Non Sibi High School

Andover's Chem 250: Introductory/Basic Chemistry

Chapter 4, Review Quiz 1 Answers

1

Balance the equation $N_2O_5 \longrightarrow NO_2 + O_2$ using the smallest possible whole-number coefficients.

$$N_2O_5 \longrightarrow 2NO_2 + O_2$$

$$N_2O_5 \longrightarrow 2NO_2 + \frac{1}{2}O_2$$

$$2N_2O_5 \longrightarrow 4NO_2 + O_2$$

2

Given the unbalanced equation $CS_2 + O_2 \longrightarrow CO_2 + SO_2$, if 265 grams of CS_2 react, how many grams of SO_2 will be produced?

$$CS_2 + 3O_2 \longrightarrow CO_2 + 2SO_2$$

$$265\,\text{g}\,CS_2 \left(\frac{1\,\text{mol}\,CS_2}{76.15\,\text{g}\,CS_2}\right)\left(\frac{2\,\text{mol}\,SO_2}{1\,\text{mol}\,CS_2}\right)\left(\frac{64.07\,\text{g}\,SO_2}{1\,\text{mol}\,SO_2}\right) = 446\,\text{g}\,SO_2$$

3

Given the unbalanced equation $CaCO_3 + HC_2H_3O_2 \longrightarrow Ca(C_2H_3O_2)_2 + CO_2 + H_2O$, if 16.8 grams of $CaCO_3$ is mixed with 11.0 grams of $HC_2H_3O_2$:

a. Which is the limiting reagent and what maximum mass of CO_2 can form?

$$CaCO_3 + 2HC_2H_3O_2 \longrightarrow Ca(C_2H_3O_2)_2 + CO_2 + H_2O$$

$$16.8\,\text{g}\,CaCO_3 \left(\frac{1\,\text{mol}\,CaCO_3}{100.1\,\text{g}\,CaCO_3}\right)\left(\frac{1\,\text{mol}\,CO_2}{1\,\text{mol}\,CaCO_3}\right)\left(\frac{44.01\,\text{g}\,CO_2}{1\,\text{mol}\,CO_2}\right) = 7.39\,\text{g}\,CO_2$$

$$11.0\,\text{g}\,HC_2H_3O_2\left(\frac{1\,\text{mol}\,HC_2H_3O_2}{60.05\,\text{g}\,HC_2H_3O_2}\right)\left(\frac{1\,\text{mol}\,CO_2}{2\,\text{mol}\,HC_2H_3O_2}\right)\left(\frac{44.01\,\text{g}\,CO_2}{1\,\text{mol}\,CO_2}\right)=4.03\,\text{g}\,CO_2$$

$HC_2H_3O_2$ produces less CO_2, so $HC_2H_3O_2$ is the limiting reagent and 4.03 g of CO_2 maximum can form.

b. What mass of the excess reagent remains when the reaction is complete?

$$4.03\,\text{g}\,CO_2\left(\frac{1\,\text{mol}\,CO_2}{44.01\,\text{g}\,CO_2}\right)\left(\frac{1\,\text{mol}\,CaCO_3}{1\,\text{mol}\,CO_2}\right)\left(\frac{100.1\,\text{g}\,CaCO_3}{1\,\text{mol}\,CaCO_3}\right)=9.17\,\text{g}\,CaCO_3\,\text{used up}$$

$$16.8\,\text{g}-9.17\,\text{g}=7.6\,\text{g}\,CaCO_3\,\text{excess}$$

4

Given the unbalanced equation $Pb(NO_3)_2 + KI \longrightarrow PbI_2 + KNO_3$, if 4.1 grams of KI react with an excess of $Pb(NO_3)_2$ and then 4.9 grams of PbI_2 are actually collected, what is the percent yield of the reaction?

$$Pb(NO_3)_2 + 2KI \longrightarrow PbI_2 + 2KNO_3$$

$$4.1\,\text{g}\,KI\left(\frac{1\,\text{mol}\,KI}{166.0\,\text{g}\,KI}\right)\left(\frac{1\,\text{mol}\,PbI_2}{2\,\text{mol}\,KI}\right)\left(\frac{461.0\,\text{g}\,PbI_2}{1\,\text{mol}\,PbI_2}\right)=5.7\,\text{g}\,PbI_2=\text{theoretical yield}$$

$$\frac{4.9\,\text{g}}{5.7\,\text{g}}\times 100\%=86\%\,\text{yield}$$