Solutions

Introduction to Chemistry

1. 0.6μm **2.** 5.4 x 10^4nL 10 **3.** 3.5 x 10^{-6} 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 x 10^8 d. 45.7 e. 105.46 f. 2.02 x 10^9 g. 0.6748 h. 95.813 i. 4.92 x 10^{-4} j. 1.195 **9.** a. 2.0 x 10^9 b. 1.1 x 10^5 c. 3.9 x 10^{28} d. 7.9 x 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. Spins quickly. Dense materials forced outward to the bottom of the test tube. **4.** New chemical substances formed. Eg: Burning, photosynthesis, neutralization, etc. **5.** 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. $ZnCO_3 \cdot 4H_2O$ d. HNO_3 e. PI_5 f. $Fe(SCN)_3$ 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 x 10^3 L g. 7.97 x 10^5 mL
2. 3.62 x 10^{23} molecules **3.** 13.6 g/mL **4.** 6.14 g/L **5.** a. 111 g/mol b. SeO_2 **6.** 58.04% Sr, 13.69% P, 28.27% 0 **7.** a. 76.8 g b. KSO_4 c. $K_2S_2O_8$ **8.** $[Zn(NO_3)_2]$ =1.000 M **9.** 25.328 g **10.** 0.256 L **11.** $[HNO_3]$ = 0.33 M **12.** 240.0 mL **13.** Add 14.31 g of Ca(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. $3\ K_2SO_4 + 2\ Co(NO_3)_3 \rightarrow Co(SO_4)_3 + 6\ KNO_3$ (D.R.)
b. $2\ C_3H_7OH + 9\ O_2 \rightarrow 6\ CO_2 + 8\ H_2O$ (Comb.)
c. $2\ NH_4NO_3 \rightarrow 2\ N_2 + 6\ H_2 + 3\ O_2$ (Dec.) d. $Zn + 2\ AgNO_3 \rightarrow 2\ Ag + Zn(NO_3)_2$ (S.R.)
e. $Br_2 + 2\ NaI \rightarrow I_2 + 2\ NaBr$ (S.R.) f. $3\ Br_2 + 2\ Al \rightarrow 2\ AlBr_3$ (Syn.)
g. $2\ Rb + Cl_2 \rightarrow 2\ RbCl$ (Syn.) h. $2\ HCl + Sr(OH)_2 \rightarrow 2\ H_2O + SrCl_2$ (Neut.)

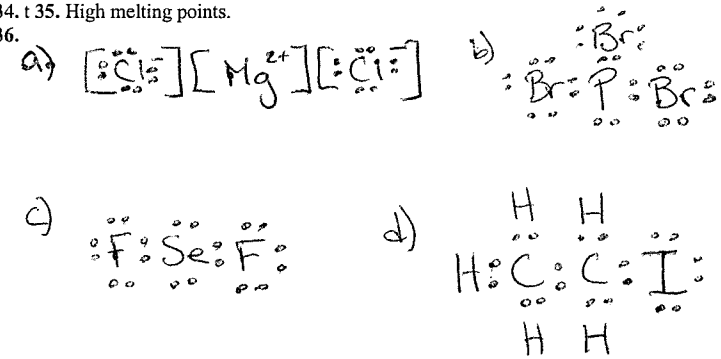
3. a. endo b. exo c. endo d. exo e. endo f. endo **4.** a. 9396.67 kJ b. 2870.25 kJ c. 3758.67 kJ

Stoichiometry

1. a. 3.67 mol b. 0.157 mol c. 19.35 mol d. 14.4 g HF **2.** a. 47.85 L Br_2 b. 741.6 g HBr
3. a. 0.948 g b. 0.450 L **4.** a. $[HNO_3]$ = 0.437 M b. 0.004424 L **5.** a. Cu in excess. b. 90.0 g
6. a. 440.7 g BF_3 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. $^{262}_{105}Pb^{2+}$ b. $^{123}_{51}Sb^{3+}$ c. $^{75}_{33}As^{3-}$ d. $^{133}_{54}Xe$ e. $^{244}_{94}Pu^{3+}$ **8.** 79.986 g/mol; Bromine **9.** orbitals **10.** n; energy **11.** a. [Ne] $3s^2\ 3p^3$ b. [Kr] $5s^2\ 4d^4$ c. [Ar] $4s^2\ 3d^{10}\ 4p^4$ d. [Kr] $5s^1$ e. [Ne] $3s^2\ 3p^6$ f. [He] $2s^2\ 2p^6$ g. [Ne] $3s^2\ 3p^6$ h. [Ne] $3s^2\ 3p^6$ **12.** lose, 2, Sr^{2+}; gain, 3, As^{3-}; lose, 3, Al^{3+}; gain, 2, Se^{2-}; gain, 3, N^{3-}; gain, 1, I^-; lose, 1, Cs^+; gain, 2, Te^{2-} **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.