Scenario 5: mole-to-mole ratio

$C_7H_{16} + 11O_2 \longrightarrow 7CO_2 + 8H_2O$

mole-to-mole ratio of: CO_2/C_7H_{16} = 7 moles of CO_2/1 moles of C_7H_{16}
H_2O/O_2 = 8 moles of H_2O/11 moles of O_2

mole-to-mole ratio is the ratio of the stoichiometric amounts of the species involved. (number in front of molecule)

Scenario 6: calculating limiting reactant = reactant that gives off the least amount of moles of the product

$C_7H_{16} + 11O_2 \longrightarrow 7CO_2 + 8H_2O$

moles of CO_2 from X = Scenario 1*Scenario 5 = moles

from O_2 = 7000 g of O_2 $\dfrac{1 \text{ mol of } O_2}{32.00 \text{ g of } O_2}$ (Scenario 1) $\dfrac{7 \text{ moles of } CO_2}{11 \text{ moles of } O_2}$ (Scenario 5) = 139.2 moles of CO_2

From C_7H_{16}= 4000 g of C_7H_{16} $\dfrac{1 \text{ mol of } C_7H_{16}}{100.2 \text{ g of } C_7H_{16}}$ (Scenario 1) $\dfrac{7 \text{ moles of } CO_2}{1 \text{ moles of } C_7H_{16}}$ (Scenario 5) = 279.4 moles of CO_2

$2SO_2 + O_2 \longrightarrow 2SO_3$

moles of $O_2 = \dfrac{1 \text{ mol of } O_2}{2 \text{ mol of } SO_2}$ 3.6 mol of SO_2 = 1.8 moles of O_2

$C_4H_{10} + 13/2O_2 \longrightarrow 4CO_2 + 5H_2O$

$2C_4H_{10} + 13O_2 \longrightarrow 8CO_2 + 10H_2O$

moles of CO_2 = 1.25 moles ~~of~~ C_4H_{10} $\dfrac{8 \text{ mol of } CO_2}{2 \text{ mol ~~of~~ } C_4H_{10}}$ = 5 moles of CO_2

$H_2 + Cl_2 \longrightarrow 2HCl$

$2.5* 10^3$ (limiting reactant because Cl_2 is in excess)

mass of HCl from $H_2 = 2.5*10^3$ g ~~H_2~~ $\dfrac{1 \text{ mol of } H_2}{2.016 \text{ g of } H_2}$ $\dfrac{2 \text{ mol of HCl}}{1 \text{ mol of } H_2}$ $\dfrac{36.46 \text{ g of HCl}}{1 \text{ mol of HCl}}$ = 90426 g of HCl

Scientific Notation = $9.0 * 10^4$ g of HCl