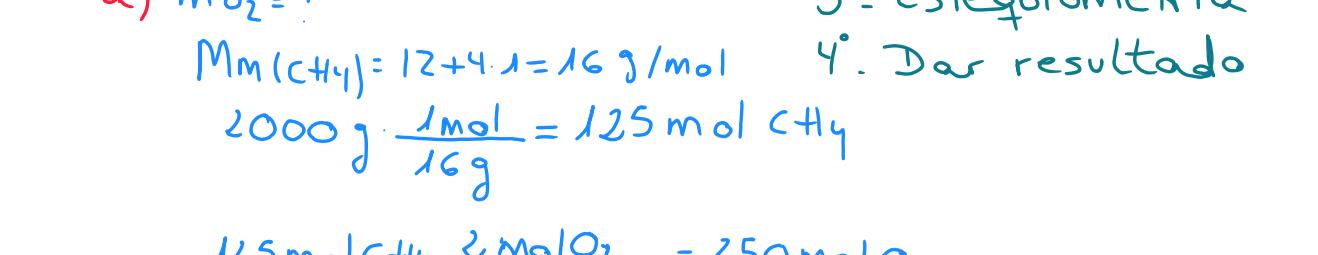


## Soluciones problemas U6: Reacciones Químicas



$$m = 2\text{ kg} = 2000\text{ g}$$

$$a) \text{Moles de O}_2 = ?$$

$$\text{M}_m(\text{C}_2\text{H}_4) = 12 + 2 \cdot 4 = 16 \text{ g/mol}$$

$$2000\text{ g} \cdot \frac{1\text{ mol}}{16\text{ g}} = 125\text{ mol C}_2\text{H}_4$$

$$125\text{ mol C}_2\text{H}_4 \cdot \frac{2\text{ mol O}_2}{1\text{ mol C}_2\text{H}_4} = 250\text{ mol O}_2$$

$$\text{M}_m(\text{O}_2) = 16 \cdot 2 = 32 \text{ g/mol}$$

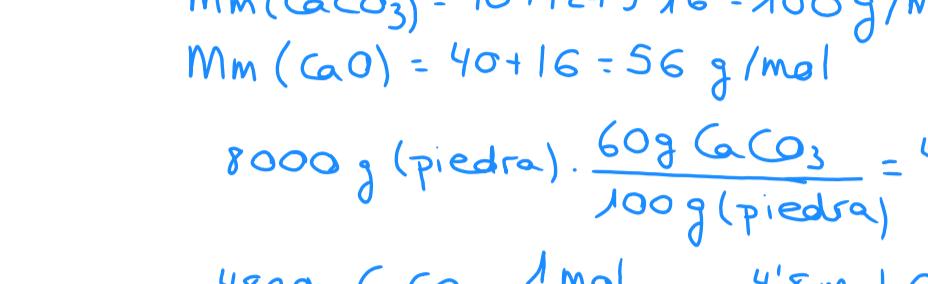
$$250\text{ mol O}_2 \cdot \frac{32\text{ g}}{1\text{ mol}} \rightarrow \boxed{m_{\text{O}_2} = 8000\text{ g}}$$

$$b) \text{Moles de CO}_2 = ?$$

$$\text{M}_m(\text{CO}_2) = 12 + 2 \cdot 16 = 44 \text{ g/mol}$$

$$125\text{ mol C}_2\text{H}_4 \cdot \frac{1\text{ mol CO}_2}{1\text{ mol C}_2\text{H}_4} = 125\text{ mol CO}_2$$

$$125\text{ mol CO}_2 \cdot \frac{44\text{ g}}{1\text{ mol}} \rightarrow \boxed{m_{\text{CO}_2} = 5500\text{ g}}$$



a) Datos

$$m_{\text{Al}} = ?$$

$$V_{\text{HCl}} = 80\text{ mL} = 0'08\text{ L}$$

$$M_{\text{HCl}} = 0'5\text{ mol/L}$$

$$M_{\text{Al}} = 27\text{ g/mol}$$

$$0'08\text{ L} \cdot \frac{0'5\text{ mol}}{1\text{ L}} = 0'04\text{ mol HCl}$$

$$0'04\text{ mol HCl} \cdot \frac{1\text{ mol Al}}{3\text{ mol HCl}} = 0'013\text{ mol Al}$$

$$0'013\text{ mol} \cdot \frac{27\text{ g}}{1\text{ mol}} \rightarrow \boxed{m_{\text{Al}} = 0'356\text{ g}}$$

b) Datos

$$V_{\text{H}_2} = ? \quad T = 298\text{ K}$$

$$C, N \leftarrow P = 1\text{ atm}$$

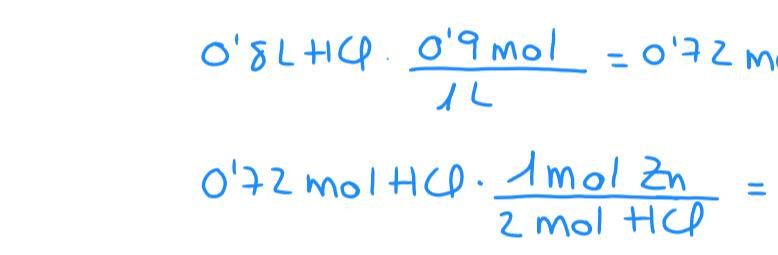
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Condiciones Normales

$$0'04\text{ mol HCl} \cdot \frac{3/2\text{ mol H}_2}{3\text{ mol HCl}} = 0'02\text{ mol H}_2$$

Ley de los gases ideales  $\rightarrow P \cdot V = n \cdot R \cdot T$

$$R = 0'082 \text{ atm L/mol K}$$

$$V = \frac{n \cdot R \cdot T}{P} = \frac{0'02 \cdot 0'082 \cdot 298}{1} \rightarrow \boxed{V = 0'49\text{ L}}$$



Datos

$$m_{\text{CaCO}_3} = 8\text{ kg} = 8000\text{ g} \text{ (piedra)}$$

$$R = 60\% \quad \begin{cases} 100\text{ g piedra} \\ \downarrow 60\text{ g CaCO}_3 \end{cases}$$

$$a) \text{Moles de CaO} = ?$$

$$\text{M}_m(\text{CaCO}_3) = 40 + 12 + 3 \cdot 16 = 100 \text{ g/mol}$$

$$\text{M}_m(\text{CaO}) = 40 + 16 = 56 \text{ g/mol}$$

$$8000\text{ g (piedra)} \cdot \frac{60\text{ g CaCO}_3}{100\text{ g (piedra)}} = 4800\text{ g CaCO}_3$$

$$4800\text{ g CaCO}_3 \cdot \frac{1\text{ mol}}{100\text{ g}} = 4'8 \text{ mol CaCO}_3$$

$$4'8 \text{ mol CaCO}_3 \cdot \frac{1\text{ mol CaO}}{1\text{ mol CaCO}_3} = 4'8 \text{ mol CaO}$$

$$4'8 \text{ mol CaO} \cdot \frac{56\text{ g}}{1\text{ mol}} \rightarrow \boxed{m_{\text{CaO}} = 268'8\text{ g}}$$

$$b) \text{Moles de CO}_2 = ?$$

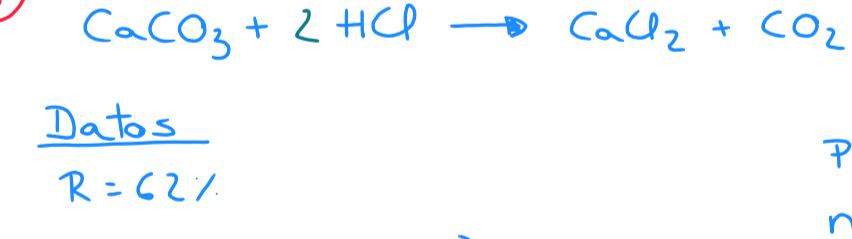
$$P = 1'5 \text{ atm}$$

$$T = 18^\circ\text{C} = 291 \text{ atm}$$

$$4'8 \text{ mol CaCO}_3 \cdot \frac{1\text{ mol CO}_2}{1\text{ mol CaCO}_3} = 4'8 \text{ mol CO}_2$$

$$PV = nRT$$

$$V = \frac{nRT}{P} = \frac{4'8 \cdot 0'082 \cdot 291}{1'5} \rightarrow \boxed{V = 76'36\text{ L}}$$



Datos

$$m_{\text{CaCO}_3} = 10\text{ kg} = 10000\text{ g} \text{ (piedra)}$$

$$m_{\text{CaO}} = 4\text{ kg} = 4000\text{ g}$$

Riqueza = ?

$$M_{\text{CaO}} = 40 + 16 = 56 \text{ g/mol}$$

$$4000\text{ g CaO} \cdot \frac{1\text{ mol}}{56\text{ g}} = 71'43 \text{ mol CaO}$$

$$71'43 \text{ mol CaO} \cdot \frac{1\text{ mol CaCO}_3}{1\text{ mol CaO}} = 71'43 \text{ mol CaCO}_3 \text{ (puro)}$$

$$\text{M}_m(\text{CaCO}_3) = 40 + 12 + 3 \cdot 16 = 100 \text{ g/mol}$$

$$71'43 \text{ mol CaCO}_3 \cdot \frac{100\text{ g}}{1\text{ mol}} = 7143 \text{ g CaCO}_3 \text{ (puro)}$$

$$R = \frac{m_{\text{puro}}}{m_{\text{piedra}}} \cdot 100 = \frac{7143}{10000} \cdot 100 \rightarrow \boxed{R = 71'43\%}$$



Datos

$$m_{\text{Zn}} = 140\text{ g}$$

$$V_{\text{HCl}} = 800\text{ mL} = 0'8\text{ L}$$

$$M_{\text{HCl}} = 0'5\text{ mol/L}$$

$$\text{Riqueza} = ?$$

$$Riqueza = \frac{m_{\text{puro}}}{m_{\text{impuro}}} \cdot 100$$

Los datos de la reacción son puros

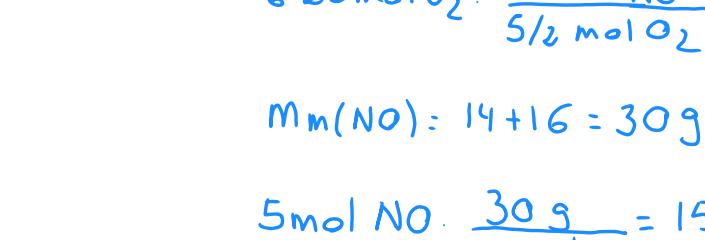
$$0'8\text{ L HCl} \cdot \frac{0'9\text{ mol}}{1\text{ L}} = 0'72 \text{ mol HCl}$$

$$0'72 \text{ mol HCl} \cdot \frac{1\text{ mol Zn}}{2\text{ mol HCl}} = 0'36 \text{ mol Zn}$$

$$M_{\text{Zn}} = 65 \text{ g/mol}$$

$$0'36 \text{ mol Zn} \cdot \frac{65\text{ g}}{1\text{ mol}} = 23'4 \text{ g Zn puros}$$

$$R = \frac{m_{\text{pura}}}{m_{\text{piedra}}} \cdot 100 = \frac{23'4}{140} \cdot 100 \rightarrow \boxed{R = 16'71\%}$$



Datos

$$R = 85\%$$

$$V_{\text{CO}_2} = ?$$

$$T = 290\text{ mmHg}$$

$$T = 20^\circ\text{C} = 293\text{ K}$$

$$M_{\text{C}_2\text{H}_{10}} = 2'5 \text{ kg} = 2500\text{ g}$$

$$M_{\text{C}_2\text{H}_{10}} = 4 \cdot 12 + 10 \cdot 1 = 58 \text{ g/mol}$$

$$P = 750\text{ mmHg}$$

$$\frac{1\text{ atm}}{760\text{ mmHg}} = \frac{0'96\text{ atm}}{750\text{ mmHg}}$$

$$R = 0'082 \text{ atm L/mol K}$$

$$2500\text{ g C}_2\text{H}_{10} \cdot \frac{1\text{ mol}}{58\text{ g}} = 43'10 \text{ mol C}_2\text{H}_{10}$$

$$43'10 \text{ mol C}_2\text{H}_{10} \cdot \frac{4\text{ mol CO}_2}{1\text{ mol C}_2\text{H}_{10}} = 172'41 \text{ mol CO}_2$$

$$PV = nRT$$

$$V = \frac{nRT}{P}$$

$$V = \frac{172'41 \cdot 0'082 \cdot 293}{0'96} \rightarrow \boxed{V = 4314'92 \text{ L}}$$



Datos

$$m_{\text{H}_2\text{O}} = 60\text{ g}$$

$$m_{\text{CaH}_2} = 80\text{ g}$$

$$M_{\text{H}_2\text{O}} = 2 \cdot 1 + 16 = 18 \text{ g/mol}$$

$$M_{\text{CaH}_2} = 40 + 2 \cdot 1 = 42 \text{ g/mol}$$

$$a) \text{Reactivos limitante} = ?$$

$$M_{\text{reactivo sobra}}$$

1. Calcular los moles de cada reactivo

2. Por estequiometría calcular los moles de cada reactivo

3. Decidir el reactivo limitante

$$60\text{ g H}_2\text{O} \cdot \frac{1\text{ mol}}{18\text{ g}} = 3'33 \text{ mol H}_2\text{O} \text{ (tengo)}$$

$$80\text{ g CaH}_2 \cdot \frac{1\text{ mol}}{42\text{ g}} = 1'90 \text{ mol CaH}_2 \text{ (tengo)}$$

$$3'33 \text{ mol H}_2\text{O} \cdot \frac{1\text{ mol CaH}_2}{2\text{ mol H}_2\text{O}} = 1'66 \text{ mol CaH}_2 \text{ (necesito)}$$

$$1'90 \text{ mol CaH}_2 \cdot \frac{2\text{ mol H}_2\text{O}}{1\text{ mol CaH}_2} = 3'8 \text{ mol H}_2\text{O} \text{ (necesito)}$$

$$1'66 \text{ mol CaH}_2 \cdot \frac{1\text{ mol Ca(OH)}_2}{1\text{ mol CaH}_2} = 1'66 \text{ mol Ca(OH)}_2$$

$$1'66 \text{ mol Ca(OH)}_2 \cdot \frac{1\text{ mol H}_2}{1\text{ mol Ca(OH)}_2} = 1'66 \text{ mol H}_2$$

$$1'66 \text{ mol H}_2 \cdot \frac{1\text{ mol}}{2\text{ mol}} = 0'83 \text{ mol H}_2$$

$$1'66 \text{ mol H}_2 \cdot \frac{2\text{ mol NH}_3}{1\text{ mol H}_2} = 3'32 \text{ mol NH}_3$$

$$3'32 \text{ mol NH}_3 \cdot \frac{1\text{ mol}}{17\text{ g}} = 196'3 \text{ g NH}_3$$

$$196'3 \text{ g NH}_3 \cdot \frac{1\text{ mol}}{17\text{ g}} = 11'48 \text{ mol NH}_3$$

$$11'48 \$$