MOLE UNIT REVIEW → ANSWER KEY !

3.1 Review Questions, p. 113

1. a. $\frac{2245\text{ g}}{825\text{ g}} = 2.72$ $\quad 2.72 \times 1.00\text{ mmu} = 2.72\text{ mmu}$

   b. The mass ratio of any equal number of identical items is the same.

2. a. $5.000\text{ g NaCl} - 1.965\text{ g Na} = 3.035\text{ g Cl}$

   $\frac{1.965\text{ g Na}}{3.035\text{ g Cl}} = 0.6474$

   b. $0.6474 \times 35.5\text{ u} = 23.0\text{ u}$

3. a. $10.000\text{ g ZuF} - 8.503\text{ g Zu} = 1.497\text{ g F}$

   $\frac{8.503\text{ g Zu}}{1.497\text{ g F}} \times 19.0\text{ u} = 108\text{ u}$

   b. silver

4. a. $\frac{2.037\text{ g Zn}}{1.000\text{ g S}} \times 32.1\text{ u} = 65.4\text{ u}$

   b. $2 \times \frac{2.037\text{ g Zn}}{1.000\text{ g S}} \times 32.1\text{ u} = 130\text{ u}$

   c. $0.667 \times \frac{2.037\text{ g Zn}}{1.000\text{ g S}} \times 32.1\text{ u} = 43.8\text{ u}$

5. a. $\frac{13.073\text{ g Cu}}{1.647\text{ g O}} \times 16.0\text{ u} = 127\text{ u}$

   b. $0.50 \times \frac{13.073\text{ g Cu}}{1.647\text{ g O}} \times 16.0\text{ u} = 63.5\text{ u}$

   c. $2.00 \times \frac{13.073\text{ g Cu}}{1.647\text{ g O}} \times 16.0\text{ u} = 254\text{ u}$

6. a. $\frac{25.0}{0.3864} = 64.7$

   b. 63.5 u $\qquad$ Cu_2O

7. Al $\frac{25.0}{0.903} = 27.7$ (3% error)

   Mg $\frac{25.0}{1.05} = 23.8$ (–2% error)

   Ag $\frac{25.0}{0.23772} = 105$ (–3% error)

8.

Element	Mass of Gas (g)	Relative Atomic Mass (u)
H	0.210	1.0
Cl	7.455	**35.5**

9. A potassium atom weighs 39.1 times as much as a hydrogen atom.

10. a. 31.0 u
    b. 40.1 u
    c. 238 u

11. a. $\frac{628.2\text{ g}}{213.1\text{ g}} = 2.948$

    The mass of a knife is 2.948 times the mass of a fork.

    b. If eight knives weigh 2.948 times as much as eight forks then one knife will weigh 2.948 times as much as one fork.

    c. The average mass of a knife is 2.948 times the average mass of a fork.

12. For example: Weigh a pile containing one 10 g coin and two 20 g coins. If the pile weighs:

    49 g then the 10 g coin is actually 9 g
    48 g then the 20 g coin is actually 19 g
    50 g then the 30 g coin is actually 29 g

3.2 Review

1. a. A quantity equal to the number of atoms in the atomic mass of any element expressed in grams
   b. $6.02214179 \times 10^{23}$
   c. Avogadro's number

2. a. 12.0 g
   b. 36.0 g
   c. 64.2 g

3. a. 55.8 g
   b. molar mass

4. a. 44.0 u
   b. 74.1 u
   c. 154.0 g

5. $3.2 \text{ mol C} \times \frac{6.02 \times 10^{23} \text{ atoms C}}{1 \text{ mol C}} = 1.9 \times 10^{24} \text{ atoms C}$

6. $0.0085 \text{ moles } C_2H_6 \times \frac{6.02 \times 10^{23} \text{ molecules } C_2H_6}{1 \text{ mol } C_2H_6} = 5.1 \times 10^{21} \text{ molecules } C_2H_6$

7. $1.4 \times 10^{18} \text{ atoms Ag} \times \frac{1 \text{ mol Ag}}{6.02 \times 10^{23} \text{ atoms Ag}} = 2.3 \times 10^{-6} \text{ mol Ag}$

8. $2.99 \text{ g Na} \times \frac{1 \text{ mol Na}}{23.0 \text{ g Na}} = 0.130 \text{ mol Na}$

9. $5.2 \text{ mol F} \times \frac{19.0 \text{ g F}}{1 \text{ mol F}} = 99 \text{ g F}$

10. $2.0 \text{ g Li} \times \frac{1 \text{ mol Li}}{6.9 \text{ g Li}} = 0.316 \text{ mol Li}$

11. $0.32 \text{ mol } NaNO_2 \times \frac{69.0 \text{ g } NaNO_2}{1 \text{ mol } NaNO_2} = 22 \text{ g } NaNO_2$

12. $0.058 \text{ g } C_8H_{10}N_4O_2 \times \frac{1 \text{ mol } C_8H_{10}N_4O_2}{194.0 \text{ g } C_8H_{10}N_4O_2} = 3.0 \times 10^{-4} \text{ mol } C_8H_{10}N_4O_2$

13. $0.725 \text{ mol } CO_2 \times \frac{6.02 \times 10^{23} \text{ molecules } CO_2}{1 \text{ mol } CO_2} = 4.36 \times 10^{23} \text{ molecules } CO_2$

14. $1.70 \times 10^{9} \text{ molecules Pher} \times \frac{1 \text{ mol Pher}}{6.02 \times 10^{23} \text{ molecules Pher}} = 2.82 \times 10^{-15} \text{ mol Pher}$

15. $1300 \text{ g Ti} \times \frac{1 \text{ mol Ti}}{47.9 \text{ g Ti}} = 27 \text{ mol Ti}$

16. $1.75 \text{ mol } CuSO_4, 5H_2O \times \frac{249.6 \text{ g } CuSO_4, 5H_2O}{1 \text{ mol } CuSO_4, 5H_2O} = 437 \text{ g } CuSO_4, 5H_2O$

17. 8.18×10^6 mol $NH_3 \times \frac{17.0\ g\ NH_3}{1\ mol\ NH_3} \times \frac{1\ tonne\ NH_3}{1000\ g\ NH_3} = 1.39 \times 10^5$ tonnes NH_3

18. 2.640×10^3 g $(NH_4)PO_4 \times \frac{1\ mol\ (NH_4)PO_4}{47.9\ g\ (NH_4)PO_4} = 55$ mol $(NH_4)PO_4$

19. 5.925 mol $SnCr_2O_7 \times \frac{334.7\ g\ SnCr_2O_7}{1\ mol\ SnCr_2O_7} = 1983$ g $SnCr_2O_7$

3.3 Review Questions, p. 130

1. 1.0×10^3 atoms Ag $\times \frac{1\ mol\ Ag}{6.02 \times 10^{23}\ atoms\ Ag} \times \frac{107.9\ g\ Ag}{1\ mol\ Ag} = 1.8 \times 10^{-19}$ g Ag

2. 106.0 g C $\times \frac{1\ mol\ C}{12.0\ g\ C} \times \frac{6.02 \times 10^{23}\ atoms\ C}{1\ mol\ C} = 5.32 \times 10^{24}$ atoms C

3. 1 atom Cl $\times \frac{1\ mol\ Cl}{6.02 \times 10^{23}\ atoms\ Cl} \times \frac{35.5\ g\ Cl}{1\ mol\ Cl} = 5.90 \times 10^{-23}$ g Cl

4. 72.6 g $C_3H_8 \times \frac{1\ mol\ C_3H_8}{44.0\ g\ C_3H_8} \times \frac{6.02 \times 10^{23}\ molecules\ C_3H_8}{1\ mol\ C_3H_8} = 9.93 \times 10^{23}$ molecules C_3H_8

5. a. 31.1 g Au $\times \frac{1\ mol\ Au}{197.0\ g\ Au} \times \frac{6.02 \times 10^{23}\ atoms\ Au}{1\ mol\ Au} = 9.50 \times 10^{22}$ atoms Au

   b. $\frac{9.50 \times 10^{22}\ atoms\ Au}{1.3 \times 10^5\ cents} = 7.3 \times 10^{17}$ atoms Au per cent

6. a. $\frac{4\ mol\ O}{1\ mol\ N_2O_4}$ b. $\frac{1\ mol\ NO_2}{1\ mol\ N}$

7. 2.3 mol $CO_2 \times \frac{2\ mol\ O}{1\ mol\ CO_2} = 4.6$ mol O

8. 52.4 mg $CaC_2O_4 \times \frac{1\ g\ CaC_2O_4}{1000\ mg\ CaC_2O_4} = 0.0524$ g CaC_2O_4

   0.0524 g $CaC_2O_4 \times \frac{1\ mol\ CaC_2O_4}{128.1\ g\ CaC_2O_4} \times \frac{2\ mol\ C}{1\ mol\ CaC_2O_4} = 8.18 \times 10^{-4}$ mol C

9. 6.80×10^{24} f.units $Na_3PO_4 \times \frac{1\ mol\ Na_3PO_4}{6.02 \times 10^{23}\ f.units\ Na_3PO_4} \times \frac{3\ mol\ Na^+}{1\ mol\ Na_3PO_4}$

   $= 33.9$ mol Na^+

10. 1.4 mol O $\times \frac{1\ mol\ H_2SO_4}{4\ mol\ O} \times \frac{98.1\ g\ H_2SO_4}{1\ mol\ H_2SO_4} = 34$ g H_2SO_4

11. $0.85 \text{ mol } C_8H_9NO_2 \times \frac{8 \text{ mol C}}{1 \text{ mol } C_8H_9NO_2} \times \frac{6.02 \times 10^{23} \text{ atoms C}}{1 \text{ mol C}} = 4.1 \times 10^{24} \text{ atoms C}$

12. $100.0 \text{ g } HgCl_2 \times \frac{1 \text{ mol } HgCl_2}{271.6 \text{ g } HgCl_2} \times \frac{1 \text{ mol } Hg^{2+}}{1 \text{ mol } HgCl_2} \times \frac{6.02 \times 10^{23} \text{ ions } Hg^{2+}}{1 \text{ mol } Hg^{2+}}$

$= 2.22 \times 10^{23} \text{ ions } Hg^{2+}$

13. $8.3 \text{ g } CuCl_2 \times \frac{1 \text{ mol } CuCl_2}{134.5 \text{ g } CuCl_2} \times \frac{2 \text{ mol } Cl^-}{1 \text{ mol } CuCl_2} \times \frac{35.5 \text{ g } Cl^-}{1 \text{ mol } Cl^-} = 4.4 \text{ g } Cl^-$

14. $4.8 \times 10^{26} \text{ molecules } C_2H_5OH \times \frac{1 \text{ mol } C_2H_5OH}{6.02 \times 10^{23} \text{ molecules } C_2H_5OH} \times \frac{2 \text{ mol C}}{1 \text{ mol } C_2H_5OH} \times \frac{12.0 \text{ g C}}{1 \text{ mol C}}$

$= 1.9 \times 10^4 \text{ g C} = 19 \text{ kg C}$

15. $3.9 \times 10^{27} \text{ molecules HF} \times \frac{1 \text{ mol HF}}{6.02 \times 10^{23} \text{ molecules HF}} \times \frac{20.0 \text{ g HF}}{1 \text{ mol HF}} \times \frac{1 \text{ kg HF}}{1000 \text{ g HF}}$

$= 1.3 \times 10^2 \text{ kg HF}$

16. $1.44 \times 10^8 \text{ g } NO_2 \times \frac{1 \text{ mol } NO_2}{46.0 \text{ g } NO_2} \times \frac{2 \text{ mol O}}{1 \text{ mol } NO_2} \times \frac{6.02 \times 10^{23} \text{ atoms O}}{1 \text{ mol O}}$

$= 3.77 \times 10^{30} \text{ atoms O}$

17. $1.000 \times 10^{-3} \text{ g } CCl_4 \times \frac{1 \text{ mol } CCl_4}{154.0 \text{ g } CCl_4} \times \frac{6.02 \times 10^{23} \text{ molecules } CCl_4}{1 \text{ mol } CCl_4}$

$= 3.91 \times 10^{18} \text{ molecules } CCl_4$

18. $4.5 \text{ mol } C_3H_5(OH)_3 \times \frac{8 \text{ mol H}}{1 \text{ mol } C_3H_5(OH)_3} \times \frac{6.02 \times 10^{23} \text{ atoms H}}{1 \text{ mol H}} = 2.2 \times 10^{25} \text{ atoms H}$

19. $14.56 \text{ g } NaHSO_4 \times \frac{1 \text{ mol } NaHSO_4}{120.1 \text{ g } NaHSO_4} \times \frac{7 \text{ mol atoms}}{1 \text{ mol } NaHSO_4} \times \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol atoms}}$

$= 5.11 \times 10^{23} \text{ atoms}$

3.4 Review Questions, p. 140

1. $0.250 \text{ mol } C_8H_{18} \times \frac{82.4 \text{ mL } C_8H_{18}}{1 \text{ mol } C_8H_{18}} = 20.6 \text{ mL } C_8H_{18}$

2. $2.4 \text{ L air} \times \frac{1 \text{ mol air}}{22.4 \text{ L air}} = 0.11 \text{ mol air}$

3. $2.75 \text{ L } N_2 \times \frac{1 \text{ mol } N_2}{22.4 \text{ L } N_2} = 0.123 \text{ mol } N_2$

4. $5.0 \text{ L air} \times \frac{21 \text{ L } O_2}{100 \text{ L air}} \times \frac{1 \text{ mol } O_2}{22.4 \text{ L } O_2} = 0.047 \text{ mol } O_2$

5. $2.57 \text{ L } P_2O_5 \times \frac{1 \text{ mol } P_2O_5}{22.4 \text{ L } P_2O_5} \times \frac{142.0 \text{ g } P_2O_5}{1 \text{ mol } P_2O_5} = 16.3 \text{ g } P_2O_5$

6. $\frac{0.935\ g}{525\ mL} \times \frac{22400\ mL}{1\ mol} = 39.9$ g/mol (Argon)

7. $1400\ L\ C_2H_2 \times \frac{1\ mol\ C_2H_2}{22.4\ L\ C_2H_2} \times \frac{6.02 \times 10^{23}\ molecules\ C_2H_2}{1\ mol\ C_2H_2} = 3.8 \times 10^{25}$ molecules C_2H_2

8. 5×10^{19} molecules $PH_3 \times \frac{1\ mol\ PH_3}{6.02 \times 10^{23}\ molecules\ PH_3} \times \frac{22.4\ L\ PH_3}{1\ mol\ PH_3} = 0.002\ L\ PH_3$

$0.002\ L\ PH_3 \times \frac{1000\ mL}{1\ L} = 2\ mL\ PH_3$

9. $9100\ g\ C_3H_8 \times \frac{1\ mol\ C_3H_8}{44.0\ g\ C_3H_8} \times \frac{22.4\ L\ C_3H_8}{1\ mol\ C_3H_8} = 4600\ L\ C_3H_8$

10. (3.7) $0.355\ L\ CO_2 \times \frac{1\ mol\ CO_2}{22.4\ L\ CO_2} \times \frac{44.0\ g\ CO_2}{1\ mol\ CO_2} = 2.6\ g\ CO_2$

11. $83.9\ L\ NH_3 \times \frac{1\ mol\ NH_3}{22.4\ L\ NH_3} \times \frac{3\ mol\ H}{1\ mol\ NH_3} = 11.2\ mol\ H$

12. $3.84\ L\ N_2O \times \frac{1\ mol\ N_2O}{22.4\ L\ N_2O} \times \frac{2\ mol\ N}{1\ mol\ N_2O} \times \frac{14.0\ g\ N}{1\ mol\ N} = 4.80\ g\ N$

13. $27.2\ L\ N_2O_4 \times \frac{1\ mol\ N_2O_4}{22.4\ L\ N_2O_4} \times \frac{4\ mol\ O}{1\ mol\ N_2O_4} \times \frac{6.02 \times 10^{23}\ atoms\ O}{1\ mol\ O}$

$= 2.92 \times 10^{24}$ atoms O

14. $15\ mL\ C_4H_{10} \times \frac{0.601\ g\ C_4H_{10}}{1\ mL\ C_4H_{10}} = 9.0\ g\ C_4H_{10}$

15. $\frac{200.6\ g\ Hg}{1\ mol\ Hg} \times \frac{1\ mL\ Hg}{13.546\ g\ Hg} = 14.81$ mL/mol Hg

16. $5.0\ cm^3\ Au \times \frac{19.42\ g\ Au}{1\ cm^3\ Au} \times \frac{1\ mol\ Au}{197.0\ g\ Au} = 0.49\ mol\ Au$

17. $15.0\ mL\ Br_2 \times \frac{3.53\ g\ Br_2}{1\ mL\ Br_2} \times \frac{1\ mol\ Br_2}{159.8\ g\ Br_2} \times \frac{6.02 \times 10^{23}\ molecules\ Br_2}{1\ mol\ Br_2}$

$= 1.99 \times 10^{23}$ molecules Br_2

3.5 Review Questions, p. 149

1.

10 C	$(10 \times 12.0\ g)/mol = 120.0\ g/mol$	$= 76.9\%$
20 H	$(20 \times 1.0\ g)/mol = 20.0\ g/mol$	$= 12.8\%$
1 O	$(1 \times 16.0\ g)/mol = 16.0\ g/mol$	$= 10.3\%$
	$156.0\ g/mol$	100.0%

2.

1 Na	$(1 \times 23.0\ g)/mol$	$= 23.0\ g/mol$
2 C	$(2 \times 12.0\ g)/mol$	$= 24.0\ g/mol$
3 H	$(3 \times 1.0\ g)/mol$	$= 3.0\ g/mol$
2 O	$(2 \times 16.0\ g)/mol$	$= \underline{32.0\ g/mol}$
		$82.0\ g/mol$
$3H_2O$	$(3 \times 18.0\ g)/mol$	$= \underline{54.0\ g/mol}$
		$136.0\ g/mol$

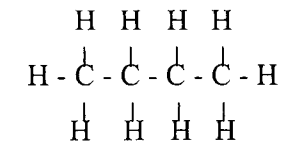
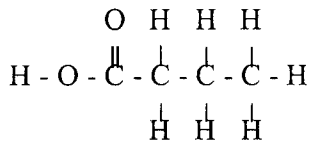
$= 39.7\%$

3.

7 C	$(7 \times 12.0\ g)/mol$	$= 84.0\ g/mol$
5 H	$(5 \times 1.0\ g)/mol$	$= 5.0\ g/mol$
6 O	$(6 \times 16.0\ g)/mol$	$= 96.0\ g/mol$
3 N	$(3 \times 14.0\ g)/mol$	$= \underline{42.0\ g/mol}$
		$227\ g/mol$

$= 18.5\%$

4.

Structural Formula	Molecular Formula	Empirical Formula
	C_4H_{10}	C_2H_5
	$C_4H_8O_2$	C_2H_4O

5. a. Many compounds have the same empirical formula
   b. Its molar mass

6. $BaCO_3$

7. $1.4844\ g\ C \times \frac{1\ mol\ C}{12.0\ g\ C} = 0.1237\ mol\ C$

$0.1545\ g\ H \times \frac{1\ mol\ H}{1.0\ g\ H} = 0.1545\ mol\ H$

$0.4947\ g\ O \times \frac{1\ mol\ O}{16.0\ g\ O} = 0.0309\ mol\ O$

$0.8661\ g\ N \times \frac{1\ mol\ N}{14.0\ g\ N} = 0.0619\ mol\ N$

$C_4H_5ON_2$

8. $0.0285\ mol\ Al \times \frac{27.0\ g\ Al}{1\ mol\ Al} = 0.7695\ g\ Al = 1.8\%\ Al$

$0.8740\ mol\ Si \times \frac{28.1\ g\ Si}{1\ mol\ Si} = 24.5594\ g\ Si = 58.2\%\ Si$

$0.0975\ mol\ Yb \times \frac{173.0\ g\ Yb}{1\ mol\ Yb} = 16.8675\ g\ Yb = \frac{40.0\%}{100.0\%}\ Yb$

b. For example: If Heliomolar was introduced in 1984, the person did not die before 1984 or perhaps Heliomolar was only used in certain countries.

9. 1 N $(1 \times 14.0\text{ g})/\text{mol} = 14.0\text{ g/mol}$
2 H $(2 \times 1.0\text{ g})/\text{mol} = 2.0\text{ g/mol}$
16.0 g/mol

$\frac{32.1\text{ g/mol}}{16.0\text{ g/mol}} = 2.01$

$2\,(NH_2) = N_2H_4$

10. $1.080\text{ g C} \times \frac{1\text{ mol C}}{12.0\text{ g C}} = 0.090\text{ mol C}$

$0.121\text{ g H} \times \frac{1\text{ mol H}}{1.0\text{ g H}} = 0.121\text{ mol H}$

$1.439\text{ g O} \times \frac{1\text{ mol O}}{16.0\text{ g O}} = 0.090\text{ mol O}$

$3\,(CH_{1.34}O) = C_3H_4O_3$

3 C $(3 \times 12.0\text{ g})/\text{mol} = 36.0\text{ g/mol}$

4 H $(4 \times 1.0\text{ g})/\text{mol} = 4.0\text{ g/mol}$
3 O $(3 \times 16.0\text{ g})/\text{mol} = 48.0\text{ g/mol}$
88.0 g/mol

$\frac{176.1\text{ g/mol}}{88.0\text{ g/mol}} = 2.00$

$2\,(C_3H_4O_3) = C_6H_8O_6$

11. $92.29\text{ g C} \times \frac{1\text{ mol C}}{12.0\text{ g C}} = 7.69\text{ mol C}$

$7.71\text{ g H} \times \frac{1\text{ mol H}}{1.0\text{ g H}} = 7.71\text{ mol H}$

CH

1 C $(1 \times 12.0\text{ g})/\text{mol} = 12.0\text{ g/mol}$
1 H $(1 \times 1.0\text{ g})/\text{mol} = 1.0\text{ g/mol}$
13.0 g/mol

$\frac{78.0\text{ g/mol}}{13.0\text{ g/mol}} = 6.00$

$6\,(CH) = C_6H_6$

12. a. $0.273 \times 44.0\text{u} = 12.0\text{u}$
b. Yes, this is carbon's atomic mass.

3.6 Review Questions, 159

1. 1.5 mol HCl per 1 L soln

2. $0.0050\text{ L DM} \times \frac{0.011\text{ mol DM}}{1\text{ L syrup}} = 5.5 \times 10^{-5}\text{ mol DM}$

3. $0.075\text{ mol } Ca^{2+} \times \frac{1\text{ L soln}}{0.20\text{ mol } Ca^{2+}} = 0.37 \text{ or } 0.38\text{ L soln}$

4. $5.00 \times 10^{-13}\text{ L soln} \times \frac{1.2 \times 10^{-2}\text{ mol } Na^+}{1\text{ L soln}} \times \frac{6.02 \times 10^{23}\text{ ions } Na^+}{1\text{ mol } Na^+} = 3.6 \times 10^{9}\text{ ions } Na^+$

5. a. $0.10\text{ g } C_8H_{10}N_4O_2 \times \frac{1\text{ mol } C_8H_{10}N_4O_2}{194.0\text{ g } C_8H_{10}N_4O_2} = 5.155 \times 10^{-4}\text{ mol } C_8H_{10}N_4O_2$

$$\frac{5.155 \times 10^{-4}\text{ mol } C_8H_{10}N_4O_2}{0.296\text{ L soln}} = 1.7 \times 10^{-3}\text{ M } C_8H_{10}N_4O_2$$

b. $42.6\text{ g } C_6H_{12}O_6 \times \frac{1\text{ mol } C_6H_{12}O_6}{180.0\text{ g } C_6H_{12}O_6} = 0.237\text{ mol } C_6H_{12}O_6$

$$\frac{0.237\text{ mol } C_6H_{12}O_6}{0.355\text{ L soln}} = 0.667\text{ M } C_6H_{12}O_6$$

6. $5.0\text{ L blood} \times \frac{4.0 \times 10^{-3}\text{ mol } C_6H_{12}O_6}{1\text{ L blood}} \times \frac{180.0\text{ g } C_6H_{12}O_6}{1\text{ mol } C_6H_{12}O_6} = 3.6\text{ g } C_6H_{12}O_6$

7. $0.250\text{ L soln} \times \frac{0.50\text{ mol } NaNO_3}{1\text{ L soln}} \times \frac{85.0\text{ g } NaNO_3}{1\text{ mol } NaNO_3} = 11\text{ g } NaNO_3$

Measure out 11 g $NaNO_3$ and add water up to 250 mL soln

8. $0.3000\text{ L soln} \times \frac{4.5 \times 10^{-4}\text{ mol } O_2}{1\text{ L soln}} \times \frac{22.4\text{ L } O_2}{1\text{ mol } O_2} = 3.0 \times 10^{-3}\text{ L } O_2$

$3.0 \times 10^{-3}\text{ L } O_2 \times \frac{1000.0\text{ mL}}{1\text{ L}} = 3.0\text{ mL } O_2$

9. a. $Fe_2(Cr_2O_7)_3(s) \longrightarrow 2Fe^{3+}(aq) + 3Cr_2O_7^{2-}(aq)$ — 0.70 M Fe^{3+} and 1.0 or 1.1 M $Cr_2O_7^{2-}$

b. $Sr(CN)_2(s) \longrightarrow Sr^{2+}(aq) + 2CN^-(aq)$ — 1.6 M Sr^{2+} and 3.2 M CN^-

10. $FeCl_3(s) \longrightarrow Fe^{3+}(aq) + 3Cl^-(aq)$ — 0.013 M $FeCl_3$

11. a.

$Fe_2(SO_4)_3(s)$	$\longrightarrow$	$2Fe^{3+}(aq)$	$3SO_4^{2-}(aq)$
	dissolves to form	1.5 M	?
	dissolves to form	1.5 M	**2.3 M**

$1.5\text{ M } Fe^{3+} \times \frac{3\text{ M } SO_4^{2-}}{2\text{ M } Fe^{3+}} = 2.2 \text{ or } 2.3\text{ M } SO_4^{2-}$

b.

$Fe_2(SO_4)_3(s)$	$\longrightarrow$	$2Fe^{3+}(aq)$	$3SO_4^{2-}(aq)$
	dissolves to form	?	3.0 M
	dissolves to form	**2.0 M**	3.0 M

$3.0\text{ M } SO_4^{2-} \times \frac{2\text{ M } Fe^{3+}}{3\text{ M } SO_4^{2-}} = 2.0\text{ M } Fe^{3+}$

12. a. $ZnCrO_4(s) \longrightarrow Zn^{2+}(aq) + CrO_4^{2-}(aq)$ $\quad [Zn^{2+}] = [CrO_4^{2-}]$

b. $Sr(OH)_2(s) \longrightarrow Sr^{2+}(aq) + 2OH^-(aq)$ $\quad [OH^-] = 2[Sr^{2+}]$

13. $0.250 \text{ L soln} \times \dfrac{3.14 \times 10^{-2} \text{ mol } Ca^{2+}}{1 \text{ L soln}} \times \dfrac{40.1 \text{ g } Ca^{2+}}{1 \text{ mol } Ca^{2+}} = 0.31 \text{ g } Ca^{2+}$

14. $1.5 \text{ L soln} \times \dfrac{3.0 \text{ mol } Na_2CO_3}{1 \text{ L soln}} \times \dfrac{2 \text{ mol } Na^+}{1 \text{ mol } Na_2CO_3} \times \dfrac{6.02 \times 10^{23} \text{ ions } Na^+}{1 \text{ mol } Na^+}$

$= 5.4 \times 10^{24} \text{ ions } Na^+$

15. $\dfrac{0.0050 \text{ L}}{145 \text{ drops}} \times 1 \text{ drop} = 3.45 \times 10^{-5} \text{ L}$

$3.45 \times 10^{-5} \text{ L soln} \times \dfrac{0.10 \text{ mol } FeBr_3}{1 \text{ L soln}} \times \dfrac{3 \text{ mol } Br^-}{1 \text{ mol } FeBr_3} \times \dfrac{79.9 \text{ g } Br^-}{1 \text{ mol } Br^-}$

$= 8.3 \times 10^{-4} \text{ g } Br^-$

16. $0.049 \text{ g P} \times \dfrac{1 \text{ mol P}}{31.0 \text{ g P}} \times \dfrac{1 \text{ mol } H_3PO_4}{1 \text{ mol P}} = 1.581 \times 10^{-3} \text{ mol } H_3PO_4$

$\dfrac{1.581 \times 10^{-3} \text{ mol } H_3PO_4}{0.355 \text{ L soln}} = 4.4 \times 10^{-3} \text{ M } H_3PO_4 \text{ or } 4.4 \text{ mM } H_3PO_4$

17.