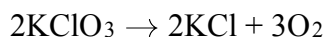


1. Which pair consists of a molecular formula and its corresponding empirical formula?
 A) C_2H_2 and CH_3CH_3
 B) C_6H_6 and C_2H_2
 C) P_4O_{10} and P_2O_5
 D) SO_2 and SO_3
2. What is the total number of atoms contained in 1 mole of NH_3 ?
 A) 1 mole B) 2 moles
 C) 3 moles D) 4 moles
3. An example of an empirical formula is
 A) CH_4 B) C_2H_4
 C) $C_2H_4(OH)_2$ D) $C_6H_{12}O_6$
4. 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}
5. The formula H_2O_2 is an example of
 A) a molecular formula
 B) an empirical formula
 C) an ionic formula
 D) an organic formula
6. A compound whose empirical formula is NO_2 could have a molecular mass of
 A) 23 B) 39 C) 92 D) 120
7. The gram formula mass of NH_4Cl is
 A) 22.4 g/mole B) 28.0 g/mole
 C) 53.5 g/mole D) 95.5 g/mole
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 gram formula mass of $Ca_3(PO_4)_2$?
 A) 196 g B) 214 g
 C) 245 g D) 310. g
10. What is the total number of oxygen atoms in the formula $MgSO_4 \cdot 7H_2O$? [The \cdot represents seven units of H_2O attached to one unit of $MgSO_4$.]
 A) 11 B) 7 C) 5 D) 4
11. 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
12. 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
13. The number of moles of molecules in a 12.0-gram sample of Cl_2 is
 A) $\frac{12.0}{35.5}$ mole B) $\frac{12.0}{71.0}$ mole
 C) 12.0 moles D) 12.0×35.5 moles
14. One mole of O_2 has approximately the same mass as one mole of
 A) CH_4 B) S C) LiH D) Cl_2
15. 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
16. 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) $\frac{184}{160.} \times 100$
17. What is the percent composition by mass of nitrogen in NH_4NO_3 (gram-formula mass = 80.0 grams/mole)?
 A) 17.5% B) 35.0%
 C) 52.5% D) 60.0%
18. The percent by mass of hydrogen in NH_3 is equal to
 A) $\frac{17}{1} \times 100$ B) $\frac{17}{3} \times 100$
 C) $\frac{1}{17} \times 100$ D) $\frac{3}{17} \times 100$
19. Which list includes three types of chemical reactions?
 A) condensation, double replacement, and sublimation
 B) condensation, solidification, and synthesis
 C) decomposition, double replacement, and synthesis
 D) decomposition, solidification, and sublimation

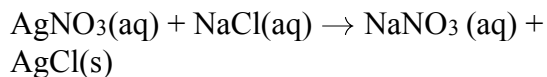
20. Given the balanced equation:



Which type of reaction is represented by this equation?

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

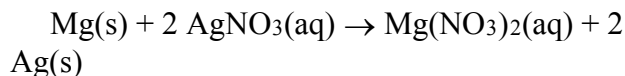
21. Given the balanced equation:



This reaction is classified as

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

22. Given the reaction:



Which type of reaction is represented?

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

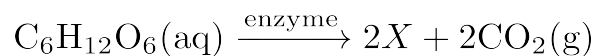
23. Which equation shows a conservation of mass?

- A) $\text{Na} + \text{Cl}_2 \rightarrow \text{NaCl}$
- B) $\text{Al} + \text{Br}_2 \rightarrow \text{AlBr}_3$
- C) $\text{H}_2\text{O} \rightarrow \text{H}_2 + \text{O}_2$
- D) $\text{PCl}_5 \rightarrow \text{PCl}_3 + \text{Cl}_2$

24. All chemical reactions have a conservation of

- A) mass, only
- B) mass and charge, only
- C) charge and energy, only
- D) mass, charge, and energy

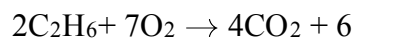
25. Given the balanced equation with an unknown compound represented by X :



Which compound is represented by X ?

- A) $\text{CH}_3\text{OH}(\text{aq})$
- B) $\text{CH}_2(\text{OH})_4(\text{aq})$
- C) $\text{CH}_3\text{CH}_2\text{OH}(\text{aq})$
- D) $\text{CH}_2\text{OHCH}_2\text{OH}(\text{aq})$

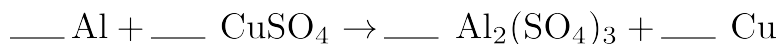
26. Given the incomplete equation for the combustion of ethane:



What is the formula of the missing product?

- A) CH_3OH
- B) HCOOH
- C) H_2O
- D) H_2O_2

27. Given the unbalanced equation:



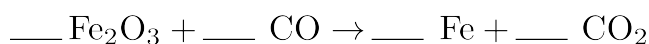
When the equation is balanced using the *smallest* whole-number coefficients, what is the coefficient of Al?

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

28. If an equation is balanced properly, both sides of the equation must have the same number of

- A) atoms
B) coefficients
C) molecules
D) moles of molecules

29. Given the unbalanced equation:



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

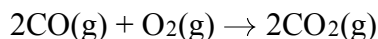
30. Given the balanced equation representing a reaction:



What is the *minimum* number of moles of O₂ that are needed to completely react with 16 moles of NH₃?

- A) 16 mol B) 20. mol
C) 64 mol D) 80. mol

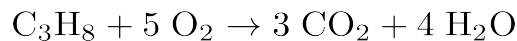
31. Given the balanced equation representing a reaction:



What is the mole ratio of CO(g) to CO₂(g) in this reaction?

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

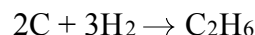
32. Given the balanced equation representing the reaction between propane and oxygen:



According to this equation, which ratio of oxygen to propane is correct?

- A) $\frac{5 \text{ grams O}_2}{1 \text{ gram C}_3\text{H}_8}$
B) $\frac{5 \text{ moles O}_2}{1 \text{ mole C}_3\text{H}_8}$
C) $\frac{10 \text{ grams O}_2}{11 \text{ grams C}_3\text{H}_8}$
D) $\frac{10 \text{ moles O}_2}{11 \text{ moles C}_3\text{H}_8}$

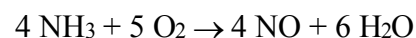
33. Given the balanced equation:



What is the total number of moles of C that must completely react to produce 2.0 moles of C₂H₆?

- A) 1.0 mol B) 2.0 mol
C) 3.0 mol D) 4.0 mol

34. Given the reaction:



What is the total number of moles of NO produced when 1.0 mole of O₂ is completely consumed?

- A) 1.0 mole B) 1.2 moles
C) 0.80 mole D) 4.0 moles

35. What is the total number of atoms contained in a 1.00-mole sample of helium?

- A) 1.00 atom
B) 2.00 atoms
C) 1.20×10^{24} atoms
D) 6.02×10^{23} atoms

36. What is the name of the polyatomic ion in the compound Na₂O₂?

- A) hydroxide B) oxalate
C) oxide D) peroxide

37. Which formula represents lead(II) chromate?

- A) PbCrO_4 B) $\text{Pb}(\text{CrO}_4)_2$
 C) Pb_2CrO_4 D) $\text{Pb}_2(\text{CrO}_4)_3$

38. A compound is made up of iron and oxygen, only. The ratio of iron ions to oxide ions is 2:3 in this compound. The IUPAC name for this compound is

- A) triiron dioxide B) iron(II) oxide
 C) iron(III) oxide D) iron trioxide

39. What is the IUPAC name for the compound FeS ?

- A) iron(II) sulfate B) iron(III) sulfate
 C) iron(II) sulfide D) Iron(III) sulfide

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

- A) FeS B) Fe_2S_3
 C) FeSO_4 D) $\text{Fe}_2(\text{SO}_4)_3$

41. What is the formula of titanium(II) oxide?

- A) TiO B) TiO_2
 C) Ti_2O D) Ti_2O_3

42. Which group on the Periodic Table of the Elements contains elements that react with oxygen to form compounds with the general formula X_2O ?

- A) Group 1 B) Group 2
 C) Group 14 D) Group 18

43. What is the total number of different elements present in NH_4NO_3 ?

- A) 7 B) 9 C) 3 D) 4

44. Element X reacts with iron to form two different compounds with the formulas $\text{Fe}X$ and Fe_2X_3 . To which group on the Periodic Table does element X belong?

- A) Group 8 B) Group 2
 C) Group 13 D) Group 16

45. A metal, M , forms an oxide compound with the general formula M_2O . In which group on the Periodic Table could metal M be found?

- A) Group 1 B) Group 2
 C) Group 16 D) Group 17

46. What is the chemical formula for sodium sulfate?

- A) Na_2SO_3 B) Na_2SO_4
 C) NaSO_3 D) NaSO_4

47. An unknown element X can form a compound with the formula $X\text{Br}_3$. In which group on the Periodic Table would element X be found?

- A) 1 B) 2 C) 13 D) 14

48. What is the chemical formula for copper(II) hydroxide?

- A) CuOH B) CuOH_2
 C) $\text{Cu}_2(\text{OH})$ D) $\text{Cu}(\text{OH})_2$

49. Which formula correctly represents the composition of iron (III) oxide?

- A) FeO_3 B) Fe_2O_3
 C) Fe_3O D) Fe_3O_2

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

- A) Ni_2Br B) NiBr_2
 C) N_2Br D) NBr_2

51. Atoms of which set of elements all exhibit the same oxidation state?

- A) H, He, Li B) He, F, C
 C) Be, Ca, Sr D) B, Si, As

52. Atoms of metals tend to

- A) lose electrons and form negative ions
 B) lose electrons and form positive ions
 C) gain electrons and form negative ions
 D) gain electrons and form positive ions