How many grams go propane can be burned by 24g of O_2 ?

Solution:

Propane burning can occur as follows:
Complete oxidation of propane

1. $CH_2(CH_3)_2 + 5O_2 = 3CO_2 + 4H_2O$

Partial oxidation of propane

2. $2CH_2(CH_3)_2 + 7O_2 = 3CO + 8H_2O$

3. $CH_2(CH_3)_2 + 2O_2 = 3C + 4H_2O$

Find number of moles of oxygen

$n(O_2) = m(O_2) / M(O_2)$

$n(O_2) = 24g / 32g \bullet mol^{-1} = 0.75mol$

Find number of moles of propane (n_1, n_2, n_3) for each reaction equation

$n_1(CH_2(CH_3)_2) = n(O_2) / 5$

$n_1(CH_2(CH_3)_2) = 0.75mol / 5 = 0.15mol$

$n_2(CH_2(CH_3)_2) = n(O_2) / 3.5$

$n_2(CH_2(CH_3)_2) = 0.75mol / 3.5 = 0.214mol$

$n_3(CH_2(CH_3)_2) = n(O_2) / 2$

$n_3(CH_2(CH_3)_2) = 0.75mol / 2 = 0.375mol$

Find weight of propane for each reaction equation

$m_1(CH_2(CH_3)_2) = n_1(CH_2(CH_3)_2) * M(CH_2(CH_3)_2)$

$m_1(CH_2(CH_3)_2) = 0.15mol * 44g \bullet mol^{-1} = 6.6g$

$m_2(CH_2(CH_3)_2) = n_2(CH_2(CH_3)_2) * M(CH_2(CH_3)_2)$

$m_2(CH_2(CH_3)_2) = 0.214mol * 44g \bullet mol^{-1} = 9.416g$

$m_3(CH_2(CH_3)_2) = n_3(CH_2(CH_3)_2) * M(CH_2(CH_3)_2)$

$m_3(CH_2(CH_3)_2) = 0.375mol * 44g \bullet mol^{-1} = 16.5g$

Answer: In 24 g of oxygen during the partial oxidation 16.5 g of propane can be burnt.