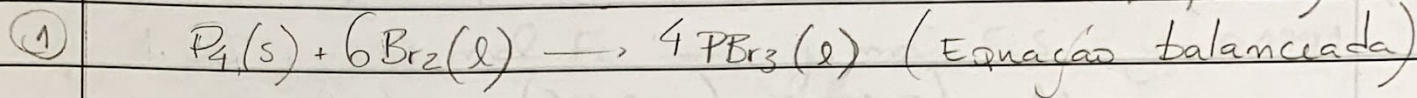


QUI 016 - Exercícios - Módulo 3, aula 2

1

(17/04/2025)



$$50,0g \text{ de } P_4 \rightarrow M(P_4) = 4 \times (30,974) = 123,896 \text{ g mol}^{-1}$$

$$200,0g \text{ de } Br_2 \rightarrow M(Br_2) = 2 \times (79,904) = 159,808 \text{ g mol}^{-1}$$

$$n(P_4) = \frac{m(P_4)}{M(P_4)} = \frac{(50,0)}{(123,896)} \text{ g} = 0,404 \text{ mol}$$

$$n(Br_2) = \frac{m(Br_2)}{M(Br_2)} = \frac{(200,0)}{(159,808)} = 1,251 \text{ mol}$$

• Verificação do reagente limitante:

$$\begin{array}{l} 1 \text{ mol } P_4 \rightarrow 6 \text{ mols } Br_2 \\ 0,404 \text{ mol } P_4 \rightarrow x \text{ mols } Br_2 \quad x = 2,424 \end{array}$$

• Como $x > 1,251 \text{ mol}$, Br_2 é o reagente limitante.

• Quantidade de mols de P_4 que reage:

$$\begin{array}{l} 1 \text{ mol } P_4 \rightarrow 6 \text{ mols } Br_2 \\ y \text{ mol } P_4 \rightarrow 1,251 \text{ mol } Br_2 \quad y = 0,209 \end{array}$$

a) • Quantidade de PBr_3 produzida:

$$\begin{array}{l} 1 \text{ mol } P_4 \rightarrow 4 \text{ mols } PBr_3 \\ 0,209 \text{ mol } P_4 \rightarrow z \text{ mol } PBr_3 \quad z = 0,836 \end{array}$$

$$M(PBr_3) = (30,974) + 3 \times (79,904) = 270,686 \text{ g mol}^{-1}$$

$$m(PBr_3) = n(PBr_3) \times M(PBr_3) = (0,836) (270,686) = 226,293 \text{ g}$$

(2)

b) $n(\text{P}_4)$ em excesso: $0,404 - 0,209 = 0,195 \text{ mol}$

$$m = n \times M = (0,195) \times (123,896) = 24,160 \text{ g}$$

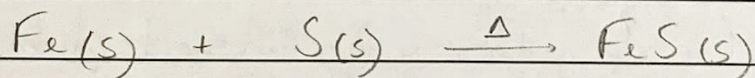
Tabela IMF:

	P_4	6Br_2	4PBr_3
$I(\text{mol})$	0,404	1,251	0
$M(\text{mol})$	-0,209	-1,251	+0,836
$F(\text{mol})$	0,195	0	0,836

Conferindo os cálculos:

$$\begin{aligned} \sum \text{reagentes} &= \sum \text{produtos} \\ (50,0 - 24,160) + (200,0) &= (226,293) \\ 25,840 + 200,0 &= 226,293 \\ 225,840 &\approx 226,293 \quad \checkmark \end{aligned}$$

(2)



$$M(\text{Fe}) = 55,845 \text{ g mol}^{-1} \xrightarrow{10,0\text{g}} 0,1791 \text{ mol de Fe}$$

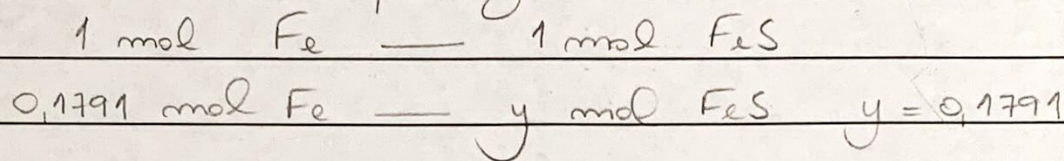
$$M(\text{S}) = 32,065 \text{ g mol}^{-1} \xrightarrow{8,0\text{g}} 0,2495 \text{ mol de S}$$

• Determinação do reagente limitante:

$$\begin{aligned} 1 \text{ mol Fe} &\text{ — } 1 \text{ mol S} \\ 0,1791 \text{ mol Fe} &\text{ — } x \text{ mol S} \quad \boxed{x = 0,1791} \end{aligned}$$

• Como $x < 0,2495$, S está em excesso (0,0704 mol em excesso) e Fe é o limitante.

a) Quantidade de FeS produzida:



$$M(\text{FeS}) = (55,845) + (32,065) = 87,910 \text{ g mol}^{-1}$$

$$m = n \times M = (0,1791) \times (87,910) = \underline{\underline{15,745 \text{ g}}}$$

Tabela IMF:

	Fe(s)	S(s)	FeS(s)
I (mol)	0,1791	0,2495	0
M (mol)	-0,1791	-0,1791	+0,1791
F (mol)	0	<u>0,0704</u>	0,1791

b) Gramas de S que não reage:

$$m = n \times M = (0,0704) \times (32,065) = 2,2574 \text{ g}$$

Conferindo as contas:

$$\sum \text{reagentes} = \sum \text{produtos}$$

$$(10,0) + (8,0 - 2,2574) = 15,745$$

$$15,743 \approx 15,745 \quad (\checkmark)$$

c) Rendimento percentual:

$$n_{\text{teórico}} = 15,745 \text{ g} \quad n_{\text{exp}} = 12,431 \text{ g}$$

$$\eta_{\%} = \frac{12,431}{15,745} \times 100\% = 78,95 \sim \underline{\underline{79,0\%}}$$