Exercício 1..

massa atómica média = $0.6909 \times 62.93 + 0.3091 \times 64.9278$

≈ 63.55 u.m.a.

Exercício 2.

massa atómica média = $0.1978 \times 10.0129 + 0.8022 \times 11.0093$

$\approx 10,8122$ u.m.a.

Exercício 3.

$n = \frac{m}{M} \Leftrightarrow m = n \times M = 0.356\ mol \times 65.37\ g/mol$

$m \approx 23.3\ g$

Exercício 4.

$n = \frac{m}{M} = \frac{16.3\ g}{32.06\ g.mol^{-1}} \approx 0.51\ mol$

$N = 0.51\ mol \times 6.022 \times 10^{23}\ mol^{-1}$

$N \approx 3.06 \times 10^{23}$

Exercício 5.

$C_2H_5OH \quad M = 2 \times 12.01 + 6 \times 1 + 16 \approx 46.02\ g/mol$

$C_8H_{18} \quad M = 8 \times 12.01 + 18 \times 1 \approx 114.08\ g/mol$

Exercício 6.

$CH_4 \quad M = 12.01 + 4 \times 1 \approx 16\ g/mol$

$n = \frac{m}{M} = \frac{6.07\ g}{16\ g.mol^{-1}} \approx 0.38\ mol$

EXERCÍCIO 7.

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$$

$$M = 6 \times 12.01 + 12 \times 1 + 6 \times 16 \approx 180.06\ g/mol$$

$$n = \frac{856\ g}{180.06\ g.mol^{-1}} \approx 4.75\ mol$$

$$n_{CO_2} = 4.75\ mol\ de\ glucose \times \frac{6\ mol\ CO_2}{1\ mol\ de\ glucose} \approx 28.5\ mol$$

$$m_{CO_2} = 28.5\ mol \times 44\ g.mol^{-1}$$

$$\approx 1255\ g$$

EXERCÍCIO 8.

$$2\,CH_3OH + 3O_2 \rightarrow 2CO_2 + 4H_2O$$

$$M = 12.01 + 4 \times 1 + 16 \approx 32.01\ g/mol$$

$$n_{CH_3OH} = \frac{209\ g}{32.01\ g/mol} \approx 6.53\ mol$$

$$n_{H_2O} = 6.53\ mol\ de\ metanol \times \frac{4\ mol\ de\ H_2O}{2\ mol\ de\ metanol} \approx$$

$$\approx 13.06\ mol$$

$$m_{H_2O} = 13.06\ mol \times 18\ \frac{g}{mol} \approx 235\ g$$

EXERCÍCIO 9.

$$n_{CO_2} = \frac{7.4\ g}{44\ g.mol^{-1}} \approx 0.168\ mol$$

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

$$V = \frac{0.168\ mol \times 0.082\ atm.L.K^{-1}.mol^{-1} \times 273.15\ K}{1\ atm}$$

$$V \approx 3.8\ L$$

EXERCÍCIO 10.

$$T/K = 62^{\circ}C + 273.15$$

$$T = 335.15\ K$$

$$PV = nRT \Leftrightarrow P = \frac{nRT}{V} = \frac{6{,}9\ mol \times 0.082\ atm \cdot L \cdot K^{-1} \cdot mol^{-1} \times 335.15\ K}{30.4\ L}$$

$$P \simeq 6.2\ atm$$

EXERCÍCIO 11.

$$T = 25^{\circ}C + 273.15 = 298.15\ K$$

$$\frac{P_i V = nRT_i}{P_f V = nRT_f} \Leftrightarrow \frac{T_f}{T_i} = \frac{P_f}{P_i} \Leftrightarrow T_f = T_i \times \left(\frac{P_f}{P_i}\right)$$

$$T_f = 298.15\ K \times \frac{2\ atm}{0.5\ atm} \simeq 745.4\ K\ (\sim 472^{\circ}C)$$

EXERCÍCIO 12.

$$2\ C_2H_2(g) + 5O_2(g) \rightarrow 4CO_2(g) + 2H_2O(l)$$

$V \propto n$, logo

$$V_{O_2} = 2.64\ L \text{ de acetileno} \times \frac{5\ mol}{2\ mol} \simeq 6.6\ L$$

EXERCÍCIO 13.

$$2\ C_4H_{10}(g) + 13O_2(g) \rightarrow 8CO_2(g) + 10H_2O(l)$$

$$V_{O_2} = 14.9\ L \text{ de butano} \times \frac{13}{2} \simeq 96.85\ L$$

EXERCÍCIO 14.

$$2\,SO_2(g) + O_2(g) \rightarrow 2\,SO_3(g)$$

$M = 1 \times 32.06 + 2 \times 16 = 64.06\ g/mol$

$$n = \frac{87.9\ g}{64.06\ g/mol} \simeq 1.37\ mol$$

$$\Delta H = -\frac{198.2\ kJ \times 1.37\ mol}{2\ mol} \simeq -136\ kJ$$

logo libertam-se 136 kJ na forma de calor

EXERCÍCIO 15.

$$P_4(s) + 5O_2(g) \rightarrow P_4O_{10}(s)$$

$M = 4 \times 30.97 \simeq 123.9\ g/mol$

$$n = \frac{2.66\ g}{123.9\ g/mol} \simeq 0.02\ mol$$

$\Delta H = -3013\ kJ \times 0.02 \simeq -64.7\ kJ$

logo libertam-se 64.7 kJ na forma de calor

EXERCÍCIO 16. Octano, C_8H_{18}

$$C_8H_{18}(g) + 12.5\,O_2(g) \rightarrow 8\,(O_2(g)) + 9H_2O(g)$$

$$m_{O_2} = 12.5\ mol \times \frac{32\ g}{mol} \simeq 400\ g$$

Massa de O_2 para a combustão de 1 kg de octano

$$m = \frac{400}{114} \simeq 3.51\ kg$$

$$m_{ar} = \frac{3.51}{0.23} \simeq 15.2\ kg$$

logo o $A/F = 15.2$ (p/a gasolina é 14.7)

EXERCÍCIO 17.

Etanol, C_2H_5OH

$$C_2H_5OH(g) + 3\,O_2(g) \rightarrow 2(CO_2(g) + 3H_2O(g)$$

$$m_{O_2} = 3\ mol \times 32\ \frac{g}{mol} = 96\ g$$

Para a combustão de 1kg de etanol

$$m = \frac{96}{46} \simeq 2.09\ kg$$

$$m_{ar} = \frac{2.09}{0.23} \simeq 9.1\ kg$$

Logo $A/C \simeq 9.1$

EXERCÍCIO 18.

$$\Delta H = \frac{-890\ kJ.mol^{-1}}{16\ g.mol^{-1}} \simeq -55.6\ kJ/g$$

P.C.S = 55.6 kJ/g

P.C.I = 50.1 kJ/g

$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$

$\Delta H = -890 + 2 \times 44$

$= -802\ kJ.mol^{-1}$

EXERCÍCIO 19.

$$\Delta H = -458\ kcal.mol^{-1} \times \frac{4.184\ kJ}{1\ kcal} \simeq$$

$$\simeq -1916.3\ kJ.mol^{-1}$$

$$\Delta H = \frac{-1916.3\ kJ.mol^{-1}}{46\ g.mol^{-1}} \simeq 41.6\ kJ/g$$

PCS = 41.6 kJ/g

PCI = 38.8 kJ/g