Answer on Question #76110 – Chemistry – Inorganic Chemistry

What mass of PCl_5 will be produced from the given masses of both reactants? 22 g of PCl_3 and 57 g of Cl_2?

Solution:

$PCl_3 + Cl_2 \rightarrow PCl_5$

$(22\ g\ PCl_3) \times (1\ mole\ PCl_3 / 137.33\ g\ PCl_3) = 0.16\ mole\ PCl_3$

$(57\ g\ Cl_2) \times (1\ mole\ Cl_2 / 70.91\ g\ Cl_2) = 0.80\ moles\ Cl_2$

From the balanced equation, 0.16 mole PCl_3 would react with 0.80 mole Cl_2. There is more Cl_2 present than that, so Cl_2 is in excess and PCl_3 is the limiting reactant.

The mole ratio of PCl_3 to PCl_5 is 1:1, so 0.16 moles of PCl_5 are theoretically produced. In grams, that is $(0.16\ moles\ PCl_5) \times (208.24\ g\ PCl_5 / 1\ mole\ PCl_5) = 33.3\ g\ PCl_5$