Answer on Question #85474 - Chemistry - General Chemistry

Task:
How many grams of O_2 are needed to react with 57.3 g of NH_3?

Solution:
The balanced equation for reaction when ammonia burns in oxygen can be written as follows
$4NH_3\ (g) + 3O_2\ (g) \rightarrow 2N_2\ (g) + 6H_2O\ (l)$

$$\frac{m(NH_3)}{M(4NH_3)} = \frac{m(O_2)}{M(3O_2)}$$
$$m(O_2) = \frac{m(NH_3) \cdot M(3O_2)}{M(4NH_3)}$$
$$M(4NH_3) = 4 \cdot (14 + 3 \cdot 1) = 68\ amu$$
$$M(3O_2) = 3 \cdot (2 \cdot 16) = 96\ amu$$
$$m(O_2) = \frac{57.3 \cdot 96}{68} \approx 80.9\ g$$

From the other hand, the balanced equation for reaction when ammonia burns in air can be written as follows
$4NH_3\ (g) + 5O_2\ (g) \rightarrow 4NO\ (g) + 6H_2O\ (l)$

$$\frac{m(NH_3)}{M(4NH_3)} = \frac{m(O_2)}{M(5O_2)}$$
$$m(O_2) = \frac{m(NH_3) \cdot M(5O_2)}{M(4NH_3)}$$
$$M(4NH_3) = 4 \cdot (14 + 3 \cdot 1) = 68\ amu$$
$$M(3O_2) = 5 \cdot (2 \cdot 16) = 160\ amu$$
$$m(O_2) = \frac{57.3 \cdot 160}{68} \approx 134.8\ g$$

Answer:
80.9 g (for ammonia burning in oxygen) or 134.8 g (for ammonia burning in air)