Chemistry CP

Name: _____

Multi-Step Problems in Stoichiometry   Date: _____

A General Process for Problem Solving

1. List what you know.	2. Set up the problem.	3. Estimate and calculate.
• Is the equation balanced? • What are you solving for? • Set up the stoichiometric relationships table	• Keep close eye on units • Iinclude conversion factors • All factors should cancel out to give units of answer	• Is the answer reasonable? • Use significant figures

Work out these problems on a separate sheet of paper.

1. Limestone, $CaCO_3$, can be decomposed with heat to form lime, CaO, and carbon dioxide. How many moles of lime would be formed from the reaction of 20.1 kg of limestone?
$$CaCO_3 \rightarrow CaO + CO_2 \qquad\qquad (201 \text{ mol CaO})$$

2. Propane, C_3H_8, burns in oxygen to produce carbon dioxide and water. What mass of propane could be combusted by 8.35 mol of oxygen?   (73.7 g propane)
$$C_3H_8 + O_2 \rightarrow H_2O + CO_2$$

3. Oxygen, O_2, was discovered by Joseph Priestley in 1774 when he decomposed mercury (II) oxide, HgO, into its constituent elements by heating it. How many moles of oxygen could Priestley have produced if he had reacted 216.59 g of mercury (II) oxide ? (.50000 mol O_2)
$$2 \ HgO \rightarrow 2 \ Hg + O_2$$

4. Limestone ($CaCO_3$) will react with most acids to form a calcium salt, water, and carbon dioxide. Determine the grams of water produced if 0.651 moles of calcium carbonate are allowed to react with phosphoric acid according to the following equation.   (11.8 g H_2O)
$$3 \ CaCO_3 + 2 \ H_3PO_4 \rightarrow Ca_3(PO_4)_2 + 3 \ H_2O + 3 \ CO_2$$

5. Tin (II) fluoride, also known as stannous fluoride, is added to some dental products to help prevent cavities. How many moles of tin (II) fluoride can be made from 55.0 g of hydrogen fluoride, HF, if there is plenty of tin?   (1.37 moles SnF_2)
$$Sn \ (s) + 2 \ HF \ (aq) \rightarrow SnF_2 \ (aq) + H_2(g)$$

6. The human body needs at least 1.03×10^{-2} mol O_2 every minute. If all of this oxygen is used for the cellular respiration reaction that breaks down glucose, how many grams of glucose does the human body consume each minute?   (.309 g glucose)
$$C_6H_{12}O_6 + 6 \ O_2 \rightarrow 6 \ CO_2 + 6 \ H_2O$$

7. Carbon monoxide can be combined with hydrogen to produce methanol, CH_4O, which is used as an industrial solvent, as a reactant in synthesis, and as a clean-burning fuel for some racing cars. If you had 152.5 g CO, how many grams of CH_4O would be produced?
(174.5 g methanol)

$$CO + 2 \ H_2 \rightarrow CH_4O$$