Homework Key
Chapter 1
(Textbook Ch.2-3)

39. In ionic compounds, metals lose electrons to form cations, and nonmetals gain electrons to form anions. Group 1A, 2A, and 3A metals form stable 1+, 2+, and 3+ charged cations, respectively. Group 5A, 6A, and 7A nonmetals form 3–, 2–, and 1– charged anions, respectively.

a. Lose 2 e^- to form Ra^{2+}. b. Lose 3 e^- to form In^{3+}. c. Gain 3 e^- to form P^{3-}.

d. Gain 2 e^- to form Te^{2-}. e. Gain 1 e^- to form Br^-. f. Lose 1 e^- to form Rb^+.

41. Atomic number = 63 (Eu); net charge = +63 – 60 = 3+; mass number = 63 + 88 = 151; symbol: $^{151}_{63}Eu^{3+}$

Atomic number = 50 (Sn); mass number = 50 + 68 = 118; net charge = +50 – 48 = 2+; symbol: $^{118}_{50}Sn^{2+}$.

48.
a. acetic acid
b. ammonium nitrite
c. colbalt(III) sulfide
d. iodine monochloride
e. lead(II) phosphate
f. potassium chlorate
g. sulfuric acid
h. strontium nitride
i. aluminum sulfite
j. tin(IV) oxide
k. sodium chromate
l. hypochlorous acid

49.
a. copper(I) iodide
b. copper(II) iodide
c. cobalt(II) iodide
d. sodium carbonate
e. sodium hydrogen carbonate or sodium bicarbonate
f. tetrasulfur tetranitride
g. selenium tetrabromide
h. sodium hypochlorite
i. barium chromate
j. ammonium nitrate

53.
a. SO_2
b. SO_3
c. Na_2SO_3
d. $KHSO_3$
e. Li_3N
f. $Cr_2(CO_3)_3$
g. $Cr(C_2H_3O_2)_2$
h. SnF_4
i. NH_4HSO_4: composed of NH_4^+ and HSO_4^- ions
j. $(NH_4)_2HPO_4$
k. $KClO_4$
l. NaH
m. HBrO
n. HBr

54. a. Iron forms 2+ and 3+ charged ions; we need to include a Roman numeral for iron. Iron(III) chloride is correct.

b. This is a covalent compound so use the covalent rules. Nitrogen dioxide is correct.

c. This is an ionic compound, so use the ionic rules. Calcium oxide is correct. Calcium only forms stable 2+ ions when in ionic compounds, so no Roman numeral is needed.

d. This is an ionic compound, so use the ionic rules. Aluminum sulfide is correct.

e. This is an ionic compound, so use the ionic rules. Mg is magnesium. Magnesium acetate is correct.

f. Because phosphate has a 3– charge, the charge on iron is 3+. Iron(III) phosphate is correct.

g. This is a covalent compound, so use the covalent rules. Diphosphorus pentasulfide is correct.

h. Because each sodium is 1+ charged, we have the O_2^{2-} (peroxide) ion present. Sodium peroxide is correct. Note that sodium oxide would be Na_2O.

i. HNO_3 is nitric acid, not nitrate acid. Nitrate acid does not exist.

j. H_2S is hydrosulfuric acid or dihydrogen sulfide or just hydrogen sulfide (common name). H_2SO_4 is sulfuric acid.

63. In the case of sulfur, SO_4^{2-} is sulfate, and SO_3^{2-} is sulfite. By analogy:

SeO_4^{2-}: selenate; SeO_3^{2-}: selenite; TeO_4^{2-}: tellurate; TeO_3^{2-}: tellurite

23. $186.207 = 0.6260(186.956) + 0.3740(A)$, $186.207 - 117.0 = 0.3740(A)$

$$A = \frac{69.2}{0.3740} = 185 \text{ amu (A = 184.95 amu without rounding to proper significant figures)}$$

37. a. $2(12.01) + 3(1.008) + 3(35.45) + 2(16.00) = 165.39$ g/mol

b. $500.0\text{ g} \times \dfrac{1\text{ mol}}{165.39\text{ g}} = 3.023\text{ mol } C_2H_3Cl_3O_2$

c. $2.0 \times 10^{-2}\text{ mol} \times \dfrac{165.39\text{ g}}{\text{mol}} = 3.3\text{ g } C_2H_3Cl_3O_2$

d. $5.0\text{ g } C_2H_3Cl_3O_2 \times \dfrac{1\text{ mol}}{165.39\text{ g}} \times \dfrac{6.02 \times 10^{23}\text{ molecules}}{\text{mol}} \times \dfrac{3\text{ atoms Cl}}{\text{molecule}}$

$= 5.5 \times 10^{22}$ atoms of chlorine

e. $1.0\text{ g Cl} \times \dfrac{1\text{ mol Cl}}{35.45\text{ g}} \times \dfrac{1\text{ mol } C_2H_3Cl_3O_2}{3\text{ mol Cl}} \times \dfrac{165.39\text{ g } C_2H_3Cl_3O_2}{\text{mol } C_2H_3Cl_3O_2} = 1.6\text{ g chloral hydrate}$

f. $500\text{ molecules} \times \dfrac{1\text{ mol}}{6.022 \times 10^{23}\text{ molecules}} \times \dfrac{165.39\text{ g}}{\text{mol}} = 1.373 \times 10^{-19}\text{ g}$

47. There are 0.390 g Cu for every 100.000 g of fungal laccase. Let's assume 100.000 g fungal laccase.

$$\text{Mol fungal laccase} = 0.390\text{ g Cu} \times \frac{1\text{ mol Cu}}{63.55\text{ g Cu}} \times \frac{1\text{ mol fungal laccase}}{4\text{ mol Cu}} = 1.53 \times 10^{-3}\text{ mol}$$

$$\frac{x\text{ g fungal laccase}}{1\text{ mol fungal laccase}} = \frac{100.000\text{ g}}{1.53 \times 10^{-3}\text{ mol}},\quad x = \text{molar mass} = 6.54 \times 10^{4}\text{ g/mol}$$