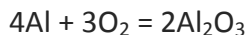


Answer on Question #77933, Chemistry / General Chemistry

what mass of aluminum oxide will be produced when 500.0 dm³ of oxygen at STP react with aluminum?

Solution



Find amount of substance of oxygen.

$$n = V/V_m;$$

where n- amount of substance of a gas, mol

V- volume of a gas, dm³

V_m – volume of one mole of a gas at STP, V_m = 22.4 dm³/mol

$$n(\text{O}_2) = 500.0/22.4 = 22.3 \text{ (mol)}$$

According to equation 3 moles of O₂ give 2 moles of Al₂O₃

We have 22.3 mol of O₂ that give x mol of Al₂O₃

$$\text{Solve the proportion: } \frac{3}{22.3} = \frac{2}{x}$$

$$x = 14.9$$

$$n(\text{Al}_2\text{O}_3) = 14.9 \text{ mol}$$

Find mass of aluminum oxide:

$$m = M \cdot n,$$

where n – amount of substance,

M= molar mass of a substance

m- mass of a substance

$$M_r(\text{Al}_2\text{O}_3) = A_r(\text{Al}) \cdot 2 + A_r(\text{O}) \cdot 3 = 27 \cdot 2 + 16 \cdot 3 = 102$$

$$M_r = M$$

$$M(\text{Al}_2\text{O}_3) = 102 \text{ g/mol}$$

$$m(\text{Al}_2\text{O}_3) = 102 \cdot 14.9 = 1519.8 \text{ (g)}$$

Answer: 1519.8 g