

Key

Solutions

Introduction to Chemistry

1. $0.6\mu\text{m}$ 2. $5.4 \times 10^4 \text{nL}$ 10 3. $3.5 \times 10^{-6} \text{mg/mL}$ 4. 25.2 g 5. 556 mL 6. 8.92 g/mL 7. a. 2 b. 4 c. 5 d. 2 e. 8 f. 3 8. a. 0.647 b. 394.78 c. 1×10^8 d. 45.7 e. 105.46 f. 2.02×10^9 g. 0.6748 h. 95.813 i. 492×10^{-4} j. 1.195 9. a. 2.0×10^9 b. 1.1×10^5 c. 3.9×10^{28} d. 7.9×10^7 10. a. 1.9 g/mL b. 0.0 g c. Mass = 1.9 g/mL · volume d. 285 g e. 126 mL f. D = slope = 1.9 g/mL

Properties of Matter

1. See textbook or notes. 2. See textbook or notes. 3. a. Components have different melting points. Increase in temperature until only one boils. Vapour condensed to liquid. Other substances stay in the flask. b. Small amounts of ink, pigments, etc. c. Filtration. d. immiscible; separatory e. Spins quickly. Dense materials forced outward to the bottom of the test tube. 4. The chemical composition does not change. Eg: Freezing, melting, mixing grinding, etc. 5. New chemical substances formed. Eg: Burning, photosynthesis, neutralization, etc. 6. a. Increase in temperature of the solid. b. Melting the solid. c. Warm up the liquid of substance "X". d. Boil the liquid. e. 43°C f. 77°C g. 3 h. gaseous i. All the nrg is being used for melting the solid. No nrg is available to warm the substance until melting is complete.

Names and Formulas for Compounds

1. a. NH_4ClO_3 b. CuSO_3 c. $\text{ZnCO}_3 \cdot 4\text{H}_2\text{O}$ d. HNO_3 e. PI_5 f. $\text{Fe}(\text{SCN})_3$ g. H_2SO_4 h. N_2F_4
2. a. Manganese (IV) sulphate b. Lead (II) chromate hexahydrate c. Diarsenic trioxide d. Acetic acid e. Nickel (III) oxalate f. Nitrogen trifluoride g. Ammonium monohydrogen phosphate h. Barium hydroxide decahydrate

The Mole Concept

1. a. 0.64 mol b. 0.588 g c. 7.6 mol d. 92.96 L e. 1.38 g f. 4.00×10^3 L g. 7.97×10^5 mL
2. 3.62×10^{23} molecules 3. 13.6 g/mL 4. 6.14 g/L 5. a. 100.9 g/mol b. SeO_2 6. 58.04% Sr, 13.69% P, 28.27% O 7. a. 76.8 g b. KSO_4 c. $\text{K}_2\text{S}_2\text{O}_8$ 8. $[\text{Zn}(\text{NO}_3)_2] = 1.000 \text{ M}$ 9. 25.328 g
10. 0.256 L 11. $[\text{HNO}_3] = 0.327 \text{ M}$ 12. 90.0 mL 13. Add 14.31 g of $\text{Ca}(\text{ClO})$ to less than 5.00 L of water and dissolve. Add more water to a final volume of 5.00 L.

Chemical Reactions

1. a. 4, 5, 4, 6 b. 3, 2, 1, 6 c. 2, 43, 28, 30 d. 2, 6, 2, 3 e. 1, 6, 4 f. 14, 2, 2, 7, 3 g. 2, 3, 16 h. 1, 1, 1, 4 i. 2, 21, 14, 16 j. 1, 1, 5
2. a. $3 \text{K}_2\text{SO}_4 + 2 \text{Co}(\text{NO}_3)_3 \rightarrow \text{Co}(\text{SO}_4)_3 + 6 \text{KNO}_3$ (D.R.)
b. $2 \text{C}_3\text{H}_7\text{OH} + 9 \text{O}_2 \rightarrow 6 \text{CO}_2 + 8 \text{H}_2\text{O}$ (Comb.)
c. $2 \text{NH}_4\text{NO}_3 \rightarrow 2 \text{N}_2 + 6 \text{H}_2 + 3 \text{O}_2$ (Dec.) d. $\text{Zn} + 2 \text{AgNO}_3 \rightarrow 2 \text{Ag} + \text{Zn}(\text{NO}_3)_2$ (S.R.)
e. $\text{Br}_2 + 2 \text{NaI} \rightarrow \text{I}_2 + 2 \text{NaBr}$ (S.R.) f. $3 \text{Br}_2 + 2 \text{Al} \rightarrow 2 \text{AlBr}_3$ (Syn.)
g. $2 \text{Rb} + \text{Cl}_2 \rightarrow 2 \text{RbCl}$ (Syn.) h. $2 \text{HCl} + \text{Sr}(\text{OH})_2 \rightarrow 2 \text{H}_2\text{O} + \text{SrCl}_2$ (Neut.)

3. a. endo b. exo c. endo d. exo e. endo f. endo 4. a. 9396.67 kJ b. 2870.25 kJ c. 3758.67 kJ

Stoichiometry

1. a. 3.67 mol b. 0.157 mol c. 19.35 mol d. 14.4 g HF 2. a. 47.85 L Br₂ b. 741.6 g HBr
 3. a. 0.948 g b. 0.450 L 4. a. [HNO₃] = 0.437 M b. 0.004424 L 5. a. Cu in excess. b. 90.0 g
 6. a. 440.7 g BF₃ b. 74.0% 7. a. 288.0 g NO b. 192.96 g

Atoms, Periodic Table and Bonding

1. Democritus 2. John Dalton; Atomic 3. J.J. Thompson 4. Ernest Rutherford; nucleus
 5. a. Hydrogen; energy; orbitals (shells); higher; light (photons); lower b. Only worked for hydrogen; no evidence that e- travel in orbits.

6.

Isotope	Protons	Neutrons	Electrons
¹⁹⁴ Ir ³⁺	77	117	74
²⁰² Hg ²⁺	80	122	78
¹²⁵ Te ²⁻	52	73	54
²⁶³ Sg	106	157	106
² H ⁺	1	1	0

7. a. ²⁶²Pb²⁺ b. ¹²³Sb³⁺ c. ⁷⁵As³⁻ d. ¹³³Xe e. ²⁴⁴Pu³⁺ 8. 79.986 g/mol; Bromine 9. orbitals.
 10. n; energy 11. a. [Ne] 3s² 3p³ b. [Kr] 5s² 4d⁴ c. [Ar] 4s² 3d¹⁰ 4p⁴ d. [Kr] 5s¹ e. [Ne] 3s² 3p⁶
 f. [He] 2s² 2p⁶ g. [Ne] 3s² 3p⁶ h. [Ne] 3s² 3p⁶ 12. lose, 2, Sr²⁺; gain, 3, As³⁻; lose, 3, Al³⁺; gain, 2, Se²⁻; gain, 3, N³⁻; gain, 1, I; lose, 1, Cs⁺; gain, 2, Te²⁻ 13. Ge 14. Na 15. Cs 16. Cl 17. Na 18. Bi
 19. Kr 20. C 21. Energy required to remove outermost e-. 22. Pb 23. Cs 24. Mg 25. Cl 26. F
 27. The attraction an atom has for the e- of another atom. 28. Ba 29. Tl 30. Ga 31. c 32. F 33. l
 34. t 35. High melting points.
 36.