0.606 mol O/0.201 mol C = 3.01 mol O/1.00 mol C = 3 mol O/1 mol C

1 mol K : 1 mol C : 3 mol O

empirical formula: KCO_3

(39.10 g + 12.01 g + 48.00 g) = 99.11 g

molar mass KCO_3 = 99.11 g/mol KCO_3

n = molar mass of molecular formula/molar mass of empirical formula

= 198.22 g/~~mol~~/99.11 ~~g/mol~~

= 2 $(KCO^3)n$

The molecular formula of the compound is $K_2C_2O_6$.

Section 10.5 The Formula for a Hydrate

1. hydrate
2. hydration
3. water molecules
4. formula unit
5. anhydrous
6. water of hydration
7. crystal structure
8. desiccants
9. cadmium sulfate monohydrate
10. CdSO4 dot 4 H_2O
11. 2.00 g $FeCl_2 \cdot xH_2O$ – 1.27 g $FeCl_2$ = 0.73 g H_2O

    0.73 g H_2O × 1 mol xH_2O/18.02 g H_2O = 0.040 mol H_2O

    1.27 g $FeCl_2$ × 1 mol $FeCl_2$/126.75 g $FeCl_2$ = 0.0100 mol $FeCl_2$

    0.040 mol H_2O/0.0100 mol $FeCl_2$ = 4 mol H_2O/1 mol $FeCl_2$

    4 mol H_2O: 1 mol $FeCl_2$

    $FeCl_2 \cdot H_2O$

iron(II) chloride tetrahydrate

Chapter Assessment - Chapter 10 – The Mole

Reviewing Vocabulary

1. c
2. g
3. d
4. b
5. f
6. e
7. a
8. molar mass
9. true
10. true
11. percent composition

Understanding Main Ideas (Part A)

1. b
2. b
3. d
4. d
5. c
6. c
7. c
8. d
9. d
10. c

Understanding Main Ideas (Part B)

1. By definition, 12.00 g of carbon-12 atoms contain one mole of carbon-12 (C-12) atoms. One mole of any substance is Avogadro's number of representative particles, which in this case, are C-12 atoms. Because 6.00 g of C-12 atoms make up one-half mole, 6.00 g of C-12 contain one-half Avogadro's number of carbon-12 atoms.
2. From the percent composition, one can find the whole-number mole ratio of the elements in a compound. This whole-number mole ratio determines the empirical formula of the compound. For some compounds, the empirical formula indicates the actual number of atoms or ions in a compound, so it is the compound's molecular formula. Examples include H_2O and HCl. For other compounds, the molecular formula is the empirical formula multiplied by a whole number. To find the whole number, the molar mass must be known. Examples include C_2H_2 and C_4H_4, and NO and N_2O_2.
3. Because the formula unit contains only one atom or ion of each element, the ranking of the

5. cobalt(II) orthophosphate ($Co_3(PO_4)_2$)

   1 ~~mol $Co_3(PO_4)_2$~~ × 3 ~~mol Co~~/1 ~~mol $Co_3(PO_4)_2$~~ × 58.933 g Co/1 ~~mol Co~~ = 176.799 g Co

   1 ~~mol $Co_3(PO_4)_2$~~ × 2 ~~mol P~~/1 ~~mol $Co_3(PO_4)_2$~~ × 30.974 g P/1 ~~mol P~~ = 61.948 g P

   1 ~~mol $Co_3(PO_4)_2$~~ × 8 ~~mol O~~/1 ~~mol $Co_3(PO_4)_2$~~ × 15.999 g O/1 ~~mol O~~ = 127.992 g O

   molar mass $Co_3(PO_4)_2$ = 366.739 g/mol $Co_3(PO_4)_2$

Study Guide - Chapter 10 – The Mole

Section 10.1 Measuring Matter

1. pair
2. 5
3. dozen
4. gross
5. 200
6. ream
7. 6,000,000,000
8. 0.5 mol
9. 6.02×10^{23}
10. four moles
11. $\frac{6.02 \times 10^{23} \text{ Cu atoms}}{1 \text{ mol Cu}}$
12. $\frac{1 \text{ mol } CH_4}{6.02 \times 10^{23} \text{ molecules } CH_4}$
13. $\frac{1 \text{ mol Xe}}{6.02 \times 10^{23} \text{ molecules Xe}}$
14. $\frac{6.02 \times 10^{23} \text{ molecules } F_2}{1 \text{ mol } F_2}$

Section 10.2 Mass and the Mole

1. false
2. true
3. false
4. true
5. true
6. true
7. false
8. true
9. b
10. d, a
11. a
12. b, c
13. d
14. c

Section 10.3 Moles of Compounds

1. carbon, 1 atom; hydrogen, 4 atoms
2. carbon, 1 atom; hydrogen, 1 atom; chlorine, 3 atoms
3. 1 mol C; 4 mol H
4. 1 mol C; 1 mol H; 3 mol Cl
5. 6.02×10^{23}
6. 1.81×10^{24}
7. 16.05 g/mol
8. 1.20×10^{24}

Section 10.4 Empirical and Molecular Formulas

1. The percent composition of a compound is the percent by mass of each of the elements in a compound.
2. Divide the mass of each element in the sample by the mass of the sample. Then multiply each quotient by 100.
3. c
4. c
5. b
6. b
7. c
8. c
9. d
10. 7.89 ~~g K~~ × 1 mol K/39.10 ~~g K~~ = 0.202 mol K

    2.42 ~~g C~~ × 1 mol C/12.01 ~~g C~~ = 0.201 mol C

    9.69 ~~g O~~ × 1 mol O/16.00 ~~g O~~ = 0.606 mol O

    0.202 mol K/0.201 mol C = 1.00 mol K/1.00 mol C = 1 mol K/1 mol C

    0.201 mol C/0.201 mol C = 1.00 mol C/1.00 mol C = 1 mol C/1 mol C