

Question 26 (4 marks)

A gas is produced when 10.0 g of zinc is placed in 0.50 L of 0.20 mol L⁻¹ nitric acid. 4

Calculate the volume of gas produced at 25°C and 100 kPa. Include a balanced chemical equation in your answer.

$V = \text{Molar mass} \times \text{mass}$ ~~2.479~~

~~mol~~ zinc = $\frac{10}{65.41}$ Equation: $2\text{Zn}_{(s)} + 2\text{HNO}_3 \rightarrow 2\text{ZnNO}_3 + \text{H}_2$

$= 0.152881822\dots$ 2 : 2 \rightarrow 2 + 1

$= 0.153$ (2 sig fig) \therefore 1 mol of Hydrogen

$\text{HNO}_3 = 0.20 \text{ mol/L}^{-1}$ $V_{\text{gas}} = 0.10 \times 24.79$

$V = 0.50 \text{ L}$ $V_{\text{gas}} = 2.479$

$\frac{1.008 + 14.01 + 16 \times 3}{2}$ $V_{\text{gas}} = 0.06115 \times 24.79$

$= \frac{500 \text{ ml}}{63.018}$ $= 1.52 \text{ L}$

mass = 7.93 grams $V_{\text{gas}} = \frac{7.93}{2} \times 24.79$

(HNO₃) $= 98.29 \text{ Litres.}$