Chemistry 141 Name key

Dr. Cary Willard

Quiz 3a (20 points) September 12, 2012

1. (7 points) A metal forms a compound with the formula MCl3. If the compounds contains 68.96 % Cl by mass, what is the identity of the metal?

$$\frac{100 g MCl\_{3}}{68.96 g Cl}×\frac{35.45 g Cl}{1 mol Cl}×\frac{3 mol Cl}{1 mol MCl\_{3}}=\frac{154.2 g}{mol MCl\_{3}}$$

In one mole of the compound there are

$$154.2 g MCl\_{3}-3\left(35.45g Cl\right)=47.9 g M$$

Titanium has a molar mass of 47.88 so the metal must be Ti.

1. (7 points) Vanadium forms four different oxides. One of the oxides is 68% vanadium, what is the empirical formula of this vanadium oxide?

$$68 g V×\frac{1 mol V}{50.94 g V}=1.33 mol V$$

$$32 g O×\frac{1 mol O}{16.00 g O}=2.00 mol O$$

$$V\_{\frac{1.33}{1.33}}O\_{\frac{2.00}{1.33} \rightarrow \rightarrow V\_{1}O\_{1.5} \rightarrow \rightarrow V\_{2}O\_{3}}$$

1. (6 points) Write and balance the equation for the reaction described below:

Solid lead(II) sulfide reacts with aqueous hydrobromic acid to form solid lead(II) bromide and dihydrogen monosulfide gas.

PbS(s) 2 HBr(aq) 🡪 PbBr2(s) + H2S(g)

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1. (7 points) A metal forms a compound with the formula MCl3. If the compounds contains 52.57 % Cl by mass, what is the identity of the metal?

$$\frac{100 g MCl\_{3}}{52.57 g Cl}×\frac{35.45 g Cl}{1 mol Cl}×\frac{3 mol Cl}{1 mol MCl\_{3}}=\frac{202.3 g}{mol MCl\_{3}}$$

In one mole of the compound there are

$$202.3 g MCl\_{3}-3\left(35.45g Cl\right)=96.0 g M$$

Molybdenum has a molar mass of 95.94 so the metal must be Mo.

1. (7 points) Vanadium forms four different oxides. One of the oxides is 56% vanadium, what is the empirical formula of this vanadium oxide?

$$56 g V×\frac{1 mol V}{50.94 g V}=1.10 mol V$$

$$44 g O×\frac{1 mol O}{16.00 g O}=2.75 mol O$$

$$V\_{\frac{1.10}{1.10}}O\_{\frac{2.75}{1.10} \rightarrow \rightarrow V\_{1}O\_{2.5} \rightarrow \rightarrow V\_{2}O\_{5}}$$

1. (6 points) Write and balance the equation for the reaction described below:

Aqueous hydrochloric acid reacts with solid manganese(IV) oxide to form aqueous manganese(II) chloride, liquid water, and chlorine gas.

4 HCl(aq) + MnO2(s) 🡪 MnCl2(aq) + 2 H2O(l) + Cl2(g)