formula for lead(IV) oxide?

A) PbO_2 B) PbO_4 C) Pb_2O D) Pb_4O

32. What is the chemical formula for sodium sulfate?

A) Na_2SO_3 B) Na_2SO_4

C) $NaSO_3$ D) $NaSO_4$

33. The chemical formula for nickel (II) bromide is

A) Ni_2Br B) $NiBr_2$

C) N_2Br D) NBr_2

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

A) Mg_2P B) MgP_2

C) Mg_2P_3 D) Mg_3P_2

35. Which formula represents copper(I) oxide?

A) CuO B) CuO_2
C) Cu_2O D) Cu_2O_2

36. Which formula represents lead(II) chromate?

A) $PbCrO_4$ B) $Pb(CrO_4)_2$
C) Pb_2CrO_4 D) $Pb_2(CrO_4)_3$

37. The correct chemical formula for iron(II) sulfide is

A) FeS B) Fe_2S_3
C) $FeSO_4$ D) $Fe_2(SO_4)_3$

38. Which is a binary compound?

A) $CaCl_2$ B) KOH
C) $NaNO_3$ D) $MgSO_4$

39. What is the correct formula for ammonium carbonate?

A) $NH_4(CO_3)_2$ B) NH_4CO_3
C) $(NH_4)_2(CO_3)_2$ D) $(NH_4)_2CO_3$