

Άσκηση 2.30.

$$8,4 \text{ g } C_3H_6 \quad M_r = 3 \cdot 12 + 6 \cdot 1 = 42$$

$$m_{CO_2} = ?$$

Υπολογίζουμε τα mol του C_3H_6 :

$$n_{C_3H_6} = \frac{m}{M_r} = \frac{8,4}{42} = 0,2 \text{ mol}$$

Πραγματοποιείται η καύση:



$$M_r_{CO_2} = 12 + 2 \cdot 16 = 44 \quad \text{άρα: } m_{CO_2} = n \cdot M_r = 0,6 \cdot 44 = 26,4 \text{ g}$$

Άσκηση 2.31

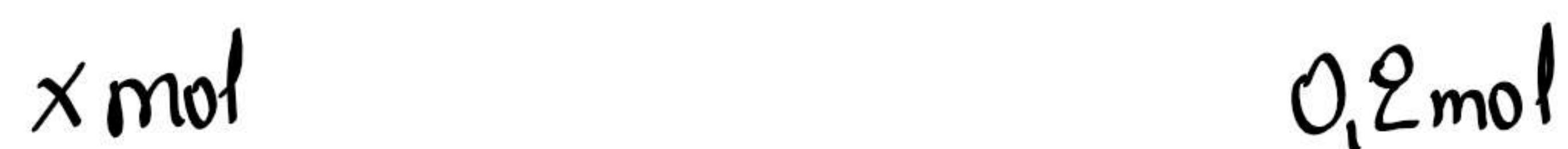
$$A: C_nH_{2n+2} \quad M_r = 44$$

$$a) \quad M_r = 12n + (2n+2) \cdot 1 = 44 \quad \Rightarrow \quad 14n + 2 = 44 \quad \Rightarrow \quad 14n = 42 \quad \Rightarrow \quad \underline{n=3}$$

Συντακτικός τύπος: $CH_3 - CH_2 - CH_3$

$$b) \quad m_{C_3H_8} = ? \quad \xrightarrow{+O_2} \quad 4,48 \text{ L } H_2O \text{ (STP)}$$

$$n_{H_2O} = \frac{4,48}{22,4} = 0,2 \text{ mol}$$



$$x = 0,05 \quad \Rightarrow \quad m_{C_3H_8} = n \cdot M_r = 0,05 \cdot 44 = 2,2 \text{ g}$$

Агрегация 2.32

$$8,96 \text{ L } \text{C}_3\text{H}_8 \text{ (STP)} \quad V_{\text{CO}_2} = ; \quad m_{\text{H}_2\text{O}} = ;$$

$$n_{\text{C}_3\text{H}_8} = \frac{8,96}{22,4} = 0,4 \text{ mol}$$



$$1 \text{ mol} \quad 5 \text{ mol} \quad 3 \text{ mol} \quad 4 \text{ mol}$$

$$0,4 \text{ mol} \quad x = 1,2 \text{ mol} \quad y = 1,6 \text{ mol}$$

$$\text{CO}_2: \quad n = \frac{V}{22,4} = 1,2 \Rightarrow V = 1,2 \cdot 22,4 = 26,88 \text{ L}$$

$$\text{H}_2\text{O}: \quad m_{\text{H}_2\text{O}} = n \cdot M_r = 1,6 \cdot 18 = 28,8 \text{ g}$$

Агрегация 2.33

$$\text{C}_4\text{H}_6 \quad 10,8 \text{ g} \quad m_{\text{CO}_2} = ;$$

$$M_r = 4 \cdot 12 + 6 \cdot 1 = 48 + 6 = 54 \quad \text{аpa: } n_{\text{C}_4\text{H}_6} = \frac{10,8}{54} = 0,2 \text{ mol}$$



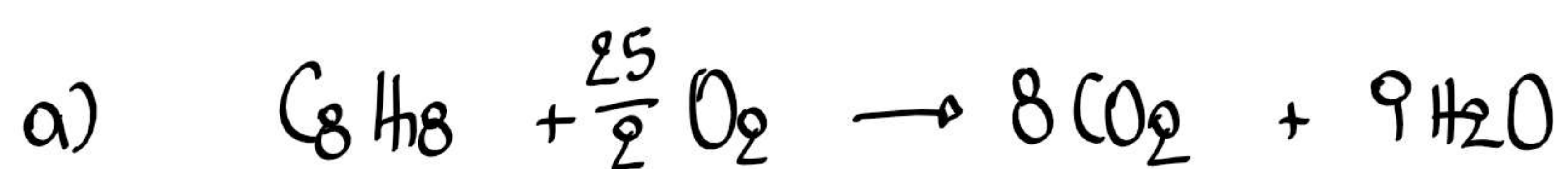
$$1 \text{ mol} \quad \frac{11}{2} \text{ mol} \quad 4 \text{ mol} \quad 3 \text{ mol}$$

$$0,2 \text{ mol} \quad x = 0,8 \text{ mol}$$

$$m_{\text{CO}_2} = n_{\text{CO}_2} \cdot M_r_{\text{CO}_2} = 0,8 \cdot 44 = 35,2 \text{ g}$$

Агрегация 2.34.

$$1,14 \text{ kg} \Rightarrow 1140 \text{ g } \text{C}_8\text{H}_{18} \Rightarrow n_{\text{C}_8\text{H}_{18}} = \frac{1140}{114} = 10 \text{ mol}$$

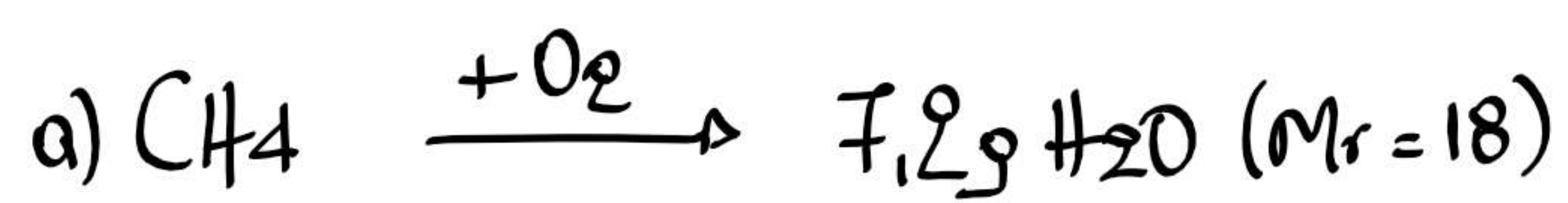


$$\text{б) } 1 \text{ mol} \quad \frac{25}{2} \text{ mol} \quad 8 \text{ mol} \quad 9 \text{ mol}$$

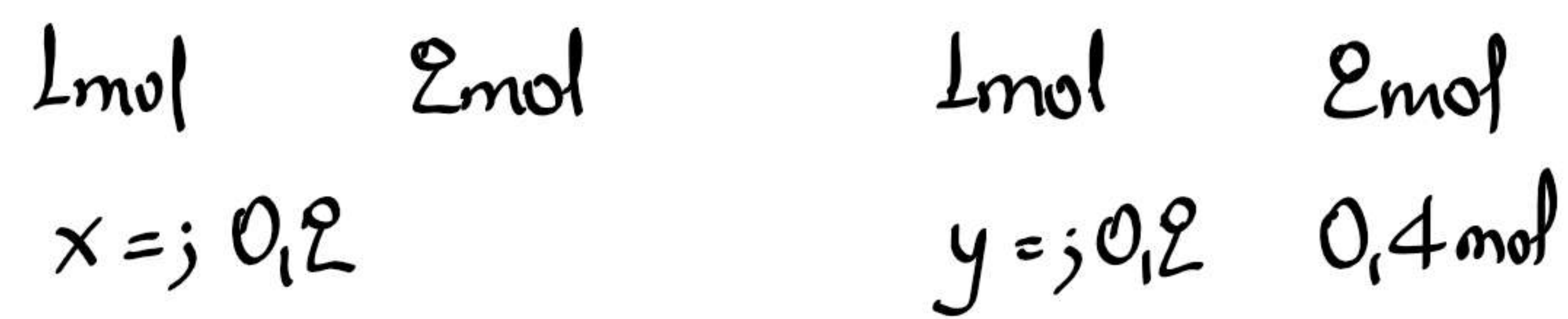
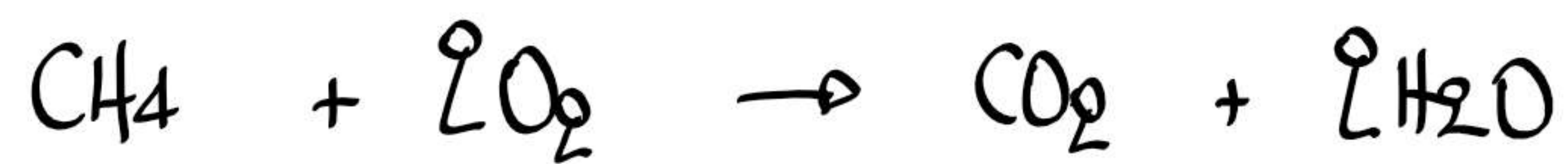
$$10 \text{ mol} \quad x = ; \quad 125 \text{ mol}$$

$$V_{\text{O}_2} = n \cdot 22,4 = 125 \cdot 22,4 = 2800 \text{ L}$$

Άσκηση 2.35

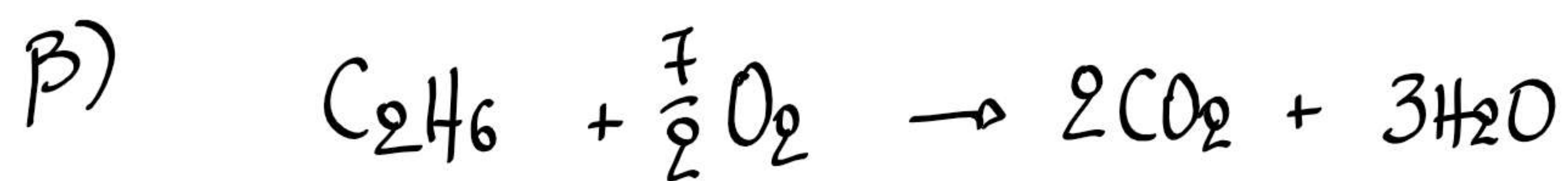


$$n_{\text{H}_2\text{O}} = \frac{7,2}{18} = 0,4 \text{ mol}$$



$$V_{\text{CH}_4} = 0,2 \cdot 22,4 = 4,48 \text{ L}$$

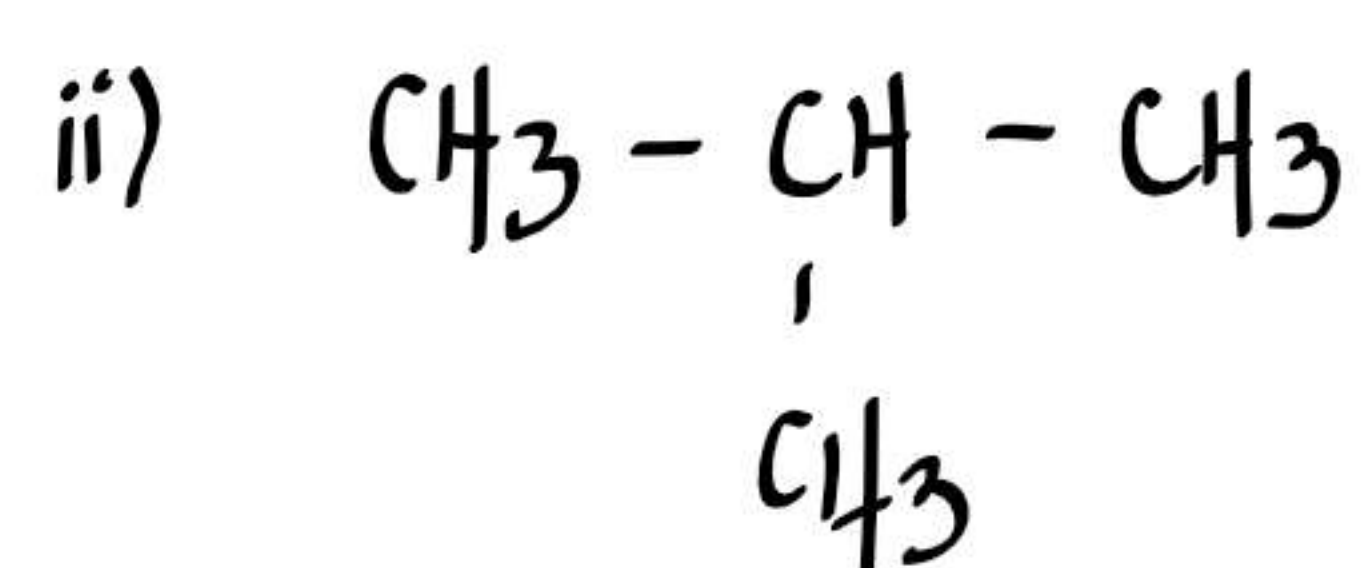
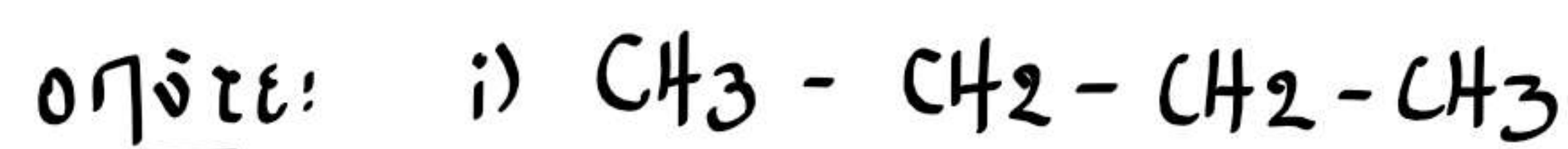
$$V_{\text{CO}_2} = 0,2 \cdot 22,4 = 4,48 \text{ L}$$



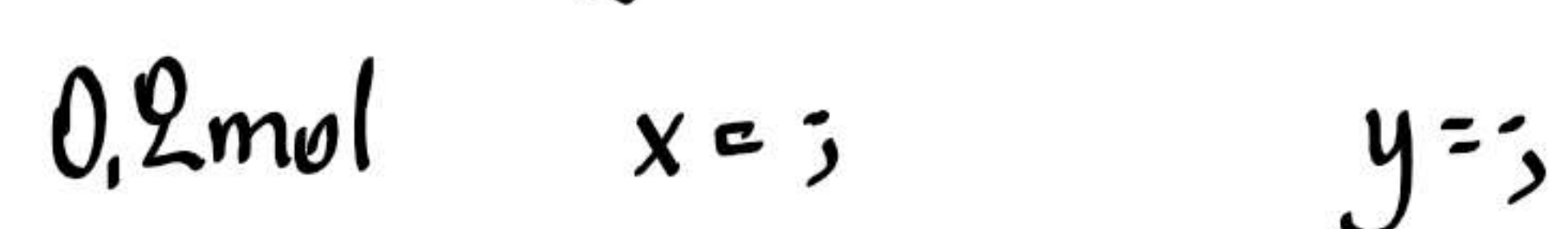
$$V_{\text{C}_2\text{H}_6} = 0,1 \cdot 22,4 = 2,24 \text{ L}$$

Άσκηση 2.36

a) A: $\text{C}_x\text{H}_y\text{O}_z$ $M_r=58$ } Άρα: $12x + (2y+2) \cdot 1 = 58 \Rightarrow 12x + 2y + 2 = 58 \Rightarrow 12x + 2y = 56 \Rightarrow \underline{\underline{v=4}}$
Ar: C=12, H=1

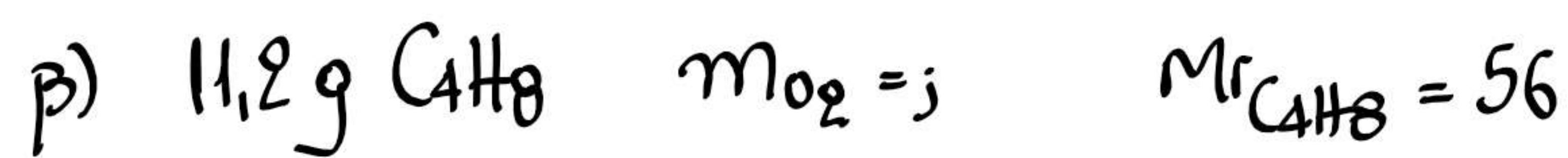
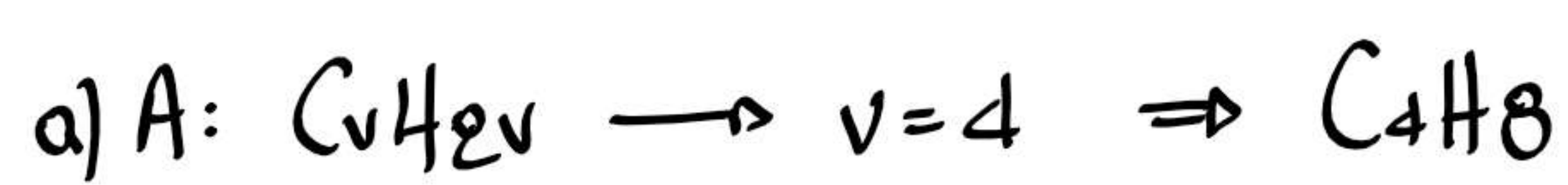


\downarrow
 $n=0,2 \text{ mol}$

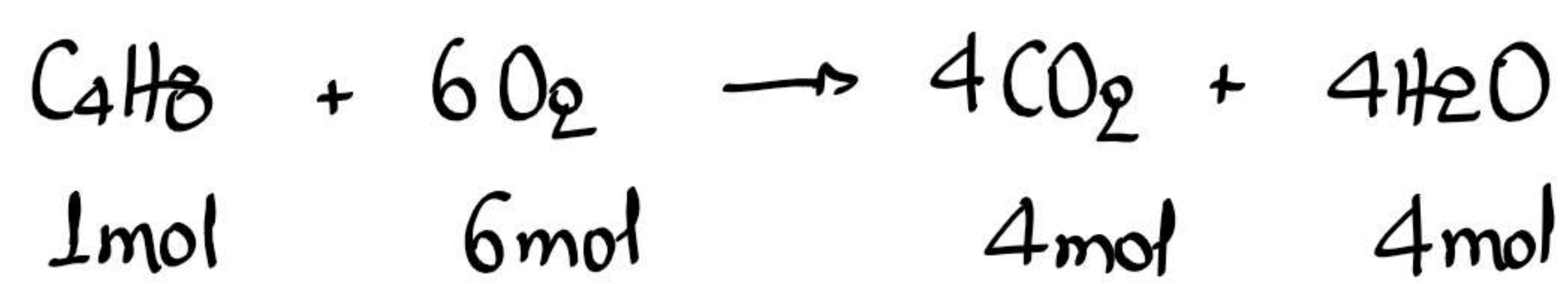


$$V = 1,3 \cdot 22,4 = 29,12 \text{ L} \quad m = 0,8 \cdot 44 = 35,2 \text{ g}$$

· Άσκηση 2.37.



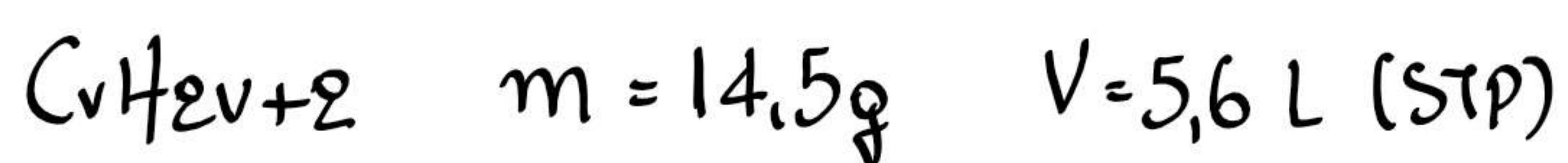
$$C_4H_8: n = \frac{11,2}{56} = 0,2 \text{ mol}$$



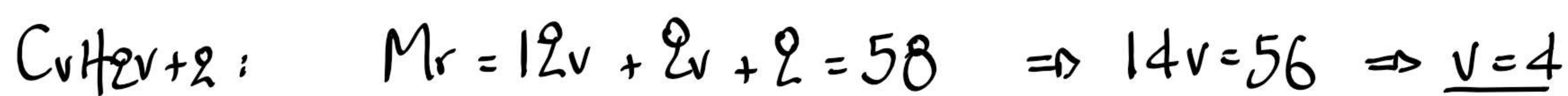
0,2 mol $x = 1,2 \text{ mol}$

· Άρα 1,2 mol O_2 απαιτούνται για την καύση.

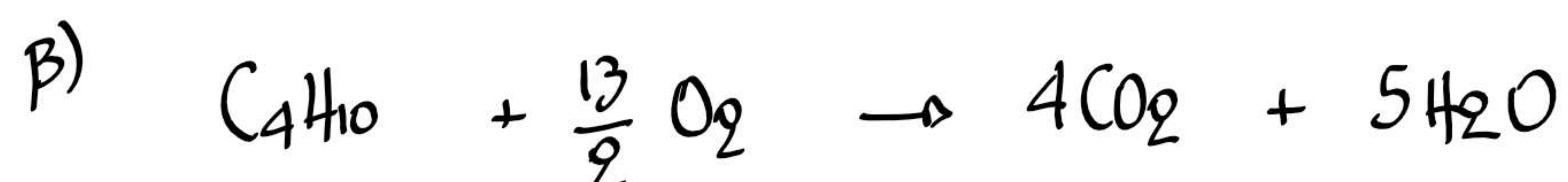
· Άσκηση 2.38



α)
$$\left. \begin{aligned} \eta &= \frac{m}{M_r} = \frac{14,5}{M_r} \text{ mol} \\ \eta &= \frac{V}{22,4} = \frac{5,6}{22,4} = 0,25 \text{ mol} \end{aligned} \right\} \frac{14,5}{M_r} = 0,25 \Rightarrow M_r = 58$$



· Άρα: C_4H_{10}



1 mol 13/2 mol 4 mol 5 mol

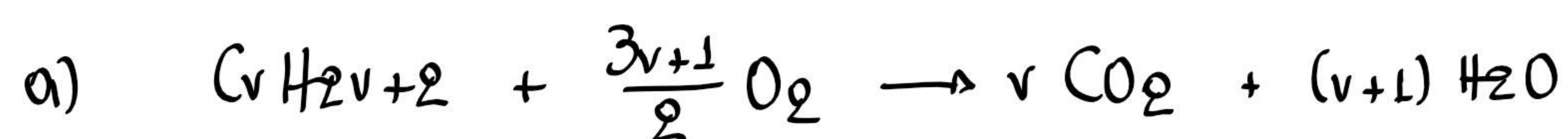
0,25 mol $x = 1,25 \text{ mol}$

$$m_{H_2O} = 1,25 \cdot 18 = 22,5 \text{ g}$$

· Άσκηση 2.39

$$2,24 \text{ L } C_vH_{2v+2} \text{ (STP)} \Rightarrow n = \frac{2,24}{22,4} = 0,1 \text{ mol}$$

$$5,4 \text{ g } H_2O \Rightarrow n = \frac{5,4}{18} = 0,3 \text{ mol}$$



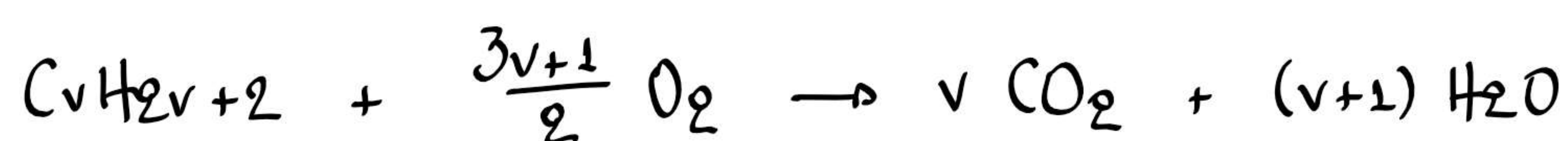
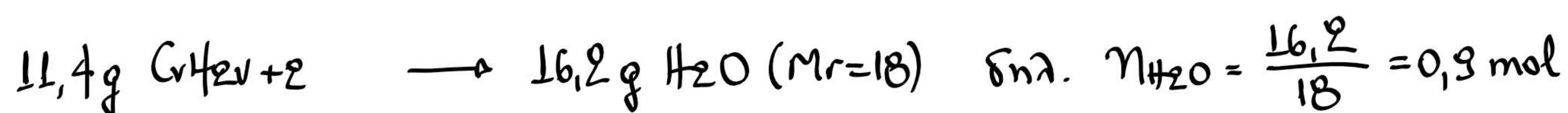
1 mol v mol $(v+1)$ mol

0,1 mol $j \cdot x$ 0,3 mol

· Άρα: $0,3 = 0,1 \cdot (v+1) \Rightarrow v=2 \Rightarrow C_2H_6$



Άσκηση 2.42.



$$1 \cdot 0,9 = (n+1) \cdot \frac{11,4}{14n+2} \Rightarrow$$

$$\Rightarrow 0,9 \cdot (14n+2) = 11,4n + 11,4 \Rightarrow 12,6n + 1,8 = 11,4n + 11,4 \Rightarrow 1,2n = 9,6$$

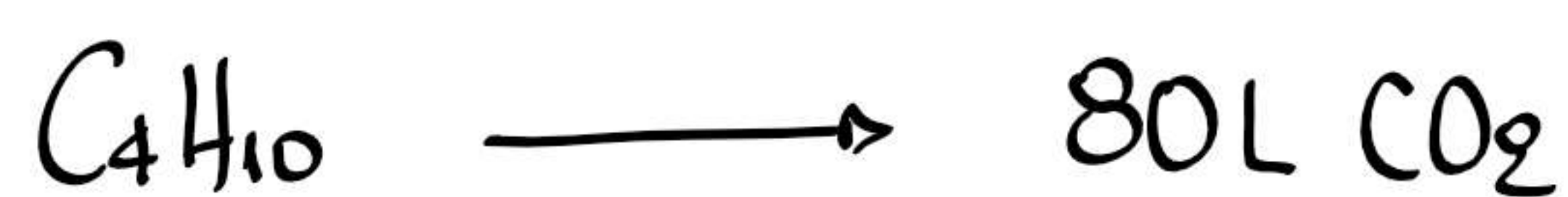
$$\Rightarrow \underline{n=8}$$

Μ.Τ. : C_8H_{18}



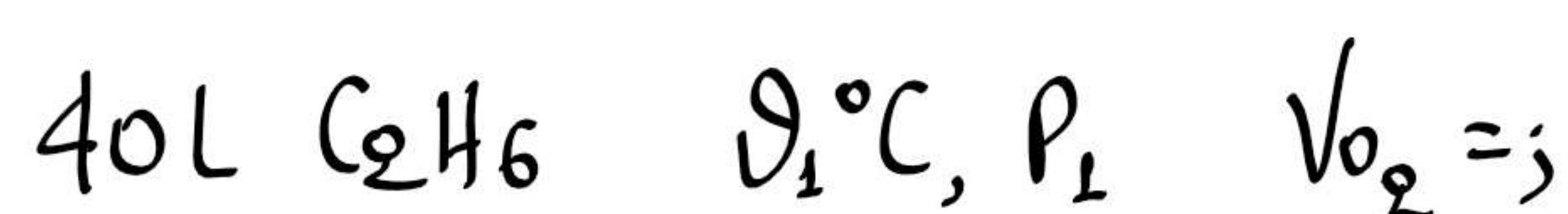
το οποίο αντιστοιχεί στην τιμή 100 του αριθμού οκτανίων

Άσκηση 2.43.



$$\text{Άρα: } 1 \cdot 80 = 4 \cdot V \Rightarrow \underline{V=20 \text{ L}}$$

Άσκηση 2.44.



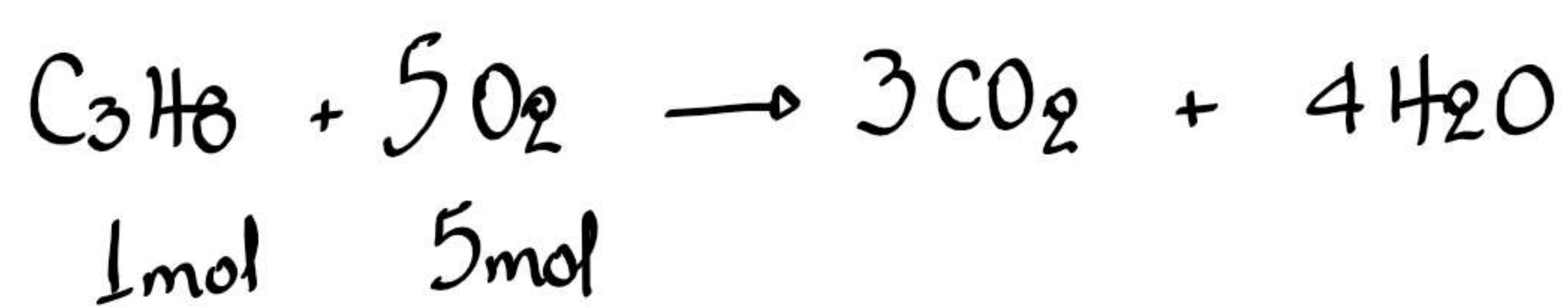
$$\text{Άρα: } \underline{V_{O_2} = 120 \text{ L}}$$

σε σταθ. συνθήκες πίεσης και θερμοκρασίας,
αναλογίες mol είναι και αναλογίες όγκων.

Άσκηση 2.45



$$n_{\text{C}_3\text{H}_8} = \frac{8,8}{44} = 0,2 \text{ mol}$$



$$0,2 \text{ mol} \quad ; \quad 1 \text{ mol}$$

$$V_{\text{O}_2} = n \cdot V_m = 1 \cdot V_m = V_m$$

Στα 100 mL αέρα περιέχονται 20 mL O_2

Στα $j \cdot x$ V_m

$$100 \cdot V_m = 20 \cdot x \Rightarrow \underline{\underline{x = 5V_m}}$$

Άσκηση 2.46.



$$V = j \text{ (STP)} \quad V_{\text{O}_2} = j \quad m_{\text{H}_2\text{O}} = j$$

$$\text{για το } \text{CO}_2: \quad M_r = 44 \quad n_{\text{CO}_2} = \frac{m}{M_r} = \frac{13,2}{44} = 0,3 \text{ mol}$$



$$1 \text{ mol} \quad \frac{7}{2} \text{ mol} \quad 2 \text{ mol} \quad 3 \text{ mol}$$

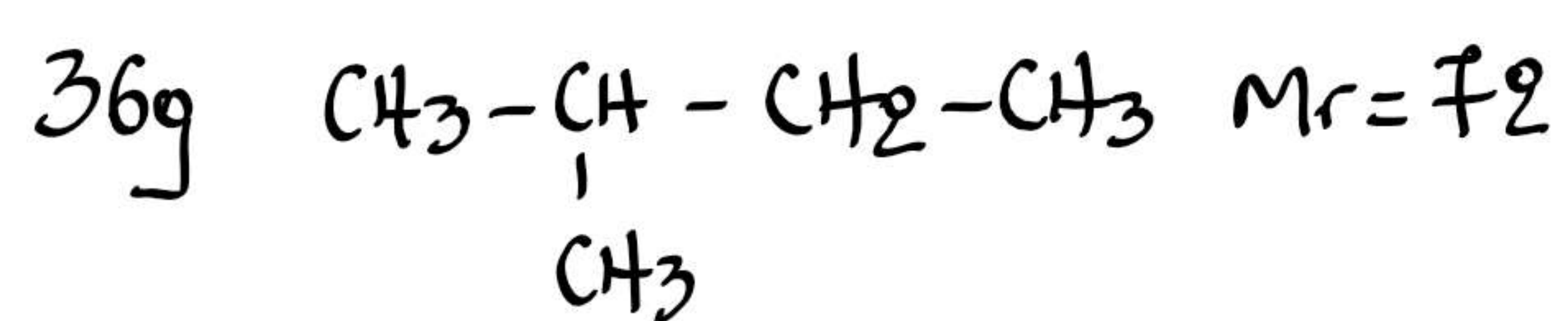
$$x = j \quad y = j \quad 0,3 \text{ mol} \quad w = j$$

$$x = 0,15 \text{ mol} \Rightarrow V_{\text{C}_2\text{H}_6} = 0,15 \cdot 22,4 = 3,36 \text{ L}$$

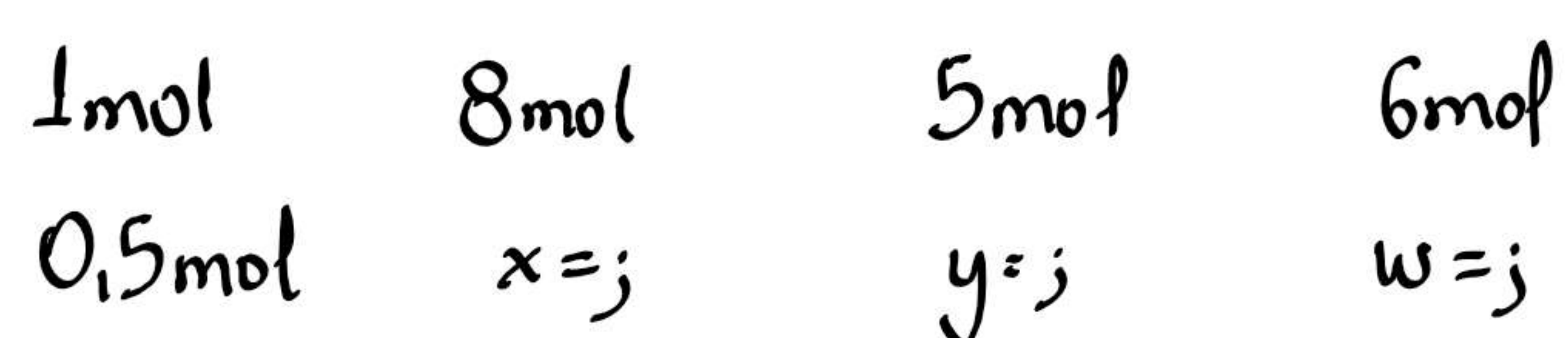
$$\frac{7}{2} \cdot 0,3 = 2 \cdot y \Rightarrow y = \frac{2,1}{4} \Rightarrow y = 0,525 \text{ mol} \Rightarrow V_{\text{O}_2} = 0,525 \cdot 22,4 = 11,76 \text{ L}$$

$$2 \cdot w = 3 \cdot 0,3 \Rightarrow w = 0,45 \Rightarrow m_{\text{H}_2\text{O}} = 0,45 \cdot 18 = 8,1 \text{ g}$$

· Άσκηση 2.47.

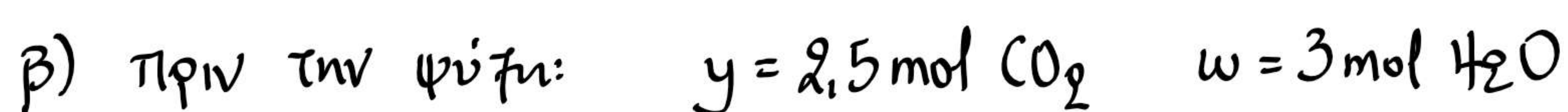


$$n = \frac{m}{M_r} = \frac{36}{72} = 0,5 \text{ mol}$$



$$1 \cdot x = 8 \cdot 0,5 \Rightarrow x = 4 \text{ mol O}_2$$

$$V_{\text{O}_2} = n \cdot V_m = 4 \cdot 22,4 = 89,6 \text{ L}$$



$$V_{\text{CO}_2} = 2,5 \cdot 22,4 = 56 \text{ L} \quad V_{\text{H}_2\text{O}} = 3 \cdot 22,4 = 67,2 \text{ L}$$

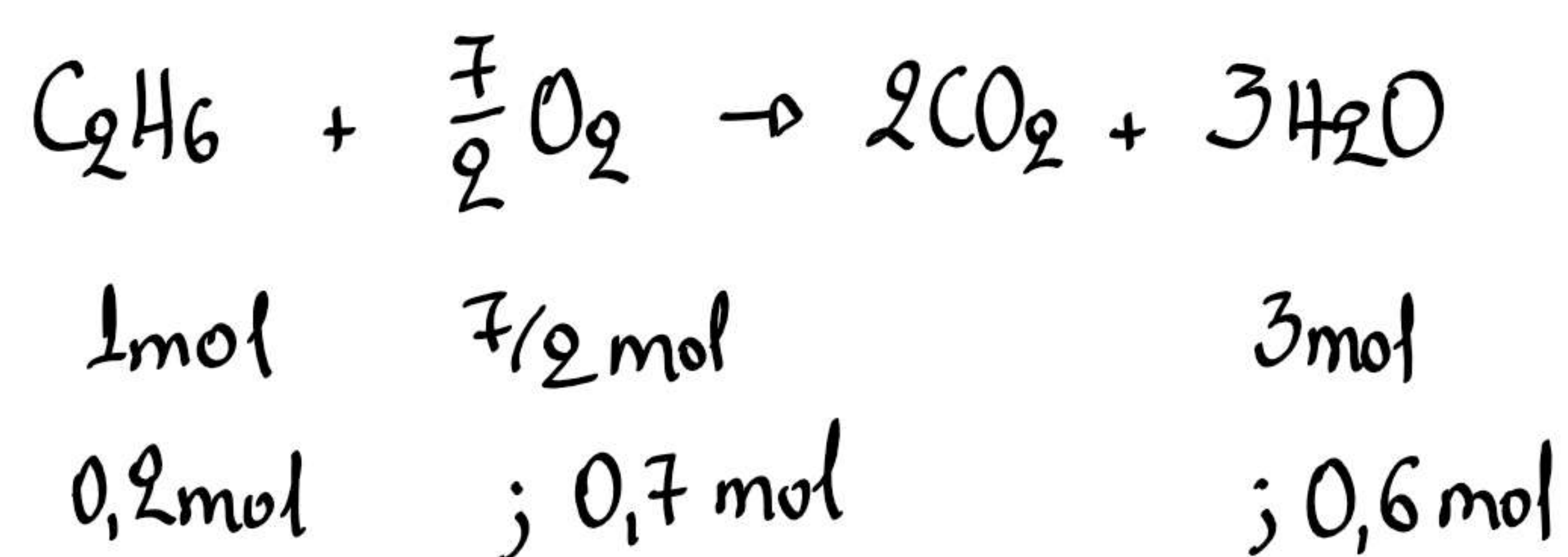
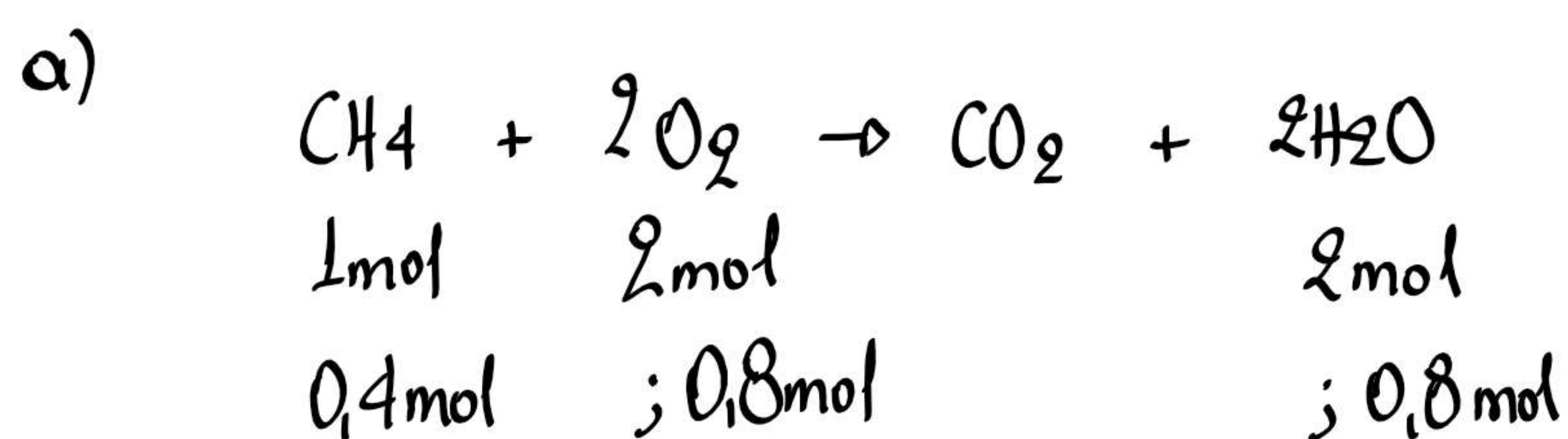
μετά την ψύξη: δεσφύεται το H₂O άρα στα κανακίρια έχουμε μόνο το CO₂

$$V_{\text{CO}_2} = 56 \text{ L}$$

· Άσκηση 2.48.

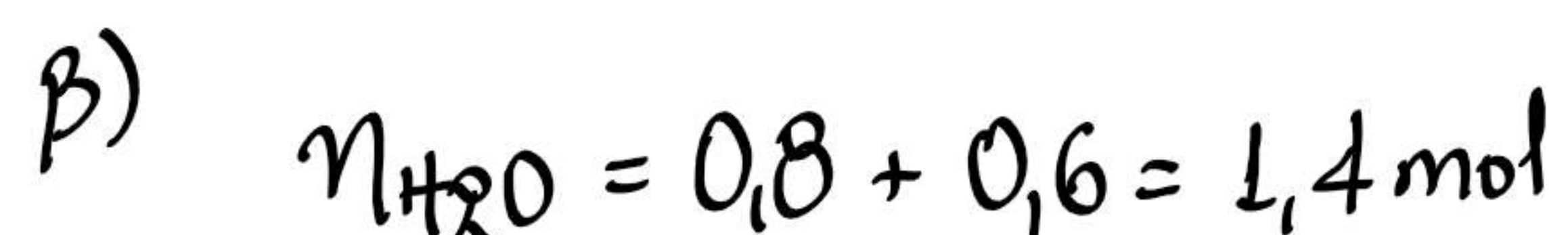


$$n = \frac{6,4}{16} = 0,4 \text{ mol} \quad n_{\text{C}_2\text{H}_6} = \frac{4,48}{22,4} = 0,2 \text{ mol}$$



$$n_{\text{O}_2} = 0,8 + 0,7 = 1,5 \text{ mol}$$

$$V_{\text{O}_2} = 1,5 \cdot 22,4 = 33,6 \text{ L}$$



$$m_{\text{H}_2\text{O}} = 1,4 \cdot 18 = 25,2 \text{ g}$$

Άσκηση 2.49

$$75\% \omega/w \text{ C}_v\text{H}_{2v+2} \quad M_r = 12v + 2v + 2 = 14v + 2$$

α) Στα 100g C_vH_{2v+2} έχουμε 75g C

$$\text{Στα } (14v+2)\text{g} \quad 12v \text{ g C}$$

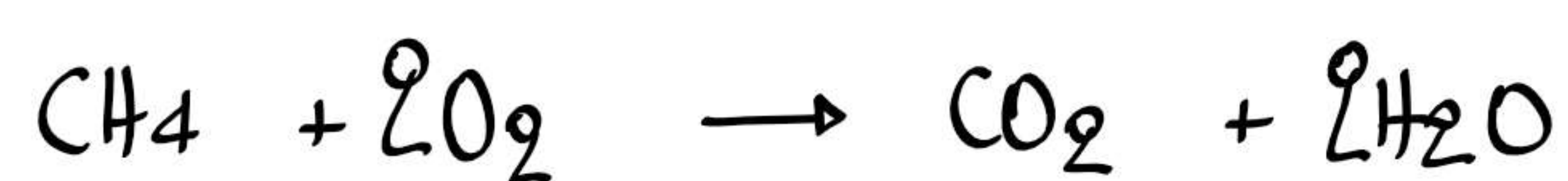
$$100 \cdot 12v = 75 \cdot (14v+2) \Rightarrow 1200v = 1050v + 150 \Rightarrow 150v = 150 \Rightarrow \underline{v=1}$$

Άρα: CH₄

β) 4g CH₄ $\xrightarrow{\text{O}_2}$

$$m_{\text{H}_2\text{O}} = j \quad V_{\text{αέρα}} = j$$

$$n_{\text{CH}_4} = \frac{m}{M_r} = \frac{4}{16} = 0,25 \text{ mol}$$



$$1 \text{ mol} \quad 2 \text{ mol} \quad 1 \text{ mol} \quad 2 \text{ mol}$$

$$0,25 \text{ mol} \quad x = 0,5 \text{ mol} \quad y = 0,5 \text{ mol}$$

$$m_{\text{H}_2\text{O}} = n_{\text{H}_2\text{O}} \cdot M_r = 0,5 \cdot 18 = 9 \text{ g}$$

$$V_{\text{O}_2} = 0,5 \cdot 22,4 = 11,2 \text{ L}$$

Στα 100L αέρα έχουμε 20L O₂

$$w = 56 \text{ L} \quad 11,2 \text{ L O}_2$$

άρα 56 L αέρα.

Άσκηση 2.50.

$$2,2\text{g } \text{C}_3\text{H}_8 \quad M_r = 44$$

$$\alpha) n_{\text{C}_3\text{H}_8} = \frac{m}{M_r} = \frac{2,2}{44} = 0,05 \text{ mol}$$



$$1 \text{ mol} \quad 5 \text{ mol} \quad 3 \text{ mol} \quad 4 \text{ mol}$$

$$0,05 \text{ mol} \quad x=j \quad \quad \quad y=j$$

$$x = 0,25 \text{ mol O}_2 \Rightarrow V_{\text{O}_2} = 0,25 \cdot 22,4 = 5,6 \text{ L}$$

$$\beta) y = 4 \cdot 0,05 = 0,2 \text{ mol H}_2\text{O} \Rightarrow m_{\text{H}_2\text{O}} = 0,2 \cdot 18 = 3,6 \text{ g}$$

Η αύξηση της μάζας του H_2SO_4 ισοδυναμεί με τη μάζα του H_2O που παράγεται.

$$\Delta m_{\text{H}_2\text{SO}_4} = 3,6 \text{ g}$$

Άσκηση 2.51.



$$1 \text{ mL} \quad 5 \text{ mL} \quad 3 \text{ mL} \quad 4 \text{ mL}$$

$$100 \text{ mL} \quad ; 500 \text{ mL} \quad ; 300 \text{ mL} \quad ; 400 \text{ mL}$$

$$\text{Καυσαέρια: } 300 \text{ mL CO}_2$$

$$400 \text{ mL H}_2\text{O}$$

$$100 \text{ mL O}_2 \quad (600 - 500 = 100 \text{ mL})$$

β) με αφυδάτωση αφαιρείται η ποσότητα του νερού από τα καυσαέρια.

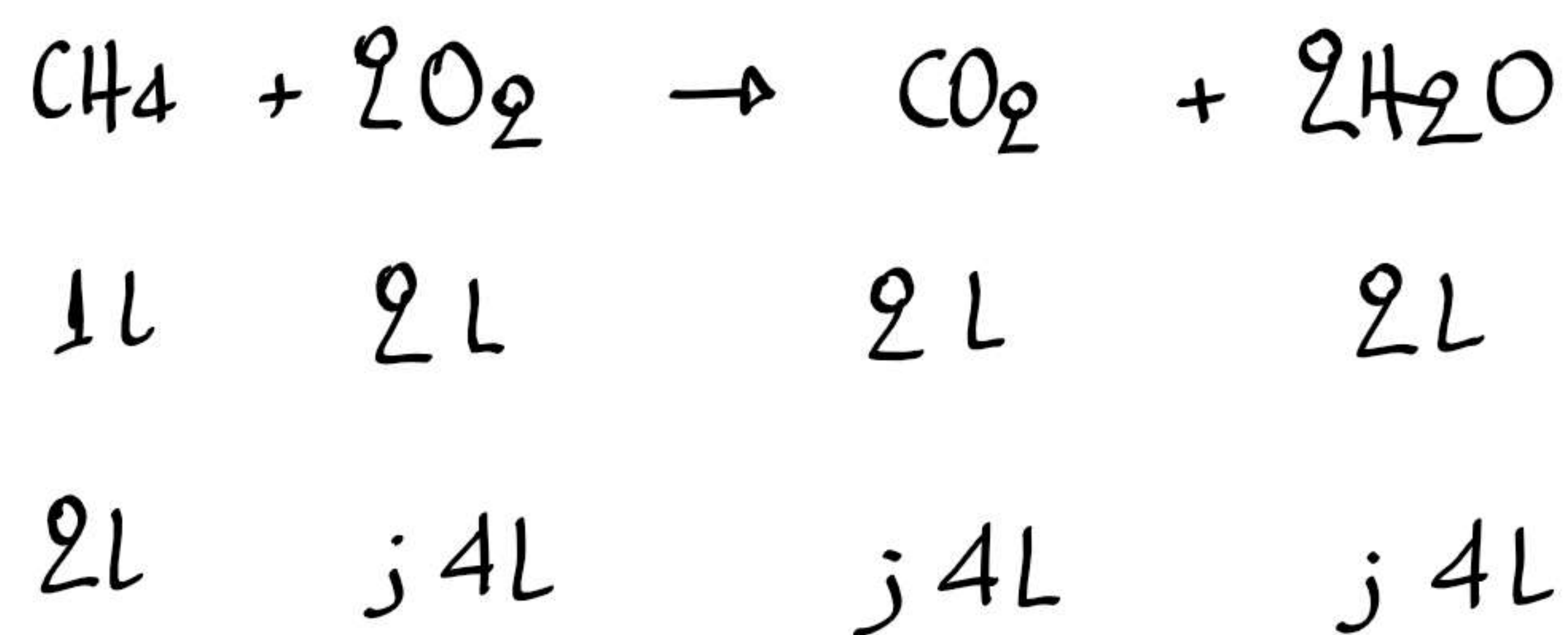
$$\text{Καυσαέρια: } 300 \text{ mL CO}_2$$

$$100 \text{ mL O}_2$$

Άσκηση 2.53

2L CH₄ 25L ατμ. αέρας

α) Αέρας: 1^ητα 100L αέρα περιέχ. 20L O₂
2^ητα 25L αέρα x = 5L O₂



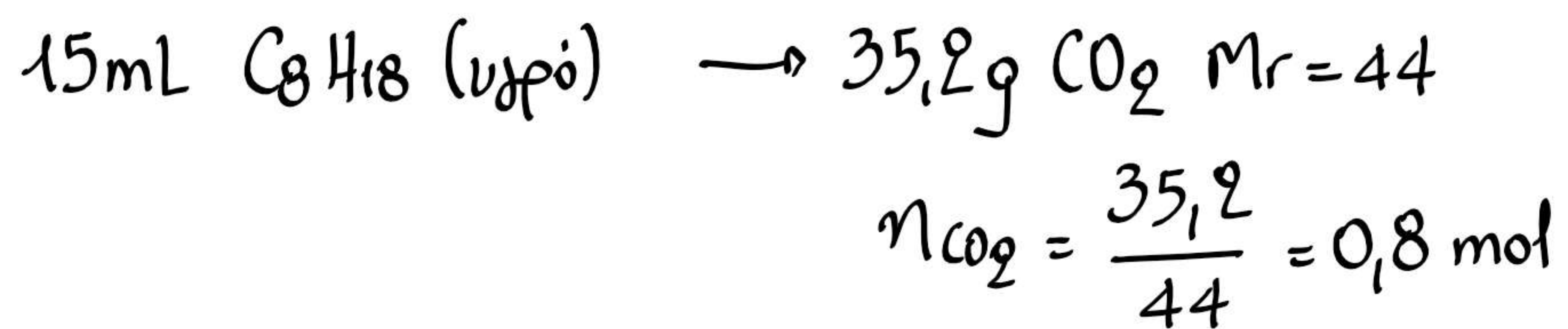
καυσαέρια: 1L O₂ - 4L CO₂ - 4L H₂O - 20L N₂

(προσοχή το N₂ από τον ατμοσφ. αέρα ανήκει στα καυσαέρια)

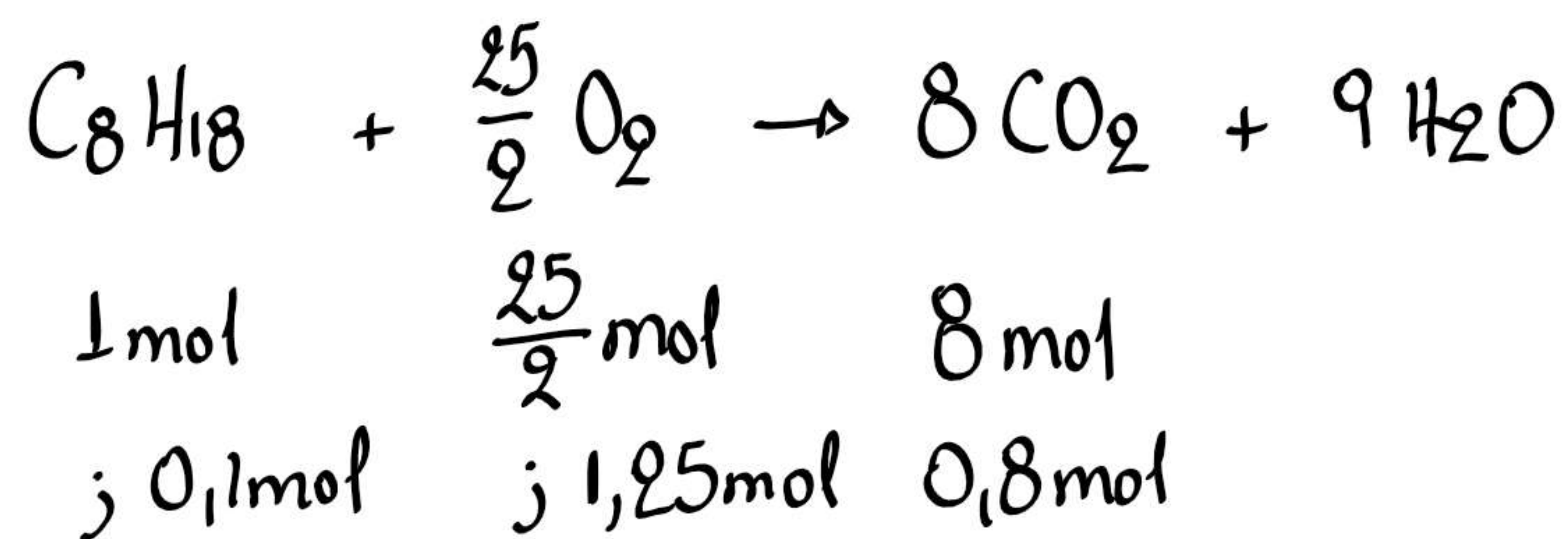
β) ψύξη ⇒ δέστευση νερού

καυσαέρια: 1L O₂ - 4L CO₂ - 20L N₂

Άσκηση 2.54.



$$\rho_{\text{C}_8\text{H}_{18}} = \frac{m}{V} = ;$$



$$\left. \begin{array}{l} m_{\text{C}_8\text{H}_{18}} = n \cdot M_r = 0,1 \cdot 114 = 11,4 \text{ g} \\ M_{r\text{C}_8\text{H}_{18}} = 8 \cdot 12 + 18 = 96 + 18 = 114 \end{array} \right\} \text{ άρα: } \rho_{\text{C}_8\text{H}_{18}} = \frac{11,4}{15} = 0,76 \text{ g/ml}$$

$$V_{\text{O}_2} = n \cdot 22,4 = 1,25 \cdot 22,4 = 28\text{L}$$

$$V_{\text{αέρα}} = 5 \cdot 28 = 140 \text{ L}$$