Chemistry 141 Name key

Dr. Cary Willard

Quiz 2a (20 points) September 4, 2013

1. (5 points) Give the proper name or formula as appropriate below:

|  |  |
| --- | --- |
| IUPAC name | Chemical Formula |
| Sodium acetate | NaC2H3O2 |
| Iron(II) phosphate | Fe3(PO4)2 |
| heptane | C7H16 |
| sodium perchlorate | NaClO4 |
| manganese(II) sulfate | MnSO4 |

1. (5 points) The chloride of an unknown metal is believed to have the formula MCl3. A 2.543 g sample of the compound is found to contain 4.850 x 10-2 mol Cl. Find the atomic mass of M and predict its identity.

$$\frac{2.543 g MCl\_{3}}{0.04850 mol Cl}×\frac{3 mol Cl}{1 mol MCl\_{3}}=\frac{157.3 g MCl\_{3}}{mol}$$

$${157.3 g MCl\_{3}}/{mol}-3\left({35.45 g Cl}/{mol} \right)={50.94 g M}/{mol∴Mis vanadium} $$

1. (7 points) Combustion analysis of a 13.42 g sample of equilin (which contains only carbon, hydrogen, and oxygen) produces 39.61 g CO2 and 9.01 g H2O. The molar mass of equilin is 268.34 g/mol. Find its molecular formula.

$$39.61 g CO\_{2}×\frac{1 mol CO\_{2}}{44.01 g CO\_{2}}×\frac{1 mol C}{1 mol CO\_{2}}×\frac{12.01 g C}{1 mol C}=10.81 g C\rightarrow 80.54\% C$$

$$9.01 g H\_{2}O×\frac{1 mol H\_{2}O}{18.01 g H\_{2}O}×\frac{2 mol H}{1 mol H\_{2}O}×\frac{1.008 g H}{1 mol H}=1.009 g H \rightarrow 7.51\% H$$

$$100\%-\left(80.54\% C+7.51\% H\right)=11.95\% O$$

$$80.54 g C×\frac{1 mol C}{12.01 g C}=6.706 mol C$$

$$7.51 g H×\frac{1 mol H}{1.008 g H}=7.45 mol H$$

$$11.95 g O×\frac{1 mol O}{16.00 g O}=0.7468 mol O$$

$$C\_{\frac{6.706}{0.7468}}H\_{\frac{7.45}{0.7468}}O\_{\frac{0.7468}{0.7468}} \rightarrow \rightarrow C\_{9}H\_{10}O \rightarrow molar mass 134∴C\_{18}H\_{20}O\_{2}$$

1. (3 points) In a popular classroom demonstration, solid sodium is added to liquid water and reacts to produce hydrogen gas and aqueous sodium hydroxide. Write a balanced chemical equation for this reaction.

2 Na(s) + 2 H2O(l) 🡪 H2(g) + 2 NaOH(aq)

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Quiz 2b (20 points) September 4, 2013

1. (5 points) Give the proper name or formula as appropriate below:

|  |  |
| --- | --- |
| IUPAC name | Chemical Formula |
| Ammonium sulfide | (NH4)2S |
| Chromium(III) carbonate | Cr2(CO3)3 |
| nonane | C9H20 |
| sodium hypobromite | NaBrO |
| nickel(III) borate | NiBO3 |

1. (5 points) The chloride of an unknown metal is believed to have the formula MCl3. A 2.543 g sample of the compound is found to contain 3.771 x 10-2 mol Cl. Find the atomic mass of M and predict its identity.

$$\frac{2.543 g MCl\_{3}}{0.03771 mol Cl}×\frac{3 mol Cl}{1 mol MCl\_{3}}=\frac{202.3 g MCl\_{3}}{mol}$$

$${202.3 g MCl\_{3}}/{mol}-3\left({35.45 g Cl}/{mol} \right)={95.96 g M}/{mol∴Mis molybdenum} $$

1. (7 points) Combustion analysis of a 13.42 g sample of equilin (which contains only carbon, hydrogen, and oxygen) produces 39.61 g CO2 and 9.01 g H2O. The molar mass of equilin is 268.34 g/mol. Find its molecular formula.

$$39.61 g CO\_{2}×\frac{1 mol CO\_{2}}{44.01 g CO\_{2}}×\frac{1 mol C}{1 mol CO\_{2}}×\frac{12.01 g C}{1 mol C}=10.81 g C\rightarrow 80.54\% C$$

$$9.01 g H\_{2}O×\frac{1 mol H\_{2}O}{18.01 g H\_{2}O}×\frac{2 mol H}{1 mol H\_{2}O}×\frac{1.008 g H}{1 mol H}=1.009 g H \rightarrow 7.51\% H$$

$$100\%-\left(80.54\% C+7.51\% H\right)=11.95\% O$$

$$80.54 g C×\frac{1 mol C}{12.01 g C}=6.706 mol C$$

$$7.51 g H×\frac{1 mol H}{1.008 g H}=7.45 mol H$$

$$11.95 g O×\frac{1 mol O}{16.00 g O}=0.7468 mol O$$

$$C\_{\frac{6.706}{0.7468}}H\_{\frac{7.45}{0.7468}}O\_{\frac{0.7468}{0.7468}} \rightarrow \rightarrow C\_{9}H\_{10}O \rightarrow molar mass 134∴C\_{18}H\_{20}O\_{2}$$

1. (3 points) Sulfuric acid is a component of acid rain formed when gaseous sulfur dioxide pollutant reacts with gaseous oxygen and liquid water to form aqueous sulfuric acid. Write a balanced chemical equation for this reaction.

2 SO2(g) + O2(g) + 2 H2O(l) 🡪 2 H2SO4 (aq)