Marks
3

- Balance the following equation:

$$NH_3(g) + O_2(g) \rightarrow NO(g) + H_2O(l)$$

$4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(l)$

Calculate the mass of NH_3 required to produce 140. g of water.

The molar mass of H_2O is:

molar mass = [2 × 1.008 (H) + 16.00 (O)] g mol^{-1} = 18.016 g mol^{-1}

Hence, the number of moles of water produced is:

number of moles = mass / molar mass = (140. g) / (18.016 g mol^{-1}) = 7.771 mol

From the balanced equation, 4 mol of NH_3 will produce 6 mol of H_2O. Hence, to produce 7.771 mol of H_2O so:

number of moles of NH_3 = (4/6) × 7.771 mol = 5.18 mol

The molar mass of NH_3 is:

molar mass = [14.01 (N) + 3 × 1.008 (H)] g mol^{-1} = 17.034 g mol^{-1}

The mass of NH_3 in 5.18 mol is therefore:

mass = number of moles × molar mass = (5.18 mol) × (17.034 g mol^{-1}) = 88.2 g

Answer: **88.2 g**