

Chapter 1: Stoichiometry

1. The atomic mass of C is 12.011 u. How many moles of C are there in a 3.50 g sample of carbon?
 - a. 0.291 moles
 - b. 0.374 moles
 - c. 1.00 moles
 - d. 3.43 moles
 - e. 3.50 moles
2. The formula mass of $\text{Ni}(\text{H}_2\text{O})_6\text{Cl}_2$ is
 - a. 157.69 u
 - b. 193.00 u
 - c. 227.61 u
 - d. 237.69 u
 - e. 296.83 u
3. If the atomic mass of gold is 196.9665 u, how many grams of gold are in 0.150 mol Au?
 - a. 7.62×10^{-4} g
 - b. 29.5 g
 - c. 29.54498 g
 - d. 7.61551×10^{-4} g
 - e. 0.903 g
4. How many molecules of carbon dioxide are in 154.0 grams of carbon dioxide?
 - a. 3.499
 - b. 2.107×10^{24}
 - c. 4.214×10^{24}
 - d. 9.274×10^{25}
 - e. 4.081×10^{27}
5. A sample of $\text{Ca}_3(\text{PO}_4)_2$ contains 3.51 moles of calcium ions. How many moles of $\text{Ca}_3(\text{PO}_4)_2$ are in that sample?
 - a. 3.55 moles
 - b. 0.491 moles
 - c. 10.5 moles
 - d. 1.17 moles
 - e. 3.51×10^{21} moles
6. What is the percent, by mass, of chromium in K_2CrO_4 ? Use a periodic table to find the atomic masses.
 - a. 26.776 %
 - b. 31.763 %
 - c. 40.268 %
 - d. 42.241 %
 - e. 51.996 %

7. A sample of $\text{Ni}(\text{CO})_4$, a toxic transition-metal complex, has 5.23×10^{24} atoms of carbon. How many atoms of Ni does it contain?
- 6.02×10^{23} atoms
 - 1.50×10^{23} atoms
 - 1/4 atom
 - 20.9×10^{23} atoms
 - 1.31×10^{24} atoms
8. A sample of sulfolane, $\text{C}_4\text{H}_8\text{O}_2\text{S}$, contains 5.00×10^{24} atoms. How many moles of sulfolane are in the sample?
- 0.120 moles
 - 0.554 moles
 - 1.81 moles
 - 8.30 moles
 - 3.33×10^{23} moles
9. A sample of $\text{C}_7\text{H}_5\text{N}_3\text{O}_4$ has a mass of 7.81 g. What is the mass of oxygen in this sample?
- 31.2 g
 - 2.56 g
 - 3.20×10^{23} g
 - 64.0 g
 - 1.75 g
10. Which one of the following is definitely not an empirical formula?
- $\text{C}_{12}\text{H}_{16}\text{O}_3$
 - $\text{C}_{12}\text{H}_{22}\text{O}_{11}$
 - $\text{C}_3\text{H}_8\text{O}_2$
 - $\text{C}_4\text{H}_{12}\text{N}_2\text{O}$
 - $\text{C}_6\text{H}_{12}\text{O}_4$
11. A compound has an empirical formula of CH_2Cl . An independent analysis gave a value of 99.0 for its molar mass. What is the molecular formula of the compound?
- CH_2Cl
 - $\text{C}_2\text{H}_4\text{Cl}_2$
 - $\text{C}_2\text{H}_2\text{Cl}_4$
 - $\text{C}_3\text{H}_6\text{Cl}_3$
 - $\text{C}_3\text{H}_3\text{Cl}_6$
12. Magnetite is a binary compound containing only iron and oxygen. The percent, by weight, of iron is 72.360 %. What is the empirical formula of magnetite?
- FeO
 - FeO_2
 - Fe_3O_4
 - Fe_2O_3
 - Fe_2O_5

13. Zinc metal reacts with aqueous hydrochloric acid to give an aqueous solution of zinc chloride and hydrogen gas. Select the correct balanced chemical equation for this reaction.

- a. $\text{Zn(s)} + \text{HCl(aq)} \rightarrow 3\text{ZnCl(aq)} + \text{H}_2(\text{g})$
- b. $\text{Zn(s)} + \text{HCl(g)} \rightarrow \text{ZnCl(aq)} + \text{H(g)}$
- c. $\text{Zn(s)} + 2\text{HCl(aq)} \rightarrow \text{ZnCl}_2(\text{aq}) + \text{H}_2(\text{g})$
- d. $2\text{Zn(s)} + 4\text{HCl(aq)} \rightarrow 2\text{ZnCl}_2(\text{aq}) + \text{H}_2(\text{g})$
- e. $2\text{Zn(s)} + \text{HCl(aq)} \rightarrow 2\text{ZnCl}_2(\text{aq}) + \text{H}_2(\text{g})$

14. Given: $3\text{H}_2(\text{g}) + \text{N}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$

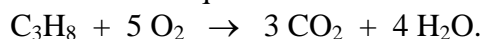
If the reaction starts with 0.500 mol of H_2 , how many atoms of hydrogen in the compound NH_3 would you expect to make?

- a. 3.01×10^{23} atoms
- b. 6.02×10^{23} atoms
- c. 12.04×10^{23} atoms
- d. 1 atom
- e. 6 atoms

15. In a chemical reaction, $\text{C}_2\text{H}_6\text{O} + \text{PCl}_3 \rightarrow \text{C}_2\text{H}_5\text{Cl} + \text{H}_3\text{PO}_3$, when the equation is balanced the sum of the coefficients of the reactants and products should be

- a. 4
- b. 5
- c. 6
- d. 7
- e. 8

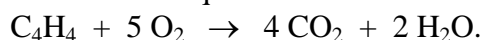
16. You are given the balanced chemical equation:



If 0.3818 moles of C_3H_8 and 1.718 moles of O_2 are allowed to react, and this is the only reaction which occurs, theoretically how many moles of water should be produced?

- a. 1.336 moles
- b. 1.374 moles
- c. 1.527 moles
- d. 1.718 moles
- e. 3.426 moles

17. You are given the balanced chemical equation:



If 0.3618 moles of C_4H_4 are allowed to react with 1.818 moles of O_2 , and this is the only reaction which occurs, what is the maximum mass of water that could be produced?

- a. 11.02 g
- b. 13.04 g
- c. 13.20 g
- d. 19.64 g
- e. 65.50 g

18. The left side of a balanced chemical equation is: $\text{K}_2\text{Cr}_2\text{O}_7 + 4 \text{H}_2\text{SO}_4 + 3 \text{SeO}_2 \rightarrow$
If 0.600 moles of $\text{K}_2\text{Cr}_2\text{O}_7$, 2.800 moles of H_2SO_4 and 1.500 moles of SeO_2 are brought together and allowed to react, then
- H_2SO_4 is the limiting reagent
 - $\text{K}_2\text{Cr}_2\text{O}_7$ is the limiting reagent
 - there are 1.300 moles of H_2SO_4 in excess
 - there are 0.800 moles of $\text{K}_2\text{Cr}_2\text{O}_7$ in excess
 - there are 0.300 moles of SeO_2 in excess
19. In a chemical equation, $\text{AsF}_3 + \text{C}_2\text{Cl}_6 \rightarrow \text{AsCl}_3 + \text{C}_2\text{Cl}_2\text{F}_4$, the theoretical yield of $\text{C}_2\text{Cl}_2\text{F}_4$ was calculated to be 1.86 moles. If the percent yield in the reaction was 77.2%, how many grams of $\text{C}_2\text{Cl}_2\text{F}_4$ were actually obtained?
- 222 grams
 - 231 grams
 - 245 grams
 - 318 grams
 - 412 grams
20. The density of an object is the ratio of its mass to its volume. What is the derived SI unit for density?
- kg m/s^3
 - kg m/s
 - kg/m^3
 - m/s^2
 - pounds per cubic inches
21. What is the number needed to complete the following: $1 \text{ dm} = __ \text{ m}$?
- 10
 - 20
 - 1
 - 0.1
 - 0.01
22. The SI base units of temperature and mass, respectively, are
- degree and gram.
 - kelvin and kilogram.
 - Celsius and milligram.
 - degree and kilogram.
 - kelvin and gram.
23. The SI prefixes giga and micro, indicate respectively:
- 10^9 and 10^{-6}
 - 10^{-9} and 10^{-6}
 - 10^6 and 10^{-3}
 - 10^3 and 10^{-3}
 - 10^{-9} and 10^{-3}

24. A solution of sodium nitrite is prepared by mixing 3.25 g of NaNO_2 with 12.0 g of water. The percent, by mass, of NaNO_2 is:
- 28.0 %
 - 23.3 %
 - 27.0 %
 - 21.3 %
 - 37.1 %
25. A solution of potassium nitrate is prepared by mixing 3.50 g of KNO_3 with 12.0 g of water. The percent, by mass, of KNO_3 is:
- 22.6 %
 - 23.3 %
 - 28.0 %
 - 29.2 %
 - 41.8 %
26. A glucose solution is prepared by dissolving 5.10 g of glucose, $\text{C}_6\text{H}_{12}\text{O}_6$, in 110.5 g of water. What is the molality of the glucose solution?
- 0.283 *m*
 - 0.000256 *m*
 - 0.245 *m*
 - 0.256 *m*
 - 0.351 *m*
27. An aqueous solution of glycerol, $\text{C}_3\text{H}_8\text{O}_3$, is 48.0% glycerol by mass and has a density of 1.120 g mL^{-1} . Calculate the molality of the glycerol solution.
- 11.2 *m*
 - 5.84 *m*
 - 0.584 *m*
 - 0.521 *m*
 - 10.0 *m*
28. Consider a 0.900 M $\text{Al}(\text{NO}_3)_3$ solution. This solution has a nitrate ion concentration of:
- 0.300 M
 - 0.900 M
 - 2.70 M
 - 3.60 M
 - 8.10 M
29. Which is a concentration unit whose value changes if the temperature of an aqueous solution is changed?
- mole fraction
 - molarity
 - molality
 - mass fraction
 - percent by weight