Answer on Question #85344 – Chemistry – General Chemistry

Task:

Calculate the volume (in mL) of 0.791 M HNO_3 needed to react completely with 9.47 g of $ZnCO_3$ in a gas-forming reaction?

Solution:

Chemical reaction equation:

$$2HNO_3 + ZnCO_3 = Zn(NO_3)_2 + H_2O + CO_2$$

According to the reaction equation:

$$n(ZnCO_3) = \frac{n(HNO_3)}{2};$$

$$n(HNO_3) = C(HNO_3) * V(HNO_3);$$

$$n(ZnCO_3) = \frac{m(ZnCO_3)}{M(ZnCO_3)};$$

$$\frac{m(ZnCO_3)}{M(ZnCO_3)} = \frac{C(HNO_3) * V(HNO_3)}{2}$$

Then,

$$V(HNO_3) = \frac{2 * m(ZnCO_3)}{M(ZnCO_3) * C(HNO_3)};$$

$$M(ZnCO_3) = Ar(Zn) + Ar(C) + 3 * Ar(O) = 65.38 + 12 + 3*16 = 125.38(g/mol)$$

$$V(HNO_3) = \frac{2 * 9.47g}{125.38\, g/mol * 0.791\, mol/L} = 0.19097L = 190.97\, mL \approx 191\ mL$$

$$V(HNO_3) = 191\ mL$$

Answer: V(HNO_3) = 191 mL.