Chemistry 141 Name

Dr. Cary Willard

Quiz 2a February 9, 2010

1. (6 points) Menthol, a strong smelling substance used in cough drops, is a compound of carbon, hydrogen, and oxygen. When 0.1595 g of menthol was subjected to combustion analysis, it produced 0.449 g of CO2 and 0.184 g of H2O. What is menthol’s empirical formula?

$$0.449 g CO\_{2}×\frac{1 mol CO\_{2}}{44.01 g CO\_{2}}×\frac{1 mol C}{1 mol CO\_{2}}=0.0102 mol C×\frac{12.01 g C}{1 mol C}=0.123 g C$$

$$0.184 g H\_{2}O×\frac{1 mol H\_{2}O}{18.02 g H\_{2}O}×\frac{2 mol H}{1 mol H\_{2}O}=0.0204 mol H×\frac{1.008 g H}{1 mol H}=0.0206g H$$

$$?g O=0.1595 g menthol-\left(0.123 g C+0.0206 g H\right)=0.0164 g O$$

$$0.0164 g O×\frac{1 mol O}{16.00 g O}=0.00103 g O$$

$$C\_{\frac{0.0102}{0.00103}}H\_{\frac{0.0204}{0.00103}}O\_{\frac{0.00103}{0.00103}} \rightarrow C\_{10}H\_{20}O$$

1. (3 points) Give the oxidation number of nitrogen in the following:
	1. N2H4 -2
	2. HNO2 +3
2. (6 points) Identify the element oxidized, element reduced, oxidizing agent and reducing agent in the following redox reaction.

8 H+1(aq) + 6Cl-1(aq) + Sn(s) + 4NO3-1(aq) 🡪 SnCl6-2(aq) + 4NO2(g) + 4H2O(l)

element oxidized Sn oxidizing agent NO3-1

element reduced N reducing agent Sn(s)

1. (5 points) Balance the following redox half reaction in acid

8 H2O + Cl2 🡪 2 ClO4-1 + 16 H+ + 14 e-1

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Quiz 2b February 9, 2010

1. (6 points) Ferrocene, first synthesized in 1951, was the first organic iron compound with Fe-C bonds. An understanding of the structure of ferrocene gave rise to new ideas about chemical bonding and led to the preparation of many useful compounds. In the combustion analysis of ferrocene, which contains only Fe, C, and H, a 0.9437 g sample produced 2.233 g of CO2 and 0.457 g of H2O. What is the empirical formula of the compound?

$$2.233 g CO\_{2}×\frac{1 mol CO\_{2}}{44.01 g CO\_{2}}×\frac{1 mol C}{1 mol CO\_{2}}=0.05074 mol C×\frac{12.01 g C}{1 mol C}=0.6094 g C$$

$$0.457 g H\_{2}O×\frac{1 mol H\_{2}O}{18.02 g H\_{2}O}×\frac{2 mol H}{1 mol H\_{2}O}=0.0508 mol H×\frac{1.008 g H}{1 mol H}=0.0512 g H$$

$$?g O=0.9437 g cmpd-\left(0.6094 g C+0.0512 g H\right)=0.2831 g O$$

$$0.2831 g O×\frac{1 mol O}{55.84 g O}=0.00507 mol O$$

$$C\_{\frac{.0.507}{0.00507}}H\_{\frac{0.0508}{0.00507}}Fe\_{\frac{0.00507}{0.00507}} \rightarrow C\_{10}H\_{10}Fe$$

1. (3 points) Give the oxidation number of sulfur in the following:
	1. H2S2 -1
	2. H2SO3 +4
2. (6 points) Identify the element oxidized, element reduced, oxidizing agent and reducing agent in the following redox reaction.

5H2C2O4(aq) + 2MnO4-1(aq) + 6H+1(aq) 🡪 2Mn+2(aq) + 10CO2(g) + 8H2O(l)

element oxidized C oxidizing agent MnO4-1

element reduced Mn reducing agent H2C2O4

1. (5 points) Balance the following redox half reaction in acid

10e-1 +12 H+1 + 2 BrO3-1 🡪 Br2 + 6 H2O