

Problemas tipo de cálculos químicos.

$$\textcircled{1} \text{ a) } m = d \cdot V = 1 \frac{\text{g}}{\text{cm}^3} \cdot 25 \text{ cm}^3 = 25 \text{ g}$$

$$n = \frac{m}{M} = \frac{25}{18} = \boxed{1.39 \text{ mol}}$$

$$\text{b) } N_H = 1.39 \text{ mol } \cancel{\text{H}_2\text{O}} \cdot \frac{2 \text{ mol } \cancel{\text{H}}}{1 \text{ mol } \cancel{\text{H}_2\text{O}}} \cdot \frac{6.022 \cdot 10^{23} \text{ átomos } \cancel{\text{H}}}{1 \text{ mol } \cancel{\text{H}}} =$$

$$= \boxed{1.67 \cdot 10^{24} \text{ átomos } \text{H}}$$

$$\text{c) } m = 1 \text{ molécula } \cancel{\text{H}_2\text{O}} \cdot \frac{1 \text{ mol } \cancel{\text{H}_2\text{O}}}{6.022 \cdot 10^{23} \text{ moléculas } \cancel{\text{H}_2\text{O}}} \cdot$$

$$\frac{18 \text{ g } \text{H}_2\text{O}}{1 \text{ mol } \cancel{\text{H}_2\text{O}}} = \boxed{2.99 \cdot 10^{-23} \text{ g } \text{H}_2\text{O}}$$

$$\textcircled{2} \quad M = 2 \cdot 55.85 + 3 \cdot 32 + 12 \cdot 16 = 399.7 \frac{\text{g}}{\text{mol}}$$

$$a) \quad n = \frac{m}{M} = \frac{500}{399.7} = \boxed{1.25 \text{ mol } \text{Fe}_2(\text{SO}_4)_3}$$

$$b) \quad N = n \cdot N_A = 1.25 \cdot 6.022 \cdot 10^{23} = \boxed{7.53 \cdot 10^{23} \text{ moléculas}}$$

$$c) \quad N = 7.53 \cdot 10^{23} \text{ moléculas} \cdot \frac{17 \text{ átomos}}{1 \text{ molécula}} = \boxed{1.28 \cdot 10^{25} \text{ átomos}}$$

$$d) \quad \text{Fe: } 1.25 \cdot 2 = \boxed{2.5 \text{ mol}}$$

$$\text{S: } 1.25 \cdot 3 = \boxed{3.75 \text{ mol}}$$

$$\text{O: } 1.25 \cdot 12 = \boxed{15 \text{ mol}}$$

$$e) \quad \text{Fe: } 2.5 \cdot 55.85 = \boxed{140 \text{ g}}$$

$$\text{S: } 3.75 \cdot 32 = \boxed{120 \text{ g}}$$

$$\text{O: } 15 \cdot 16 = \boxed{240 \text{ g}}$$

$$f) \quad \begin{array}{l} \text{Fe: } 2'5 \cdot N_A = 1'51 \cdot 10^{24} \text{ átomos} \\ \text{S: } 3'75 \cdot N_A = 2'26 \cdot 10^{24} \text{ átomos} \\ \text{O: } 15 \cdot N_A = 9'03 \cdot 10^{24} \text{ átomos} \end{array}$$

$$③ \quad M = 46 \frac{\text{g}}{\text{mol}}$$

$$C_M = \frac{95 \text{ g soluto}}{100 \text{ g disolución}} \cdot \frac{0'90 \text{ g disol.}}{1 \text{ ml disol.}} \cdot \frac{1000 \text{ ml disol.}}{1 \text{ l disol.}}$$

$$\cdot \frac{1 \text{ mol soluto}}{46 \text{ g soluto}} = \boxed{18'6 \text{ M}}$$

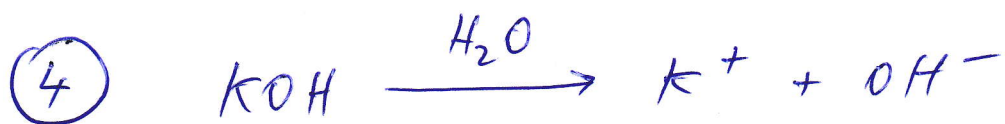
$$C = \frac{95 \text{ g soluto}}{100 \text{ g disolución}} \cdot \frac{0'90 \text{ g disol.}}{1 \text{ ml disol.}} \cdot \frac{1000 \text{ ml disol.}}{1 \text{ l disol.}} =$$

$$= \boxed{855 \frac{\text{g}}{\text{l}}}$$

$$X_s = \frac{95 \text{ g soluto}}{95 \text{ g soluto} + 5 \text{ g disolvente}} = \frac{\frac{95}{46}}{\frac{95}{46} + \frac{5}{18}} =$$

$$= \boxed{0'881}$$

$$X_d = 1 - X_s = 1 - 0'881 = \boxed{0'119}$$



* En las diluciones: $c_1 \cdot V_1 = c_2 \cdot V_2$

$$M_{\text{KOH}} = 56$$

$$c_1 = \frac{30 \text{ g KOH}}{250 \text{ ml disol.}} \cdot \frac{1000 \text{ ml disol.}}{1 \text{ l disol.}} \cdot \frac{1 \text{ mol KOH}}{56 \text{ g KOH}} =$$

$$= 2.14 \text{ M}$$

* Concentración final:

$$c_2 = \frac{c_1 \cdot V_1}{V_2} = \frac{2.14 \cdot 250}{500} = 1.07 \text{ M}$$

* Número de iones K^+ :

$$N = 1.07 \frac{\text{mol KOH}}{\text{l}} \cdot 0.050 \text{ l} \cdot \frac{1 \text{ mol K}^+}{1 \text{ mol KOH}} \cdot$$

$$\cdot \frac{6.022 \cdot 10^{23} \text{ iones K}^+}{1 \text{ mol K}^+} = \boxed{3.22 \cdot 10^{22} \text{ iones K}^+}$$

⑤ a) * Masa de disolución:

$$m_D = d_D \cdot V_D = 1.05 \frac{g}{ml} \cdot 1500 ml = 1575 g \text{ disolución}$$

$$M_{H_2SO_4} = 98$$

$$M_{H_2O} = 18$$

$$m_{H_2O} = 1428 g$$

$$X_s = \frac{n_s}{n_s + n_d} = \frac{\frac{147}{98}}{\frac{147}{98} + \frac{1428}{18}} = \boxed{0.0186}$$

$$X_d = 1 - X_s = 1 - 0.0186 = \boxed{0.9814}$$

b) * En las diluciones: $c_1 \cdot V_1 = c_2 \cdot V_2$

* Concentración inicial:

$$c_1 = \frac{147 \cancel{g H_2SO_4}}{1.5 \text{ l disolución}} \cdot \frac{1 \text{ mol } H_2SO_4}{98 \cancel{g H_2SO_4}} = 1 M$$

* Volumen inicial necesario:

$$c_1 \cdot V_1 = c_2 \cdot V_2$$

$$V_1 = \frac{c_2 \cdot V_2}{c_1} = \frac{0.5 \cdot 500}{1} = \boxed{250 ml}$$

$$\textcircled{6} \quad M = 60 \frac{\text{g}}{\text{mol}}$$

* Concentración inicial:

$$c_1 = \frac{10 \text{ g soluto}}{100 \text{ g disolución}} \cdot \frac{1'05 \text{ g disolución}}{1 \text{ ml disolución}} \cdot \frac{1000 \text{ ml disolución}}{1 \text{ l disolución}} \cdot \frac{1 \text{ mol soluto}}{60 \text{ g soluto}} = 1'75 \text{ M}$$

* Concentración final:

$$c_2 = \frac{c_1 \cdot V_1}{V_2} = \frac{1'75 \cdot 25}{250} = \boxed{0'175 \text{ M}}$$

$\textcircled{7}$ * Concentración inicial:

$$c_1 = \frac{25 \text{ g HCl}}{100 \text{ g disolución}} \cdot \frac{1 \text{ mol HCl}}{36'5 \text{ g soluto}} \cdot \frac{0'91 \text{ g disolución}}{1 \text{ ml disolución}} \cdot \frac{1000 \text{ ml disolución}}{1 \text{ l disolución}} = 6'23 \text{ M}$$

* Volumen a tomar:

$$V_1 = \frac{c_2 \cdot V_2}{c_1} = \frac{0'1 \cdot 1500}{6'23} = \boxed{24'1 \text{ ml}}$$

⑧ * Masa de soluto en 500 ml:

$$m_s = \frac{1055 \text{ g disol.}}{1 \text{ ml disol.}} \cdot 500 \text{ ml disol.} \cdot \frac{10 \text{ g soluto}}{100 \text{ g disol.}} =$$

$$= 5275 \text{ g soluto}$$

* Masa de agua en 500 ml:

$$m_d = 1055 - 5275 = 1002 \text{ g}$$

* Porcentaje en masa final:

$$\text{Porc.} = \frac{m_s \cdot 100}{m_d} = \frac{5275 \cdot 100}{1502} = \boxed{351\%}$$

⑨ a) * Concentración inicial:

$$c_1 = \frac{36 \text{ g HCl}}{100 \text{ g disolución}} \cdot \frac{1 \text{ mol HCl}}{365 \text{ g HCl}} \cdot \frac{119 \text{ g disol.}}{1 \text{ ml disol.}} \cdot \frac{1000 \text{ ml disol.}}{1 \text{ l disol.}} = 117 \text{ M}$$

* Volumen inicial:

$$V_1 = \frac{c_2 \cdot V_2}{c_1} = \frac{03 \cdot 1000}{117} = \boxed{256 \text{ ml}}$$

$$b) \quad c_1 \cdot V_1 = c_2 \cdot V_2$$

$$c_2 = \frac{c_1 \cdot V_1}{V_2} = \frac{0.3 \cdot 50}{250} = \boxed{0.06 \text{ M}}$$

10) a)

$$n = 2 \cancel{\text{ l H}_2\text{S}} \cdot \frac{1 \text{ mol H}_2\text{S}}{22.4 \cancel{\text{ l H}_2\text{S}}} = \boxed{0.0893 \text{ mol}}$$

b)

$$N = n \cdot N_A \cdot 3 = 0.0893 \cdot 6.022 \cdot 10^{23} \cdot 3 = \boxed{1.61 \cdot 10^{23} \text{ átomos}}$$

c)

$$m = 1 \cancel{\text{ molécula H}_2\text{S}} \cdot \frac{1 \cancel{\text{ mol H}_2\text{S}}}{6.022 \cdot 10^{23} \cancel{\text{ moléculas H}_2\text{S}}}$$

$$\cdot \frac{34 \text{ g H}_2\text{S}}{1 \cancel{\text{ mol H}_2\text{S}}} = \boxed{5.65 \cdot 10^{-23} \text{ g}}$$

11) a) Según la hipótesis de Avogadro: volúmenes iguales de distintos gases en las mismas condiciones de presión y temperatura contienen el mismo número de moléculas. Y al contrario: a igual número de moléculas (y, por tanto, de moles) igual volumen.

b) La del oxígeno, por tener mayor masa molecular.

$$N_2: m = n \cdot M = 1 \cdot 28 = 28 \text{ g}$$

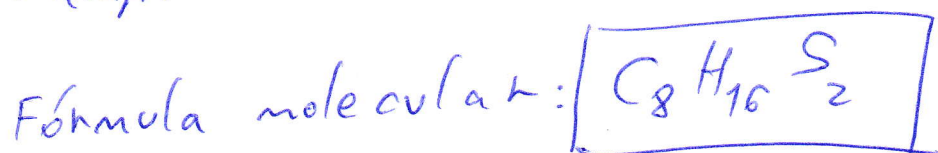
$$O_2: m = n \cdot M = 1 \cdot 32 = 32 \text{ g}$$

c) En ambos igual. Un mol de cualquier sustancia contiene un número de Avogadro de partículas.



$$a) M_{empírica} = 4 \cdot 12 + 8 + 32 = 88$$

$$\frac{M_{molecular}}{M_{empírica}} = n \Rightarrow \frac{176}{88} = 2$$



b)

$$N_H = 25 \text{ g } \cancel{\text{C}_8\text{H}_{16}\text{S}_2} \cdot \frac{1 \text{ mol } \cancel{\text{C}_8\text{H}_{16}\text{S}_2}}{176 \text{ g } \cancel{\text{C}_8\text{H}_{16}\text{S}_2}} \cdot$$

$$\cdot \frac{16 \text{ mol } \cancel{\text{H}}}{1 \text{ mol } \cancel{\text{C}_8\text{H}_{16}\text{S}_2}} \cdot \frac{6.022 \cdot 10^{23} \text{ atoms } \cancel{\text{H}}}{1 \text{ mol } \cancel{\text{H}}} =$$

$$= \boxed{1.37 \cdot 10^{24} \text{ atoms } \text{H}}$$

c)

$$P = \frac{n \cdot R \cdot T}{V} = \frac{m \cdot R \cdot T}{M \cdot V} = \frac{2 \cdot 0.082 \cdot (120 + 273)}{176 \cdot 15} =$$

$$= \boxed{0.244 \text{ atm}}$$

$$M_{\text{Fe}_2\text{O}_3} = 160$$

$$(13) \text{ a) } M_{\text{FeS}_2} = 120$$

$$m_{\text{Fe}_2\text{O}_3} = 500 \text{ kg } \cancel{\text{pirita}} \cdot \frac{92 \text{ kg } \cancel{\text{FeS}_2}}{100 \text{ kg } \cancel{\text{pirita}}} \cdot \frac{1000 \text{ g } \cancel{\text{FeS}_2}}{1 \text{ kg } \cancel{\text{FeS}_2}} \cdot$$

$$\cdot \frac{1 \text{ mol } \cancel{\text{FeS}_2}}{120 \text{ g } \cancel{\text{FeS}_2}} \cdot \frac{2 \text{ mol } \cancel{\text{Fe}_2\text{O}_3}}{4 \text{ mol } \cancel{\text{FeS}_2}} \cdot \frac{160 \text{ g } \cancel{\text{Fe}_2\text{O}_3}}{1 \text{ mol } \cancel{\text{Fe}_2\text{O}_3}} \cdot$$

$$\cdot \frac{1 \text{ kg } \cancel{\text{Fe}_2\text{O}_3}}{1000 \text{ g } \cancel{\text{Fe}_2\text{O}_3}} = \boxed{307 \text{ kg } \text{Fe}_2\text{O}_3}$$

b) * N° moles de O_2 :

$$n_{O_2} = 500 \text{ kg ~~pirita~~} \cdot \frac{92 \text{ kg ~~pirita~~ } FeS_2}{100 \text{ kg ~~pirita~~}} \cdot \frac{1000 \text{ g ~~FeS}_2~~}{1 \text{ kg ~~FeS}_2~~}} \cdot \frac{1 \text{ mol ~~FeS}_2~~}}{120 \text{ g ~~FeS}_2~~}} \cdot \frac{1 \text{ mol } O_2}{4 \text{ mol ~~FeS}_2~~}} = 958 \text{ mol } O_2$$

* Volumen de O_2 :

$$V = \frac{n \cdot R \cdot T}{P} = \frac{958 \cdot 0.082 \cdot 293}{\frac{720}{760}} = 24.296 \text{ l} = \boxed{24.3 \text{ m}^3}$$

14) $M_{AgNO_3} = 170$

$$n = \frac{m}{M} = \frac{20}{170} = 0.118 \text{ mol } AgNO_3$$

a)

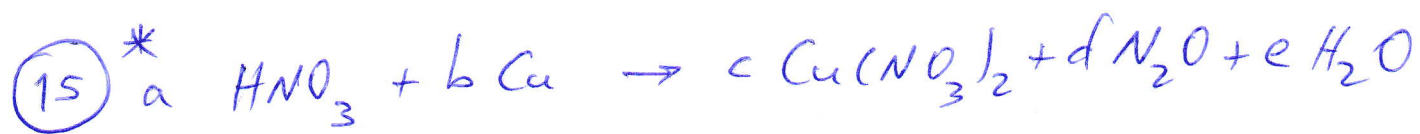
$$n_{N_2O} = 0.118 \text{ mol ~~AgNO}_3~~} \cdot \frac{1 \text{ mol } N_2O_5}{2 \text{ mol ~~AgNO}_3~~}} = \boxed{0.059 \text{ mol } N_2O_5}$$

b) * Moles de O_2 :

$$n = 0.118 \text{ mol ~~AgNO}_3~~} \cdot \frac{0.5 \text{ mol } O_2}{2 \text{ mol ~~AgNO}_3~~}} = 0.0295 \text{ mol } O_2$$

* Volumen de O_2 :

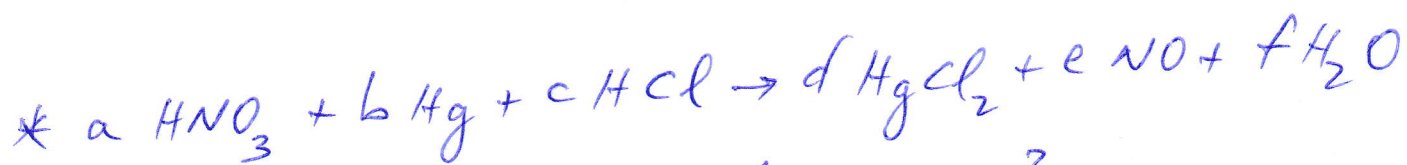
$$V = \frac{n \cdot R \cdot T}{P} = \frac{0.0295 \cdot 0.082 \cdot 293}{\frac{620}{760} (11)} = \boxed{0.869 \text{ l}}$$



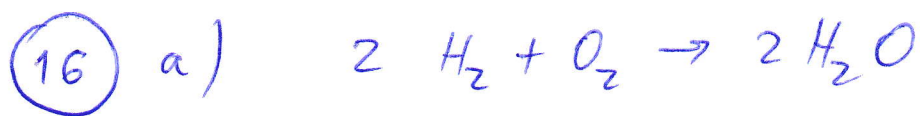
$$\begin{array}{l|l} \text{H: } a = 2e \checkmark & a = 2 \rightarrow 10 \\ \text{N: } a = 2c + 2d & b = \frac{4}{5} \rightarrow 4 \\ \text{O: } 3a = 6c + d + e & c = \frac{4}{5} \rightarrow 4 \\ \text{Cu: } b = c & d = \frac{1}{5} \rightarrow 1 \\ & e = 1 \rightarrow 5 \end{array}$$

$$\left. \begin{array}{l} 2 = 2c + 2d \\ 6 = 6c + d + 1 \end{array} \right\} \begin{array}{l} 1 = c + d \\ 5 = 6c + d \end{array} \right\} 4 = 5c \Rightarrow c = \frac{4}{5}$$

$$d = 1 - c = 1 - \frac{4}{5} = \frac{1}{5}$$



$$\begin{array}{l|l} \text{H: } a + c = 2f \checkmark & a = 1 \rightarrow 2 \\ \text{N: } a = e \checkmark & b = \frac{3}{2} \rightarrow 3 \\ \text{O: } 3a = e + f \checkmark & c = 3 \rightarrow 6 \\ \text{Hg: } b = d \checkmark & d = \frac{3}{2} \rightarrow 3 \\ \text{Cl: } c = 2d \checkmark & e = 1 \rightarrow 2 \\ & f = 2 \rightarrow 4 \end{array}$$



$$\frac{4 \text{ g H}_2}{32 \text{ g O}_2} = \frac{10 \text{ g H}_2}{x} \Rightarrow x = 80 \text{ g O}_2$$

$$80 \text{ g O}_2 > 40 \text{ g O}_2 \Rightarrow \text{Limitante: O}_2$$

$$N_{\text{H}_2\text{O}} = 40 \text{ g O}_2 \cdot \frac{1 \text{ mol O}_2}{32 \text{ g O}_2} \cdot \frac{2 \text{ mol H}_2\text{O}}{1 \text{ mol O}_2}$$

$$\cdot \frac{6'022 \cdot 10^{23} \text{ moléculas H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = \boxed{1'51 \cdot 10^{24} \text{ moléculas H}_2\text{O}}$$

b) * Masa de H_2 que reacciona:

$$\frac{4 \text{ g H}_2}{32 \text{ g O}_2} = \frac{x}{40 \text{ g O}_2}; x = 5 \text{ g H}_2$$

* Masa de H_2 en exceso:

$$m = 10 - 5 = 5 \text{ g}$$

* Átomos de H_2 en exceso:

$$N = 5 \text{ g H}_2 \cdot \frac{1 \text{ mol H}_2}{2 \text{ g H}_2} \cdot \frac{6'022 \cdot 10^{23} \text{ moléculas H}_2}{1 \text{ mol H}_2} \cdot \frac{2 \text{ átomos H}}{1 \text{ moléculas H}_2} =$$

$$(13) = \boxed{3'01 \cdot 10^{24} \text{ átomos H}}$$

(17) a) * Reacción:



* Moles de Zn:

$$n = \frac{m}{M} = \frac{20}{65.4} = 0.306 \text{ mol Zn}$$

* Moles de HCl:

$$n = c \cdot V = 6 \frac{\text{mol}}{\text{L}} \cdot 0.2 \text{ L} = 1.2 \text{ mol HCl}$$

* Limitante:

$$\frac{1 \text{ mol Zn}}{2 \text{ mol HCl}} = \frac{0.306 \text{ mol Zn}}{x} \Rightarrow x = 0.712 \text{ mol HCl}$$

$$0.712 \text{ mol HCl} < 1.2 \text{ mol HCl} \Rightarrow \text{Limitante: Zn}$$

* Moles de HCl en exceso:

$$n = 1.2 - 0.712 = 0.488 \text{ mol HCl}$$

* Masa de HCl en exceso:

$$m = 0.488 \cdot 36.5 = \boxed{17.8 \text{ g HCl}}$$

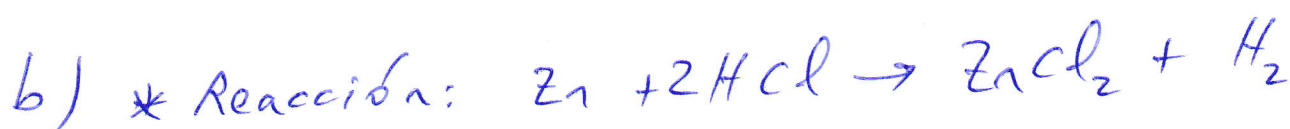
$$b) \quad n_{H_2} = 0'306 \cancel{\text{mol Zn}} \cdot \frac{1 \text{ mol } H_2}{1 \cancel{\text{mol Zn}}} = 0'306 \text{ mol } H_2$$

$$V = \frac{n \cdot R \cdot T}{P} = \frac{0'306 \cdot 0'082 \cdot 300}{1} = \boxed{7'53 \text{ l } H_2}$$

(18) a)

$$c_M = \frac{37 \cancel{\text{g HCl}}}{100 \cancel{\text{g disolución}}} \cdot \frac{1'18 \cancel{\text{g disol.}}}{1 \cancel{\text{ml disol.}}} \cdot \frac{1 \text{ mol HCl}}{36'5 \cancel{\text{g HCl}}}$$

$$\cdot \frac{1000 \cancel{\text{ml disol.}}}{1 \text{ l disol.}} = \boxed{12 \text{ M}}$$



* Masa de Zn:

$$m = 12 \frac{\cancel{\text{mol HCl}}}{\cancel{\text{X}}} \cdot 0'126 \cancel{\text{X}} \cdot \frac{1 \cancel{\text{mol Zn}}}{2 \cancel{\text{mol HCl}}}$$

$$\cdot \frac{65'4 \text{ g Zn}}{1 \cancel{\text{mol Zn}}} = 49'4 \text{ g Zn}$$

* Riqueza de la muestra:

$$m = \frac{m_{Zn} \cdot 100}{m_T} = \frac{49'4 \cdot 100}{50} = \boxed{98'8 \%}$$

(19) a)

$$C_M = \frac{200 \text{ g } \cancel{\text{NaOH}}}{1200 \text{ g } \cancel{\text{disol.}}} \cdot \frac{1 \text{ mol } \cancel{\text{NaOH}}}{40 \text{ g } \cancel{\text{NaOH}}} \cdot \frac{1'2 \text{ g } \cancel{\text{disol.}}}{1 \text{ ml } \cancel{\text{disol.}}} \cdot \frac{1000 \text{ ml } \cancel{\text{disol.}}}{1 \text{ l } \cancel{\text{disol.}}} = \boxed{5 \text{ M}}$$

$$\text{Riqueza} = \frac{m_s \cdot 100}{m_T} = \frac{200 \cdot 100}{1200} = \boxed{16'7 \%}$$

b) * En una neutralización: $v_a \cdot c_a \cdot V_a = v_b \cdot c_b \cdot V_b$

$$V_a = \frac{v_b \cdot c_b \cdot V_b}{v_a \cdot c_a} = \frac{1 \cdot 5 \cdot 20}{2 \cdot 2} = \boxed{25 \text{ ml}}$$

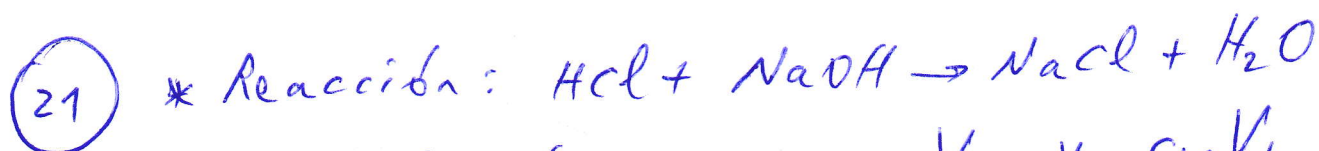
(20) a) $M_{\text{CaCO}_3} = 100$

$$V = 10 \text{ g } \cancel{\text{CaCO}_3} \cdot \frac{1 \text{ mol } \cancel{\text{CaCO}_3}}{100 \text{ g } \cancel{\text{CaCO}_3}} \cdot \frac{1 \text{ mol } \cancel{\text{H}_2\text{SO}_4}}{1 \text{ mol } \cancel{\text{CaCO}_3}} \cdot \frac{98 \text{ g } \cancel{\text{H}_2\text{SO}_4}}{1 \text{ mol } \cancel{\text{H}_2\text{SO}_4}} \cdot \frac{100 \text{ g } \cancel{\text{disol.}}}{96 \text{ g } \cancel{\text{H}_2\text{SO}_4}} \cdot \frac{1 \text{ ml } \cancel{\text{disol.}}}{1'84 \text{ g } \cancel{\text{disol.}}} = \boxed{5'55 \text{ ml disolución}}$$

b)

$$m = 20 \cancel{\text{ l CO}_2} \cdot \frac{1 \cancel{\text{ mol CO}_2}}{22.4 \cancel{\text{ l CO}_2}} \cdot \frac{1 \cancel{\text{ mol CaCO}_3}}{1 \cancel{\text{ mol CO}_2}}$$

$$\cdot \frac{100 \cancel{\text{ g CaCO}_3}}{1 \cancel{\text{ mol CaCO}_3}} \cdot \frac{100 \text{ g producto}}{80 \cancel{\text{ g CaCO}_3}} = \boxed{112 \text{ g producto}}$$



* En las volumetrías: $v_a \cdot c_a \cdot V_a = v_b \cdot c_b \cdot V_b$

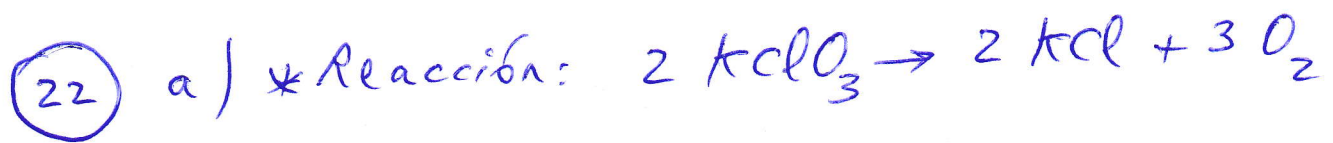
* Concentración del ácido:

$$c_a = \frac{37 \cancel{\text{ g HCl}}}{100 \cancel{\text{ g disolución}}} \cdot \frac{1 \cancel{\text{ mol HCl}}}{36.5 \cancel{\text{ g HCl}}} \cdot \frac{119 \cancel{\text{ g disol.}}}{1 \cancel{\text{ ml disol.}}}$$

$$\cdot \frac{1000 \cancel{\text{ ml disol.}}}{1 \cancel{\text{ l disol.}}} = 12.1 \text{ M}$$

* Volumen de ácido necesario:

$$V_a = \frac{v_b \cdot c_b \cdot V_b}{c_a \cdot v_a} = \frac{1 \cdot 0.12 \cdot 600}{12.1 \cdot 1} = \boxed{5.95 \text{ ml}}$$



$$M_{\text{KClO}_3} = 122.5$$

* Moles de O_2 :

$$n = \frac{P \cdot V}{R \cdot T} = \frac{2 \cdot 5}{0.082 \cdot 293} = 0.416 \text{ mol } \text{O}_2$$

* Masa de KClO_3 :

$$m = 0.416 \text{ mol } \text{O}_2 \cdot \frac{2 \text{ mol } \text{KClO}_3}{3 \text{ mol } \text{O}_2} \cdot \frac{122.5 \text{ g } \text{KClO}_3}{1 \text{ mol } \text{KClO}_3} =$$

$$= \boxed{34 \text{ g } \text{KClO}_3}$$

b) $M_{\text{KCl}} = 74.5$

$$m_{\text{KCl}} = 60 \text{ g producto} \cdot \frac{83 \text{ g } \text{KClO}_3}{100 \text{ g producto}} \cdot$$

$$\cdot \frac{1 \text{ mol } \text{KClO}_3}{122.5 \text{ g } \text{KClO}_3} \cdot \frac{2 \text{ mol } \text{KCl}}{2 \text{ mol } \text{KClO}_3} \cdot \frac{74.5 \text{ g } \text{KCl}}{1 \text{ mol } \text{KCl}} =$$

$$= \boxed{30.3 \text{ g } \text{KCl}}$$

$$\textcircled{23} \quad M_{\text{CaCO}_3} = 100 \quad M_{\text{Cl}_2} = 71$$

a) * Moles de Cl_2O obtenidos:

$$n = \frac{P \cdot V}{R \cdot T} = \frac{1'16 \cdot 20}{0'082 \cdot 283} = 1 \text{ mol } \text{Cl}_2\text{O}$$

* Moles de CaCO_3 :

$$n = 230 \text{ g producto} \cdot \frac{87 \text{ g } \text{CaCO}_3}{100 \text{ g producto}} \cdot \frac{1 \text{ mol } \text{CaCO}_3}{100 \text{ g } \text{CaCO}_3} =$$

$$= 2 \text{ mol } \text{CaCO}_3$$

* Moles de Cl_2 :

$$n = 178 \text{ g } \text{Cl}_2 \cdot \frac{1 \text{ mol } \text{Cl}_2}{71 \text{ g } \text{Cl}_2} = 2'51 \text{ mol } \text{Cl}_2$$

* Reactivo limitante:

$$\frac{1 \text{ mol } \text{CaCO}_3}{2 \text{ mol } \text{Cl}_2} = \frac{2 \text{ mol } \text{CaCO}_3}{x} \Rightarrow x = 4 \text{ mol } \text{Cl}_2$$

$$2'51 \text{ mol } \text{Cl}_2 < 4 \text{ mol } \text{Cl}_2 \Rightarrow \text{Limitante: } \text{Cl}_2$$

* Moles teóricos de Cl_2O :

$$n = 2'51 \text{ mol } \cancel{\text{Cl}_2} \cdot \frac{1 \text{ mol } \text{Cl}_2\text{O}}{2 \text{ mol } \cancel{\text{Cl}_2}} = 1'25 \text{ mol } \text{Cl}_2\text{O}$$

* Rendimiento de la reacción:

$$\text{Rendimiento} = \frac{m_{\text{teórico}} \cdot 100}{n_{\text{teórico}}} =$$

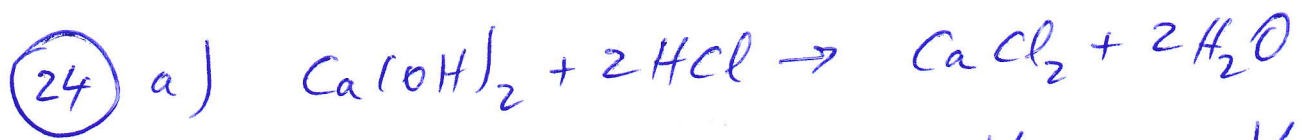
$$= \frac{1 \cdot 100}{1'25} = \boxed{80\%}$$

b) * Moles de CaCl_2 obtenidos:

$$n = 2'51 \text{ mol } \cancel{\text{Cl}_2} \cdot \frac{1 \text{ mol } \text{CaCl}_2}{2 \text{ mol } \cancel{\text{Cl}_2}} = 1'25 \text{ mol } \text{CaCl}_2$$

* Molaridad de la disolución:

$$C_M = \frac{n_s}{V_D} = \frac{1'25 \text{ mol}}{0'8 \text{ l}} = \boxed{1'56 \text{ M}}$$



b) * En las volumetrías: $v_a \cdot c_a \cdot V_a = v_b \cdot c_b \cdot V_b$

$$V_b = \frac{v_a \cdot c_a \cdot V_a}{v_b \cdot c_b} = \frac{1 \cdot 0.1 \cdot 50}{2 \cdot 0.2} = \boxed{12.5 \text{ ml}}$$

c) * Moles iniciales de $\text{Ca}(\text{OH})_2$:

$$n = c \cdot V = 0.5 \frac{\text{mol}}{\text{l}}, 0.020 \text{ l} = 0.010 \text{ mol } \text{Ca}(\text{OH})_2$$

* Moles iniciales de HCl :

$$n = c \cdot V = 0.4 \frac{\text{mol}}{\text{l}}, 0.030 \text{ l} = 0.012 \text{ mol } \text{HCl}$$

* Limitante:

$$\frac{1 \text{ mol } \text{Ca}(\text{OH})_2}{2 \text{ mol } \text{HCl}} = \frac{0.010 \text{ mol } \text{Ca}(\text{OH})_2}{x} \Rightarrow$$

$$\Rightarrow x = 0.020 \text{ mol } \text{HCl} > 0.012 \text{ mol } \text{HCl} \Rightarrow$$

$\Rightarrow$ Limitante: HCl

* Moles finales de cada sustancia:

$$\text{Ca(OH)}_2 : 0.010 - \frac{0.012}{2} = \boxed{4 \cdot 10^{-3} \text{ mol}}$$

$$\text{HCl} : \boxed{0 \text{ mol}}$$

$$\text{CaCl}_2 : \frac{0.012}{2} = \boxed{6 \cdot 10^{-3} \text{ mol}}$$

$$\text{H}_2\text{O} : \boxed{0.012 \text{ mol}}$$

(25) a) $M_{\text{PbS}} = 239$

* Masa de PbS:

$$m = 410 \text{ cm}^3 \text{H}_2\text{S} \cdot \frac{1 \text{ l H}_2\text{S}}{1000 \text{ cm}^3 \text{H}_2\text{S}} \cdot \frac{1 \text{ mol H}_2\text{S}}{22.4 \text{ l H}_2\text{S}}$$

$$\cdot \frac{1 \text{ mol PbS}}{1 \text{ mol H}_2\text{S}} \cdot \frac{239 \text{ g PbS}}{1 \text{ mol PbS}} = 4.37 \text{ g PbS}$$

* Riqueza de la galena:

$$\text{Riqueza} = \frac{m_{\text{PbS}} \cdot 100}{m_T} = \frac{4.37 \cdot 100}{5} = \boxed{87.4 \%}$$

b)

$$V = 410 \text{ cm}^3 \text{ H}_2\text{S} \cdot \frac{1 \text{ l H}_2\text{S}}{1000 \text{ cm}^3 \text{ H}_2\text{S}} \cdot \frac{1 \text{ mol H}_2\text{S}}{22.4 \text{ l H}_2\text{S}} \cdot \frac{1 \text{ mol H}_2\text{SO}_4}{1 \text{ mol H}_2\text{S}} \cdot \frac{1 \text{ l disol.}}{0.5 \text{ mol H}_2\text{SO}_4} \cdot \frac{1000 \text{ ml disol.}}{1 \text{ l disol.}} =$$

$$= \boxed{36.6 \text{ ml ácido}}$$

26) a) $M_{\text{ZnSO}_4} = 161.4$

* Moles de Zn:

$$n = \frac{m}{M} = \frac{10}{65.4} = 0.153 \text{ mol Zn}$$

* Moles de H_2SO_4 :

$$n = c \cdot V = 2 \frac{\text{mol}}{\text{l}} \cdot 0.1 \text{ l} = 0.2 \text{ mol H}_2\text{SO}_4$$

* Limitante:

$$\frac{1 \text{ mol Zn}}{1 \text{ mol H}_2\text{SO}_4} = \frac{0.153 \text{ mol Zn}}{x} \Rightarrow x = 0.153 \text{ mol H}_2\text{SO}_4$$

Limitante: Zn

* Masa de ZnSO_4 :

$$m = 0.153 \text{ mol } \cancel{\text{Zn}} \cdot \frac{1 \text{ mol } \cancel{\text{ZnSO}_4}}{1 \text{ mol } \cancel{\text{Zn}}} \cdot \frac{161.4 \text{ g } \text{ZnSO}_4}{1 \text{ mol } \cancel{\text{ZnSO}_4}} =$$

$$= \boxed{24.7 \text{ g } \text{ZnSO}_4}$$

b) * Moles de H_2 :

$$n_{\text{H}_2} = 20 \text{ g } \cancel{\text{Zn}} \cdot \frac{1 \text{ mol } \cancel{\text{Zn}}}{65.4 \text{ g } \cancel{\text{Zn}}} \cdot \frac{1 \text{ mol } \text{H}_2}{1 \text{ mol } \cancel{\text{Zn}}} =$$

$$= 0.306 \text{ mol } \text{H}_2$$

* Volumen de H_2 :

$$V = \frac{n \cdot R \cdot T}{P} = \frac{0.306 \cdot 0.082 \cdot 298}{1} = \boxed{7.48 \text{ l } \text{H}_2}$$