SOLUCIONS

(1) $V_i = 10\,dm^3 \longrightarrow V = 3V_i$

$W_{expansió}$?

$P_{ext} = 10^5\,Pa$

$$\boxed{W = -P.\Delta V}$$

$$W = -10^5\,Pa\,(30-10)\,dm^3 \cdot \frac{1\,m^3}{1000\,dm^3}$$

$$\boxed{W = -2000\,J}$$

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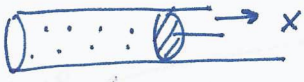
(2)



$x = 10\,cm$

$S = 200\,cm^2$

$P_{ext} = 9.10^4\,Pa$

$Q = -200\,J$

a) $$\boxed{W = -P.\Delta V}$$

$$W = -P.(base.h) = -P.(S.h)$$

$$W = -9.10^4\,Pa\left(200\,cm^2 \cdot \frac{1\,m^2}{10^4\,cm^2}\right) \cdot$$

$$\boxed{W = -180\,J}$$

b) $$\boxed{\Delta U = Q + W}$$

$$\boxed{\Delta U = -200 - 180 = -380\,J}$$

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(3)

$P_{eb\,N_2} = -195'8\,^\circ C$ (L → G)

$1\,mol\,N_2(l) \xrightarrow{\text{canvi d'estat}} (g) \qquad Q = +5'57\,kJ = 5570\,J$

$P_{ext} = 1.10^5\,Pa$

a) $$\boxed{W = -P.\Delta V = -\Delta n\,R.T} = -1.8'31.(-195'8+273) = -641'532\,J = -0$$

és un gas

$PV = nRT$

$P.\Delta V = \Delta n.R.T$

b) $$\boxed{\Delta U = Q + W} = 5570 - 641'532 = 4928'46\,J = \boxed{4'928\,kJ}$$

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(4)

$1\,kg\,Hg$ s'escalfa $\longrightarrow$ $T = 20\,^\circ C$

$T = 0\,^\circ C$

$P_{at} = 1'013.10^5\,Pa$

(per això les densitats són iguals!)

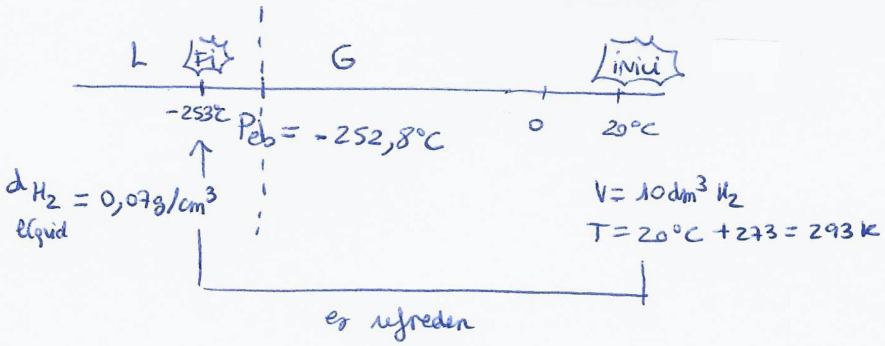
· Si no hi ha canvi d'estat $\Rightarrow \Delta V = 0 \Rightarrow W = 0$

$$\Delta U = Q + W^{\nearrow 0} = m\,c_e\,\Delta T$$

$$\Delta U = 1\,kg \cdot 138\,\frac{J}{kg.K} \cdot (20-0)$$

$$\boxed{\Delta U = 2760\,J}$$

(5)



W ?

$P_{ext} = 1{,}01 \cdot 10^5 Pa = 1 atm$

$$\boxed{W = -P \cdot \Delta V}$$

$$W = -P_{ext}(V_f - V_i) = -P_{ext}\left(V_{líquid\ T=-253ºC} - V_{gas\ T=20ºC}\right)$$

- Anem a calcular $V_{líquid}$:

$$PV = nRT$$

$$n = \frac{PV}{RT} = \frac{1 atm \cdot 10 dm^3}{0{,}082 \cdot 293 K} = 0{,}416 mol\ H_2$$

$$0{,}416 mol\ H_2 \cdot \frac{2g\ H_2}{1 mol\ H_2} \cdot \frac{1 cm^3}{0{,}07 g} = 11{,}89 cm^3 = 11{,}89 \cdot 10^{-6} m^3 \ (\text{en SI})$$

($\frac{1 cm^3}{0{,}07 g}$: d_{H_2} líquid)

Per tant:

$$\boxed{W = -P \cdot \Delta V = -1{,}01 \cdot 10^5 Pa \left(11{,}89 \cdot 10^{-6} m^3 - 10 \cdot 10^{-3} m^3\right) = +1008{,}799 J}$$

W > 0 compressió

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(6)

a) $C_3H_8(g) + 5\,O_2(g) \longrightarrow 3\,CO_2(g) + 4\,H_2O(l)$ $Q = \frac{-2220 kJ}{1 mol\ propà}$

b) $\boxed{Q = m \cdot C_e \cdot \Delta T}$

$$\boxed{m_{H_2O} = \frac{Q}{C_e \cdot \Delta T} = \frac{9{,}05 \cdot 10^6 J}{4180 \frac{J}{kg K} \cdot (80-10) K} = 30{,}94 kg\ H_2O}$$

- Buscar calor despès:

T = 298K
100 dm³ C_3H_8
$P = 1{,}01 \cdot 10^5 Pa$

$PV = nRT \Rightarrow n = \frac{PV}{RT} = \frac{1{,}01 \cdot 10^5 \cdot 0{,}1 m^3}{8{,}31 \cdot 298} = 4{,}078 mol\ propà$

on $\frac{-2200 kJ}{1 mol\ propà} \cdot 4{,}078 mol\ propà = 9054{,}34 kJ = 9{,}05 \cdot 10^6 J$