Procedimientos

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Introducción a la Química

1) $m = 0.0055\,g$

$V = 4.13\,ml\left(\frac{1\,L}{1000\,ml}\right) = 4.13 \times 10^{-3}\,L$

$T = 23°C + 273 = 296\,K$

$P = 760\,torr \rightarrow 1\,atm$

$PV = nRT$

$PV = \frac{g}{mm}RT$

$mm = \frac{gRT}{PV}$

$mm = \frac{(0.0055\,g)\left(0.08206\frac{L\,atm}{mol\,K}\right)(296\,K)}{(1\,atm)(4.13 \times 10^{-3}\,L)}$

$MM = 32.35\,uma$

El gas puede ser O_2. Puesto que se acerca a la masa molar.

$N_2 = 2 \times 14 = 28\,uma$

$O_2 = 2 \times 16 = 32\,uma$

$C_2H_4 = 2 \times 12 = 24$
$4 \times 1 = 4$
$28\,uma$

$Cl_2 = 2 \times 35 = 70\,uma$

$C_2H_6 = 2 \times 12 = 24$
$6 \times 1.01 = 6.06$
$30.06\,uma$

2) 45 Neutrones (isótopo)

$^{78}_{34}Se$ = 44 neutrones

$^{80}_{36}Kr$ = 44 neutrones

$^{34}_{17}Cl$ = 17 neutrones

$^{103}_{45}Rh$ = 58 neutrones

$^{80}_{35}Br$ = 45 neutrones

3) 29.1% Na → 29.1 g

40.6% S → 40.6 g

100% − 40.6% − 29.1% = 30.3% O → 30.3 g

$29.1\,g\,Na\left(\frac{1\,mol\,Na}{23\,g\,Na}\right) = 1.265\,mol\,Na / 1.265 = 1 \times 2 = 2$

$40.6\,g\,S\left(\frac{1\,mol\,S}{32\,g\,S}\right) = 1.268\,mol\,S / 1.265 = 1 \times 2 = 2$

$30.3\,g\,O\left(\frac{1\,mol\,O}{16\,g\,O}\right) = 1.894\,mol\,O / 1.265 = 1.50 \times 2 = 3$

Fórmula Empírica = $Na_2S_2O_3$

4) 15g Sal Hidratada

7.05g H_2O

$$7.05g\,H_2O\left(\frac{1mol\,H_2O}{18g\,H_2O}\right) = 0.392\,mol\,H_2O \,/\, 0.0559 = 7$$

Na_2SO_4

Na = 2 x 23 = 46
S = 1 x 32 = 32
O = 4 x 16 = 64
142 uma

$$7.95g\,Na_2SO_4\left(\frac{1mol\,Na_2SO_4}{142g\,Na_2SO_4}\right) = 0.0559mol\,Na_2SO_4 \,/\, 0.0559 = 1$$

$(15 - 7.05)g = 7.95g\,Na_2SO_4$

$x = 7$ | $Na_2SO_4 \cdot 7H_2O$

6) % rendimiento = 92%

g S necesarios para 80g de CS_2

$$CH_{4(g)} + 4S_{(g)} \longrightarrow CS_{2(g)} + 2H_2S_{(g)}$$

CS_2
C = 1 x 12 = 12
S = 2 x 32 = 64
76 uma

$80g\,CS_2 + 8\% = 80g\,CS_2 + 6.4g\,CS_2 = 86.4g\,CS_2$

$$86.4g\,CS_2\left(\frac{1mol\,CS_2}{76g\,CS_2}\right)\left(\frac{4mol\,S}{1mol\,CS_2}\right)\left(\frac{32g\,S}{1mol\,S}\right) = 145.5g\,S$$

Explicación:
Esta reacción unidireccional tiene un rendimiento de producción de 92%. Por lo tanto, si se quiere saber cuánto reactivo es necesario para producir 80g de producto, se ajusta esa cantidad de producto al 100%, para que el reactivo cumpla con el % de rendimiento del mismo.

7) $M_{60.4\%}$ → Isótopo 1 = 68.9257 uma

Isótopo 2 = 70.9249 uma → 100% - 60.4% = 39.6%

$$M_{atómica\ ponderada} = 68.9257g\left(\frac{60.4}{100}\right) + 70.9249g\left(\frac{39.6}{100}\right)$$

$= 41.63 + 28.08$

$= 69.71$ uma

10) $P = 1.2\ atm$ $\quad P_f = 2.4\ atm$

$V = 12\ L$ $\quad V_f = ?$

$$PV = P_f V_f$$

$$(1.2\ atm)(12\ L) = (2.4\ atm) V_f$$

$$V_f = \frac{(1.2\ atm)(12\ L)}{2.4\ atm} = 6\ L$$

12) 1 átomo de Fe

$Fe = 55.85\ uma$

$$\frac{55.85\ uma}{6.022 \times 10^{23}\ atomos} = 9.27 \times 10^{-23}\ g/\text{átomo}$$

14) $D = 1.28\ g/L$

$T = 56°C + 273 = 329\ K$

$$P = 454\ torr \left(\frac{1\ atm}{760\ torr}\right) = 0.597\ atm$$

62% C

10.4% H

27.6% O

$$62\ g\ C \left(\frac{1\ mol\ C}{12\ g\ C}\right) = 5.167\ mol\ C / 1.725 = 3$$

$$10.4\ H \left(\frac{1\ mol\ H}{1\ g\ H}\right) = 10.4\ H / 1.725 = 6.03$$

$$27.6\ g\ O \left(\frac{1\ mol\ O}{16\ g\ O}\right) = 1.725\ mol\ O / 1.725 = 1$$

empírica → C_3H_6O

15) $9.4\ cm \times 5.25\ cm \times 5.2\ cm = 245.7\ cm^3\ Al \rightarrow 245.7\ ml$

$$245.7\ ml \left(\frac{3.9\ g}{1\ ml}\right) = 958.23\ g\ Al$$

$$2Al + 6HCl \rightarrow 2AlCl_3 + 3H_2$$

$$958.23\ g\ Al \left(\frac{1\ mol\ Al}{27\ g\ Al}\right)\left(\frac{3\ mol\ H_2}{2\ mol\ Al}\right)\left(\frac{2\ g\ H_2}{1\ mol\ H_2}\right) = 106.47\ g\ H_2$$

18) $V = 10L$

$mol = (0.2 + 0.3 + 0.4)\,mol = 0.9\,mol$

$T = 25°C + 273 = 298\,K$

$PV = nRT$

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

$= \frac{(0.9\,mol)\left(0.08206\frac{atm\,L}{mol\,K}\right)(298\,K)}{10L}$

$= 2.20\,atm\left(\frac{760\,torr}{1\,atm}\right) = 1672\,torr$

20) S_8

$S = 8 \times 32{,}07 = 256.56\,uma$

$0.568\,mm^3\left(\frac{1\,cm^3}{1000\,mm^3}\right)\left(\frac{1\,ml}{1\,cm^3}\right)\left(\frac{2.07\,g}{1\,ml}\right)\left(\frac{1\,mol\,S_8}{256.56\,g}\right) = 4.6 \times 10^{-6}\,mol\,S_8$

27) 120g de cada reactivo

15g $K_2Cr_2O_7$ como producto

$K_2Cr_2O_7$

$K = 2 \times 39.1 = 78.2$

$Cr = 2 \times 52 = 104$

$O = 7 \times 16 = 112$

$294.2\,uma$

$120\,g\,H_2O\left(\frac{1\,mol\,H_2O}{18\,g\,H_2O}\right)\left(\frac{1\,mol\,K_2Cr_2O_7}{1\,mol\,H_2O}\right) = 6.66\,mol\,K_2Cr_2O_7$

limitante

$120\,g\,PbO_2\left(\frac{1\,mol\,PbO_2}{239.2\,g\,PbO_2}\right)\left(\frac{1\,mol\,K_2Cr_2O_7}{3\,mol\,PbO_2}\right) = 0.167\,mol\,K_2Cr_2O_7$

PbO_2

$Pb = 1 \times 207.2 = 207.2$

$O = 2 \times 16 = 32$

$239.2\,uma$

$120\,g\,Cr_2(SO_4)_3\left(\frac{1\,mol}{392.3\,g}\right)\left(\frac{1\,mol\,K_2Cr_2O_7}{1\,mol\,Cr_2(SO_4)_3}\right) = 0.305\,mol\,K_2Cr_2O_7$

$Cr_2(SO_4)_3$

$Cr = 2 \times 52 = 104$

$S = 3 \times 32.1 = 96.3$

$O = 12 \times 16 = 192$

$392.3\,uma$

$120\,g\,K_2SO_4\left(\frac{1\,mol}{174.1\,g}\right)\left(\frac{1\,mol\,K_2Cr_2O_7}{1\,mol\,K_2SO_4}\right) = 0.689\,mol\,K_2Cr_2O_7$

K_2SO_4

$K = 2 \times 39 = 78$

$S = 1 \times 32.1 = 32.1$

$O = 4 \times 16 = 64$

$174.1\,uma$

$0.167\,mol\,K_2Cr_2O_7\left(\frac{294.2\,g\,K_2Cr_2O_7}{1\,mol\,K_2Cr_2O_7}\right) = 49.13\,g$

$\frac{15\,g}{49.13\,g} \times 100\% = 30.5\%$ rendimiento

28) 15 mol CH_4 $T = 23°C + 273 = 296\ K$

$V = ?$ $P = 0.985\ atm$

$$15\ mol\ CH_4 \left(\frac{1\ mol\ CO_2}{1\ mol\ CH_4}\right) = 15\ mol\ CO_2$$

$$V = \frac{nRT}{P} = \frac{(15\ mol)\left(0.08206 \frac{atm\ L}{mol\ K}\right)(296\ K)}{0.985\ atm} = 370\ L$$

29) $CaC_2O_4 \cdot H_2O$

mayor porcentaje de masa (elemento)

$Ca = 1 \times 40.1 = 40.1$

$C = 2 \times 12 = 24$

$O = 4 \times 16 = 64$

128.1 uma

H_2O

$H = 2 \times 1 = 2$

$O = 1 \times 16 = 16$

18 uma

$128.1\ uma + 18\ uma = 146.1\ uma$

$Ca = 40.1/146.1 \times 100\% = 27.45\%$

$C = 24/146.1 \times 100\% = 16.43\%$

$O = (64 + 16)/146.1 \times 100\% = 54.76\%$ ← el elemento Oxigeno es el que tiene mayor porcentaje de masa

$H_2O = 18/146.1 \times 100\% = 12.32\%$