

CHEM 1050 Homework
Exam #3 Assignment-Solutions
Alan D. Earhart

7.1 1 mole is equivalent to 6.0221×10^{23} "things"

7.2 6.0221×10^{23}

7.4 a. $\left(\frac{4.5 \text{ mol Li}}{1}\right)\left(\frac{6.0221 \times 10^{23} \text{ atoms}}{1 \text{ mol}}\right) = 2.7 \times 10^{24} \text{ atoms Li}$

b. $\left(\frac{0.0180 \text{ mol CO}_2}{1}\right)\left(\frac{6.0221 \times 10^{23} \text{ molecules}}{1 \text{ mol}}\right) = 1.08 \times 10^{22} \text{ molecules CO}_2$

c. $\left(\frac{7.8 \times 10^{21} \text{ atoms Cu}}{1}\right)\left(\frac{1 \text{ mol}}{6.0221 \times 10^{23} \text{ atoms}}\right) = 0.013 \text{ mol Cu}$

d. $\left(\frac{3.75 \times 10^{23} \text{ molecules C}_2\text{H}_6}{1}\right)\left(\frac{1 \text{ mol}}{6.0221 \times 10^{23} \text{ molecules}}\right) = 0.623 \text{ mol C}_2\text{H}_6$

7.7 a. $\left(\frac{1.0 \text{ mol quinine}}{1}\right)\left(\frac{24 \text{ mol H}}{1 \text{ mol quinine}}\right) = 24 \text{ mol hydrogen}$

b. $\left(\frac{5.0 \text{ mol quinine}}{1}\right)\left(\frac{20 \text{ mol carbon}}{1 \text{ mol quinine}}\right) = 1.0 \times 10^2 \text{ mol carbon}$

c. $\left(\frac{0.020 \text{ mol quinine}}{1}\right)\left(\frac{2 \text{ mol nitrogen}}{1 \text{ mol quinine}}\right) = 0.040 \text{ mol nitrogen}$

7.9 a. 188.1 g/mol b. 159.6 g/mol c. 329.0 g/mol

d. 342.3 g/mol e. 58.3 g/mol

7.10 a. 151.9 g/mol b. 102.0 g/mol c. 183.1 g/mol

d. 60.0 g/mol e. 96.0 g/mol

7.14 a. $\left(\frac{1.50 \text{ mol K}}{1}\right)\left(\frac{39.1 \text{ gK}}{1 \text{ molK}}\right) = 58.7 \text{ g K}$

b. $\left(\frac{2.5 \text{ mol C}}{1}\right)\left(\frac{12.0 \text{ gC}}{1 \text{ molC}}\right) = 30. \text{ g C}$

c. $\left(\frac{0.25 \text{ mol P}}{1}\right)\left(\frac{31.0 \text{ gP}}{1 \text{ molP}}\right) = 7.8 \text{ g P}$

d. $\left(\frac{12.5 \text{ mol He}}{1}\right)\left(\frac{4.0 \text{ gHe}}{1 \text{ molHe}}\right) = 50. \text{ g He}$

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7.15 a. $\left(\frac{0.500 \text{ mol NaCl}}{1}\right)\left(\frac{58.5 \text{ g NaCl}}{1 \text{ mol NaCl}}\right) = 29.3 \text{ g NaCl}$

b. $\left(\frac{1.75 \text{ mol Na}_2\text{O}}{1}\right)\left(\frac{62.0 \text{ g Na}_2\text{O}}{1 \text{ mol Na}_2\text{O}}\right) = 109 \text{ g Na}_2\text{O}$

c. $\left(\frac{0.225 \text{ mol H}_2\text{O}}{1}\right)\left(\frac{18.0 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}}\right) = 4.05 \text{ g H}_2\text{O}$

d. $\left(\frac{4.42 \text{ mol CO}_2}{1}\right)\left(\frac{44.0 \text{ g CO}_2}{1 \text{ mol CO}_2}\right) = 194 \text{ g CO}_2$

7.16 a. $\left(\frac{2.0 \text{ mol MgCl}_2}{1}\right)\left(\frac{95.3 \text{ g MgCl}_2}{1 \text{ mol MgCl}_2}\right) = 190 \text{ g MgCl}_2$

b. $\left(\frac{3.5 \text{ mol C}_6\text{H}_6}{1}\right)\left(\frac{78.0 \text{ g C}_6\text{H}_6}{1 \text{ mol C}_6\text{H}_6}\right) = 270 \text{ g C}_6\text{H}_6$

c. $\left(\frac{5.00 \text{ mol C}_2\text{H}_6\text{O}}{1}\right)\left(\frac{46.0 \text{ g C}_2\text{H}_6\text{O}}{1 \text{ mol C}_2\text{H}_6\text{O}}\right) = 230 \text{ g C}_2\text{H}_6\text{O}$

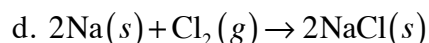
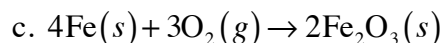
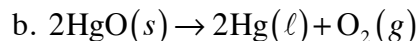
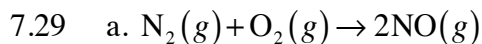
d. $\left(\frac{0.488 \text{ mol C}_3\text{H}_6\text{O}_3}{1}\right)\left(\frac{90.0 \text{ g C}_3\text{H}_6\text{O}_3}{1 \text{ mol C}_3\text{H}_6\text{O}_3}\right) = 43.9 \text{ g C}_3\text{H}_6\text{O}_3$

7.24 a. $\left(\frac{75 \text{ g C}}{1}\right)\left(\frac{1 \text{ mol C}}{12.0 \text{ g C}}\right) = 6.3 \text{ mol C}$

b. $\left(\frac{0.25 \text{ mol C}_2\text{H}_6}{1}\right)\left(\frac{2 \text{ mol C}}{1 \text{ mol C}_2\text{H}_6}\right) = 0.50 \text{ mol C}$

c. $\left(\frac{88 \text{ g CO}_2}{1}\right)\left(\frac{1 \text{ mol CO}_2}{44.0 \text{ g CO}_2}\right)\left(\frac{1 \text{ mol C}}{1 \text{ mol CO}_2}\right) = 2.0 \text{ mol C}$

7.28 a. balanced b. balanced c. unbalanced d. unbalanced



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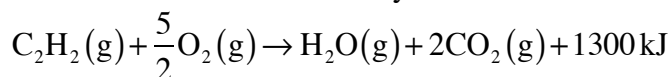
- 7.32 a. $\text{Zn}(s) + 2\text{HNO}_3(aq) \rightarrow \text{Zn}(\text{NO}_3)_2(aq) + \text{H}_2(g)$
b. $2\text{Al}(s) + 3\text{H}_2\text{SO}_4(aq) \rightarrow \text{Al}_2(\text{SO}_4)_3(aq) + 3\text{H}_2(g)$
c. $\text{K}_2\text{SO}_4(aq) + \text{BaCl}_2(aq) \rightarrow 2\text{KCl}(aq) + \text{BaSO}_4(s)$
d. balanced
- 7.35 a. combination b. single replacement c. decomposition
d. double replacement e. combustion
- 7.49 a. $\left(\frac{2.0 \text{ mol H}_2}{1}\right)\left(\frac{1 \text{ mol O}_2}{2 \text{ mol H}_2}\right) = 1.0 \text{ mol O}_2$
b. $\left(\frac{5.0 \text{ mol O}_2}{1}\right)\left(\frac{2 \text{ mol H}_2}{1 \text{ mol O}_2}\right) = 10. \text{ mol H}_2$
c. $\left(\frac{2.5 \text{ mol O}_2}{1}\right)\left(\frac{2 \text{ mol H}_2\text{O}}{1 \text{ mol O}_2}\right) = 5.0 \text{ mol H}_2\text{O}$
- 7.51 a. $\left(\frac{0.500 \text{ mol SO}_2}{1}\right)\left(\frac{5 \text{ mol C}}{2 \text{ mol SO}_2}\right) = 1.25 \text{ mol C}$
b. $\left(\frac{1.2 \text{ mol C}}{1}\right)\left(\frac{4 \text{ mol CO}}{5 \text{ mol C}}\right) = 0.96 \text{ mol CO}$
c. $\left(\frac{0.50 \text{ mol CS}_2}{1}\right)\left(\frac{2 \text{ mol SO}_2}{1 \text{ mol CS}_2}\right) = 1.0 \text{ mol C}$
d. $\left(\frac{2.5 \text{ mol C}}{1}\right)\left(\frac{1 \text{ mol CS}_2}{5 \text{ mol C}}\right) = 0.50 \text{ mol CS}_2$
- 7.58 a. $\left(\frac{75.0 \text{ g CaCN}_2}{1}\right)\left(\frac{1 \text{ mol CaCN}_2}{80.1 \text{ g CaCN}_2}\right)\left(\frac{3 \text{ mol H}_2\text{O}}{1 \text{ mol CaCN}_2}\right)\left(\frac{18.0 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}}\right) = 50.6 \text{ g H}_2\text{O}$
b. $\left(\frac{5.24 \text{ g CaCN}_2}{1}\right)\left(\frac{1 \text{ mol CaCN}_2}{80.1 \text{ g CaCN}_2}\right)\left(\frac{2 \text{ mol NH}_3}{1 \text{ mol CaCN}_2}\right)\left(\frac{17.0 \text{ g NH}_3}{1 \text{ mol NH}_3}\right) = 2.22 \text{ g NH}_3$
c. $\left(\frac{155 \text{ g H}_2\text{O}}{1}\right)\left(\frac{1 \text{ mol H}_2\text{O}}{18.0 \text{ g H}_2\text{O}}\right)\left(\frac{1 \text{ mol CaCO}_3}{3 \text{ mol H}_2\text{O}}\right)\left(\frac{100.1 \text{ g CaCO}_3}{1 \text{ mol CaCO}_3}\right) = 287 \text{ g CaCO}_3$
- 7.62 a. The difference in energies between the products and the reactants
b. exothermic = heat is produced, endothermic=heat is absorbed
c. higher
d. see the second graph on page 240 for the shape and relative energies

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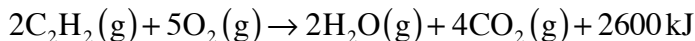
7.63 a. exothermic b. endothermic c. exothermic

7.109 When oxygen is mentioned in chemical reactions, assume it's O₂

a. In this section, I'll give you any needed chemical equations. The question in the book is balanced for one mole of acetylene as follows:



However, we discussed balancing equations using small whole numbers as follows:



Since this is for 2 moles of C₂H₂, I needed to double the energy produced.

b. exothermic

$$\text{c. } \left(\frac{2.00 \text{ mol O}_2}{1} \right) \left(\frac{2 \text{ mol H}_2\text{O}}{5 \text{ mol O}_2} \right) = 0.800 \text{ mol H}_2\text{O}$$

$$\text{d. } \left(\frac{9.80 \text{ g C}_2\text{H}_2}{1} \right) \left(\frac{1 \text{ mol C}_2\text{H}_2}{26.0 \text{ g C}_2\text{H}_2} \right) \left(\frac{5 \text{ mol O}_2}{2 \text{ mol C}_2\text{H}_2} \right) \left(\frac{32.0 \text{ g O}_2}{1 \text{ mol O}_2} \right) = 30.2 \text{ mol O}_2$$