Készült a *Gyűjtemény a Kémia emelt szintű oktatásához 9-10.* tankönyv feladataihoz.

Készítette: Bárány Zsolt Béla

3. A keverékek sajátságai

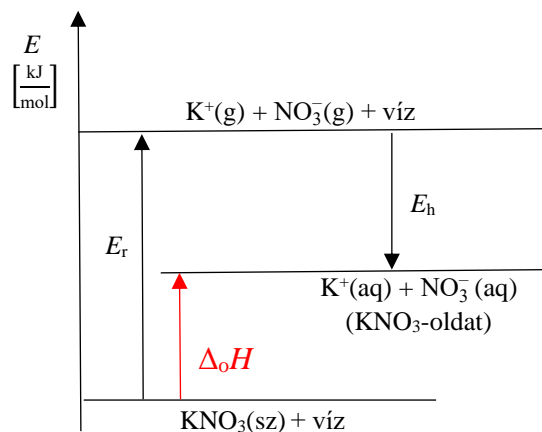|									
1.	D	14.	D	27.	D	40.	A	53.	A
2.	E	15.	D	28.	C	41.	D	54.	B
3.	A	16.	E	29.	A	42.	C	55.	D
4.	B	17.	B	30.	B	43.	B	56.	D
5.	C	18.	C	31.	B	44.	D	57.	A
6.	B	19.	E	32.	B	45.	A	58.	B
7.	B	20.	C	33.	D	46.	B	59.	B
8.	D	21.	C	34.	D	47.	A	60.	A
9.	B	22.	D	35.	C	48.	C	61.	B
10.	A	23.	A	36.	B	49.	D	62.	B
11.	B	24.	D	37.	A	50.	C	63.	B
12.	D	25.	C	38.	B	51.	A	64.	B
13.	C	26.	C	39.	B	52.	B	65.	C

A 25. feladat C) részének szövege helyesen: „A gázok vízben való oldódása endoterm folyamat."

A 44. feladat szövege helyesen: „Ez az oldódás túltelített oldatot eredményezhet…"

66. 1,41 mol
67. 9,99 mol
68. 11,8%
69. 12,4%
70. 18,2 g
71. 8,32 mol
72. 10,8%
73. 5,67%
74. 58,4 g
75. 180 g
76. 24,5%
77. 9,09%
78. 567 g
79. 1,02 mol
80. 31,4 mol
81. 3,14%
82. 80,0 g
83. $7,17 \cdot 10^3$ g
84. 398 mol
85. 1,10%
86. 12,8 g
87. 270 g
88. 0,228 mol
89. 4,52%
90. 216 g
91. 0,335 mol

92. 10,4%
93. 2,72%
94. 33,5 g
95. 0,532 mol
96. 7,44 mol
97. 6,67%
98. kakaóital
99. szilárd
100. folyékony
101. hab
102. gáz
103. folyékony
104. emulzió
105. majonéz
106. köd
107. aeroszol
108. A jód az etil-alkoholban gyorsan, teljes mértékben feloldódik, barna színű oldatot képezve. Az etil-alkohol univerzális oldószer, ezért jól oldja az apoláris jódot. Az oldat azért lesz barna színű, mert az etil-alkohol molekulái oxigént tartalmaznak.

Az etil-alkohol és a benzin korlátlanul elegyedik egymással, így homogén rendszert kapunk. Az elegyedés az etil-alkohol univerzális oldószerként való működése miatt következik be.

109. Az etil-alkohol és a desztillált víz korlátlanul elegyedik egymással, így homogén rendszert kapunk. Mindkét oldószer poláris molekulákból áll, ezért elegyednek egymással.

Az etil-alkohol és a benzin korlátlanul elegyedik egymással, így homogén rendszert kapunk. Az elegyedés az etil-alkohol univerzális oldószerként való működése miatt következik be.

A poláris karakterű desztillált víz és az apoláris benzin nem elegyedik egymással a polaritásuk miatt. Két fázisú heterogén rendszert fogunk kapni.

110. Az etil-alkohol és a desztillált víz elegye meg fog barnulni, a jód teljes mértékben fel fog oldódni. A jód az etil-alkohol jelenléte miatt fog oldódni.

Az etil-alkohol és a benzin elegye szintén meg fog barnulni, a jód teljes mértékben fel fog oldódni. A barna szín az etil-alkohol molekuláiban jelenlévő oxigén miatt jelenik meg.

A desztillált vizet és a benzint tartalmazó kémcsőben a felső fázis (a benzines) a jód hatására lila színű lesz. A jód az apoláris benzinben fog oldódni, a vízben szinte egyáltalán nem (így a vizes fázis színtelen marad).

111. A környezet hőmérséklete csökkent az oldás közben, mert a rendszer hőt vett fel a környezetétől.

112.

Energia diagram: E $\left[\frac{kJ}{mol}\right]$ tengely.

$K^+(g) + NO_3^-(g) + víz$

E_h

E_r

$K^+(aq) + NO_3^-(aq)$
(KNO₃-oldat)

$\Delta_o H$

$KNO_3(sz) + víz$

113. Mivel a kálium-nitrát oldódása endoterm, így melegítés hatására nagyobb mennyiség tud oldódni ugyanannyi oldószerben, vagyis nő az oldhatósága.

114. Endoterm oldódású anyagokból, mint amilyen a kálium-nitrát is, úgy készíthető túltelített oldat, hogy a forrón telített oldatot lassan, rázkódás- és pormentes környezetben hagyjuk lehűlni.

115. A gázok vízben való oldódása exoterm folyamat. Ennek megfelelően az ammóniagáz oldhatósága is csökken a hőmérsékletnövelés hatására.

116. Az ammónia kisebb sűrűségű, mint az azonos állapotú levegő, így felfelé száll. Emiatt a felfogására szolgáló edényt szájával lefelé kell tartani.

117. A szökőkútkísérlet csak olyan gázokkal végezhető el sikeresen, amelyek oldhatósága az adott oldószerben kiemelkedő. Ez azért fontos, mert nagy térfogatú gázt kell nagyon kevés oldószerben oldani ahhoz, hogy a lombikban annyira lecsökkenjen a nyomás, hogy abba a külső nyomás hatására az oldószer nagy mennyisége bepréselődjön. Az ammónia kiválóan oldódik vízben, ezért végezhető el segítségével a szökőkútkísérlet.

118. a hidrogén-kloriddal

119. A tej az emulzió. Az emulziók esetében mind a diszpergáló közeg, mind a diszpergált anyag folyékony halmazállapotú.

120. Hab keletkezik. A habok esetén a diszpergáló közeg folyékony, míg a diszpergált anyag gáz.

121. valódi oldat jön létre

122. szol

123. A zselé képződése végett kell lehűteni a kolloid rendszert. A hűtés közben szol-gél átalakulás megy végbe.

124. gél keletkezik

125. a metán–ammónia rendszer

126. Teljes mértékben elválasztható egymástól a konyhasó és a homok, illetve a metán és az ammónia. A víz jól oldja a konyhasót, illetve az ammóniát, de nem oldja a homokot és a metánt, vagyis az oldhatóságban mutatkozó különbség alapján történhet a szétválasztás. Részleges szétválasztás történhet meg a jód–grafit keverék esetén. A víz nagyon kis mértékben oldja a jódot, a grafitot viszont egyáltalán nem.

127. Teljes mértékben elválasztható egymástól a jód és a grafit, mivel előbbit a benzin kiválóan oldja, utóbbit viszont egyáltalán nem. Vagyis ebben az esetben is az oldhatóságban mutatkozó különbség az elválasztás alapja.

A vas és a kén elválasztása csak részben történik meg, a benzin közepesen oldja a ként, míg a vasat semennyire.

128. A legegyszerűbb mód az elválasztásra egy mágnes alkalmazása. A mágnes a vasat vonzza, a ként viszont nem.

129. A)
$$w\% = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{25{,}0 \text{ g}}{200 \text{ g}} \cdot 100 = \underline{\textbf{12,5}}.$$

B)
$$w\% = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{12{,}55 \text{ g}}{550{,}0 \text{ g}} \cdot 100 = \underline{\textbf{2,282}}.$$

C)
$$w\% = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{53{,}00 \text{ g}}{1200 \text{ g}} \cdot 100 = \underline{\textbf{4,417}}.$$

130. A)
$$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 25{,}0 \text{ g} + 200 \text{ g} = 225 \text{ g}$$
$$w\% = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{25{,}0 \text{ g}}{225 \text{ g}} \cdot 100 = \underline{\textbf{11,1}}.$$

B)
$$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 20{,}0 \text{ g} + 230 \text{ g} = 250 \text{ g}$$
$$w\% = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{20{,}0 \text{ g}}{250 \text{ g}} \cdot 100 = \underline{\textbf{8,00}}.$$

C)
$$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 0{,}122 \text{ g} + 20{,}0 \text{ g} = 20{,}1 \text{ g}$$
$$w\% = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{0{,}122 \text{ g}}{20{,}1 \text{ g}} \cdot 100 = \underline{\textbf{0,606}}.$$

131. A)
$$m(\text{NaCl}) = n(\text{NaCl}) \cdot M(\text{NaCl}) = 0{,}0100 \text{ mol} \cdot 58{,}44 \, \tfrac{\text{g}}{\text{mol}} = 0{,}584 \text{ g}$$
$$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 0{,}584 \text{ g} + 300 \text{ g} = 301 \text{ g}$$
$$w\% = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{0{,}584 \text{ g}}{301 \text{ g}} \cdot 100 = \underline{\textbf{0,194}}.$$

B)
$$m(\text{HCl}) = n(\text{HCl}) \cdot M(\text{HCl}) = 0{,}100 \text{ mol} \cdot 36{,}46 \, \tfrac{\text{g}}{\text{mol}} = 3{,}65 \text{ g}$$
$$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 3{,}65 \text{ g} + 100 \text{ g} = 104 \text{ g}$$
$$w\% = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{3{,}65 \text{ g}}{104 \text{ g}} \cdot 100 = \underline{\textbf{3,52}}.$$

C)
$$m(\text{NH}_3) = n(\text{NH}_3) \cdot M(\text{NH}_3) = 0{,}200 \text{ mol} \cdot 17{,}04 \, \tfrac{\text{g}}{\text{mol}} = 3{,}41 \text{ g}$$
$$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 3{,}41 \text{ g} + 20{,}0 \text{ g} = 23{,}4 \text{ g}$$
$$w\% = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{3{,}41 \text{ g}}{23{,}4 \text{ g}} \cdot 100 = \underline{\textbf{14,6}}.$$

132. A)
$$n(\text{NH}_3) = \frac{V(\text{NH}_3)}{V_{\text{m}}^{\text{st}}} = \frac{24{,}5 \text{ dm}^3}{24{,}5 \, \tfrac{\text{dm}^3}{\text{mol}}} = 1{,}00 \text{ mol}$$
$$m(\text{NH}_3) = n(\text{NH}_3) \cdot M(\text{NH}_3) = 1{,}00 \text{ mol} \cdot 17{,}04 \, \tfrac{\text{g}}{\text{mol}} = 17{,}0 \text{ g}$$
$$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 17{,}0 \text{ g} + 200 \text{ g} = 217 \text{ g}$$
$$w\% = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{17{,}0 \text{ g}}{217 \text{ g}} \cdot 100 = \underline{\textbf{7,85}}.$$

B)

$$n(\text{HCl}) = \frac{V(\text{HCl})}{V_m^{st}} = \frac{2{,}45 \text{ dm}^3}{24{,}5 \frac{\text{dm}^3}{\text{mol}}} = 0{,}100 \text{ mol}$$

$$m(\text{HCl}) = n(\text{HCl}) \cdot M(\text{HCl}) = 0{,}100 \text{ mol} \cdot 36{,}46 \frac{\text{g}}{\text{mol}} = 3{,}65 \text{ g}$$

$$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 3{,}65 \text{ g} + 100 \text{ g} = 104 \text{ g}$$

$$\boldsymbol{w\%} = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{3{,}65 \text{ g}}{104 \text{ g}} \cdot 100 = \underline{\textbf{3{,}52}}.$$

C)

$$n(\text{NH}_3) = \frac{V(\text{NH}_3)}{V_m^{0\,°C}} = \frac{0{,}125 \text{ dm}^3}{22{,}41 \frac{\text{dm}^3}{\text{mol}}} = 5{,}58 \cdot 10^{-3} \text{ mol}$$

$$m(\text{NH}_3) = n(\text{NH}_3) \cdot M(\text{NH}_3) = 5{,}58 \cdot 10^{-3} \text{ mol} \cdot 17{,}04 \frac{\text{g}}{\text{mol}} = 0{,}0950 \text{ g}$$

$$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 0{,}0950 \text{ g} + 20{,}0 \text{ g} = 20{,}1 \text{ g}$$

$$\boldsymbol{w\%} = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{0{,}0950 \text{ g}}{20{,}1 \text{ g}} \cdot 100 = \underline{\textbf{0{,}473}}.$$

133. A)

$$m(\text{NH}_3) = \frac{p \cdot V(\text{NH}_3) \cdot M(\text{NH}_3)}{R \cdot T} = \frac{109000 \text{ Pa} \cdot 0{,}018 \text{ m}^3 \cdot 17{,}04 \frac{\text{g}}{\text{mol}}}{8{,}314 \frac{\text{J}}{\text{mol} \cdot \text{K}} \cdot 283 \text{ K}} = 14{,}2 \text{ g}$$

$$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 14{,}2 \text{ g} + 150 \text{ g} = 164 \text{ g}$$

$$\boldsymbol{w\%} = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{14{,}2 \text{ g}}{164 \text{ g}} \cdot 100 = \underline{\textbf{8{,}65}}.$$

B)

$$m(\text{HCl}) = \frac{p \cdot V(\text{HCl}) \cdot M(\text{HCl})}{R \cdot T} = \frac{115000 \text{ Pa} \cdot 0{,}0534 \text{ m}^3 \cdot 36{,}46 \frac{\text{g}}{\text{mol}}}{8{,}314 \frac{\text{J}}{\text{mol} \cdot \text{K}} \cdot 328 \text{ K}} = 82{,}1 \text{ g}$$

$$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 82{,}1 \text{ g} + 300 \text{ g} = 382 \text{ g}$$

$$\boldsymbol{w\%} = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{82{,}1 \text{ g}}{382 \text{ g}} \cdot 100 = \underline{\textbf{21{,}5}}.$$

C)

$$m(\text{NH}_3) = \frac{p \cdot V(\text{NH}_3) \cdot M(\text{NH}_3)}{R \cdot T} = \frac{250000 \text{ Pa} \cdot 0{,}175 \text{ m}^3 \cdot 17{,}04 \frac{\text{g}}{\text{mol}}}{8{,}314 \frac{\text{J}}{\text{mol} \cdot \text{K}} \cdot 278 \text{ K}} = 323 \text{ g}$$

$$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 323 \text{ g} + 895 \text{ g} = 1{,}22 \cdot 10^3 \text{ g}$$

$$\boldsymbol{w\%} = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{323 \text{ g}}{1{,}22 \cdot 10^3 \text{ g}} \cdot 100 = \underline{\textbf{26{,}5}}.$$

134. A)

$$\boldsymbol{m(\text{oldat})} = \frac{m(\text{oldott anyag}) \cdot 100}{w\%} = \frac{10{,}2 \text{ g} \cdot 100}{26{,}1} = \underline{\textbf{39{,}1 g}}.$$

B)

$$\boldsymbol{m(\text{oldat})} = \frac{m(\text{oldott anyag}) \cdot 100}{w\%} = \frac{32{,}0 \text{ g} \cdot 100}{10{,}0} = \underline{\textbf{320 g}}.$$

C)

$$\boldsymbol{m(\text{oldat})} = \frac{m(\text{oldott anyag}) \cdot 100}{w\%} = \frac{0{,}123 \text{ g} \cdot 100}{2{,}50} = \underline{\textbf{4{,}92 g}}.$$

135. A)

$$m(\text{NaCl}) = n(\text{NaCl}) \cdot M(\text{NaCl}) = 1{,}25 \text{ mol} \cdot 58{,}44 \frac{\text{g}}{\text{mol}} = 73{,}1 \text{ g}$$

$$\boldsymbol{m(\text{oldat})} = \frac{m(\text{oldott anyag}) \cdot 100}{w\%} = \frac{73{,}1 \text{ g} \cdot 100}{25{,}0} = 292{,}2 \text{ g} \approx \underline{\textbf{292 g}}.$$

B)

$$m(\text{NaOH}) = n(\text{NaOH}) \cdot M(\text{NaOH}) = 33{,}3 \text{ mol} \cdot 40{,}00 \frac{\text{g}}{\text{mol}} = 1{,}33 \cdot 10^3 \text{ g}$$

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$$m\textbf{(oldat)} = \frac{m(\text{oldott anyag}) \cdot 100}{w\%} = \frac{1{,}33 \cdot 10^3 \text{ g} \cdot 100}{12{,}1} = \underline{\textbf{1,10} \cdot \textbf{10}^4 \textbf{ g}}.$$

C)

$$m(\text{HCl}) = n(\text{HCl}) \cdot M(\text{HCl}) = 0{,}125 \text{ mol} \cdot 36{,}46 \tfrac{\text{g}}{\text{mol}} = 4{,}56 \text{ g}$$

$$m\textbf{(oldat)} = \frac{m(\text{oldott anyag}) \cdot 100}{w\%} = \frac{4{,}56 \text{ g} \cdot 100}{2{,}70} = 168{,}80 \text{ g} \approx \underline{\textbf{169 g}}.$$

136. A)

$$n(\text{NH}_3) = \frac{V(\text{NH}_3)}{V_\text{m}^\text{st}} = \frac{24{,}5 \text{ dm}^3}{24{,}5 \tfrac{\text{dm}^3}{\text{mol}}} = 1{,}00 \text{ mol}$$

$$m(\text{NH}_3) = n(\text{NH}_3) \cdot M(\text{NH}_3) = 1{,}00 \text{ mol} \cdot 17{,}04 \tfrac{\text{g}}{\text{mol}} = 17{,}0 \text{ g}$$

$$m\textbf{(oldat)} = \frac{m(\text{oldott anyag}) \cdot 100}{w\%} = \frac{17{,}0 \text{ g} \cdot 100}{2{,}00} = \underline{\textbf{852 g}}.$$

B)

$$n(\text{HCl}) = \frac{V(\text{HCl})}{V_\text{m}^\text{st}} = \frac{4{,}90 \text{ dm}^3}{24{,}5 \tfrac{\text{dm}^3}{\text{mol}}} = 0{,}200 \text{ mol}$$

$$m(\text{HCl}) = n(\text{HCl}) \cdot M(\text{HCl}) = 0{,}200 \text{ mol} \cdot 36{,}46 \tfrac{\text{g}}{\text{mol}} = 7{,}29 \text{ g}$$

$$m\textbf{(oldat)} = \frac{m(\text{oldott anyag}) \cdot 100}{w\%} = \frac{7{,}29 \text{ g} \cdot 100}{24{,}1} = 30{,}26 \text{ g} \approx \underline{\textbf{30,3 g}}.$$

C)

$$n(\text{NH}_3) = \frac{V(\text{NH}_3)}{V_\text{m}^{0\,°\text{C}}} = \frac{20{,}0 \text{ dm}^3}{22{,}41 \tfrac{\text{dm}^3}{\text{mol}}} = 0{,}892 \text{ mol}$$

$$m(\text{NH}_3) = n(\text{NH}_3) \cdot M(\text{NH}_3) = 0{,}892 \text{ mol} \cdot 17{,}04 \tfrac{\text{g}}{\text{mol}} = 15{,}2 \text{ g}$$

$$m\textbf{(oldat)} = \frac{m(\text{oldott anyag}) \cdot 100}{w\%} = \frac{15{,}2 \text{ g} \cdot 100}{2{,}33} = 652{,}68 \text{ g} \approx \underline{\textbf{653 g}}.$$

137. A)

$$m(\text{NH}_3) = \frac{p \cdot V(\text{NH}_3) \cdot M(\text{NH}_3)}{R \cdot T} = \frac{305000 \text{ Pa} \cdot 0{,}100 \text{ m}^3 \cdot 17{,}04 \tfrac{\text{g}}{\text{mol}}}{8{,}314 \tfrac{\text{J}}{\text{mol} \cdot \text{K}} \cdot 313 \text{ K}} = 199{,}72 \text{ g} \approx 200 \text{ g}$$

$$m\textbf{(oldat)} = \frac{m(\text{oldott anyag}) \cdot 100}{w\%} = \frac{200 \text{ g} \cdot 100}{16{,}5} = \underline{\textbf{1,21} \cdot \textbf{10}^3 \textbf{ g}}.$$

B)

$$m(\text{HCl}) = \frac{p \cdot V(\text{HCl}) \cdot M(\text{HCl})}{R \cdot T} = \frac{230000 \text{ Pa} \cdot 0{,}0950 \text{ m}^3 \cdot 36{,}46 \tfrac{\text{g}}{\text{mol}}}{8{,}314 \tfrac{\text{J}}{\text{mol} \cdot \text{K}} \cdot 305 \text{ K}} = 314{,}17 \text{ g} \approx 314 \text{ g}$$

$$m\textbf{(oldat)} = \frac{m(\text{oldott anyag}) \cdot 100}{w\%} = \frac{314 \text{ g} \cdot 100}{10{,}0} = \underline{\textbf{3,14} \cdot \textbf{10}^3 \textbf{ g}}.$$

C)

$$m(\text{NH}_3) = \frac{p \cdot V(\text{NH}_3) \cdot M(\text{NH}_3)}{R \cdot T} = \frac{85600 \text{ Pa} \cdot 2{,}35 \text{ m}^3 \cdot 17{,}04 \tfrac{\text{g}}{\text{mol}}}{8{,}314 \tfrac{\text{J}}{\text{mol} \cdot \text{K}} \cdot 293 \text{ K}} = 1{,}41 \cdot 10^3 \text{ g}$$

$$m\textbf{(oldat)} = \frac{m(\text{oldott anyag}) \cdot 100}{w\%} = \frac{1{,}41 \cdot 10^3 \text{ g} \cdot 100}{8{,}55} = \underline{\textbf{1,65} \cdot \textbf{10}^4 \textbf{ g}}.$$

138. A)

$$m\textbf{(oldott anyag)} = \frac{m(\text{oldat}) \cdot w\%}{100} = \frac{340 \text{ g} \cdot 15{,}0}{100} = \underline{\textbf{51,0 g}}$$

$$m\textbf{(oldószer)} = m(\text{oldat}) - m(\text{oldott anyag}) = 340 \text{ g} - 51{,}0 \text{ g} = \underline{\textbf{289 g}}.$$

B)

$$m\textbf{(oldott anyag)} = \frac{m(\text{oldat}) \cdot w\%}{100} = \frac{1432 \text{ g} \cdot 10{,}53}{100} = \underline{\textbf{150,8 g}}$$

$$m\textbf{(oldószer)} = m(\text{oldat}) - m(\text{oldott anyag}) = 1432 \text{ g} - 150{,}8 \text{ g} = 1281{,}2 \text{ g} \approx \underline{\textbf{1281 g}}.$$

C)

$$m(\text{oldott anyag}) = \frac{m(\text{oldat}) \cdot w\%}{100} = \frac{170 \text{ g} \cdot 11{,}1}{100} = 18{,}87 \text{ g} \approx \underline{\textbf{18,9 g}}$$

$$m(\textbf{oldószer}) = m(\text{oldat}) - m(\text{oldott anyag}) = 170 \text{ g} - 18{,}9 \text{ g} = 151{,}1 \text{ g} \approx \underline{\textbf{151 g}}.$$

139. A)

$$m(\text{oldat}) = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 1{,}165 \frac{\text{g}}{\text{cm}^3} \cdot 350{,}0 \text{ cm}^3 = 407{,}75 \text{ g} \approx 407{,}8 \text{ g}$$

$$w\% = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{2{,}750 \text{ g}}{407{,}8 \text{ g}} \cdot 100 = \underline{\textbf{0,6744}}.$$

B)

$$m(\text{oldat}) = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 1{,}10 \frac{\text{g}}{\text{cm}^3} \cdot 700 \text{ cm}^3 = 770 \text{ g}$$

$$w\% = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{10{,}0 \text{ g}}{770 \text{ g}} \cdot 100 = \underline{\textbf{1,30}}.$$

C)

$$m(\text{oldat}) = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 1{,}012 \frac{\text{g}}{\text{cm}^3} \cdot 1325 \text{ cm}^3 = 1340{,}9 \text{ g} \approx 1341 \text{ g}$$

$$w\% = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{223{,}3 \text{ g}}{1341 \text{ g}} \cdot 100 = \underline{\textbf{16,65}}.$$

140. A)

$$m(\text{oldószer}) = \varrho(\text{oldószer}) \cdot V(\text{oldószer}) = 1{,}00 \frac{\text{g}}{\text{cm}^3} \cdot 250 \text{ cm}^3 = 250 \text{ g}$$

$$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 25{,}0 \text{ g} + 250 \text{ g} = 275 \text{ g}$$

$$w\% = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{25{,}0 \text{ g}}{275 \text{ g}} \cdot 100 = \underline{\textbf{9,09}}.$$

B)

$$m(\text{oldószer}) = \varrho(\text{oldószer}) \cdot V(\text{oldószer}) = 1{,}59 \frac{\text{g}}{\text{cm}^3} \cdot 300 \text{ cm}^3 = 477 \text{ g}$$

$$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 8{,}00 \text{ g} + 477 \text{ g} = 485 \text{ g}$$

$$w\% = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{8{,}00 \text{ g}}{485 \text{ g}} \cdot 100 = \underline{\textbf{1,65}}.$$

C)

$$m(\text{oldószer}) = \varrho(\text{oldószer}) \cdot V(\text{oldószer}) = 0{,}789 \frac{\text{g}}{\text{cm}^3} \cdot 100 \text{ cm}^3 = 78{,}9 \text{ g}$$

$$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 2{,}50 \text{ g} + 78{,}9 \text{ g} = 81{,}4 \text{ g}$$

$$w\% = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{2{,}50 \text{ g}}{81{,}4 \text{ g}} \cdot 100 = \underline{\textbf{3,07}}.$$

141. A)

$$m(\text{oldószer}) = \varrho(\text{oldószer}) \cdot V(\text{oldószer}) = 1{,}00 \frac{\text{g}}{\text{cm}^3} \cdot 200 \text{ cm}^3 = 200 \text{ g}$$

$$n(\text{NH}_3) = \frac{V(\text{NH}_3)}{V_\text{m}^\text{st}} = \frac{92{,}0 \text{ dm}^3}{24{,}5 \frac{\text{dm}^3}{\text{mol}}} = 3{,}755 \text{ mol} \approx 3{,}76 \text{ mol}$$

$$m(\text{NH}_3) = n(\text{NH}_3) \cdot M(\text{NH}_3) = 3{,}76 \text{ mol} \cdot 17{,}04 \frac{\text{g}}{\text{mol}} = 63{,}99 \text{ g} \approx 64{,}0 \text{ g}$$

$$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 64{,}0 \text{ g} + 200 \text{ g} = 264 \text{ g}$$

$$w\% = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{64{,}0 \text{ g}}{264 \text{ g}} \cdot 100 = \underline{\textbf{24,2}}.$$

B)

$$m(\text{oldószer}) = \varrho(\text{oldószer}) \cdot V(\text{oldószer}) = 1{,}00 \frac{\text{g}}{\text{cm}^3} \cdot 530 \text{ cm}^3 = 530 \text{ g}$$

$$n(\text{NH}_3) = \frac{V(\text{NH}_3)}{V_\text{m}^\text{st}} = \frac{162 \text{ dm}^3}{24{,}5 \frac{\text{dm}^3}{\text{mol}}} = 6{,}61 \text{ mol}$$

$$m(\text{NH}_3) = n(\text{NH}_3) \cdot M(\text{NH}_3) = 6{,}61 \text{ mol} \cdot 17{,}04 \frac{\text{g}}{\text{mol}} = 112{,}67 \text{ g} \approx 113 \text{ g}$$

$$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 113 \text{ g} + 530 \text{ g} = 643 \text{ g}$$

$$w\% = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{113 \text{ g}}{643 \text{ g}} \cdot 100 = \underline{\textbf{17,5}}.$$

C)

$$m(\text{oldószer}) = \varrho(\text{oldószer}) \cdot V(\text{oldószer}) = 1,00 \frac{\text{g}}{\text{cm}^3} \cdot 1,00 \text{ cm}^3 = 1,00 \text{ g}$$

$$n(\text{HCl}) = \frac{V(\text{HCl})}{V_\text{m}^{0\,°C}} = \frac{5,30 \cdot 10^{-3} \text{ dm}^3}{22,41 \frac{\text{dm}^3}{\text{mol}}} = 2,365 \cdot 10^{-4} \text{ mol} \approx 2,37 \cdot 10^{-4} \text{ mol}$$

$$m(\text{HCl}) = n(\text{HCl}) \cdot M(\text{HCl}) = 2,37 \cdot 10^{-4} \text{ mol} \cdot 36,46 \frac{\text{g}}{\text{mol}} = 8,62 \cdot 10^{-3} \text{ g}$$

$$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 1,00 \text{ g} + 8,62 \cdot 10^{-3} \text{ g} = 1,0086 \text{ g} \approx 1,01 \text{ g}$$

$$w\% = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{8,62 \cdot 10^{-3} \text{ g}}{1,01 \text{ g}} \cdot 100 = \underline{\textbf{0,855}}.$$

142. A)

$$m(\text{oldat}) = \frac{m(\text{oldott anyag}) \cdot 100}{w\%} = \frac{21,0 \text{ g} \cdot 100}{14,9} = 140,94 \text{ g} \approx 141 \text{ g}$$

$$V(\textbf{oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{141 \text{ g}}{0,940 \frac{\text{g}}{\text{cm}^3}} = 149,94 \text{ cm}^3 \approx \underline{\textbf{150 cm}^3}.$$

B)

$$m(\text{oldat}) = \frac{m(\text{oldott anyag}) \cdot 100}{w\%} = \frac{164 \text{ g} \cdot 100}{4,27} = 3,84 \cdot 10^3 \text{ g}$$

$$V(\textbf{oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{3,84 \cdot 10^3 \text{ g}}{0,980 \frac{\text{g}}{\text{cm}^3}} = 3919,13 \text{ cm}^3 \approx \underline{\textbf{3,92} \cdot \textbf{10}^3 \textbf{ cm}^3}.$$

C)

$$m(\text{oldat}) = \frac{m(\text{oldott anyag}) \cdot 100}{w\%} = \frac{425 \text{ g} \cdot 100}{9,34} = 4,55 \cdot 10^3 \text{ g}$$

$$V(\textbf{oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{4,55 \cdot 10^3 \text{ g}}{0,960 \frac{\text{g}}{\text{cm}^3}} = 4739,92 \text{ cm}^3 \approx \underline{\textbf{4,74} \cdot \textbf{10}^3 \textbf{ cm}^3}.$$

143. A)

$$m(\text{HCl}) = \frac{p \cdot V(\text{HCl}) \cdot M(\text{HCl})}{R \cdot T} = \frac{115000 \text{ Pa} \cdot 0,08000 \text{ m}^3 \cdot 36,46 \frac{\text{g}}{\text{mol}}}{8,314 \frac{\text{J}}{\text{mol} \cdot \text{K}} \cdot 293,0 \text{ K}} = 137,70 \text{ g} \approx 137,7 \text{ g}$$

$$m(\text{oldat}) = \frac{m(\text{oldott anyag}) \cdot 100}{w\%} = \frac{137,7 \text{ g} \cdot 100}{20,39} = 675,32 \text{ g} \approx 675,3 \text{ g}$$

$$V(\textbf{oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{675,3 \text{ g}}{1,100 \frac{\text{g}}{\text{cm}^3}} = 613,93 \text{ cm}^3 \approx \underline{\textbf{613,9 cm}^3}.$$

B)

$$m(\text{HCl}) = \frac{p \cdot V(\text{HCl}) \cdot M(\text{HCl})}{R \cdot T} = \frac{120000 \text{ Pa} \cdot 0,100 \text{ m}^3 \cdot 36,46 \frac{\text{g}}{\text{mol}}}{8,314 \frac{\text{J}}{\text{mol} \cdot \text{K}} \cdot 293 \text{ K}} = 179,61 \text{ g} \approx 180 \text{ g}$$

$$m(\text{oldat}) = \frac{m(\text{oldott anyag}) \cdot 100}{w\%} = \frac{180 \text{ g} \cdot 100}{8,49} = 2115,50 \text{ g} \approx 2,12 \cdot 10^3 \text{ g}$$

$$V(\textbf{oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{2,12 \cdot 10^3 \text{ g}}{1,04 \frac{\text{g}}{\text{cm}^3}} = 2034,13 \text{ cm}^3 \approx \underline{\textbf{2,03} \cdot \textbf{10}^3 \textbf{ cm}^3}.$$

C)

$$m(\text{HCl}) = \frac{p \cdot V(\text{HCl}) \cdot M(\text{HCl})}{R \cdot T} = \frac{123400 \text{ Pa} \cdot 0,6210 \text{ m}^3 \cdot 36,46 \frac{\text{g}}{\text{mol}}}{8,314 \frac{\text{J}}{\text{mol} \cdot \text{K}} \cdot 293,0 \text{ K}} = 1146,95 \text{ g} \approx 1147 \text{ g}$$

$$m(\text{oldat}) = \frac{m(\text{oldott anyag}) \cdot 100}{w\%} = \frac{1147 \text{ g} \cdot 100}{36,23} = 3165,76 \text{ g} \approx 3,166 \cdot 10^3 \text{ g}$$

$$V(\textbf{oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{3,166 \cdot 10^3 \text{ g}}{1,180 \frac{\text{g}}{\text{cm}^3}} = 2682,84 \text{ cm}^3 \approx \underline{\textbf{2,683} \cdot \textbf{10}^3 \textbf{ cm}^3}.$$

144. A)

$$m(\text{oldószer}) = \varrho(\text{oldószer}) \cdot V(\text{oldószer}) = 1,00 \frac{\text{g}}{\text{cm}^3} \cdot 250 \text{ cm}^3 = 250 \text{ g}$$

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$m(\text{oldott anyag}) = \frac{w\% \cdot m(\text{oldószer})}{100 - w\%} = \frac{8{,}28 \cdot 250 \text{ g}}{100 - 8{,}28} = 22{,}57 \text{ g} \approx \underline{\textbf{22,6 g}}$

$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 22{,}6 \text{ g} + 250 \text{ g} = 272{,}6 \text{ g} \approx 273 \text{ g}$

$V(\text{oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{273 \text{ g}}{1{,}09 \frac{\text{g}}{\text{cm}^3}} = 250{,}06 \text{ cm}^3 \approx \underline{\textbf{250 cm}^3}.$

B)

$m(\text{oldószer}) = \varrho(\text{oldószer}) \cdot V(\text{oldószer}) = 1{,}000 \frac{\text{g}}{\text{cm}^3} \cdot 420{,}0 \text{ cm}^3 = 420{,}0 \text{ g}$

$m(\text{oldott anyag}) = \frac{w\% \cdot m(\text{oldószer})}{100 - w\%} = \frac{10{,}49 \cdot 420{,}0 \text{ g}}{100 - 10{,}49} = \underline{\textbf{49,22 g}}$

$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 49{,}22 \text{ g} + 420{,}0 \text{ g} = 469{,}22 \text{ g} \approx 469{,}2 \text{ g}$

$V(\text{oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{469{,}2 \text{ g}}{1{,}095 \frac{\text{g}}{\text{cm}^3}} = 428{,}51 \text{ cm}^3 \approx \underline{\textbf{428,5 cm}^3}.$

C)

$m(\text{oldószer}) = \varrho(\text{oldószer}) \cdot V(\text{oldószer}) = 1{,}00 \frac{\text{g}}{\text{cm}^3} \cdot 545 \text{ cm}^3 = 545 \text{ g}$

$m(\text{oldott anyag}) = \frac{w\% \cdot m(\text{oldószer})}{100 - w\%} = \frac{20{,}0 \cdot 545 \text{ g}}{100 - 20{,}0} = 136{,}25 \text{ g} \approx \underline{\textbf{136 g}}$

$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 136 \text{ g} + 545 \text{ g} = 681 \text{ g}$

$V(\text{oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{681 \text{ g}}{1{,}16 \frac{\text{g}}{\text{cm}^3}} = 587{,}28 \text{ cm}^3 \approx \underline{\textbf{587 cm}^3}.$

145. A)

$m(\text{oldószer}) = \varrho(\text{oldószer}) \cdot V(\text{oldószer}) = 1{,}00 \frac{\text{g}}{\text{cm}^3} \cdot 80{,}0 \text{ cm}^3 = 80{,}0 \text{ g}$

$m(\text{oldott anyag}) = \frac{w\% \cdot m(\text{oldószer})}{100 - w\%} = \frac{6{,}75 \cdot 80{,}0 \text{ g}}{100 - 6{,}75} = 5{,}79 \text{ g}$

$V(\text{NH}_3) = \frac{m(\text{NH}_3) \cdot R \cdot T}{p \cdot M(\text{NH}_3)} = \frac{5{,}79 \text{ g} \cdot 8{,}314 \frac{\text{J}}{\text{mol·K}} \cdot 293 \text{ K}}{202000 \text{ Pa} \cdot 17{,}04 \frac{\text{g}}{\text{mol}}} = 4{,}098 \cdot 10^{-3} \text{ m}^3 \approx \underline{\textbf{4,10 dm}^3}$

$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 5{,}79 \text{ g} + 80{,}0 \text{ g} = 85{,}79 \text{ g} \approx 85{,}8 \text{ g}$

$V(\text{oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{85{,}8 \text{ g}}{0{,}970 \frac{\text{g}}{\text{cm}^3}} = 88{,}44 \text{ cm}^3 \approx \underline{\textbf{88,4 cm}^3}.$

B)

$m(\text{oldószer}) = \varrho(\text{oldószer}) \cdot V(\text{oldószer}) = 1{,}00 \frac{\text{g}}{\text{cm}^3} \cdot 420 \text{ cm}^3 = 420 \text{ g}$

$m(\text{oldott anyag}) = \frac{w\% \cdot m(\text{oldószer})}{100 - w\%} = \frac{10{,}4 \cdot 420 \text{ g}}{100 - 10{,}4} = 48{,}75 \text{ g} \approx 48{,}8 \text{ g}$

$V(\text{NH}_3) = \frac{m(\text{NH}_3) \cdot R \cdot T}{p \cdot M(\text{NH}_3)} = \frac{48{,}8 \text{ g} \cdot 8{,}314 \frac{\text{J}}{\text{mol·K}} \cdot 293 \text{ K}}{125000 \text{ Pa} \cdot 17{,}04 \frac{\text{g}}{\text{mol}}} = 0{,}05575 \text{ m}^3 \approx \underline{\textbf{55,8 dm}^3}$

$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 48{,}8 \text{ g} + 420 \text{ g} = 468{,}8 \text{ g} \approx 469 \text{ g}$

$V(\text{oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{469 \text{ g}}{0{,}956 \frac{\text{g}}{\text{cm}^3}} = 490{,}32 \text{ cm}^3 \approx \underline{\textbf{490 cm}^3}.$

C)

$m(\text{oldószer}) = \varrho(\text{oldószer}) \cdot V(\text{oldószer}) = 1{,}00 \frac{\text{g}}{\text{cm}^3} \cdot 20{,}0 \text{ cm}^3 = 20{,}0 \text{ g}$

$m(\text{oldott anyag}) = \frac{w\% \cdot m(\text{oldószer})}{100 - w\%} = \frac{26{,}2 \cdot 20{,}0 \text{ g}}{100 - 26{,}2} = 7{,}10 \text{ g}$

$V(\text{HCl}) = \frac{m(\text{HCl}) \cdot R \cdot T}{p \cdot M(\text{HCl})} = \frac{7{,}10 \text{ g} \cdot 8{,}314 \frac{\text{J}}{\text{mol·K}} \cdot 293 \text{ K}}{132000 \text{ Pa} \cdot 36{,}46 \frac{\text{g}}{\text{mol}}} = 3{,}594 \cdot 10^{-3} \text{ m}^3 \approx \underline{\textbf{3,59 dm}^3}$

$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 7{,}10 \text{ g} + 20{,}0 \text{ g} = 27{,}10 \text{ g} \approx 27{,}1 \text{ g}$

$V(\text{oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{27{,}1 \text{ g}}{1{,}13 \frac{\text{g}}{\text{cm}^3}} = 23{,}98 \text{ cm}^3 \approx \underline{\textbf{24,0 cm}^3}.$

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146. **A)**

	I. oldat	+	II. oldat	→	III. oldat
$m_1 =$	150 g		$m_2 =$ 350 g		$m_3 =$ 500 g
$w\%_1 =$	12,0		$w\%_2 =$ 25,0		$w\%_3 =$ a

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$150 \cdot 12,0 + 350 \cdot 25,0 = 500 \cdot a$

amelyből $a = \mathbf{w\%_3 = \underline{21,1}}$.

B)

	I. oldat	+	II. oldat	→	III. oldat
$m_1 =$	450 g		$m_2 =$ 705 g		$m_3 =$ 1155 g
$w\%_1 =$	2,50		$w\%_2 =$ 10,0		$w\%_3 =$ a

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$450 \cdot 2,50 + 705 \cdot 10,0 = 1155 \cdot a$

amelyből $a = \mathbf{w\%_3} = 7,078 \approx \mathbf{\underline{7,08}}$.

C)

	I. oldat	+	II. oldat	→	III. oldat
$m_1 =$	1050 g		$m_2 =$ 3700 g		$m_3 =$ 4750 g
$w\%_1 =$	10,00		$w\%_2 =$ 75,00		$w\%_3 =$ a

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$1050 \cdot 10,00 + 3700 \cdot 75,00 = 4750 \cdot a$

amelyből $a = \mathbf{w\%_3 = \underline{60,63}}$.

147. **A)**

	I. oldat	+	II. oldat (víz)	→	III. oldat
$m_1 =$	330 g		$m_2 =$ 770 g		$m_3 =$ 1100 g
$w\%_1 =$	12,0		$w\%_2 =$ 0,00		$w\%_3 =$ a

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$330 \cdot 12,0 + 770 \cdot 0,00 = 1100 \cdot a$

amelyből $a = \mathbf{w\%_3 = \underline{3,60}}$.

B)

	I. oldat	+	II. oldat (víz)	→	III. oldat
$m_1 =$	700 g		$m_2 =$ 400 g		$m_3 =$ 1100 g
$w\%_1 =$	32,0		$w\%_2 =$ 0,00		$w\%_3 =$ a

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$700 \cdot 32,0 + 400 \cdot 0,00 = 1100 \cdot a$

amelyből $a = \mathbf{w\%_3} = 20,36 \approx \mathbf{\underline{20,4}}$.

C)

	I. oldat	+	II. oldat (víz)	→	III. oldat
$m_1 =$	30,00 g		$m_2 =$ 1250 g		$m_3 =$ 1280 g
$w\%_1 =$	85,00		$w\%_2 =$ 0,000		$w\%_3 =$ a

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$30,00 \cdot 85,00 + 1250 \cdot 0,000 = 1280 \cdot a$

amelyből $a = \mathbf{w\%_3 = \underline{1,992}}$.

Készült a *Gyűjtemény a Kémia emelt szintű oktatásához 9-10.* tankönyv feladataihoz.

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148. **A)**

	I. oldat	+	II. oldat (só)	$\rightarrow$	III. oldat
	$m_1 = 7{,}30$ kg		$m_2 = 1{,}70$ kg		$m_3 = 9{,}00$ kg
	$w\%_1 = 14{,}0$		$w\%_2 = 100$		$w\%_3 = a$

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
$7{,}30 \cdot 14{,}0 + 1{,}70 \cdot 100 = 9{,}00 \cdot a$
amelyből $a = \boldsymbol{w\%_3} = 30{,}24 \approx \underline{\textbf{30,2}}$.

B)

	I. oldat	+	II. oldat (só)	$\rightarrow$	III. oldat
	$m_1 = 400$ g		$m_2 = 50{,}0$ g		$m_3 = 450$ g
	$w\%_1 = 8{,}00$		$w\%_2 = 100$		$w\%_3 = a$

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
$400 \cdot 8{,}00 + 50{,}0 \cdot 100 = 450 \cdot a$
amelyből $a = \boldsymbol{w\%_3} = 18{,}22 \approx \underline{\textbf{18,2}}$.

C)

	I. oldat	+	II. oldat (só)	$\rightarrow$	III. oldat
	$m_1 = 900$ g		$m_2 = 125$ g		$m_3 = 1025$ g
	$w\%_1 = 2{,}60$		$w\%_2 = 100$		$w\%_3 = a$

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
$900 \cdot 2{,}60 + 125 \cdot 100 = 1025 \cdot a$
amelyből $a = \boldsymbol{w\%_3} = 14{,}48 \approx \underline{\textbf{14,5}}$.

149. **A)**

	I. oldat	–	II. oldat (víz)	$\rightarrow$	III. oldat
	$m_1 = 3500$ g		$m_2 = 700$ g		$m_3 = 2800$ g
	$w\%_1 = 16{,}0$		$w\%_2 = 0{,}00$		$w\%_3 = a$

$m_1 \cdot w\%_1 - m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
$3500 \cdot 16{,}0 - 700 \cdot 0{,}00 = 2800 \cdot a$
amelyből $a = \boldsymbol{w\%_3} = \underline{\textbf{20,0}}$.

B)

	I. oldat	–	II. oldat (víz)	$\rightarrow$	III. oldat
	$m_1 = 150$ g		$m_2 = 70{,}0$ g		$m_3 = 80{,}0$ g
	$w\%_1 = 2{,}00$		$w\%_2 = 0{,}00$		$w\%_3 = a$

$m_1 \cdot w\%_1 - m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
$150 \cdot 2{,}00 - 70{,}0 \cdot 0{,}00 = 80{,}0 \cdot a$
amelyből $a = \boldsymbol{w\%_3} = \underline{\textbf{3,75}}$.

C)

	I. oldat	–	II. oldat (víz)	$\rightarrow$	III. oldat
	$m_1 = 320$ g		$m_2 = 35{,}0$ g		$m_3 = 285$ g
	$w\%_1 = 7{,}80$		$w\%_2 = 0{,}00$		$w\%_3 = a$

$m_1 \cdot w\%_1 - m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
$320 \cdot 7{,}80 - 35{,}0 \cdot 0{,}00 = 285 \cdot a$
amelyből $a = \boldsymbol{w\%_3} = 8{,}758 \approx \underline{\textbf{8,76}}$.

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150. A)

	I. oldat	+	II. oldat	→	III. oldat
$m_1 =$	a g		$m_2 =$ $(455 - a)$ g		$m_3 =$ 455 g
$w\%_1 =$	12,0		$w\%_2 =$ 45,0		$w\%_3 =$ 22,0

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$a \cdot 12,0 + (455 - a) \cdot 45,0 = 455 \cdot 22,0$

amelyből $a = m_1 = 317,22$ g $\approx$ **317 g**,

és $(455 - a) = m_2 = 137,88$ g $\approx$ **138 g**.

B)

	I. oldat	+	II. oldat (víz)	→	III. oldat
$m_1 =$	a g		$m_2 =$ $(250 - a)$ g		$m_3 =$ 250 g
$w\%_1 =$	22,0		$w\%_2 =$ 0,00		$w\%_3 =$ 2,00

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$a \cdot 22,0 + (250 - a) \cdot 0,00 = 250 \cdot 2,00$

amelyből $a = m_1 = 22,73$ g $\approx$ **22,7 g**,

és $(250 - a) = m_2 = 227,27$ g $\approx$ **227 g**.

C)

	I. oldat	+	II. oldat (só)	→	III. oldat
$m_1 =$	a g		$m_2 =$ $(2500 - a)$ g		$m_3 =$ 2500 g
$w\%_1 =$	31,0		$w\%_2 =$ 100		$w\%_3 =$ 45,0

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$a \cdot 31,0 + (2500 - a) \cdot 100 = 2500 \cdot 45,0$

amelyből $a = m_1 = 1992,75$ g $\approx$ **$1,99 \cdot 10^3$ g**,

és $(2500 - a) = m_2 = 507,25$ g $\approx$ **507 g**.

151. A)

$m_3 = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 1,15 \frac{\text{g}}{\text{cm}^3} \cdot 124 \text{ cm}^3 = 142,6 \text{ g} \approx 143 \text{ g}$

	I. oldat	+	II. oldat	→	III. oldat
$m_1 =$	a g		$m_2 =$ $(142,6 - a)$ g		$m_3 =$ 142,6 g
$w\%_1 =$	10,0		$w\%_2 =$ 46,0		$w\%_3 =$ 21,4

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$a \cdot 10,0 + (142,6 - a) \cdot 46,0 = 142,6 \cdot 21,4$

amelyből $a = m_1 = 97,44$ g $\approx$ **97,4 g**,

és $(142,6 - a) = m_2 = 45,16$ g $\approx$ **45,2 g**.

B)

	I. oldat	+	II. oldat (víz)	→	III. oldat
$m_1 =$	a g		$m_2 =$ $(2750 - a)$ g		$m_3 =$ 2750 g
$w\%_1 =$	12,51		$w\%_2 =$ 0,000		$w\%_3 =$ 3,500

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$a \cdot 12,51 + (2750 - a) \cdot 0,000 = 2750 \cdot 3,500$

amelyből $a = m_1 = 769,38$ g $\approx$ 769,4 g,

és $(2750 - a) = m_2 = 1980,62$ g $\approx$ **1981 g**.

$$V(\text{1. oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{769,4 \text{ g}}{1,060 \frac{\text{g}}{\text{cm}^3}} = 725,83 \text{ cm}^3 \approx \mathbf{725,8 \text{ cm}^3}.$$

C)

$$m_3 = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 1,430 \frac{\text{g}}{\text{cm}^3} \cdot 2500 \text{ cm}^3 = 3575 \text{ g}$$

	I. oldat	+	II. oldat (só)	→	III. oldat
$m_1 =$	a g		$m_2 =$ (3575 − a) g		$m_3 =$ 3575 g
$w\%_1 =$	11,92		$w\%_2 =$ 100,0		$w\%_3 =$ 40,00

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
$a \cdot 11,92 + (3575 - a) \cdot 100,0 = 3575 \cdot 40,00$
amelyből $a = m_1 = 2435,29 \text{ g} \approx 2435 \text{ g}$,
és $(3575 - a) = \boldsymbol{m_2} = 1139,71 \text{ g} \approx \underline{\mathbf{1140 \text{ g}}}$.

$$V(\text{1. oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{2435 \text{ g}}{1,130 \frac{\text{g}}{\text{cm}^3}} = 2155,12 \text{ cm}^3 \approx \underline{\mathbf{2155 \text{ cm}^3}}.$$

152. A)

$M(\text{CuSO}_4) = 159,61 \frac{\text{g}}{\text{mol}}$

$M(\text{CuSO}_4 \cdot 5 \text{ H}_2\text{O}) = 249,71 \frac{\text{g}}{\text{mol}}$

$w\%_1 = \frac{159,61 \text{ g CuSO}_4}{249,71 \text{ g CuSO}_4 \cdot 5 \text{ H}_2\text{O}} \cdot 100 = 63,9$

	I. oldat (kr. só)	+	II. oldat (víz)	→	III. oldat
$m_1 =$	130 g		$m_2 =$ 770 g		$m_3 =$ 900 g
$w\%_1 =$	63,9		$w\%_2 =$ 0,00		$w\%_3 =$ a

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
$130 \cdot 63,9 + 770 \cdot 0,00 = 900 \cdot a$
amelyből $a = \boldsymbol{w\%_3} = \underline{\mathbf{9,23}}$.

B)

$M(\text{ZnSO}_4) = 161,44 \frac{\text{g}}{\text{mol}}$

$M(\text{ZnSO}_4 \cdot 7 \text{ H}_2\text{O}) = 287,58 \frac{\text{g}}{\text{mol}}$

$w\%_1 = \frac{161,44 \text{ g ZnSO}_4}{287,58 \text{ g ZnSO}_4 \cdot 7 \text{ H}_2\text{O}} \cdot 100 = 56,1$

	I. oldat (kr. só)	+	II. oldat (víz)	→	III. oldat
$m_1 =$	200 g		$m_2 =$ 400 g		$m_3 =$ 600 g
$w\%_1 =$	56,1		$w\%_2 =$ 0,00		$w\%_3 =$ a

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
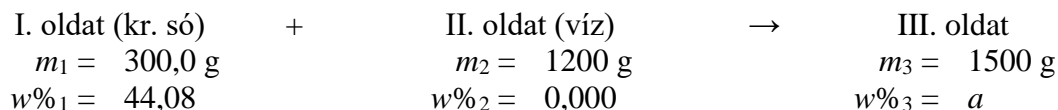$200 \cdot 56,1 + 400 \cdot 0,00 = 600 \cdot a$
amelyből $a = \boldsymbol{w\%_3} = 18,71 \approx \underline{\mathbf{18,7}}$.

C)

$M(\text{Na}_2\text{SO}_4) = 142,04 \frac{\text{g}}{\text{mol}}$

$M(\text{Na}_2\text{SO}_4 \cdot 10 \text{ H}_2\text{O}) = 322,24 \frac{\text{g}}{\text{mol}}$

$w\%_1 = \frac{142,04 \text{ g Na}_2\text{SO}_4}{322,24 \text{ g Na}_2\text{SO}_4 \cdot 10 \text{ H}_2\text{O}} \cdot 100 = 44,08$

Készült a *Gyűjtemény a Kémia emelt szintű oktatásához 9-10.* tankönyv feladataihoz.

Készítette: Bárány Zsolt Béla

I. oldat (kr. só)	+	II. oldat (víz)	$\rightarrow$	III. oldat
$m_1 =$ 300,0 g		$m_2 =$ 1200 g		$m_3 =$ 1500 g
$w\%_1 =$ 44,08		$w\%_2 =$ 0,000		$w\%_3 =$ a

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$300{,}0 \cdot 44{,}08 + 1200 \cdot 0{,}000 = 1500 \cdot a$

amelyből $a = \boldsymbol{w\%_3} = \underline{\textbf{8,816}}$.

153. **A)**

Ha 100 gramm víz és 35,9 gramm só felhasználásával 135,9 gramm telített oldat keletkezik, akkor 150 gramm telített oldat készítéséhez

$\boldsymbol{m}(\textbf{só}) = \frac{35{,}9 \cdot 150}{135{,}9} = 39{,}62$ g $\approx \underline{\textbf{39,6 g}}$ szükséges.

B)

Ha 100 gramm víz és 84,2 gramm só felhasználásával 184,2 gramm telített oldat keletkezik, akkor 250 gramm telített oldat készítéséhez

$\boldsymbol{m}(\textbf{só}) = \frac{84{,}2 \cdot 250}{184{,}2} = 114{,}28$ g $\approx \underline{\textbf{114 g}}$ szükséges.

C)

Ha 100,0 gramm víz és 34,03 gramm só felhasználásával 134,03 gramm telített oldat keletkezik, akkor 35,0 gramm telített oldat készítéséhez
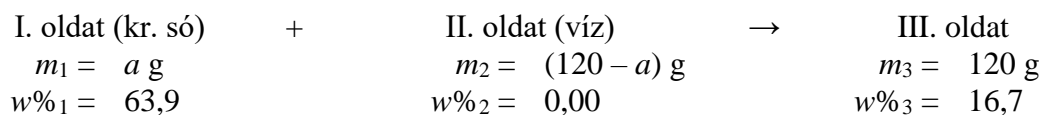
$\boldsymbol{m}(\textbf{só}) = \frac{34{,}03 \cdot 350{,}0}{134{,}03} = \underline{\textbf{88,86 g}}$ szükséges.

154. **A)**

$M(CuSO_4) = 159{,}61 \frac{g}{mol}$

$M(CuSO_4 \cdot 5\ H_2O) = 249{,}71 \frac{g}{mol}$

$w\%_1 = \frac{159{,}61\ \text{g } CuSO_4}{249{,}71\ \text{g } CuSO_4 \cdot 5\ H_2O} \cdot 100 = 63{,}9$

I. oldat (kr. só)	+	II. oldat (víz)	$\rightarrow$	III. oldat
$m_1 =$ a g		$m_2 =$ $(120 - a)$ g		$m_3 =$ 120 g
$w\%_1 =$ 63,9		$w\%_2 =$ 0,00		$w\%_3 =$ 16,7

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$a \cdot 63{,}9 + (120 - a) \cdot 0{,}00 = 120 \cdot 16{,}7$

amelyből $a = \boldsymbol{m_1} = 31{,}36$ g $\approx \underline{\textbf{31,4 g}}$.

B)

$M(Na_2CO_3) = 105{,}99 \frac{g}{mol}$

$M(Na_2CO_3 \cdot 10\ H_2O) = 286{,}19 \frac{g}{mol}$

$w\%_1 = \frac{105{,}99\ \text{g } Na_2CO_3}{286{,}19\ \text{g } Na_2CO_3 \cdot 10\ H_2O} \cdot 100 = 37{,}0$

I. oldat (kr. só)	+	II. oldat (víz)	$\rightarrow$	III. oldat
$m_1 =$ a g		$m_2 =$ $(200 - a)$ g		$m_3 =$ 200 g
$w\%_1 =$ 37,0		$w\%_2 =$ 0,00		$w\%_3 =$ 32,2
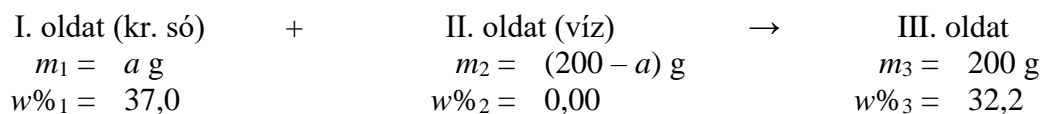
$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$a \cdot 37{,}0 + (200 - a) \cdot 0{,}00 = 200 \cdot 32{,}2$

amelyből $a = m_1 =$ 173,89 g ≈ **174 g**.

C)

$M(KAl(SO_4)_2) = 258{,}2\ \frac{g}{mol}$

$M(KAl(SO_4)_2 \cdot 12\ H_2O) = 474{,}44\ \frac{g}{mol}$

$w\%_1 = \dfrac{258{,}2\ g\ KAl(SO_4)_2}{474{,}44\ g\ KAl(SO_4)_2 \cdot 12\ H_2O} \cdot 100 = 54{,}4$

	I. oldat (kr. só)	+	II. oldat (víz)	→	III. oldat
$m_1 =$	a g		$m_2 =$ (300 − a) g		$m_3 =$ 300 g
$w\%_1 =$	54,4		$w\%_2 =$ 0,00		$w\%_3 =$ 5,57

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$a \cdot 54{,}4 + (300 - a) \cdot 0{,}00 = 300 \cdot 5{,}57$

amelyből $a = m_1 =$ **30,7 g**.

155. A)

20,0 °C-on: $\quad w\%_3 = \dfrac{70{,}0\ g\ vízmentes\ só}{(100 + 70{,}0)\ g\ telített\ oldat} \cdot 100 = 41{,}176 ≈ 41{,}2$

	I. oldat (kr. só)	+	II. oldat (víz)	→	III. oldat
$m_1 =$	77,6 g		$m_2 =$ 42,2 g		$m_3 =$ 119,8 g
$w\%_1 =$	a		$w\%_2 =$ 0,00		$w\%_3 =$ 41,2

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$77{,}6 \cdot a + 42{,}2 \cdot 0{,}00 = 119{,}8 \cdot 41{,}2$

amelyből $a = w\%_1 = 63{,}57 ≈ 63{,}6$.

Ez azt jelenti, hogy minden 100 gramm kristályvizes só 63,57 gramm vízmentes sót és 36,43 gramm vizet tartalmaz. Ezek anyagmennyiségei:

$n(Na_2S_2O_3) = \dfrac{m(Na_2S_2O_3)}{M(Na_2S_2O_3)} = \dfrac{63{,}57\ g}{158{,}1\ \frac{g}{mol}} = 0{,}402\ mol$

$n(H_2O) = \dfrac{m(H_2O)}{M(H_2O)} = \dfrac{36{,}43\ g}{18{,}02\ \frac{g}{mol}} = 2{,}02\ mol$

Ha $\quad$ 0,402 mol $Na_2S_2O_3$-tal $\quad$ 2,02 mol víz kristályosodik, akkor

$\qquad$ 1,00 mol $Na_2S_2O_3$-tal $\quad$ 5,03 mol víz kristályosodik, vagyis a kristályvizes

só képlete: **$Na_2S_2O_3 \cdot 5\ H_2O$**.

B)

20,0 °C-on: $\quad w\%_3 = \dfrac{37{,}5\ g\ vízmentes\ só}{(100 + 37{,}5)\ g\ telített\ oldat} \cdot 100 = 27{,}27 ≈ 27{,}3$

	I. oldat (kr. só)	+	II. oldat (víz)	→	III. oldat
$m_1 =$	68,0 g		$m_2 =$ 69,5 g		$m_3 =$ 137,5 g
$w\%_1 =$	a		$w\%_2 =$ 0,00		$w\%_3 =$ 27,3

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$68{,}0 \cdot a + 69{,}5 \cdot 0{,}00 = 137{,}5 \cdot 27{,}3$

amelyből $a = w\%_1 = 55{,}147 ≈ 55{,}1$.

Ez azt jelenti, hogy minden 100 gramm kristályvizes só 55,1 gramm vízmentes sót és 44,9 gramm vizet tartalmaz. Ezek anyagmennyiségei:

$$n(\text{NiSO}_4) = \frac{m(\text{NiSO}_4)}{M(\text{NiSO}_4)} = \frac{55,1 \text{ g}}{154,75 \frac{\text{g}}{\text{mol}}} = 0,356 \text{ mol}$$

$$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{44,9 \text{ g}}{18,02 \frac{\text{g}}{\text{mol}}} = 2,49 \text{ mol}$$

Ha   0,356 mol NiSO$_4$-tal   2,49 mol víz kristályosodik, akkor
        1,00 mol NiSO$_4$-tal   6,98 mol víz kristályosodik, vagyis a kristályvizes
só képlete: **NiSO$_4$·7 H$_2$O**.

C)

20,0 °C-on: $w\%_3 = \frac{20,70 \text{ g vízmentes só}}{(100,0 + 20,70) \text{ g telített oldat}} \cdot 100 = 17,15$

	I. oldat (kr. só)	+	II. oldat (víz)	→	III. oldat
$m_1 =$	64,70 g		$m_2 =$ 176,6 g		$m_3 =$ 241,3 g
$w\%_1 =$	a		$w\%_2 =$ 0,000		$w\%_3 =$ 17,15

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
$64,70 \cdot a + 176,6 \cdot 0,000 = 241,3 \cdot 17,15$
amelyből $a = w\%_1 = 63,96$.

Ez azt jelenti, hogy minden 100 gramm kristályvizes só 63,96 gramm vízmentes sót és 36,04 gramm vizet tartalmaz. Ezek anyagmennyiségei:

$$n(\text{CuSO}_4) = \frac{m(\text{CuSO}_4)}{M(\text{CuSO}_4)} = \frac{63,96 \text{ g}}{159,61 \frac{\text{g}}{\text{mol}}} = 0,4007 \text{ mol}$$

$$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{36,04 \text{ g}}{18,02 \frac{\text{g}}{\text{mol}}} = 2,000 \text{ mol}$$

Ha   0,4007 mol CuSO$_4$-tal   2,000 mol víz kristályosodik, akkor
        1,000 mol CuSO$_4$-tal   4,991 mol víz kristályosodik, vagyis a kristályvizes só képlete: **CuSO$_4$·5 H$_2$O**.

156. **A)**

$$M(\text{CuSO}_4) = 159,61 \frac{\text{g}}{\text{mol}}$$

$$M(\text{CuSO}_4 \cdot 5 \text{ H}_2\text{O}) = 249,71 \frac{\text{g}}{\text{mol}}$$

$$w\%_2 = \frac{159,61 \text{ g CuSO}_4}{249,71 \text{ g CuSO}_4 \cdot 5 \text{ H}_2\text{O}} \cdot 100 = 63,9$$

	I. oldat	+	II. oldat (kr. só)	→	III. oldat
$m_1 =$	6300 g		$m_2 =$ 700 g		$m_3 =$ 7000 g
$w\%_1 =$	12,0		$w\%_2 =$ 63,9		$w\%_3 =$ a

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
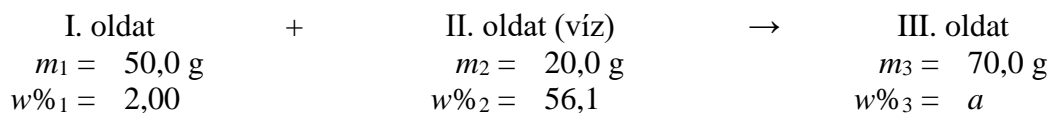$6300 \cdot 12,0 + 700 \cdot 63,9 = 7000 \cdot a$
amelyből $a = \boldsymbol{w\%_3} = 17,19 \approx \underline{\textbf{17,2}}$.

B)

$$M(\text{ZnSO}_4) = 161,44 \frac{\text{g}}{\text{mol}}$$

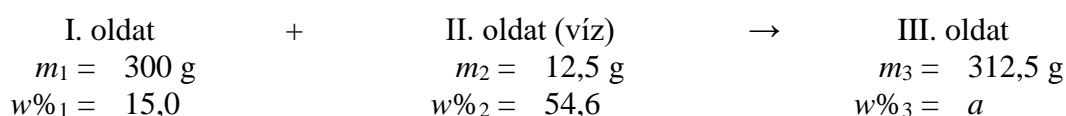$$M(\text{ZnSO}_4 \cdot 7 \text{ H}_2\text{O}) = 287,58 \frac{\text{g}}{\text{mol}}$$

$$w\%_2 = \frac{161,44 \text{ g ZnSO}_4}{287,58 \text{ g ZnSO}_4 \cdot 7 \text{ H}_2\text{O}} \cdot 100 = 56,1$$

I. oldat	+	II. oldat (víz)	$\rightarrow$	III. oldat
$m_1 = $ 50,0 g		$m_2 = $ 20,0 g		$m_3 = $ 70,0 g
$w\%_1 = $ 2,00		$w\%_2 = $ 56,1		$w\%_3 = $ a

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$50,0 \cdot 2,00 + 20,0 \cdot 56,1 = 70,0 \cdot a$

amelyből $a = \boldsymbol{w\%_3} = 17,47 \approx \underline{\textbf{17,5}}$.

C)

$M(FeSO_4) = 151,91 \ \frac{g}{mol}$

$M(FeSO_4 \cdot 7 \ H_2O) = 278,05 \ \frac{g}{mol}$

$w\%_2 = \frac{151,91 \ \text{g FeSO}_4}{278,05 \ \text{g FeSO}_4 \cdot 7 \ \text{H}_2\text{O}} \cdot 100 = 54,6$

I. oldat	+	II. oldat (víz)	$\rightarrow$	III. oldat
$m_1 = $ 300 g		$m_2 = $ 12,5 g		$m_3 = $ 312,5 g
$w\%_1 = $ 15,0		$w\%_2 = $ 54,6		$w\%_3 = $ a

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$300 \cdot 15,0 + 12,5 \cdot 54,6 = 312,5 \cdot a$

amelyből $a = \boldsymbol{w\%_3} = 16,59 \approx \underline{\textbf{16,6}}$.

157. A)

$M(CuSO_4) = 159,61 \ \frac{g}{mol}$

$M(CuSO_4 \cdot 5 \ H_2O) = 249,71 \ \frac{g}{mol}$

$w\%_2 = \frac{159,61 \ \text{g CuSO}_4}{249,71 \ \text{g CuSO}_4 \cdot 5 \ \text{H}_2\text{O}} \cdot 100 = 63,9$

I. oldat	+	II. oldat (kr. só)	$\rightarrow$	III. oldat
$m_1 = $ a g		$m_2 = $ $(555 - a)$ g		$m_3 = $ 555 g
$w\%_1 = $ 10,0		$w\%_2 = $ 63,9		$w\%_3 = $ 32,0
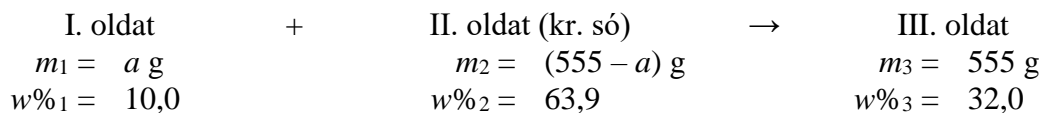
$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$a \cdot 10,0 + (555 - a) \cdot 63,9 = 555 \cdot 32,0$

amelyből $a = \boldsymbol{m_1} = 328,55 \ \text{g} \approx \underline{\textbf{329 g}}$,

$(555 - a) = \boldsymbol{m_2} = 226,45 \ \text{g} \approx \underline{\textbf{226 g}}$.

B)

$M(FeSO_4) = 151,91 \ \frac{g}{mol}$

$M(FeSO_4 \cdot 7 \ H_2O) = 278,05 \ \frac{g}{mol}$

$w\%_2 = \frac{151,91 \ \text{g FeSO}_4}{278,05 \ \text{g FeSO}_4 \cdot 7 \ \text{H}_2\text{O}} \cdot 100 = 54,6$

I. oldat	+	II. oldat (kr. só)	$\rightarrow$	III. oldat
$m_1 = $ a g		$m_2 = $ $(753 - a)$ g		$m_3 = $ 753 g
$w\%_1 = $ 14,0		$w\%_2 = $ 54,6		$w\%_3 = $ 26,0
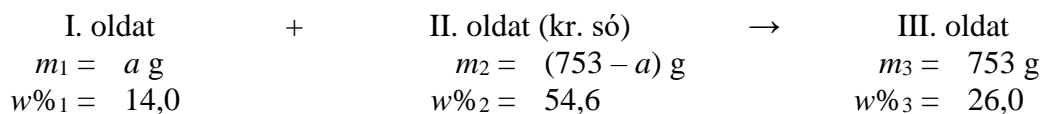
$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$a \cdot 14,0 + (753 - a) \cdot 54,6 = 753 \cdot 26,0$

amelyből $a = \boldsymbol{m_1} = 530,63 \ \text{g} \approx \underline{\textbf{531 g}}$,

$(753 - a) = \mathbf{m_2} = 222,37 \text{ g} \approx \underline{\mathbf{222\ g}}$.

C)

$M(\text{Na}_2\text{SO}_4) = 142,04\ \frac{\text{g}}{\text{mol}}$

$M(\text{Na}_2\text{SO}_4 \cdot 10\ \text{H}_2\text{O}) = 322,24\ \frac{\text{g}}{\text{mol}}$

$w\%_2 = \frac{142,04\ \text{g Na}_2\text{SO}_4}{322,24\ \text{g Na}_2\text{SO}_4 \cdot 10\ \text{H}_2\text{O}} \cdot 100 = 44,1$

	I. oldat	+	II. oldat (kr. só)	→	III. oldat
$m_1 =$	a g		$m_2 =$ $(2500 - a)$ g		$m_3 =$ 2500 g
$w\%_1 =$	5,00		$w\%_2 =$ 44,1		$w\%_3 =$ 20,0

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$a \cdot 5,00 + (2500 - a) \cdot 44,1 = 2500 \cdot 20,0$

amelyből $a = \mathbf{m_1} = 1540,40 \text{ g} \approx \underline{\mathbf{1,54 \cdot 10^3\ g}}$,

$(2500 - a) = \mathbf{m_2} = 959,6 \text{ g} \approx \underline{\mathbf{960\ g}}$.

158. **A)**

$m_3 = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 1,08\ \frac{\text{g}}{\text{cm}^3} \cdot 125\ \text{cm}^3 = 135\ \text{g}$

$M(\text{CuSO}_4) = 159,61\ \frac{\text{g}}{\text{mol}}$

$M(\text{CuSO}_4 \cdot 5\ \text{H}_2\text{O}) = 249,71\ \frac{\text{g}}{\text{mol}}$

$w\%_2 = \frac{159,61\ \text{g CuSO}_4}{249,71\ \text{g CuSO}_4 \cdot 5\ \text{H}_2\text{O}} \cdot 100 = 63,9$

	I. oldat	+	II. oldat (kr. só)	→	III. oldat
$m_1 =$	a g		$m_2 =$ $(135 - a)$ g		$m_3 =$ 135 g
$w\%_1 =$	1,00		$w\%_2 =$ 63,9		$w\%_3 =$ 8,00

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$a \cdot 1,00 + (135 - a) \cdot 63,9 = 135 \cdot 8,00$

amelyből $a = \mathbf{m_1} = 119,98 \text{ g} \approx \underline{\mathbf{120\ g}}$,

$(135 - a) = \mathbf{m_2} = 15,02 \text{ g} \approx \underline{\mathbf{15,0\ g}}$.

B)

$m_3 = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 1,12\ \frac{\text{g}}{\text{cm}^3} \cdot 200\ \text{cm}^3 = 224\ \text{g}$

$M(\text{FeSO}_4) = 151,91\ \frac{\text{g}}{\text{mol}}$

$M(\text{FeSO}_4 \cdot 7\ \text{H}_2\text{O}) = 278,05\ \frac{\text{g}}{\text{mol}}$

$w\%_2 = \frac{151,91\ \text{g FeSO}_4}{278,05\ \text{g FeSO}_4 \cdot 7\ \text{H}_2\text{O}} \cdot 100 = 54,6$

	I. oldat	+	II. oldat (kr. só)	→	III. oldat
$m_1 =$	a g		$m_2 =$ $(224 - a)$ g		$m_3 =$ 224 g
$w\%_1 =$	5,00		$w\%_2 =$ 54,6		$w\%_3 =$ 10,0

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$a \cdot 5,00 + (224 - a) \cdot 54,6 = 224 \cdot 10,0$

amelyből $a = \mathbf{m_1} = 201,43 \text{ g} \approx \underline{\mathbf{201\ g}}$,

$(224 - a) = \mathbf{m_2} = 22,57 \text{ g} \approx \underline{\mathbf{22,6\ g}}$.

C)

$m_3 = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 1{,}10 \, \frac{\text{g}}{\text{cm}^3} \cdot 400 \, \text{cm}^3 = 440 \, \text{g}$

$M(\text{NiSO}_4) = 154{,}75 \, \frac{\text{g}}{\text{mol}}$

$M(\text{NiSO}_4 \cdot 7 \, \text{H}_2\text{O}) = 280{,}89 \, \frac{\text{g}}{\text{mol}}$

$w\%_2 = \frac{154{,}75 \, \text{g NiSO}_4}{280{,}89 \, \text{g NiSO}_4 \cdot 7 \, \text{H}_2\text{O}} \cdot 100 = 55{,}1$

	I. oldat	+	II. oldat (kr. só)	→	III. oldat
$m_1 =$	a g		$m_2 = (440 - a)$ g		$m_3 = 440$ g
$w\%_1 =$	10,0		$w\%_2 = 55{,}1$		$w\%_3 = 15{,}0$

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
$a \cdot 10{,}0 + (440 - a) \cdot 55{,}1 = 440 \cdot 15{,}0$
amelyből $a = \boldsymbol{m_1} = 391{,}21 \, \text{g} \approx \boldsymbol{\underline{391 \, \text{g}}}$,
$(440 - a) = \boldsymbol{m_2} = 48{,}79 \, \text{g} \approx \boldsymbol{\underline{48{,}8 \, \text{g}}}$.

159. A)

$M(\text{CuSO}_4) = 159{,}61 \, \frac{\text{g}}{\text{mol}}$

$M(\text{CuSO}_4 \cdot 5 \, \text{H}_2\text{O}) = 249{,}71 \, \frac{\text{g}}{\text{mol}}$

$w\%_1 = \frac{159{,}61 \, \text{g CuSO}_4}{249{,}71 \, \text{g CuSO}_4 \cdot 5 \, \text{H}_2\text{O}} \cdot 100 = 63{,}9$

	I. oldat (kr. só)	+	II. oldat	→	III. oldat
$m_1 =$	a g		$m_2 = 100$ g		$m_3 = (a + 100)$ g
$w\%_1 =$	63,9		$w\%_2 = 10{,}0$		$w\%_3 = 16{,}7$

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
$a \cdot 63{,}9 + 100 \cdot 10{,}0 = (a + 100) \cdot 16{,}7$
amelyből $a = \boldsymbol{m_1} = 14{,}19 \, \text{g} \approx \boldsymbol{\underline{14{,}2 \, \text{g}}}$.

B)

$M(\text{Na}_2\text{CO}_3) = 105{,}99 \, \frac{\text{g}}{\text{mol}}$

$M(\text{Na}_2\text{CO}_3 \cdot 10 \, \text{H}_2\text{O}) = 286{,}19 \, \frac{\text{g}}{\text{mol}}$

$w\%_1 = \frac{105{,}99 \, \text{g Na}_2\text{CO}_3}{286{,}19 \, \text{g Na}_2\text{CO}_3 \cdot 10 \, \text{H}_2\text{O}} \cdot 100 = 37{,}0$

	I. oldat (kr. só)	+	II. oldat	→	III. oldat
$m_1 =$	a g		$m_2 = 230$ g		$m_3 = (a + 230)$ g
$w\%_1 =$	37,0		$w\%_2 = 20{,}0$		$w\%_3 = 32{,}2$

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
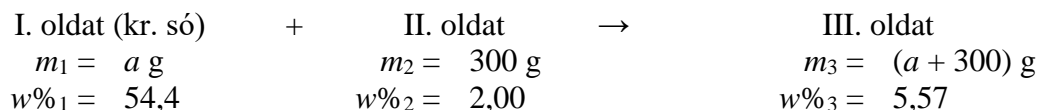$a \cdot 37{,}0 + 230 \cdot 20{,}0 = (a + 230) \cdot 32{,}2$
amelyből $a = \boldsymbol{m_1} = 580{,}38 \, \text{g} \approx \boldsymbol{\underline{580 \, \text{g}}}$.

C)

$M(\text{KAl(SO}_4)_2) = 258{,}2 \, \frac{\text{g}}{\text{mol}}$

$M(\text{KAl(SO}_4)_2 \cdot 12 \, \text{H}_2\text{O}) = 474{,}44 \, \frac{\text{g}}{\text{mol}}$

$w\%_1 = \frac{258{,}2 \, \text{g KAl(SO}_4)_2}{474{,}44 \, \text{g KAl(SO}_4)_2 \cdot 12 \, \text{H}_2\text{O}} \cdot 100 = 54{,}4$

I. oldat (kr. só)	+	II. oldat	$\rightarrow$	III. oldat
$m_1 =$ a g		$m_2 =$ 300 g		$m_3 =$ $(a + 300)$ g
$w\%_1 =$ 54,4		$w\%_2 =$ 2,00		$w\%_3 =$ 5,57

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$a \cdot 54,4 + 300 \cdot 2,00 = (a + 300) \cdot 5,57$

amelyből $a = \boldsymbol{m_1} = 21,92$ g $\approx$ **21,9 g**.

160. **A)**

50,0 °C-on: $w\% = \dfrac{33,3 \text{ g vízmentes só}}{(100 + 33,3) \text{ g telített oldat}} \cdot 100 = 25,0$
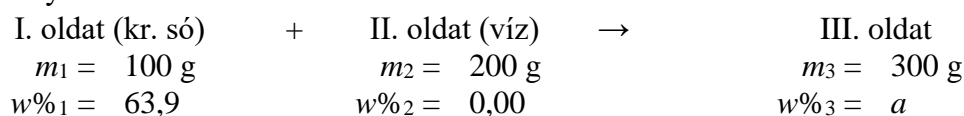
$M(CuSO_4) = 159,61 \dfrac{\text{g}}{\text{mol}}$

$M(CuSO_4 \cdot 5 \ H_2O) = 249,71 \dfrac{\text{g}}{\text{mol}}$

$w\%_1 = \dfrac{159,61 \text{ g } CuSO_4}{249,71 \text{ g } CuSO_4 \cdot 5 \ H_2O} \cdot 100 = 63,9$

100 gramm víz legfeljebb 33,3 gramm sót old, így a 200 gramm vízben legfeljebb 66,6 gramm só oldható fel. Mivel 100 gramm vízmentes sót szeretnénk feloldani, amely több, mint a maximálisan feloldható 66,6 gramm, **telített oldatot kapunk** és a só egy része kristályos formában az edény alján marad.

Az oldat **25,0 *w*%-os** lesz.

Kristályvizes só esetén:

I. oldat (kr. só)	+	II. oldat (víz)	$\rightarrow$	III. oldat
$m_1 =$ 100 g		$m_2 =$ 200 g		$m_3 =$ 300 g
$w\%_1 =$ 63,9		$w\%_2 =$ 0,00		$w\%_3 =$ a

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$100 \cdot 63,9 + 200 \cdot 0,00 = 300 \cdot a$

amelyből $a = \boldsymbol{w\%_3} = 21,31 \approx$ **21,3**.

Ez kisebb koncentráció, mint a 25,0 *w*%, vagyis ebben az esetben **telítetlen oldatot kapunk**.

B)

20,0 °C-on: $w\% = \dfrac{20,7 \text{ g vízmentes só}}{(100 + 20,7) \text{ g telített oldat}} \cdot 100 = 17,1$

$M(CuSO_4) = 159,61 \dfrac{\text{g}}{\text{mol}}$

$M(CuSO_4 \cdot 5 \ H_2O) = 249,71 \dfrac{\text{g}}{\text{mol}}$

$w\%_1 = \dfrac{159,61 \text{ g } CuSO_4}{249,71 \text{ g } CuSO_4 \cdot 5 \ H_2O} \cdot 100 = 63,9$

100 gramm víz legfeljebb 17,1 gramm sót old, így a 300 gramm vízben legfeljebb 51,4 gramm só oldható fel. Mivel 100 gramm vízmentes sót szeretnénk feloldani, amely több, mint a maximálisan feloldható 51,4 gramm, **telített oldatot kapunk** és a só egy része kristályos formában az edény alján marad.

Az oldat **17,1 *w*%-os** lesz.

Kristályvizes só esetén:

I. oldat (kr. só)	+	II. oldat (víz)	→	III. oldat
$m_1 = $ 100 g		$m_2 = $ 300 g		$m_3 = $ 400 g
$w\%_1 = $ 63,9		$w\%_2 = $ 0,00		$w\%_3 = $ a

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
$100 \cdot 63,9 + 300 \cdot 0,00 = 400 \cdot a$
amelyből $a = w\%_3 = 15,98 \approx$ **16,0**.
Ez kisebb koncentráció, mint a 17,1 $w\%$, vagyis ebben az esetben **telítetlen oldatot kapunk**.

C)

80,0 °C-on: $w\% = \dfrac{53,6 \text{ g vízmentes só}}{(100 + 53,6) \text{ g telített oldat}} \cdot 100 = 34,9$

$M(CuSO_4) = 159,61 \dfrac{g}{mol}$

$M(CuSO_4 \cdot 5\,H_2O) = 249,71 \dfrac{g}{mol}$

$w\%_1 = \dfrac{159,61 \text{ g } CuSO_4}{249,71 \text{ g } CuSO_4 \cdot 5\,H_2O} \cdot 100 = 63,9$

100 gramm víz legfeljebb 53,6 gramm sót old, így a 250 gramm vízben legfeljebb 134 gramm só oldható fel. Mivel 100 gramm vízmentes sót szeretnénk feloldani, amely kevesebb, mint a maximálisan feloldható 134 gramm, **telítetlen oldatot kapunk**.
Az oldat **28,6 $w\%$-os** lesz.

Kristályvizes só esetén:

I. oldat (kr. só)	+	II. oldat (víz)	→	III. oldat
$m_1 = $ 100 g		$m_2 = $ 250 g		$m_3 = $ 350 g
$w\%_1 = $ 63,9		$w\%_2 = $ 0,00		$w\%_3 = $ a

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
$100 \cdot 63,9 + 250 \cdot 0,00 = 350 \cdot a$
amelyből $a = w\%_3 = 18,26 \approx$ **18,3**.
Ez kisebb koncentráció, mint a 34,9 $w\%$, vagyis ebben az esetben **telítetlen oldatot kapunk**.

161. A)

I. oldat (80,0 °C)	–	II. oldat (só)	→	III. oldat (20,0 °C)
$m_1 = $ 235 g		$m_2 = $ a g		$m_3 = $ (235 − a) g
$w\%_1 = $ 63,0		$w\%_2 = $ 100		$w\%_3 = $ 24,2

$m_1 \cdot w\%_1 - m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
$235 \cdot 63,0 - a \cdot 100 = (235 - a) \cdot 24,2$
amelyből $a = m_2 = 120,29$ g $\approx$ **120 g**.

B)

I. oldat (70,0 °C)	–	II. oldat (só)	→	III. oldat (10,0 °C)
$m_1 = $ 36,0 g		$m_2 = $ a g		$m_3 = $ (36,0 − a) g
$w\%_1 = $ 60,6		$w\%_2 = $ 100		$w\%_3 = $ 50,8

$m_1 \cdot w\%_1 - m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
$36,0 \cdot 60,6 - a \cdot 100 = (36,0 - a) \cdot 50,8$

amelyből $a = m_2 = $ **7,17 g**.

C)

I. oldat (80,0 °C)	–	II. oldat (só)	→	III. oldat (0,00 °C)
$m_1 = $ 4500 g		$m_2 = $ a g		$m_3 = $ (4500 − a) g
$w\%_1 = $ 33,9		$w\%_2 = $ 100		$w\%_3 = $ 21,7
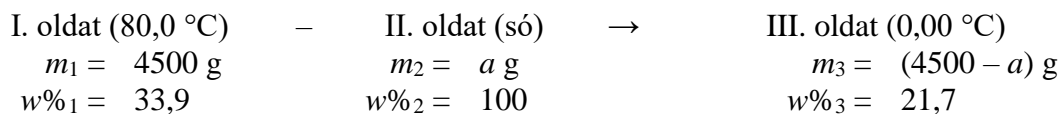
$m_1 \cdot w\%_1 - m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
$4500 \cdot 33,9 - a \cdot 100 = (4500 - a) \cdot 21,7$
amelyből $a = m_2 = 701,15$ g $\approx$ **701 g**.
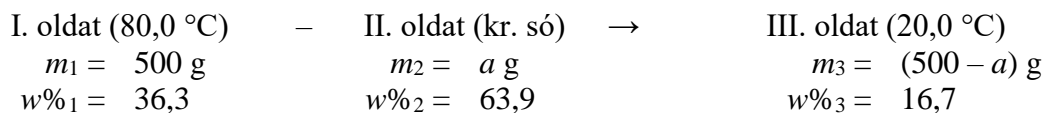
162. **A)**

$M(CuSO_4) = 159,61 \frac{g}{mol}$

$M(CuSO_4 \cdot 5\ H_2O) = 249,71 \frac{g}{mol}$

$w\%_2 = \frac{159,61\ g\ CuSO_4}{249,71\ g\ CuSO_4 \cdot 5\ H_2O} \cdot 100 = 63,9$

I. oldat (80,0 °C)	–	II. oldat (kr. só)	→	III. oldat (20,0 °C)
$m_1 = $ 500 g		$m_2 = $ a g		$m_3 = $ (500 − a) g
$w\%_1 = $ 36,3		$w\%_2 = $ 63,9		$w\%_3 = $ 16,7

$m_1 \cdot w\%_1 - m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
$500 \cdot 36,3 - a \cdot 63,9 = (500 - a) \cdot 16,7$
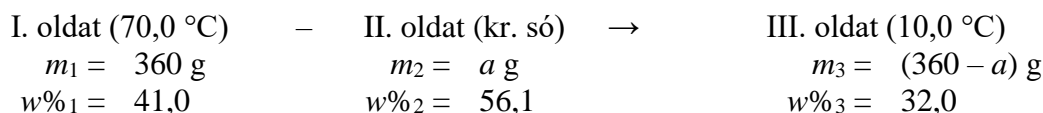amelyből $a = m_2 = 207,55$ g $\approx$ **208 g**.

B)

A feladat szövege helyesen: „A cink-szulfát telített oldata 70,0 °C-on 41,0 $w\%$-os…".

$M(ZnSO_4) = 161,44 \frac{g}{mol}$

$M(ZnSO_4 \cdot 7\ H_2O) = 287,58 \frac{g}{mol}$

$w\%_2 = \frac{161,44\ g\ ZnSO_4}{287,58\ g\ ZnSO_4 \cdot 7\ H_2O} \cdot 100 = 56,1$

I. oldat (70,0 °C)	–	II. oldat (kr. só)	→	III. oldat (10,0 °C)
$m_1 = $ 360 g		$m_2 = $ a g		$m_3 = $ (360 − a) g
$w\%_1 = $ 41,0		$w\%_2 = $ 56,1		$w\%_3 = $ 32,0

$m_1 \cdot w\%_1 - m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
$360 \cdot 41,0 - a \cdot 56,1 = (360 - a) \cdot 32,0$
amelyből $a = m_2 = 134,44$ g $\approx$ **134 g**.

C)

$M(FeSO_4) = 151,91 \frac{g}{mol}$

$M(FeSO_4 \cdot 7\ H_2O) = 278,05 \frac{g}{mol}$

$w\%_2 = \frac{151,91\ g\ FeSO_4}{278,05\ g\ FeSO_4 \cdot 7\ H_2O} \cdot 100 = 54,6$

I. oldat (80,0 °C)	–	II. oldat (só)	→	III. oldat (0,00 °C)
$m_1 = $ 3500 g		$m_2 = $ a g		$m_3 = $ (3500 − a) g
$w\%_1 = $ 30,4		$w\%_2 = $ 54,6		$w\%_3 = $ 13,5
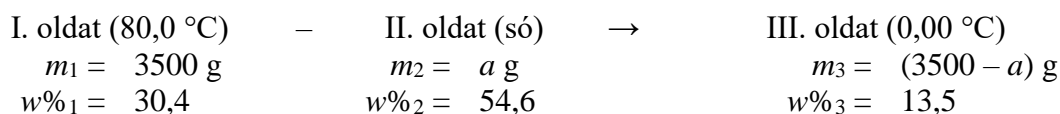
$m_1 \cdot w\%_1 - m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$3500 \cdot 30{,}4 - a \cdot 54{,}6 = (3500 - a) \cdot 13{,}5$

amelyből $a = \boldsymbol{m_2} = 1437{,}98$ g $\approx \boldsymbol{\underline{1{,}44 \cdot 10^3 \text{ g}}}$.

163. **A)**

$M(\text{CuSO}_4) = 159{,}61 \frac{\text{g}}{\text{mol}}$

$M(\text{CuSO}_4 \cdot 5 \text{ H}_2\text{O}) = 249{,}71 \frac{\text{g}}{\text{mol}}$

$w\%_3 = \frac{159{,}61 \text{ g CuSO}_4}{249{,}71 \text{ g CuSO}_4 \cdot 5 \text{ H}_2\text{O}} \cdot 100 = 63{,}9$

	I. oldat	–	II. oldat (víz)	–	III. oldat (kr. só)	$\rightarrow$	IV. oldat (20,0 °C)
$m_1 =$	700 g		$m_2 =$ 250 g		$m_3 =$ a g		$m_4 =$ $(450 - a)$ g
$w\%_1 =$	10,0		$w\%_2 =$ 0,00		$w\%_3 =$ 63,9		$w\%_4 =$ 16,7

$m_1 \cdot w\%_1 - m_2 \cdot w\%_2 - m_3 \cdot w\%_3 = m_4 \cdot w\%_4$

$700 \cdot 10{,}0 - 250 \cdot 0{,}00 - a \cdot 63{,}9 = (450 - a) \cdot 16{,}7$

amelyből $a = m_3 = -10{,}91$ g $\approx -10{,}9$ g.

A negatív tömeg azt jelenti, hogy **nem válik ki kristályvizes só** a folyamat közben.

B)

$M(\text{ZnSO}_4) = 161{,}44 \frac{\text{g}}{\text{mol}}$

$M(\text{ZnSO}_4 \cdot 7 \text{ H}_2\text{O}) = 287{,}58 \frac{\text{g}}{\text{mol}}$

$w\%_3 = \frac{161{,}44 \text{ g ZnSO}_4}{287{,}58 \text{ g ZnSO}_4 \cdot 7 \text{ H}_2\text{O}} \cdot 100 = 56{,}1$

	I. oldat	–	II. oldat (víz)	–	III. oldat (kr. só)	$\rightarrow$	IV. oldat (10,0 °C)
$m_1 =$	450 g		$m_2 =$ 200 g		$m_3 =$ a g		$m_4 =$ $(250 - a)$ g
$w\%_1 =$	20,0		$w\%_2 =$ 0,00		$w\%_3 =$ 56,1		$w\%_4 =$ 32,0

$m_1 \cdot w\%_1 - m_2 \cdot w\%_2 - m_3 \cdot w\%_3 = m_4 \cdot w\%_4$

$450 \cdot 20{,}0 - 200 \cdot 0{,}00 - a \cdot 56{,}1 = (250 - a) \cdot 32{,}0$

amelyből $a = m_3 = 41{,}43$ g $\approx 41{,}4$ g.

A pozitív tömeg azt jelenti, hogy **kristályvizes só válik ki** a folyamat közben.

C)

$M(\text{FeSO}_4) = 151{,}91 \frac{\text{g}}{\text{mol}}$

$M(\text{FeSO}_4 \cdot 7 \text{ H}_2\text{O}) = 278{,}05 \frac{\text{g}}{\text{mol}}$

$w\%_3 = \frac{151{,}91 \text{ g FeSO}_4}{278{,}05 \text{ g FeSO}_4 \cdot 7 \text{ H}_2\text{O}} \cdot 100 = 54{,}6$

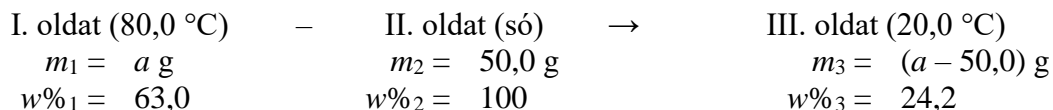|	I. oldat	–	II. oldat (víz)	–	III. oldat (kr. só)	$\rightarrow$	IV. oldat (20,0 °C)
$m_1 =$	2500 g		$m_2 =$ 750 g		$m_3 =$ a g		$m_4 =$ $(1750 - a)$ g
$w\%_1 =$	15,0		$w\%_2 =$ 0,00		$w\%_3 =$ 54,6		$w\%_4 =$ 20,8

$m_1 \cdot w\%_1 - m_2 \cdot w\%_2 - m_3 \cdot w\%_3 = m_4 \cdot w\%_4$

$2500 \cdot 15{,}0 - 750 \cdot 0{,}00 - a \cdot 54{,}6 = (1750 - a) \cdot 20{,}8$

amelyből $a = m_3 = 32{,}51$ g $\approx 32{,}5$ g.

A pozitív tömeg azt jelenti, hogy **kristályvizes só válik ki** a folyamat közben.

Készült a *Gyűjtemény a Kémia emelt szintű oktatásához 9-10.* tankönyv feladataihoz.

Készítette: Bárány Zsolt Béla

164. **A)**

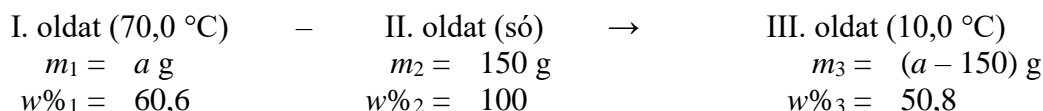| I. oldat (80,0 °C)	–	II. oldat (só)	→	III. oldat (20,0 °C)
$m_1 = a$ g		$m_2 = 50,0$ g		$m_3 = (a - 50,0)$ g
$w\%_1 = 63,0$		$w\%_2 = 100$		$w\%_3 = 24,2$

$m_1 \cdot w\%_1 - m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
$a \cdot 63,0 - 50,0 \cdot 100 = (a - 50,0) \cdot 24,2$
amelyből $a = $ **m_1** $= 97,68$ g $\approx$ **97,7 g**.

B)

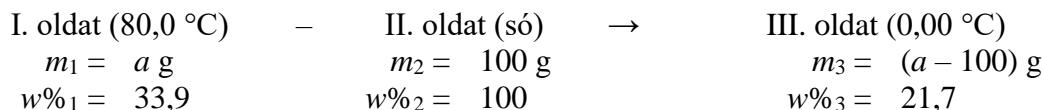| I. oldat (70,0 °C)	–	II. oldat (só)	→	III. oldat (10,0 °C)
$m_1 = a$ g		$m_2 = 150$ g		$m_3 = (a - 150)$ g
$w\%_1 = 60,6$		$w\%_2 = 100$		$w\%_3 = 50,8$

$m_1 \cdot w\%_1 - m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
$a \cdot 60,6 - 150 \cdot 100 = (a - 150) \cdot 50,8$
amelyből $a = $ **m_1** $= 753,06$ g $\approx$ **753 g**.

C)

I. oldat (80,0 °C)	–	II. oldat (só)	→	III. oldat (0,00 °C)
$m_1 = a$ g		$m_2 = 100$ g		$m_3 = (a - 100)$ g
$w\%_1 = 33,9$		$w\%_2 = 100$		$w\%_3 = 21,7$

$m_1 \cdot w\%_1 - m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
$a \cdot 33,9 - 100 \cdot 100 = (a - 100) \cdot 21,7$
amelyből $a = $ **m_1** $= 641,80$ g $\approx$ **642 g**.

165. **A)**

$M(CuSO_4) = 159,61 \frac{g}{mol}$

$M(CuSO_4 \cdot 5\ H_2O) = 249,71 \frac{g}{mol}$

$w\%_2 = \frac{159,61\ g\ CuSO_4}{249,71\ g\ CuSO_4 \cdot 5\ H_2O} \cdot 100 = 63,9$

I. oldat (80,0 °C)	–	II. oldat (kr. só)	→	III. oldat (20,0 °C)
$m_1 = a$ g		$m_2 = 10,0$ g		$m_3 = (a - 10,0)$ g
$w\%_1 = 36,3$		$w\%_2 = 63,9$		$w\%_3 = 16,7$
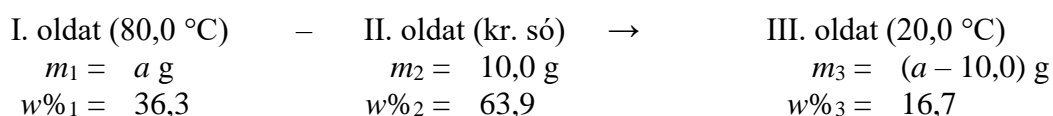
$m_1 \cdot w\%_1 - m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
$a \cdot 36,3 - 10,0 \cdot 63,9 = (a - 10,0) \cdot 16,7$
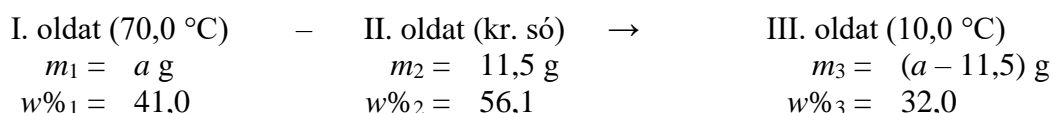amelyből $a = $ **m_1** $= 24,09$ g $\approx$ **24,1 g**.

B)

A feladat szövege helyesen: „A cink-szulfát telített oldata 70,0 °C-on 41,0 $w\%$-os…".

$M(ZnSO_4) = 161,44 \frac{g}{mol}$

$M(ZnSO_4 \cdot 7\ H_2O) = 287,58 \frac{g}{mol}$

$w\%_2 = \frac{161,44\ g\ ZnSO_4}{287,58\ g\ ZnSO_4 \cdot 7\ H_2O} \cdot 100 = 56,1$

I. oldat (70,0 °C)	–	II. oldat (kr. só)	→	III. oldat (10,0 °C)
$m_1 = a$ g		$m_2 = 11,5$ g		$m_3 = (a - 11,5)$ g
$w\%_1 = 41,0$		$w\%_2 = 56,1$		$w\%_3 = 32,0$

$m_1 \cdot w\%_1 - m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
$a \cdot 41{,}0 - 11{,}5 \cdot 56{,}1 = (a - 11{,}5) \cdot 32{,}0$
amelyből $a = \boldsymbol{m_1} = \underline{\textbf{30,8 g}}$.

C)

$M(FeSO_4) = 151{,}91 \, \frac{g}{mol}$

$M(FeSO_4 \cdot 7 \, H_2O) = 278{,}05 \, \frac{g}{mol}$

$w\%_2 = \frac{151{,}91 \text{ g FeSO}_4}{278{,}05 \text{ g FeSO}_4 \cdot 7 \text{ H}_2\text{O}} \cdot 100 = 54{,}6$

I. oldat (80,0 °C)	–	II. oldat (kr. só)	→	III. oldat (0,00 °C)
$m_1 = a$ g		$m_2 = 100$ g		$m_3 = (a - 100)$ g
$w\%_1 = 30{,}4$		$w\%_2 = 54{,}6$		$w\%_3 = 13{,}5$

$m_1 \cdot w\%_1 - m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
$a \cdot 30{,}4 - 100 \cdot 54{,}6 = (a - 100) \cdot 13{,}5$
amelyből $a = m_1 = 243{,}40$ g $\approx \underline{\textbf{243 g}}$.

166. A)

III. oldat (80,0 °C)	–	IV. oldat (só)	→	V. oldat (20,0 °C)
$m_3 = a$ g		$m_4 = 110$ g		$m_5 = (a - 110)$ g
$w\%_3 = 63{,}0$		$w\%_4 = 100$		$w\%_5 = 24{,}2$

$m_3 \cdot w\%_3 - m_4 \cdot w\%_4 = m_5 \cdot w\%_5$
$a \cdot 63{,}0 - 110 \cdot 100 = (a - 110) \cdot 24{,}2$
amelyből $a = m_3 = 214{,}90$ g ≈ 215 g.

I. oldat (só)	+	II. oldat (víz)	→	III. oldat (80,0 °C)
$m_1 = b$ g		$m_2 = (215 - b)$ g		$m_3 = 215$ g
$w\%_1 = 100$		$w\%_2 = 0{,}00$		$w\%_3 = 63{,}0$

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
$b \cdot 100 + (215 - b) \cdot 0{,}00 = 215 \cdot 63{,}0$
amelyből $b = \boldsymbol{m_1} = 135{,}39$ g $\approx \underline{\textbf{135 g}}$.

B)

III. oldat (70,0 °C)	–	IV. oldat (só)	→	V. oldat (10,0 °C)
$m_3 = a$ g		$m_4 = 1000$ g		$m_5 = (a - 1000)$ g
$w\%_3 = 60{,}6$		$w\%_4 = 100$		$w\%_5 = 50{,}8$

$m_3 \cdot w\%_3 - m_4 \cdot w\%_4 = m_5 \cdot w\%_5$
$a \cdot 60{,}6 - 1000 \cdot 100 = (a - 1000) \cdot 50{,}8$
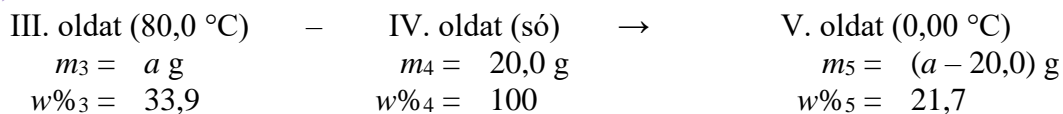amelyből $a = m_3 = 5020{,}41$ g $\approx 5{,}02 \cdot 10^3$ g.

I. oldat (só)	+	II. oldat (víz)	→	III. oldat (70,0 °C)
$m_1 = b$ g		$m_2 = (5{,}02 \cdot 10^3 - b)$ g		$m_3 = 5{,}02 \cdot 10^3$ g
$w\%_1 = 100$		$w\%_2 = 0{,}00$		$w\%_3 = 60{,}6$

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$b \cdot 100 + (5{,}02 \cdot 10^3 - b) \cdot 0{,}00 = 5{,}02 \cdot 10^3 \cdot 60{,}6$

amelyből $b = m_1 = 3042{,}37$ g $\approx$ **$3{,}04 \cdot 10^3$ g**.

C)

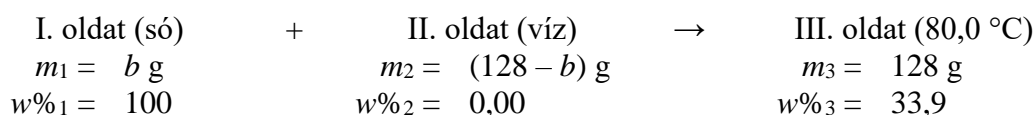| III. oldat (80,0 °C)	–	IV. oldat (só)	→	V. oldat (0,00 °C)
$m_3 = a$ g		$m_4 = 20{,}0$ g		$m_5 = (a - 20{,}0)$ g
$w\%_3 = 33{,}9$		$w\%_4 = 100$		$w\%_5 = 21{,}7$

$m_3 \cdot w\%_3 - m_4 \cdot w\%_4 = m_5 \cdot w\%_5$

$a \cdot 33{,}9 - 20{,}0 \cdot 100 = (a - 20{,}0) \cdot 21{,}7$

amelyből $a = m_3 = 128{,}36$ g ≈ 128 g.

I. oldat (só)	+	II. oldat (víz)	→	III. oldat (80,0 °C)
$m_1 = b$ g		$m_2 = (128 - b)$ g		$m_3 = 128$ g
$w\%_1 = 100$		$w\%_2 = 0{,}00$		$w\%_3 = 33{,}9$

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$b \cdot 100 + (128 - b) \cdot 0{,}00 = 128 \cdot 33{,}9$

amelyből $b = m_1 = 43{,}51$ g $\approx$ **43,5 g**.

167. A)

$M(\text{CuSO}_4) = 159{,}61 \; \frac{\text{g}}{\text{mol}}$

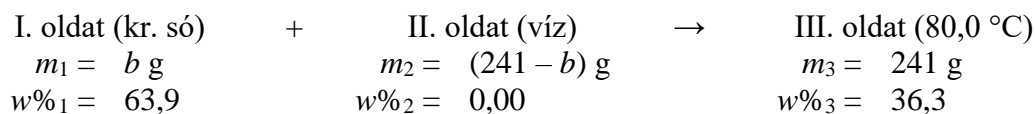$M(\text{CuSO}_4 \cdot 5\,\text{H}_2\text{O}) = 249{,}71 \; \frac{\text{g}}{\text{mol}}$

$w\%_4 = \frac{159{,}61 \text{ g CuSO}_4}{249{,}71 \text{ g CuSO}_4 \cdot 5\,\text{H}_2\text{O}} \cdot 100 = 63{,}9$

III. oldat (80,0 °C)	–	IV. oldat (kr. só)	→	V. oldat (20,0 °C)
$m_3 = a$ g		$m_4 = 100$ g		$m_5 = (a - 100)$ g
$w\%_3 = 36{,}3$		$w\%_4 = 63{,}9$		$w\%_5 = 16{,}7$
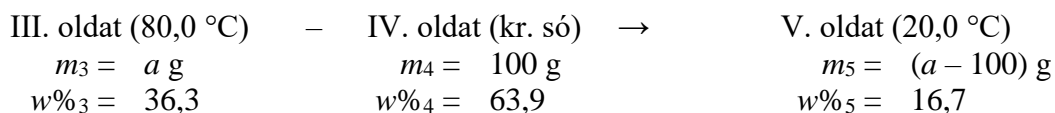
$m_3 \cdot w\%_3 - m_4 \cdot w\%_4 = m_5 \cdot w\%_5$

$a \cdot 36{,}3 - 100 \cdot 63{,}9 = (a - 100) \cdot 16{,}7$

amelyből $a = m_3 = 240{,}91$ g ≈ 241 g.

I. oldat (kr. só)	+	II. oldat (víz)	→	III. oldat (80,0 °C)
$m_1 = b$ g		$m_2 = (241 - b)$ g		$m_3 = 241$ g
$w\%_1 = 63{,}9$		$w\%_2 = 0{,}00$		$w\%_3 = 36{,}3$

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$b \cdot 63{,}9 + (241 - b) \cdot 0{,}00 = 241 \cdot 36{,}3$

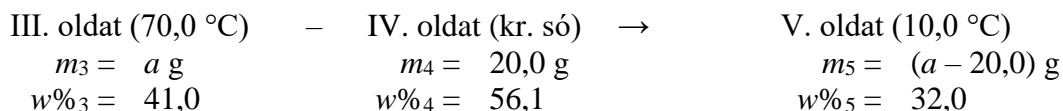amelyből $b = m_1 = 136{,}82$ g $\approx$ **137 g**.

B)

A feladat szövege helyesen: „A cink-szulfát telített oldata 70,0 °C-on 41,0 $w\%$-os…".

$M(\text{ZnSO}_4) = 161{,}44 \; \frac{\text{g}}{\text{mol}}$

$M(\text{ZnSO}_4 \cdot 7\,\text{H}_2\text{O}) = 287{,}58 \; \frac{\text{g}}{\text{mol}}$
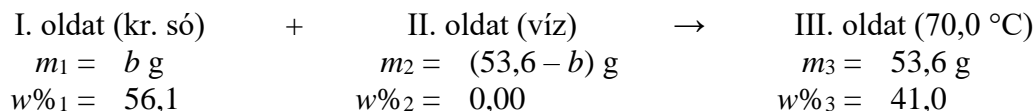
$w\%_4 = \frac{161{,}44 \text{ g ZnSO}_4}{287{,}58 \text{ g ZnSO}_4 \cdot 7\,\text{H}_2\text{O}} \cdot 100 = 56{,}1$

Készült a *Gyűjtemény a Kémia emelt szintű oktatásához 9-10.* tankönyv feladataihoz.

Készítette: Bárány Zsolt Béla

III. oldat (70,0 °C)	–	IV. oldat (kr. só)	→	V. oldat (10,0 °C)
$m_3 =$ a g		$m_4 =$ 20,0 g		$m_5 =$ $(a - 20,0)$ g
$w\%_3 =$ 41,0		$w\%_4 =$ 56,1		$w\%_5 =$ 32,0

$m_3 \cdot w\%_3 - m_4 \cdot w\%_4 = m_5 \cdot w\%_5$
$a \cdot 41,0 - 20,0 \cdot 56,1 = (a - 20,0) \cdot 32,0$
amelyből $a = m_3 = 53,56$ g $\approx 53,6$ g.

I. oldat (kr. só)	+	II. oldat (víz)	→	III. oldat (70,0 °C)
$m_1 =$ b g		$m_2 =$ $(53,6 - b)$ g		$m_3 =$ 53,6 g
$w\%_1 =$ 56,1		$w\%_2 =$ 0,00		$w\%_3 =$ 41,0

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
$b \cdot 56,1 + (53,6 - b) \cdot 0,00 = 53,6 \cdot 41,0$
amelyből $b = \boldsymbol{m_1 = \underline{39,1\text{ g}}}$.
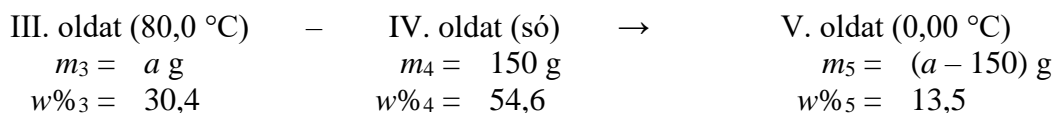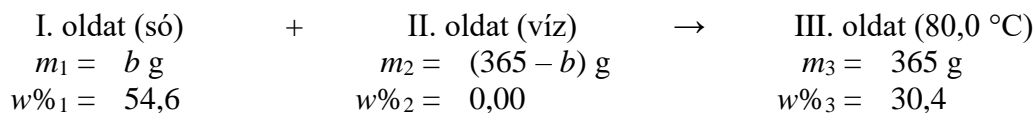
C)
$M(FeSO_4) = 151,91 \frac{g}{mol}$
$M(FeSO_4 \cdot 7\ H_2O) = 278,05 \frac{g}{mol}$
$w\%_4 = \frac{151,91\text{ g }FeSO_4}{278,05\text{ g }FeSO_4 \cdot 7\ H_2O} \cdot 100 = 54,6$

III. oldat (80,0 °C)	–	IV. oldat (só)	→	V. oldat (0,00 °C)
$m_3 =$ a g		$m_4 =$ 150 g		$m_5 =$ $(a - 150)$ g
$w\%_3 =$ 30,4		$w\%_4 =$ 54,6		$w\%_5 =$ 13,5

$m_3 \cdot w\%_3 - m_4 \cdot w\%_4 = m_5 \cdot w\%_5$
$a \cdot 30,4 - 150 \cdot 54,6 = (a - 150) \cdot 13,5$
amelyből $a = m_3 = 365,10$ g ≈ 365 g.

I. oldat (só)	+	II. oldat (víz)	→	III. oldat (80,0 °C)
$m_1 =$ b g		$m_2 =$ $(365 - b)$ g		$m_3 =$ 365 g
$w\%_1 =$ 54,6		$w\%_2 =$ 0,00		$w\%_3 =$ 30,4

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$
$b \cdot 54,6 + (365 - b) \cdot 0,00 = 365 \cdot 30,4$
amelyből $b = \boldsymbol{m_1} = 203,15$ g $\approx \boldsymbol{\underline{203\text{ g}}}$.

168. A)
Legyen m(átkristályosítandó $CuSO_4 \cdot 5\ H_2O$) = 100 g!
$M(CuSO_4) = 159,61 \frac{g}{mol}$
$M(CuSO_4 \cdot 5\ H_2O) = 249,71 \frac{g}{mol}$
$w\%_1 = \frac{159,61\text{ g }CuSO_4}{249,71\text{ g }CuSO_4 \cdot 5\ H_2O} \cdot 100 = 63,9$

I. oldat (kr. só)	+	II. oldat (víz)	→	III. oldat (80,0 °C)
$m_1 =$ 100 g		$m_2 =$ $(a - 100)$ g		$m_3 =$ a g
$w\%_1 =$ 63,9		$w\%_2 =$ 0,00		$w\%_3 =$ 36,3
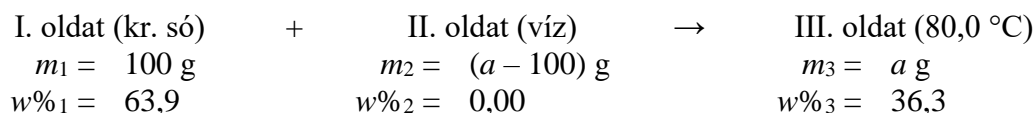
$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$100 \cdot 63,9 + (a - 100) \cdot 0,00 = a \cdot 36,3$

amelyből $a = m_3 = 176,08$ g $\approx$ 176 g.

III. oldat (80,0 °C)	–	IV. oldat (kr. só)	→	V. oldat (20,0 °C)
$m_3 =$ 176 g		$m_4 =$ b g		$m_5 =$ $(176 - b)$ g
$w\%_3 =$ 36,3		$w\%_4 =$ 63,9		$w\%_5 =$ 16,7

$m_3 \cdot w\%_3 - m_4 \cdot w\%_4 = m_5 \cdot w\%_5$

$176 \cdot 36,3 - b \cdot 63,9 = (176 - b) \cdot 16,7$

amelyből $a = m_3 = 73,09$ g $\approx$ 73,1 g.

$\eta = \dfrac{m(\text{kivált anyag})}{m(\text{beoldott anyag})} \cdot 100 = \dfrac{73,1 \text{ g}}{100 \text{ g}} \cdot 100 = \underline{\textbf{73,1\%}}$.

B)

A feladat szövege helyesen: „A cink-szulfát telített oldata 70,0 °C-on 41,0 $w\%$-os…".

Legyen m(átkristályosítandó ZnSO$_4$·7 H$_2$O) = 100 g!

$M(\text{ZnSO}_4) = 161,44 \frac{\text{g}}{\text{mol}}$

$M(\text{ZnSO}_4 \cdot 7\ \text{H}_2\text{O}) = 287,58 \frac{\text{g}}{\text{mol}}$

$w\%_4 = \dfrac{161,44 \text{ g ZnSO}_4}{287,58 \text{ g ZnSO}_4 \cdot 7\ \text{H}_2\text{O}} \cdot 100 = 56,1$

I. oldat (kr. só)	+	II. oldat (víz)	→	III. oldat (70,0 °C)
$m_1 =$ 100 g		$m_2 =$ $(a - 100)$ g		$m_3 =$ a g
$w\%_1 =$ 56,1		$w\%_2 =$ 0,00		$w\%_3 =$ 41,0

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$100 \cdot 56,1 + (a - 100) \cdot 0,00 = a \cdot 41,0$

amelyből $a = m_3 = 136,83$ g $\approx$ 137 g.

III. oldat (80,0 °C)	–	IV. oldat (kr. só)	→	V. oldat (10,0 °C)
$m_3 =$ 137 g		$m_4 =$ b g		$m_5 =$ $(137 - b)$ g
$w\%_3 =$ 41,0		$w\%_4 =$ 56,1		$w\%_5 =$ 32,0

$m_3 \cdot w\%_3 - m_4 \cdot w\%_4 = m_5 \cdot w\%_5$

$137 \cdot 41,0 - b \cdot 56,1 = (137 - b) \cdot 32,0$

amelyből $a = m_3 = 51,16$ g $\approx$ 51,2 g.

$\eta = \dfrac{m(\text{kivált anyag})}{m(\text{beoldott anyag})} \cdot 100 = \dfrac{51,2 \text{ g}}{100 \text{ g}} \cdot 100 = \underline{\textbf{51,2\%}}$.

C)

Legyen m(átkristályosítandó FeSO$_4$·7 H$_2$O) = 100 g!

$M(\text{FeSO}_4) = 151,91 \frac{\text{g}}{\text{mol}}$

$M(\text{FeSO}_4 \cdot 7\ \text{H}_2\text{O}) = 278,05 \frac{\text{g}}{\text{mol}}$

$w\%_4 = \dfrac{151,91 \text{ g FeSO}_4}{278,05 \text{ g FeSO}_4 \cdot 7\ \text{H}_2\text{O}} \cdot 100 = 54,6$

I. oldat (kr. só)	+	II. oldat (víz)	→	III. oldat (80,0 °C)
$m_1 =$ 100 g		$m_2 =$ $(a - 100)$ g		$m_3 =$ a g
$w\%_1 =$ 54,6		$w\%_2 =$ 0,00		$w\%_3 =$ 30,4

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3$

$100 \cdot 54{,}6 + (a - 100) \cdot 0{,}00 = a \cdot 30{,}4$

amelyből $a = m_3 = 179{,}72$ g ≈ 180 g.

III. oldat (80,0 °C)	−	IV. oldat (kr. só)	→	V. oldat (0,00 °C)
$m_3 = $ 180 g		$m_4 = $ b g		$m_5 = $ (180 − b) g
$w\%_3 = $ 30,4		$w\%_4 = $ 54,6		$w\%_5 = $ 13,5

$m_3 \cdot w\%_3 - m_4 \cdot w\%_4 = m_5 \cdot w\%_5$

$180 \cdot 30{,}4 - b \cdot 54{,}6 = (180 - b) \cdot 13{,}5$

amelyből $a = m_3 = 73{,}84$ g $\approx 73{,}8$ g.

$\eta = \dfrac{m(\text{kivált anyag})}{m(\text{beoldott anyag})} \cdot 100 = \dfrac{73{,}8 \text{ g}}{100 \text{ g}} \cdot 100 = \textbf{73,8\%}$.

169. A)

Legyen 1,00 gramm Na_2CO_3!

$M(Na_2CO_3) = 105{,}99 \frac{\text{g}}{\text{mol}}$

$M(Na_2CO_3 \cdot 10\,H_2O) = 286{,}19 \frac{\text{g}}{\text{mol}}$

$w\%_4 = \dfrac{105{,}99 \text{ g } Na_2CO_3}{286{,}19 \text{ g } Na_2CO_3 \cdot 10\,H_2O} \cdot 100 = 37{,}0$

I. oldat (só)	+	II. oldat (víz)	→	III. oldat (50,0 °C)	+	IV. oldat (kr. só)
$m_1 = $ 1,00 g		$m_2 = $ a g		$m_3 = $ b g		$m_4 = $ b g
$w\%_1 = $ 100		$w\%_2 = $ 0,00		$w\%_3 = $ 32,2		$w\%_4 = $ 37,0

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3 + m_4 \cdot w\%_4$

$1{,}00 \cdot 100 + a \cdot 0{,}00 = b \cdot 32{,}2 + b \cdot 37{,}0$

amelyből $b = m_3 = 1{,}44$ g.

Mivel $(m_3 + m_4) = 2b$ gramm, vagyis 2,88 gramm, a tömegmegmaradás törvénye alapján $(1{,}00 + a)$ is 2,88 gramm, amelyből $a = 1{,}88$ g.

$\boldsymbol{m_1 : m_2} = 1{,}00 \text{ g} : 1{,}88 \text{ g} = \underline{\textbf{1,00 : 1,88}}$.

B)

Legyen 1,00 gramm $KAl(SO_4)_2$!

$M(KAl(SO_4)_2) = 258{,}2 \frac{\text{g}}{\text{mol}}$

$M(KAl(SO_4)_2 \cdot 12\,H_2O) = 474{,}44 \frac{\text{g}}{\text{mol}}$

$w\%_4 = \dfrac{258{,}2 \text{ g } KAl(SO_4)_2}{474{,}44 \text{ g } KAl(SO_4)_2 \cdot 12\,H_2O} \cdot 100 = 54{,}4$

I. oldat (só)	+	II. oldat (víz)	→	III. oldat (20,0 °C)	+	IV. oldat (kr. só)
$m_1 = $ 1,00 g		$m_2 = $ a g		$m_3 = $ b g		$m_4 = $ 2b g
$w\%_1 = $ 100		$w\%_2 = $ 0,00		$w\%_3 = $ 5,57		$w\%_4 = $ 54,4

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3 + m_4 \cdot w\%_4$

$1{,}00 \cdot 100 + a \cdot 0{,}00 = b \cdot 5{,}57 + 2b \cdot 54{,}4$

amelyből $b = m_3 = 0{,}874$ g.

Mivel $(m_3 + m_4) = 3b$ gramm, vagyis 2,62 gramm, a tömegmegmaradás törvénye alapján $(1{,}00 + a)$ is 2,62 gramm, amelyből $a = 1{,}62$ g.

$m_1 : m_2 = 1,00 \text{ g} : 1,62 \text{ g} = \underline{\textbf{1,00 : 1,62}}$.

C)

Legyen 1,00 gramm $CuSO_4$!

$M(CuSO_4) = 159,61 \frac{\text{g}}{\text{mol}}$

$M(CuSO_4 \cdot 5 \text{ H}_2\text{O}) = 249,71 \frac{\text{g}}{\text{mol}}$

$w\%_4 = \frac{159{,}61 \text{ g CuSO}_4}{249{,}71 \text{ g CuSO}_4 \cdot 5 \text{ H}_2\text{O}} \cdot 100 = 63,9$

I. oldat (só)	+	II. oldat (víz)	$\rightarrow$	III. oldat (20,0 °C)	+	IV. oldat (kr. só)
$m_1 = 1,00$ g		$m_2 = a$ g		$m_3 = 2b$ g		$m_4 = b$ g
$w\%_1 = 100$		$w\%_2 = 0,00$		$w\%_3 = 16,7$		$w\%_4 = 63,9$

$m_1 \cdot w\%_1 + m_2 \cdot w\%_2 = m_3 \cdot w\%_3 + m_4 \cdot w\%_4$

$1,00 \cdot 100 + a \cdot 0,00 = 2b \cdot 16,7 + b \cdot 63,9$

amelyből $b = m_4 = 1,03$ g.

Mivel $(m_3 + m_4) = 3b$ gramm, vagyis 3,08 gramm, a tömegmegmaradás törvénye alapján $(1,00 + a)$ is 3,08 gramm, amelyből $a = 2,08$ g.

$m_1 : m_2 = 1,00 \text{ g} : 2,08 \text{ g} = \underline{\textbf{1,00 : 2,08}}$.

170. A)

A tömegszázalék jelentése: 100 gramm oldatban 48,2 gramm só és 51,8 gramm víz van. Mivel a hűtés során a só 30,0%-a kikristályosodik, a folyamat végén 70,0%, vagyis 33,7 gramm só marad oldatban.

Ha a visszamaradó telített oldatban 33,7 gramm só és 51,8 gramm víz van, kiszámítható, hogy 100 gramm tömegű víz

$m = \frac{33{,}7 \text{ g} \cdot 100 \text{ g}}{51{,}8 \text{ g}} = 65,1$ gramm sót old, így az oldhatóság:

<u>65,1 gramm só / 100 gramm víz</u>.

B)

A tömegszázalék jelentése: 100 gramm oldatban 42,5 gramm só és 57,5 gramm víz van. Mivel a hűtés során a só 82,0%-a kikristályosodik, a folyamat végén 18,0%, vagyis 7,65 gramm só marad oldatban.

Ha a visszamaradó telített oldatban 7,65 gramm só és 57,5 gramm víz van, kiszámítható, hogy 100 gramm tömegű víz

$m = \frac{7{,}65 \text{ g} \cdot 100 \text{ g}}{57{,}5 \text{ g}} = 13,3$ gramm sót old, így az oldhatóság:

<u>13,3 gramm só / 100 gramm víz</u>.

C)

A tömegszázalék jelentése: 100 gramm oldatban 63,8 gramm só és 36,2 gramm víz van. Mivel a hűtés során a só 50,0%-a kikristályosodik, a folyamat végén 50,0%, vagyis 31,9 gramm só marad oldatban.

Ha a visszamaradó telített oldatban 31,9 gramm só és 36,2 gramm víz van, kiszámítható, hogy 100 gramm tömegű víz

$m = \frac{31{,}9 \text{ g} \cdot 100 \text{ g}}{36{,}2 \text{ g}} = 88,1$ gramm sót old, így az oldhatóság:

<u>88,1 gramm só / 100 gramm víz</u>.

171. A)

$x\% = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{25{,}0 \text{ mol}}{200 \text{ mol}} \cdot 100 = \underline{\textbf{12,5}}$.

Készült a *Gyűjtemény a Kémia emelt szintű oktatásához 9-10.* tankönyv feladataihoz.

Készítette: Bárány Zsolt Béla

B)

$$x\% = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{1,25 \text{ mol}}{55,0 \text{ mol}} \cdot 100 = \underline{\mathbf{2,27}}.$$

C)

$$x\% = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{5,000 \text{ mol}}{1200 \text{ mol}} \cdot 100 = \underline{\mathbf{0,4167}}.$$

172. A)

$$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{350 \text{ g}}{18,02 \frac{\text{g}}{\text{mol}}} = 19,4 \text{ mol}$$

$$n(\text{oldat}) = n(\text{oldott anyag}) + n(\text{oldószer}) = 0,0100 \text{ mol} + 19,4 \text{ mol} = 19,4 \text{ mol}$$

$$x\% = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{0,0100 \text{ mol}}{19,4 \text{ mol}} \cdot 100 = \underline{\mathbf{0,0515}}.$$

B)

$$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{110 \text{ g}}{18,02 \frac{\text{g}}{\text{mol}}} = 6,10 \text{ mol}$$

$$n(\text{oldat}) = n(\text{oldott anyag}) + n(\text{oldószer}) = 0,120 \text{ mol} + 6,10 \text{ mol} = 6,22 \text{ mol}$$

$$x\% = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{0,120 \text{ mol}}{6,22 \text{ mol}} \cdot 100 = \underline{\mathbf{1,93}}.$$

C)

$$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{25,0 \text{ g}}{18,02 \frac{\text{g}}{\text{mol}}} = 1,39 \text{ mol}$$

$$n(\text{oldat}) = n(\text{oldott anyag}) + n(\text{oldószer}) = 0,100 \text{ mol} + 1,39 \text{ mol} = 1,49 \text{ mol}$$

$$x\% = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{0,100 \text{ mol}}{1,49 \text{ mol}} \cdot 100 = \underline{\mathbf{6,72}}.$$

173. A)

$$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{250 \text{ g}}{18,02 \frac{\text{g}}{\text{mol}}} = 13,87 \text{ mol} \approx 13,9 \text{ mol}$$

$$n(\text{NaCl}) = \frac{m(\text{NaCl})}{M(\text{NaCl})} = \frac{25,0 \text{ g}}{58,44 \frac{\text{g}}{\text{mol}}} = 0,428 \text{ mol}$$

$$n(\text{oldat}) = n(\text{oldott anyag}) + n(\text{oldószer}) = 0,428 \text{ mol} + 13,9 \text{ mol} = 14,3 \text{ mol}$$

$$x\% = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{0,428 \text{ mol}}{14,3 \text{ mol}} \cdot 100 = \underline{\mathbf{2,99}}.$$

B)

$$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{200 \text{ g}}{18,02 \frac{\text{g}}{\text{mol}}} = 11,1 \text{ mol}$$

$$n(\text{NH}_3) = \frac{m(\text{NH}_3)}{M(\text{NH}_3)} = \frac{20,0 \text{ g}}{17,04 \frac{\text{g}}{\text{mol}}} = 1,17 \text{ mol}$$

$$n(\text{oldat}) = n(\text{oldott anyag}) + n(\text{oldószer}) = 1,17 \text{ mol} + 11,1 \text{ mol} = 12,27 \text{ mol} \approx 12,3 \text{ mol}$$

$$x\% = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{1,17 \text{ mol}}{12,3 \text{ mol}} \cdot 100 = \underline{\mathbf{9,56}}.$$

C)

$$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{30,0 \text{ g}}{18,02 \frac{\text{g}}{\text{mol}}} = 1,66 \text{ mol}$$

$$n(\text{NaOH}) = \frac{m(\text{NaOH})}{M(\text{NaOH})} = \frac{0,122 \text{ g}}{40,0 \frac{\text{g}}{\text{mol}}} = 3,05 \cdot 10^{-3} \text{ mol}$$

$$n(\text{oldat}) = n(\text{oldott anyag}) + n(\text{oldószer}) = 3,05 \cdot 10^{-3} \text{ mol} + 1,66 \text{ mol} = 1,67 \text{ mol}$$

$$x\% = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{3,05 \cdot 10^{-3} \text{ mol}}{1,67 \text{ mol}} \cdot 100 = \underline{\mathbf{0,183}}.$$

174. A)

$$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{250 \text{ g}}{18,02 \frac{\text{g}}{\text{mol}}} = 13,87 \text{ mol} \approx 13,9 \text{ mol}$$

$n(\text{NH}_3) = \frac{V(\text{NH}_3)}{V_\text{m}^\text{st}} = \frac{15{,}0 \ \text{dm}^3}{24{,}5 \ \frac{\text{dm}^3}{\text{mol}}} = 0{,}612 \ \text{mol}$

$n(\text{oldat}) = n(\text{oldott anyag}) + n(\text{oldószer}) = 0{,}612 \ \text{mol} + 13{,}9 \ \text{mol} = 14{,}5 \ \text{mol}$

$\boldsymbol{x\%} = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{0{,}612 \ \text{mol}}{14{,}5 \ \text{mol}} \cdot 100 = \underline{\mathbf{4{,}23}}.$

B)

$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{1000 \ \text{g}}{18{,}02 \ \frac{\text{g}}{\text{mol}}} = 55{,}5 \ \text{mol}$

$n(\text{HCl}) = \frac{V(\text{HCl})}{V_\text{m}^\text{st}} = \frac{32{,}0 \ \text{dm}^3}{24{,}5 \ \frac{\text{dm}^3}{\text{mol}}} = 1{,}31 \ \text{mol}$

$n(\text{oldat}) = n(\text{oldott anyag}) + n(\text{oldószer}) = 1{,}31 \ \text{mol} + 55{,}5 \ \text{mol} = 56{,}8 \ \text{mol}$

$\boldsymbol{x\%} = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{1{,}31 \ \text{mol}}{56{,}8 \ \text{mol}} \cdot 100 = \underline{\mathbf{2{,}30}}.$

C)

$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{200 \ \text{g}}{18{,}02 \ \frac{\text{g}}{\text{mol}}} = 11{,}1 \ \text{mol}$

$n(\text{H}_2\text{S}) = \frac{V(\text{H}_2\text{S})}{V_\text{m}^{0 \ °\text{C}}} = \frac{2{,}25 \ \text{dm}^3}{22{,}41 \ \frac{\text{dm}^3}{\text{mol}}} = 0{,}100 \ \text{mol}$

$n(\text{oldat}) = n(\text{oldott anyag}) + n(\text{oldószer}) = 0{,}100 \ \text{mol} + 11{,}1 \ \text{mol} = 11{,}2 \ \text{mol}$

$\boldsymbol{x\%} = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{0{,}100 \ \text{mol}}{11{,}2 \ \text{mol}} \cdot 100 = \underline{\mathbf{0{,}897}}.$

175. **A)**

$m(\text{H}_2\text{O}) = \varrho(\text{H}_2\text{O}) \cdot V(\text{H}_2\text{O}) = 1{,}00 \ \frac{\text{g}}{\text{cm}^3} \cdot 200 \ \text{cm}^3 = 200 \ \text{g}$

$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{200 \ \text{g}}{18{,}02 \ \frac{\text{g}}{\text{mol}}} = 11{,}1 \ \text{mol}$

$n(\text{NaCl}) = \frac{m(\text{NaCl})}{M(\text{NaCl})} = \frac{2{,}50 \ \text{g}}{58{,}44 \ \frac{\text{g}}{\text{mol}}} = 0{,}0428 \ \text{mol}$

$n(\text{oldat}) = n(\text{oldott anyag}) + n(\text{oldószer}) = 0{,}0428 \ \text{mol} + 11{,}1 \ \text{mol} = 11{,}1 \ \text{mol}$

$\boldsymbol{x\%} = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{0{,}0428 \ \text{mol}}{11{,}1 \ \text{mol}} \cdot 100 = \underline{\mathbf{0{,}384}}.$

B)

$m(\text{H}_2\text{O}) = \varrho(\text{H}_2\text{O}) \cdot V(\text{H}_2\text{O}) = 1{,}00 \ \frac{\text{g}}{\text{cm}^3} \cdot 430 \ \text{cm}^3 = 430 \ \text{g}$

$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{430 \ \text{g}}{18{,}02 \ \frac{\text{g}}{\text{mol}}} = 23{,}86 \ \text{mol} \approx 23{,}9 \ \text{mol}$

$n(\text{KCl}) = \frac{m(\text{KCl})}{M(\text{KCl})} = \frac{62{,}0 \ \text{g}}{74{,}55 \ \frac{\text{g}}{\text{mol}}} = 0{,}832 \ \text{mol}$

$n(\text{oldat}) = n(\text{oldott anyag}) + n(\text{oldószer}) = 0{,}832 \ \text{mol} + 23{,}9 \ \text{mol} = 24{,}7 \ \text{mol}$

$\boldsymbol{x\%} = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{0{,}832 \ \text{mol}}{24{,}7 \ \text{mol}} \cdot 100 = \underline{\mathbf{3{,}37}}.$

C)

$m(\text{H}_2\text{O}) = \varrho(\text{H}_2\text{O}) \cdot V(\text{H}_2\text{O}) = 1{,}00 \ \frac{\text{g}}{\text{cm}^3} \cdot 820 \ \text{cm}^3 = 820 \ \text{g}$

$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{820 \ \text{g}}{18{,}02 \ \frac{\text{g}}{\text{mol}}} = 45{,}5 \ \text{mol}$

$n(\text{MgCl}_2) = \frac{m(\text{MgCl}_2)}{M(\text{MgCl}_2)} = \frac{142 \ \text{g}}{95{,}21 \ \frac{\text{g}}{\text{mol}}} = 1{,}49 \ \text{mol}$

$n(\text{oldat}) = n(\text{oldott anyag}) + n(\text{oldószer}) = 1{,}49 \ \text{mol} + 45{,}5 \ \text{mol} = 47{,}0 \ \text{mol}$

$\boldsymbol{x\%} = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{1{,}49 \ \text{mol}}{47{,}0 \ \text{mol}} \cdot 100 = \underline{\mathbf{3{,}17}}.$

176. **A)**

$$m(H_2O) = \varrho(H_2O) \cdot V(H_2O) = 1{,}00 \, \tfrac{g}{cm^3} \cdot 300 \, cm^3 = 300 \, g$$

$$n(H_2O) = \frac{m(H_2O)}{M(H_2O)} = \frac{300 \, g}{18{,}02 \, \tfrac{g}{mol}} = 16{,}6 \, mol$$

$$n(NH_3) = \frac{V(NH_3)}{V_m^{st}} = \frac{13{,}0 \, dm^3}{24{,}5 \, \tfrac{dm^3}{mol}} = 0{,}531 \, mol$$

$$n(\text{oldat}) = n(\text{oldott anyag}) + n(\text{oldószer}) = 0{,}531 \, mol + 16{,}6 \, mol = 17{,}2 \, mol$$

$$\boldsymbol{x\%} = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{0{,}531 \, mol}{17{,}2 \, mol} \cdot 100 = \underline{\textbf{3,09}}.$$

B)

$$m(H_2O) = \varrho(H_2O) \cdot V(H_2O) = 1{,}00 \, \tfrac{g}{cm^3} \cdot 160 \, cm^3 = 160 \, g$$

$$n(H_2O) = \frac{m(H_2O)}{M(H_2O)} = \frac{160 \, g}{18{,}02 \, \tfrac{g}{mol}} = 8{,}88 \, mol$$

$$n(HCl) = \frac{p \cdot V}{R \cdot T} = \frac{205000 \, Pa \cdot 0{,}0100 \, m^3}{8{,}314 \, \tfrac{J}{mol \cdot K} \cdot 285 \, K} = 0{,}865 \, mol$$

$$n(\text{oldat}) = n(\text{oldott anyag}) + n(\text{oldószer}) = 0{,}865 \, mol + 8{,}88 \, mol = 9{,}75 \, mol$$

$$\boldsymbol{x\%} = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{0{,}865 \, mol}{9{,}75 \, mol} \cdot 100 = \underline{\textbf{8,88}}.$$

C)

$$m(H_2O) = \varrho(H_2O) \cdot V(H_2O) = 1{,}00 \, \tfrac{g}{cm^3} \cdot 500 \, cm^3 = 500 \, g$$

$$n(H_2O) = \frac{m(H_2O)}{M(H_2O)} = \frac{500 \, g}{18{,}02 \, \tfrac{g}{mol}} = 27{,}7 \, mol$$

$$n(H_2S) = \frac{p \cdot V}{R \cdot T} = \frac{255000 \, Pa \cdot 0{,}00825 \, m^3}{8{,}314 \, \tfrac{J}{mol \cdot K} \cdot 313 \, K} = 0{,}808 \, mol$$

$$n(\text{oldat}) = n(\text{oldott anyag}) + n(\text{oldószer}) = 0{,}808 \, mol + 27{,}7 \, mol = 28{,}6 \, mol$$

$$\boldsymbol{x\%} = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{0{,}808 \, mol}{28{,}6 \, mol} \cdot 100 = \underline{\textbf{2,83}}.$$

177. **A)**

$$n(\text{oldat}) = \frac{n(\text{oldott anyag}) \cdot 100}{x\%} = \frac{1{,}50 \, mol \cdot 100}{2{,}50} = 60{,}0 \, mol$$

$$n(\text{oldószer}) = n(\text{oldat}) - n(\text{oldott anyag}) = 60{,}0 \, mol - 1{,}50 \, mol = 58{,}5 \, mol$$

$$m(H_2O) = n(H_2O) \cdot M(H_2O) = 58{,}5 \, mol \cdot 18{,}02 \, \tfrac{g}{mol} = 1{,}05 \cdot 10^3 \, g$$

$$m(NaCl) = n(NaCl) \cdot M(NaCl) = 1{,}50 \, mol \cdot 58{,}44 \, \tfrac{g}{mol} = 87{,}7 \, g$$

$$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 87{,}7 \, g + 1{,}05 \cdot 10^3 \, g =$$

$$\boldsymbol{m(\text{oldat})} = 1141{,}83 \, g \approx \underline{\textbf{1,14} \cdot \textbf{10}^3 \textbf{ g}}.$$

B)

$$n(\text{oldat}) = \frac{n(\text{oldott anyag}) \cdot 100}{x\%} = \frac{33{,}3 \, mol \cdot 100}{1{,}20} = 2775 \, mol \approx 2{,}78 \cdot 10^3 \, mol$$

$$n(\text{oldószer}) = n(\text{oldat}) - n(\text{oldott anyag}) = 2{,}78 \cdot 10^3 \, mol - 33{,}3 \, mol = 2{,}74 \cdot 10^3 \, mol$$

$$m(H_2O) = n(H_2O) \cdot M(H_2O) = 2{,}74 \cdot 10^3 \, mol \cdot 18{,}02 \, \tfrac{g}{mol} = 4{,}94 \cdot 10^4 \, g$$

$$m(NaOH) = n(NaOH) \cdot M(NaOH) = 33{,}3 \, mol \cdot 40{,}00 \, \tfrac{g}{mol} = 1{,}33 \cdot 10^3 \, g$$

$$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 1{,}33 \cdot 10^3 \, g + 4{,}94 \cdot 10^4 \, g =$$

$$\boldsymbol{m(\text{oldat})} = 50737{,}43 \, g \approx \underline{\textbf{5,07} \cdot \textbf{10}^4 \textbf{ g}}.$$

C)

$$n(\text{oldat}) = \frac{n(\text{oldott anyag}) \cdot 100}{x\%} = \frac{0{,}125 \, mol \cdot 100}{3{,}70} = 3{,}38 \, mol$$

$$n(\text{oldószer}) = n(\text{oldat}) - n(\text{oldott anyag}) = 3{,}38 \, mol - 0{,}125 \, mol = 3{,}25 \, mol$$

$m(\text{H}_2\text{O}) = n(\text{H}_2\text{O}) \cdot M(\text{H}_2\text{O}) = 3{,}25 \text{ mol} \cdot 18{,}02 \frac{\text{g}}{\text{mol}} = 58{,}6 \text{ g}$

$m(\text{HCl}) = n(\text{HCl}) \cdot M(\text{HCl}) = 0{,}125 \text{ mol} \cdot 36{,}46 \frac{\text{g}}{\text{mol}} = 4{,}56 \text{ g}$

$\boldsymbol{m(\text{oldat})} = m(\text{oldott anyag}) + m(\text{oldószer}) = 4{,}56 \text{ g} + 58{,}6 \text{ g} = 63{,}18 \text{ g} \approx \underline{\textbf{63{,}2 g}}$.

178. A)

$n(\text{KCl}) = \frac{m(\text{KCl})}{M(\text{KCl})} = \frac{50{,}0 \text{ g}}{74{,}55 \frac{\text{g}}{\text{mol}}} = 0{,}671 \text{ mol}$

$n(\text{oldat}) = \frac{n(\text{oldott anyag}) \cdot 100}{x\%} = \frac{0{,}671 \text{ mol} \cdot 100}{2{,}00} = 33{,}5 \text{ mol}$

$n(\text{oldószer}) = n(\text{oldat}) - n(\text{oldott anyag}) = 33{,}5 \text{ mol} - 0{,}671 \text{ mol} = 32{,}9 \text{ mol}$

$m(\text{H}_2\text{O}) = n(\text{H}_2\text{O}) \cdot M(\text{H}_2\text{O}) = 32{,}9 \text{ mol} \cdot 18{,}02 \frac{\text{g}}{\text{mol}} = 592{,}21 \text{ g} \approx 592 \text{ g}$

$\boldsymbol{m(\text{oldat})} = m(\text{oldott anyag}) + m(\text{oldószer}) = 50{,}0 \text{ g} + 592 \text{ g} = 642{,}21 \text{ g} \approx \underline{\textbf{642 g}}$.

B)

$n(\text{Na}_2\text{S}) = \frac{m(\text{Na}_2\text{S})}{M(\text{Na}_2\text{S})} = \frac{32{,}0 \text{ g}}{78{,}04 \frac{\text{g}}{\text{mol}}} = 0{,}410 \text{ mol}$

$n(\text{oldat}) = \frac{n(\text{oldott anyag}) \cdot 100}{x\%} = \frac{0{,}410 \text{ mol} \cdot 100}{1{,}00} = 41{,}0 \text{ mol}$

$n(\text{oldószer}) = n(\text{oldat}) - n(\text{oldott anyag}) = 41{,}0 \text{ mol} - 0{,}410 \text{ mol} = 40{,}6 \text{ mol}$

$m(\text{H}_2\text{O}) = n(\text{H}_2\text{O}) \cdot M(\text{H}_2\text{O}) = 40{,}6 \text{ mol} \cdot 18{,}02 \frac{\text{g}}{\text{mol}} = 731{,}51 \text{ g} \approx 732 \text{ g}$

$\boldsymbol{m(\text{oldat})} = m(\text{oldott anyag}) + m(\text{oldószer}) = 32{,}0 \text{ g} + 732 \text{ g} = 763{,}51 \text{ g} \approx \underline{\textbf{764 g}}$.

C)

$n(\text{MgCl}_2) = \frac{m(\text{MgCl}_2)}{M(\text{MgCl}_2)} = \frac{0{,}133 \text{ g}}{95{,}21 \frac{\text{g}}{\text{mol}}} = 1{,}40 \cdot 10^{-3} \text{ mol}$

$n(\text{oldat}) = \frac{n(\text{oldott anyag}) \cdot 100}{x\%} = \frac{1{,}40 \cdot 10^{-3} \text{ mol} \cdot 100}{2{,}50} = 0{,}0559 \text{ mol}$

$n(\text{oldószer}) = n(\text{oldat}) - n(\text{oldott anyag}) = 0{,}0559 \text{ mol} - 1{,}40 \cdot 10^{-3} \text{ mol} = 0{,}0545 \text{ mol}$

$m(\text{H}_2\text{O}) = n(\text{H}_2\text{O}) \cdot M(\text{H}_2\text{O}) = 0{,}0545 \text{ mol} \cdot 18{,}02 \frac{\text{g}}{\text{mol}} = 0{,}982 \text{ g}$

$\boldsymbol{m(\text{oldat})} = m(\text{oldott anyag}) + m(\text{oldószer}) = 0{,}133 \text{ g} + 0{,}982 \text{ g} = \underline{\textbf{1{,}11 g}}$.

179. A)

$n(\text{NH}_3) = \frac{V(\text{NH}_3)}{V_m^{\text{st}}} = \frac{20{,}0 \text{ dm}^3}{24{,}5 \frac{\text{dm}^3}{\text{mol}}} = 0{,}816 \text{ mol}$

$m(\text{NH}_3) = n(\text{NH}_3) \cdot M(\text{NH}_3) = 0{,}816 \text{ mol} \cdot 17{,}04 \frac{\text{g}}{\text{mol}} = 13{,}91 \text{ g} \approx 13{,}9 \text{ g}$

$n(\text{oldat}) = \frac{n(\text{oldott anyag}) \cdot 100}{x\%} = \frac{0{,}816 \text{ mol} \cdot 100}{1{,}80} = 45{,}35 \text{ mol} \approx 45{,}4 \text{ mol}$

$n(\text{oldószer}) = n(\text{oldat}) - n(\text{oldott anyag}) = 45{,}4 \text{ mol} - 0{,}816 \text{ mol} = 44{,}5 \text{ mol}$

$m(\text{H}_2\text{O}) = n(\text{H}_2\text{O}) \cdot M(\text{H}_2\text{O}) = 44{,}5 \text{ mol} \cdot 18{,}02 \frac{\text{g}}{\text{mol}} = 802{,}52 \text{ g} \approx 803 \text{ g}$

$\boldsymbol{m(\text{oldat})} = m(\text{oldott anyag}) + m(\text{oldószer}) = 13{,}9 \text{ g} + 803 \text{ g} = 816{,}43 \text{ g} \approx \underline{\textbf{816 g}}$.

B)

$n(\text{HCl}) = \frac{p \cdot V}{R \cdot T} = \frac{140000 \text{ Pa} \cdot 0{,}0140 \text{ m}^3}{8{,}314 \frac{\text{J}}{\text{mol} \cdot \text{K}} \cdot 285 \text{ K}} = 0{,}827 \text{ mol}$

$m(\text{HCl}) = n(\text{HCl}) \cdot M(\text{HCl}) = 0{,}827 \text{ mol} \cdot 36{,}46 \frac{\text{g}}{\text{mol}} = 30{,}16 \text{ g} \approx 30{,}2 \text{ g}$

$n(\text{oldat}) = \frac{n(\text{oldott anyag}) \cdot 100}{x\%} = \frac{0{,}827 \text{ mol} \cdot 100}{0{,}500} = 165{,}44 \text{ mol} \approx 165 \text{ mol}$

$n(\text{oldószer}) = n(\text{oldat}) - n(\text{oldott anyag}) = 165 \text{ mol} - 0{,}827 \text{ mol} = 164{,}61 \text{ mol} \approx 165 \text{ mol}$

$m(\text{H}_2\text{O}) = n(\text{H}_2\text{O}) \cdot M(\text{H}_2\text{O}) = 165 \text{ mol} \cdot 18{,}02 \frac{\text{g}}{\text{mol}} = 2966{,}26 \text{ g} \approx 2{,}97 \cdot 10^3 \text{ g}$

$\boldsymbol{m(\text{oldat})} = m(\text{oldott anyag}) + m(\text{oldószer}) = 32{,}0 \text{ g} + 2{,}97 \cdot 10^3 \text{ g} = 2996{,}42 \text{ g} \approx \underline{\textbf{3{,}00} \cdot \textbf{10}^3 \textbf{ g}}$.

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C)

$$n(\text{H}_2\text{S}) = \frac{p \cdot V}{R \cdot T} = \frac{105000 \text{ Pa} \cdot 0{,}850 \text{ m}^3}{8{,}314 \frac{\text{J}}{\text{mol} \cdot \text{K}} \cdot 278 \text{ K}} = 38{,}6 \text{ mol}$$

$$m(\text{H}_2\text{S}) = n(\text{H}_2\text{S}) \cdot M(\text{H}_2\text{S}) = 38{,}6 \text{ mol} \cdot 34{,}08 \frac{\text{g}}{\text{mol}} = 1315{,}99 \text{ g} \approx 1{,}32 \cdot 10^3 \text{ g}$$

$$n(\text{oldat}) = \frac{n(\text{oldott anyag}) \cdot 100}{x\%} = \frac{38{,}6 \text{ mol} \cdot 100}{0{,}0120} = 321789{,}72 \text{ mol} \approx 3{,}22 \cdot 10^5 \text{ mol}$$

$$n(\text{oldószer}) = n(\text{oldat}) - n(\text{oldott anyag}) = 3{,}22 \cdot 10^5 \text{ mol} - 1{,}32 \cdot 10^3 \text{ mol} = 3{,}20 \cdot 10^5 \text{ mol}$$

$$m(\text{H}_2\text{O}) = n(\text{H}_2\text{O}) \cdot M(\text{H}_2\text{O}) = 3{,}20 \cdot 10^5 \text{ mol} \cdot 18{,}02 \frac{\text{g}}{\text{mol}} = 5774936{,}55 \text{ g} \approx 5{,}77 \cdot 10^6 \text{ g}$$

$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 1{,}32 \cdot 10^3 \text{ g} + 5{,}77 \cdot 10^6 \text{ g} = 5776252{,}54 \text{ g} \approx$

$m(\text{oldat}) \approx \underline{\underline{5{,}78 \cdot 10^6 \text{ g}}}$.

180. A)

$$m(\text{H}_2\text{O}) = \varrho(\text{H}_2\text{O}) \cdot V(\text{H}_2\text{O}) = 1{,}00 \frac{\text{g}}{\text{cm}^3} \cdot 2500 \text{ cm}^3 = 2500 \text{ g}$$

$$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{2500 \text{ g}}{18{,}02 \frac{\text{g}}{\text{mol}}} = 138{,}73 \text{ mol} \approx 139 \text{ mol}$$

$$n(\text{oldott anyag}) = \frac{x\% \cdot n(\text{oldószer})}{100 - x\%} = \frac{0{,}810 \cdot 139 \text{ mol}}{100 - 0{,}810} = 1{,}13 \text{ mol}$$

$m(\text{NaOH}) = n(\text{NaOH}) \cdot M(\text{NaOH}) = 1{,}13 \text{ mol} \cdot 40{,}00 \frac{\text{g}}{\text{mol}} = 45{,}32 \text{ g} \approx \underline{\underline{45{,}3 \text{ g}}}$.

B)

$$m(\text{H}_2\text{O}) = \varrho(\text{H}_2\text{O}) \cdot V(\text{H}_2\text{O}) = 1{,}00 \frac{\text{g}}{\text{cm}^3} \cdot 750 \text{ cm}^3 = 750 \text{ g}$$

$$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{750 \text{ g}}{18{,}02 \frac{\text{g}}{\text{mol}}} = 41{,}62 \text{ mol} \approx 41{,}6 \text{ mol}$$

$$n(\text{oldott anyag}) = \frac{x\% \cdot n(\text{oldószer})}{100 - x\%} = \frac{1{,}20 \cdot 41{,}6 \text{ mol}}{100 - 1{,}20} = 0{,}506 \text{ mol}$$

$m(\text{NaNO}_3) = n(\text{NaNO}_3) \cdot M(\text{NaNO}_3) = 0{,}506 \text{ mol} \cdot 85{,}00 \frac{\text{g}}{\text{mol}} = 42{,}97 \text{ g} \approx \underline{\underline{43{,}0 \text{ g}}}$.

C)

$$m(\text{H}_2\text{O}) = \varrho(\text{H}_2\text{O}) \cdot V(\text{H}_2\text{O}) = 1{,}00 \frac{\text{g}}{\text{cm}^3} \cdot 500 \text{ cm}^3 = 500 \text{ g}$$

$$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{500 \text{ g}}{18{,}02 \frac{\text{g}}{\text{mol}}} = 27{,}7 \text{ mol}$$

$$n(\text{oldott anyag}) = \frac{x\% \cdot n(\text{oldószer})}{100 - x\%} = \frac{2{,}30 \cdot 27{,}7 \text{ mol}}{100 - 2{,}30} = 0{,}653 \text{ mol}$$

$m(\text{KI}) = n(\text{KI}) \cdot M(\text{KI}) = 0{,}653 \text{ mol} \cdot 166{,}00 \frac{\text{g}}{\text{mol}} = 108{,}43 \text{ g} \approx \underline{\underline{108 \text{ g}}}$.

181. A)

$$m(\text{H}_2\text{O}) = \varrho(\text{H}_2\text{O}) \cdot V(\text{H}_2\text{O}) = 1{,}00 \frac{\text{g}}{\text{cm}^3} \cdot 20{,}0 \text{ cm}^3 = 20{,}0 \text{ g}$$

$$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{20{,}0 \text{ g}}{18{,}02 \frac{\text{g}}{\text{mol}}} = 1{,}11 \text{ mol}$$

$$n(\text{oldott anyag}) = \frac{x\% \cdot n(\text{oldószer})}{100 - x\%} = \frac{0{,}0515 \cdot 1{,}11 \text{ mol}}{100 - 0{,}0515} = 5{,}72 \cdot 10^{-4} \text{ mol}$$

$V(\text{HCl}) = n(\text{HCl}) \cdot V_{\text{m}}^{\text{st}} = 5{,}72 \cdot 10^{-4} \text{ mol} \cdot 24{,}5 \frac{\text{dm}^3}{\text{mol}} = \underline{\underline{0{,}0140 \text{ dm}^3}}$.

B)

$$m(\text{H}_2\text{O}) = \varrho(\text{H}_2\text{O}) \cdot V(\text{H}_2\text{O}) = 1{,}00 \frac{\text{g}}{\text{cm}^3} \cdot 165 \text{ cm}^3 = 165 \text{ g}$$

$$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{165 \text{ g}}{18{,}02 \frac{\text{g}}{\text{mol}}} = 9{,}156 \text{ mol} \approx 9{,}16 \text{ mol}$$

$$n(\text{oldott anyag}) = \frac{x\% \cdot n(\text{oldószer})}{100 - x\%} = \frac{0{,}127 \cdot 9{,}16 \text{ mol}}{100 - 0{,}127} = 0{,}0116 \text{ mol}$$

$V(\text{NH}_3) = n(\text{NH}_3) \cdot V_{\text{m}}^{0 \text{ °C}} = 0{,}0116 \text{ mol} \cdot 22{,}41 \frac{\text{dm}^3}{\text{mol}} = \underline{\underline{0{,}261 \text{ dm}^3}}$.

C)

$$m(H_2O) = \varrho(H_2O) \cdot V(H_2O) = 1{,}00 \, \tfrac{g}{cm^3} \cdot 460 \, cm^3 = 460 \, g$$

$$n(H_2O) = \frac{m(H_2O)}{M(H_2O)} = \frac{460 \, g}{18{,}02 \, \frac{g}{mol}} = 25{,}53 \, mol \approx 25{,}5 \, mol$$

$$n(\text{oldott anyag}) = \frac{x\% \cdot n(\text{oldószer})}{100 - x\%} = \frac{1{,}23 \cdot 25{,}5 \, mol}{100 - 1{,}23} = 0{,}318 \, mol$$

$$\mathbf{V(H_2S)} = n(H_2S) \cdot V_m^{st} = 0{,}318 \, mol \cdot 24{,}5 \, \tfrac{dm^3}{mol} = \mathbf{\underline{7{,}79 \, dm^3}}.$$

182. A)

Az anyagmennyiség-százalék jelentése: minden 100 mol oldatban 1,50 mol oldott anyag és 98,5 mol oldószer van.

$$m(NaCl) = n(NaCl) \cdot M(NaCl) = 1{,}50 \, mol \cdot 58{,}44 \, \tfrac{g}{mol} = 87{,}66 \, g \approx 87{,}7 \, g$$

$$m(H_2O) = n(H_2O) \cdot M(H_2O) = 98{,}5 \, mol \cdot 18{,}02 \, \tfrac{g}{mol} = 1774{,}97 \, g \approx 1{,}77 \cdot 10^3 \, g$$

100 mol oldat tömege:

$$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 87{,}7 \, g + 1{,}77 \cdot 10^3 \, g = 1862{,}63 \, g \approx 1{,}86 \cdot 10^3 \, g.$$

$1{,}86 \cdot 10^3$ g oldatban	87,7 g nátrium-klorid	$1{,}77 \cdot 10^3$ g víz
350 g oldatban	**16,5 g nátrium-klorid**	**334 g víz**.
	(16,47 g)	(333,53 g)

B)

Az anyagmennyiség-százalék jelentése: minden 100,0 mol oldatban 1,052 mol oldott anyag és 98,948 mol oldószer van.

$$m(H_2SO_4) = n(H_2SO_4) \cdot M(H_2SO_4) = 1{,}052 \, mol \cdot 98{,}08 \, \tfrac{g}{mol} = 103{,}18 \, g \approx 103 \, g$$

$$m(H_2O) = n(H_2O) \cdot M(H_2O) = 98{,}948 \, mol \cdot 18{,}02 \, \tfrac{g}{mol} = 1783{,}04 \, g \approx 1{,}78 \cdot 10^3 \, g$$

100 mol oldat tömege:

$$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 103 \, g + 1{,}78 \cdot 10^3 \, g = 1886{,}22 \, g \approx 1{,}89 \cdot 10^3 \, g.$$

$1{,}89 \cdot 10^3$ g oldatban	103 g kénsav	$1{,}78 \cdot 10^3$ g víz
1500 g oldatban	**82,05 g kénsav**	**$1{,}418 \cdot 10^3$ g víz**.
		(1417,95 g)

C)

Az anyagmennyiség-százalék jelentése: minden 100 mol oldatban 1,11 mol oldott anyag és 98,89 mol ($\approx$ 98,9 mol) oldószer van.

$$m(HNO_3) = n(HNO_3) \cdot M(HNO_3) = 1{,}11 \, mol \cdot 63{,}02 \, \tfrac{g}{mol} = 69{,}95 \, g \approx 70{,}0 \, g$$

$$m(H_2O) = n(H_2O) \cdot M(H_2O) = 98{,}9 \, mol \cdot 18{,}02 \, \tfrac{g}{mol} = 1782{,}00 \, g \approx 1{,}78 \cdot 10^3 \, g$$

100 mol oldat tömege:

$$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 70{,}0 \, g + 1{,}78 \cdot 10^3 \, g = 1851{,}95 \, g \approx 1{,}85 \cdot 10^3 \, g.$$

$1{,}85 \cdot 10^3$ g oldatban	70,0 g salétromsav	$1{,}78 \cdot 10^3$ g víz
100 g oldatban	**3,78 g salétromsav**	**96,2 g víz**.
	(3,777 g)	(96,22 g)

183. A)

$$\boldsymbol{\varphi\%} = \frac{V(\text{oldott anyag})}{V(\text{oldat})} \cdot 100 = \frac{27{,}0 \, cm^3}{250 \, cm^3} \cdot 100 = \mathbf{\underline{10{,}8}}.$$

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B)

$$\boldsymbol{\varphi\%} = \frac{V(\text{oldott anyag})}{V(\text{oldat})} \cdot 100 = \frac{15,55 \text{ cm}^3}{500,0 \text{ cm}^3} \cdot 100 = \underline{\textbf{3,110}}.$$

C)

A feladat szövege helyesen: „…salétromsav található. Hány $\varphi\%$-os az oldat?"

$$\boldsymbol{\varphi\%} = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{55,00 \text{ cm}^3}{1300 \text{ cm}^3} \cdot 100 = \underline{\textbf{4,231}}.$$

184. A)

$$V(\text{kénsav}) = \frac{m(\text{kénsav})}{\varrho(\text{kénsav})} = \frac{75,0 \text{ g}}{1,83 \frac{\text{g}}{\text{cm}^3}} = 40,98 \text{ cm}^3 \approx 41,0 \text{ cm}^3$$

$$\boldsymbol{\varphi\%} = \frac{V(\text{oldott anyag})}{V(\text{oldat})} \cdot 100 = \frac{41,0 \text{ cm}^3}{500 \text{ cm}^3} \cdot 100 = \underline{\textbf{8,20}}.$$

B)

$$V(\text{etanol}) = \frac{m(\text{etanol})}{\varrho(\text{etanol})} = \frac{10,0 \text{ g}}{0,789 \frac{\text{g}}{\text{cm}^3}} = 12,67 \text{ cm}^3 \approx 12,7 \text{ cm}^3$$

$$\boldsymbol{\varphi\%} = \frac{V(\text{oldott anyag})}{V(\text{oldat})} \cdot 100 = \frac{12,7 \text{ cm}^3}{75,0 \text{ cm}^3} \cdot 100 = \underline{\textbf{16,9}}.$$

C)

$$V(\text{salétromsav}) = \frac{m(\text{salétromsav})}{\varrho(\text{salétromsav})} = \frac{900,0 \text{ g}}{1,513 \frac{\text{g}}{\text{cm}^3}} = 594,84 \text{ cm}^3 \approx 594,8 \text{ cm}^3$$

$$\boldsymbol{\varphi\%} = \frac{V(\text{oldott anyag})}{V(\text{oldat})} \cdot 100 = \frac{594,8 \text{ cm}^3}{1500 \text{ cm}^3} \cdot 100 = \underline{\textbf{39,66}}.$$

185. A)

$$\boldsymbol{V(\text{oldat})} = \frac{V(\text{oldott anyag}) \cdot 100}{\varphi\%} = \frac{10,5 \text{ cm}^3 \cdot 100}{2,61} = 402,30 \text{ cm}^3 \approx \underline{\textbf{402 cm}^3}.$$

B)

$$\boldsymbol{V(\text{oldat})} = \frac{V(\text{oldott anyag}) \cdot 100}{\varphi\%} = \frac{32,0 \text{ cm}^3 \cdot 100}{10,0} = \underline{\textbf{320 cm}^3}.$$

C)

$$\boldsymbol{V(\text{oldat})} = \frac{V(\text{oldott anyag}) \cdot 100}{\varphi\%} = \frac{12,3 \text{ cm}^3 \cdot 100}{25,0} = \underline{\textbf{49,2 cm}^3}.$$

186. A)

$$V(\text{kénsav}) = \frac{m(\text{kénsav})}{\varrho(\text{kénsav})} = \frac{35,5 \text{ g}}{1,83 \frac{\text{g}}{\text{cm}^3}} = 19,4 \text{ cm}^3$$

$$\boldsymbol{V(\text{oldat})} = \frac{V(\text{oldott anyag}) \cdot 100}{\varphi\%} = \frac{19,4 \text{ cm}^3 \cdot 100}{70,0} = 27,71 \text{ cm}^3 \approx \underline{\textbf{27,7 cm}^3}.$$

B)

$$V(\text{etanol}) = \frac{m(\text{etanol})}{\varrho(\text{etanol})} = \frac{45,0 \text{ g}}{0,789 \frac{\text{g}}{\text{cm}^3}} = 57,0 \text{ cm}^3$$

$$\boldsymbol{V(\text{oldat})} = \frac{V(\text{oldott anyag}) \cdot 100}{\varphi\%} = \frac{57,0 \text{ cm}^3 \cdot 100}{15,0} = 380,23 \text{ cm}^3 \approx \underline{\textbf{380 cm}^3}.$$

C)

$$V(\text{salétromsav}) = \frac{m(\text{salétromsav})}{\varrho(\text{salétromsav})} = \frac{0,1250 \text{ g}}{1,513 \frac{\text{g}}{\text{cm}^3}} = 0,08262 \text{ cm}^3$$

$$\boldsymbol{V(\text{oldat})} = \frac{V(\text{oldott anyag}) \cdot 100}{\varphi\%} = \frac{0,08262 \text{ cm}^3 \cdot 100}{20,00} = \underline{\textbf{0,4131 cm}^3}.$$

187. A)

$$m(\text{H}_2\text{SO}_4) = n(\text{H}_2\text{SO}_4) \cdot M(\text{H}_2\text{SO}_4) = 1,51 \text{ mol} \cdot 98,08 \frac{\text{g}}{\text{mol}} = 148,10 \text{ g} \approx 148 \text{ g}$$

$$V(\text{kénsav}) = \frac{m(\text{kénsav})}{\varrho(\text{kénsav})} = \frac{148 \text{ g}}{1,83 \frac{\text{g}}{\text{cm}^3}} = 80,93 \text{ cm}^3 \approx 80,9 \text{ cm}^3$$

$V(\text{oldat}) = \frac{V(\text{oldott anyag}) \cdot 100}{\varphi\%} = \frac{80{,}9 \text{ cm}^3 \cdot 100}{75{,}0} = 107{,}91 \text{ cm}^3 \approx \underline{\mathbf{108 \text{ cm}^3}}$.

B)

$m(\text{C}_2\text{H}_6\text{O}) = n(\text{C}_2\text{H}_6\text{O}) \cdot M(\text{C}_2\text{H}_6\text{O}) = 3{,}33 \text{ mol} \cdot 46{,}08 \frac{\text{g}}{\text{mol}} = 153{,}45 \text{ g} \approx 153 \text{ g}$

$V(\text{etanol}) = \frac{m(\text{etanol})}{\varrho(\text{etanol})} = \frac{153 \text{ g}}{0{,}789 \frac{\text{g}}{\text{cm}^3}} = 194{,}48 \text{ cm}^3 \approx 194 \text{ cm}^3$

$V(\text{oldat}) = \frac{V(\text{oldott anyag}) \cdot 100}{\varphi\%} = \frac{194 \text{ cm}^3 \cdot 100}{12{,}0} = 1620{,}68 \text{ cm}^3 \approx \underline{\mathbf{1{,}62 \cdot 10^3 \text{ cm}^3}}$.

C)

$m(\text{HNO}_3) = n(\text{HNO}_3) \cdot M(\text{HNO}_3) = 0{,}1755 \text{ mol} \cdot 63{,}02 \frac{\text{g}}{\text{mol}} = 11{,}06 \text{ g}$

$V(\text{salétromsav}) = \frac{m(\text{salétromsav})}{\varrho(\text{salétromsav})} = \frac{11{,}06 \text{ g}}{1{,}513 \frac{\text{g}}{\text{cm}^3}} = 7{,}310 \text{ cm}^3$

$V(\text{oldat}) = \frac{V(\text{oldott anyag}) \cdot 100}{\varphi\%} = \frac{7{,}310 \text{ cm}^3 \cdot 100}{27{,}00} = \underline{\mathbf{27{,}07 \text{ cm}^3}}$.

188. A)

$m(\text{víz}) = \varrho(\text{víz}) \cdot V(\text{víz}) = 1{,}00 \frac{\text{g}}{\text{cm}^3} \cdot 178 \text{ cm}^3 = 178 \text{ g}$

$m(\text{etanol}) = \varrho(\text{etanol}) \cdot V(\text{etanol}) = 0{,}789 \frac{\text{g}}{\text{cm}^3} \cdot 25{,}0 \text{ cm}^3 = 19{,}73 \text{ g} \approx 19{,}7 \text{ g}$

$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 19{,}7 \text{ g} + 178 \text{ g} = 197{,}73 \text{ g} \approx 198 \text{ g}$

$V(\text{oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{198 \text{ g}}{0{,}982 \frac{\text{g}}{\text{cm}^3}} = 201{,}35 \text{ cm}^3 \approx 201 \text{ cm}^3$

$\boldsymbol{\varphi\%} = \frac{V(\text{oldott anyag})}{V(\text{oldat})} \cdot 100 = \frac{25{,}0 \text{ cm}^3}{201 \text{ cm}^3} \cdot 100 = 12{,}42 \approx \underline{\mathbf{12{,}4}}$.

B)

$m(\text{víz}) = \varrho(\text{víz}) \cdot V(\text{víz}) = 1{,}00 \frac{\text{g}}{\text{cm}^3} \cdot 250 \text{ cm}^3 = 250 \text{ g}$

$m(\text{kénsav}) = \varrho(\text{kénsav}) \cdot V(\text{kénsav}) = 1{,}83 \frac{\text{g}}{\text{cm}^3} \cdot 14{,}2 \text{ cm}^3 = 25{,}99 \text{ g} \approx 26{,}0 \text{ g}$

$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 26{,}0 \text{ g} + 250 \text{ g} = 275{,}99 \text{ g} \approx 276 \text{ g}$

$V(\text{oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{276 \text{ g}}{1{,}07 \frac{\text{g}}{\text{cm}^3}} = 257{,}93 \text{ cm}^3 \approx 258 \text{ cm}^3$

$\boldsymbol{\varphi\%} = \frac{V(\text{oldott anyag})}{V(\text{oldat})} \cdot 100 = \frac{14{,}2 \text{ cm}^3}{258 \text{ cm}^3} \cdot 100 = \underline{\mathbf{5{,}51}}$.

C)

$m(\text{víz}) = \varrho(\text{víz}) \cdot V(\text{víz}) = 0{,}9998 \frac{\text{g}}{\text{cm}^3} \cdot 2500 \text{ cm}^3 = 2499{,}5 \text{ g} \approx 2500 \text{ g}$

$m(\text{salétromsav}) = \varrho(\text{salétromsav}) \cdot V(\text{salétromsav}) =$

$m(\text{salétromsav}) = 1{,}513 \frac{\text{g}}{\text{cm}^3} \cdot 150{,}0 \text{ cm}^3 = 226{,}95 \text{ g} \approx 227{,}0 \text{ g}$

$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 227{,}0 \text{ g} + 2500 \text{ g} = 2726{,}45 \text{ g} \approx 2726 \text{ g}$

$V(\text{oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{2726 \text{ g}}{1{,}039 \frac{\text{g}}{\text{cm}^3}} = 2624{,}11 \text{ cm}^3 \approx 2624 \text{ cm}^3$

$\boldsymbol{\varphi\%} = \frac{V(\text{oldott anyag})}{V(\text{oldat})} \cdot 100 = \frac{150{,}0 \text{ cm}^3}{2624 \text{ cm}^3} \cdot 100 = \underline{\mathbf{5{,}716}}$.

189. A)

$m(\text{oldat}) = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 0{,}880 \frac{\text{g}}{\text{cm}^3} \cdot 500 \text{ cm}^3 = 440 \text{ g}$

$\boldsymbol{V(\text{etanol})} = \frac{\varphi\% \cdot V(\text{oldat})}{100} = \frac{70{,}0 \cdot 500 \text{ cm}^3}{100} = \underline{\mathbf{350 \text{ cm}^3}}$

$m(\text{etanol}) = \varrho(\text{etanol}) \cdot V(\text{etanol}) = 0{,}789 \frac{\text{g}}{\text{cm}^3} \cdot 350 \text{ cm}^3 = 276{,}15 \text{ g} \approx 276 \text{ g}$

$m(\text{oldószer}) = m(\text{oldat}) - m(\text{oldott anyag}) = 440 \text{ g} - 276 \text{ g} = 163{,}85 \text{ g} \approx 164 \text{ g}$

$$V(\text{víz}) = \frac{m(\text{víz})}{\varrho(\text{víz})} = \frac{164 \text{ g}}{1{,}00 \frac{\text{g}}{\text{cm}^3}} = 163{,}85 \text{ cm}^3 \approx \underline{\mathbf{164 \text{ cm}^3}}.$$

B)

$$m(\text{oldat}) = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 1{,}145 \frac{\text{g}}{\text{cm}^3} \cdot 250{,}0 \text{ cm}^3 = 286{,}25 \text{ g} \approx 286{,}3 \text{ g}$$

$$V(\text{kénsav}) = \frac{\varphi\% \cdot V(\text{oldat})}{100} = \frac{12{,}70 \cdot 250{,}0 \text{ cm}^3}{100} = \underline{\mathbf{31{,}75 \text{ cm}^3}}$$

$$m(\text{kénsav}) = \varrho(\text{kénsav}) \cdot V(\text{kénsav}) = 1{,}830 \frac{\text{g}}{\text{cm}^3} \cdot 31{,}75 \text{ cm}^3 = 58{,}10 \text{ g}$$

$$m(\text{oldószer}) = m(\text{oldat}) - m(\text{oldott anyag}) = 286{,}3 \text{ g} - 58{,}10 \text{ g} = 228{,}1 \text{ g}$$

$$V(\text{víz}) = \frac{m(\text{víz})}{\varrho(\text{víz})} = \frac{228{,}1 \text{ g}}{0{,}9997 \frac{\text{g}}{\text{cm}^3}} = 228{,}22 \text{ cm}^3 \approx \underline{\mathbf{228{,}2 \text{ cm}^3}}.$$

C)

$$m(\text{oldat}) = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 0{,}8040 \frac{\text{g}}{\text{cm}^3} \cdot 2000 \text{ cm}^3 = 1608 \text{ g}$$

$$V(\text{etanol}) = \frac{\varphi\% \cdot V(\text{oldat})}{100} = \frac{96{,}00 \cdot 2000 \text{ cm}^3}{100} = \underline{\mathbf{1920 \text{ cm}^3}}$$

$$m(\text{etanol}) = \varrho(\text{etanol}) \cdot V(\text{etanol}) = 0{,}7890 \frac{\text{g}}{\text{cm}^3} \cdot 1920 \text{ cm}^3 = 1514{,}88 \text{ g} \approx 1515 \text{ g}$$

$$m(\text{oldószer}) = m(\text{oldat}) - m(\text{oldott anyag}) = 1608 \text{ g} - 1515 \text{ g} = 93{,}12 \text{ g}$$

$$V(\text{víz}) = \frac{m(\text{víz})}{\varrho(\text{víz})} = \frac{93{,}12 \text{ g}}{0{,}9998 \frac{\text{g}}{\text{cm}^3}} = \underline{\mathbf{93{,}14 \text{ cm}^3}}.$$

190. A)

Legyen a keletkező oldat térfogata x cm^3!

$$m(\text{oldat}) = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 0{,}8800 \frac{\text{g}}{\text{cm}^3} \cdot x \text{ cm}^3 = 0{,}8800x \text{ g}$$

$$V(\text{etanol}) = \frac{\varphi\% \cdot V(\text{oldat})}{100} = \frac{70{,}00 \cdot x \text{ cm}^3}{100} = 0{,}7000x \text{ cm}^3$$

$$m(\text{etanol}) = \varrho(\text{etanol}) \cdot V(\text{etanol}) = 0{,}7890 \frac{\text{g}}{\text{cm}^3} \cdot 0{,}7000x \text{ cm}^3 = 0{,}5523x \text{ g}$$

$$m(\text{oldószer}) = m(\text{oldat}) - m(\text{oldott anyag}) = 0{,}8800x \text{ g} - 0{,}5523x \text{ g} = 0{,}3277x \text{ g}$$

$$m(\text{víz}) = \varrho(\text{víz}) \cdot V(\text{víz}) = 0{,}9997 \frac{\text{g}}{\text{cm}^3} \cdot 2500 \text{ cm}^3 = 2499{,}25 \text{ g} \approx 2499 \text{ g}$$

Ezek alapján $2499 \text{ g} = 0{,}3277x \text{ g}$,

amelyből $x = 7626{,}64$ cm^3 oldat ≈ 7627 cm^3 oldat.

Ebből kiszámítható: $\boldsymbol{V(\text{etanol})} = 0{,}7000 \cdot 7627 \text{ cm}^3 = 5338{,}65 \text{ cm}^3 \approx \underline{\mathbf{5339 \text{ cm}^3}}$.

B)

Legyen a keletkező oldat térfogata x cm^3!

$$m(\text{oldat}) = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 1{,}145 \frac{\text{g}}{\text{cm}^3} \cdot x \text{ cm}^3 = 1{,}145x \text{ g}$$

$$V(\text{kénsav}) = \frac{\varphi\% \cdot V(\text{oldat})}{100} = \frac{12{,}67 \cdot x \text{ cm}^3}{100} = 0{,}1267x \text{ cm}^3$$

$$m(\text{kénsav}) = \varrho(\text{kénsav}) \cdot V(\text{kénsav}) = 1{,}830 \frac{\text{g}}{\text{cm}^3} \cdot 0{,}1267x \text{ cm}^3 = 0{,}2319x \text{ g}$$

$$m(\text{oldószer}) = m(\text{oldat}) - m(\text{oldott anyag}) = 1{,}145x \text{ g} - 0{,}2319x \text{ g} = 0{,}9131x \text{ g}$$

$$m(\text{víz}) = \varrho(\text{víz}) \cdot V(\text{víz}) = 0{,}9996 \frac{\text{g}}{\text{cm}^3} \cdot 450{,}0 \text{ cm}^3 = 449{,}82 \text{ g} \approx 449{,}8 \text{ g}$$

Ezek alapján $449{,}8 \text{ g} = 0{,}9131x \text{ g}$,

amelyből $x = 492{,}61$ cm^3 oldat $\approx 492{,}6$ cm^3 oldat.

Ebből kiszámítható: $\boldsymbol{V(\text{kénsav})} = 0{,}1267 \cdot 492{,}6 \text{ cm}^3 = \underline{\mathbf{62{,}41 \text{ cm}^3}}$.

C)

Legyen a keletkező oldat térfogata x cm^3!

$$m(\text{oldat}) = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 0{,}804 \frac{\text{g}}{\text{cm}^3} \cdot x \text{ cm}^3 = 0{,}804x \text{ g}$$

$$V(\text{etanol}) = \frac{\varphi\% \cdot V(\text{oldat})}{100} = \frac{96{,}0 \cdot x \text{ cm}^3}{100} = 0{,}960x \text{ cm}^3$$

$m(\text{etanol}) = \varrho(\text{etanol}) \cdot V(\text{etanol}) = 0{,}789 \, \frac{\text{g}}{\text{cm}^3} \cdot 0{,}960x \, \text{cm}^3 = 0{,}757x \, \text{g}$

$m(\text{oldószer}) = m(\text{oldat}) - m(\text{oldott anyag}) = 0{,}804x \, \text{g} - 0{,}757x \, \text{g} = 0{,}0466x \, \text{g}$

$m(\text{víz}) = \varrho(\text{víz}) \cdot V(\text{víz}) = 1{,}00 \, \frac{\text{g}}{\text{cm}^3} \cdot 30{,}0 \, \text{cm}^3 = 30{,}0 \, \text{g}$

Ezek alapján $\quad 30{,}0 \, \text{g} = 0{,}0466x \, \text{g}$,

amelyből $x = 644{,}33 \, \text{cm}^3$ oldat $\approx 644 \, \text{cm}^3$ oldat.

Ebből kiszámítható: $\boldsymbol{V(\text{etanol})} = 0{,}960 \cdot 644 \, \text{cm}^3 = 618{,}56 \, \text{cm}^3 \approx \underline{\boldsymbol{619 \, \text{cm}^3}}$.

191. A)

$$\boldsymbol{c}(\textbf{oldat}) = \frac{n(\text{oldott anyag})}{V(\text{oldat})} = \frac{0{,}0100 \, \text{mol}}{0{,}350 \, \text{dm}^3} = \underline{\boldsymbol{0{,}0286 \, \frac{\text{mol}}{\text{dm}^3}}}.$$

B)

$$\boldsymbol{c}(\textbf{oldat}) = \frac{n(\text{oldott anyag})}{V(\text{oldat})} = \frac{0{,}100 \, \text{mol}}{1{,}50 \, \text{dm}^3} = \underline{\boldsymbol{0{,}0667 \, \frac{\text{mol}}{\text{dm}^3}}}.$$

C)

$$\boldsymbol{c}(\textbf{oldat}) = \frac{n(\text{oldott anyag})}{V(\text{oldat})} = \frac{1{,}30 \, \text{mol}}{5{,}50 \, \text{dm}^3} = \underline{\boldsymbol{0{,}236 \, \frac{\text{mol}}{\text{dm}^3}}}.$$

192. A)

$$n(\text{NH}_3) = \frac{m(\text{NH}_3)}{M(\text{NH}_3)} = \frac{2{,}50 \, \text{g}}{17{,}04 \, \frac{\text{g}}{\text{mol}}} = 0{,}147 \, \text{mol}$$

$$\boldsymbol{c}(\textbf{oldat}) = \frac{n(\text{oldott anyag})}{V(\text{oldat})} = \frac{0{,}147 \, \text{mol}}{2{,}00 \, \text{dm}^3} = \underline{\boldsymbol{0{,}0734 \, \frac{\text{mol}}{\text{dm}^3}}}.$$

B)

$$n(\text{KCl}) = \frac{m(\text{KCl})}{M(\text{KCl})} = \frac{12{,}0 \, \text{g}}{74{,}55 \, \frac{\text{g}}{\text{mol}}} = 0{,}161 \, \text{mol}$$

$$\boldsymbol{c}(\textbf{oldat}) = \frac{n(\text{oldott anyag})}{V(\text{oldat})} = \frac{0{,}161 \, \text{mol}}{0{,}550 \, \text{dm}^3} = \underline{\boldsymbol{0{,}293 \, \frac{\text{mol}}{\text{dm}^3}}}.$$

C)

$$n(\text{HCl}) = \frac{m(\text{HCl})}{M(\text{HCl})} = \frac{53{,}00 \, \text{g}}{36{,}46 \, \frac{\text{g}}{\text{mol}}} = 1{,}454 \, \text{mol}$$

$$\boldsymbol{c}(\textbf{oldat}) = \frac{n(\text{oldott anyag})}{V(\text{oldat})} = \frac{1{,}454 \, \text{mol}}{1{,}200 \, \text{dm}^3} = \underline{\boldsymbol{1{,}211 \, \frac{\text{mol}}{\text{dm}^3}}}.$$

193. A)

$$n(\text{NH}_3) = \frac{V(\text{NH}_3)}{V_{\text{m}}^{\text{st}}} = \frac{16{,}8 \, \text{dm}^3}{24{,}5 \, \frac{\text{dm}^3}{\text{mol}}} = 0{,}686 \, \text{mol}$$

$$\boldsymbol{c}(\textbf{oldat}) = \frac{n(\text{oldott anyag})}{V(\text{oldat})} = \frac{0{,}686 \, \text{mol}}{0{,}200 \, \text{dm}^3} = \underline{\boldsymbol{3{,}43 \, \frac{\text{mol}}{\text{dm}^3}}}.$$

B)

$$n(\text{HCl}) = \frac{p \cdot V}{R \cdot T} = \frac{126000 \, \text{Pa} \cdot 5{\cdot}10^{-4} \, \text{m}^3}{8{,}314 \, \frac{\text{J}}{\text{mol} \cdot \text{K}} \cdot 286 \, \text{K}} = 0{,}0265 \, \text{mol}$$

$$\boldsymbol{c}(\textbf{oldat}) = \frac{n(\text{oldott anyag})}{V(\text{oldat})} = \frac{0{,}0265 \, \text{mol}}{0{,}100 \, \text{dm}^3} = \underline{\boldsymbol{0{,}265 \, \frac{\text{mol}}{\text{dm}^3}}}.$$

C)

$$n(\text{H}_2\text{S}) = \frac{p \cdot V}{R \cdot T} = \frac{99200 \, \text{Pa} \cdot 0{,}300 \, \text{m}^3}{8{,}314 \, \frac{\text{J}}{\text{mol} \cdot \text{K}} \cdot 308 \, \text{K}} = 11{,}6 \, \text{mol}$$

$$\boldsymbol{c}(\textbf{oldat}) = \frac{n(\text{oldott anyag})}{V(\text{oldat})} = \frac{11{,}6 \, \text{mol}}{2{,}50 \, \text{dm}^3} = \underline{\boldsymbol{4{,}65 \, \frac{\text{mol}}{\text{dm}^3}}}.$$

194. A)

$$\boldsymbol{V}(\textbf{oldat}) = \frac{n(\text{oldott anyag})}{c(\text{oldat})} = \frac{1{,}25 \, \text{mol}}{0{,}500 \, \frac{\text{mol}}{\text{dm}^3}} = \underline{\boldsymbol{2{,}50 \, \text{dm}^3}}.$$

Készült a *Gyűjtemény a Kémia emelt szintű oktatásához 9-10.* tankönyv feladataihoz.

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B)

$$V(\text{oldat}) = \frac{n(\text{oldott anyag})}{c(\text{oldat})} = \frac{33{,}3 \text{ mol}}{1{,}50 \frac{\text{mol}}{\text{dm}^3}} = \underline{\mathbf{22{,}2 \text{ dm}^3}}.$$

C)

$$V(\text{oldat}) = \frac{n(\text{oldott anyag})}{c(\text{oldat})} = \frac{0{,}250 \text{ mol}}{0{,}200 \frac{\text{mol}}{\text{dm}^3}} = \underline{\mathbf{1{,}25 \text{ dm}^3}}.$$

195. A)

$$n(\text{KCl}) = \frac{m(\text{KCl})}{M(\text{KCl})} = \frac{10{,}2 \text{ g}}{74{,}55 \frac{\text{g}}{\text{mol}}} = 0{,}137 \text{ mol}$$

$$V(\text{oldat}) = \frac{n(\text{oldott anyag})}{c(\text{oldat})} = \frac{0{,}137 \text{ mol}}{0{,}400 \frac{\text{mol}}{\text{dm}^3}} = \underline{\mathbf{0{,}342 \text{ dm}^3}}.$$

B)

$$n(\text{NaNO}_3) = \frac{m(\text{NaNO}_3)}{M(\text{NaNO}_3)} = \frac{22{,}2 \text{ g}}{85{,}00 \frac{\text{g}}{\text{mol}}} = 0{,}261 \text{ mol}$$

$$V(\text{oldat}) = \frac{n(\text{oldott anyag})}{c(\text{oldat})} = \frac{0{,}261 \text{ mol}}{1{,}30 \frac{\text{mol}}{\text{dm}^3}} = \underline{\mathbf{0{,}201 \text{ dm}^3}}.$$

C)

$$n(\text{ZnI}_2) = \frac{m(\text{ZnI}_2)}{M(\text{ZnI}_2)} = \frac{55{,}0 \text{ g}}{319{,}18 \frac{\text{g}}{\text{mol}}} = 0{,}172 \text{ mol}$$

$$V(\text{oldat}) = \frac{n(\text{oldott anyag})}{c(\text{oldat})} = \frac{0{,}172 \text{ mol}}{0{,}700 \frac{\text{mol}}{\text{dm}^3}} = \underline{\mathbf{0{,}246 \text{ dm}^3}}.$$

196. A)

$$n(\text{NH}_3) = \frac{V(\text{NH}_3)}{V_{\text{m}}^{\text{st}}} = \frac{76{,}2 \text{ dm}^3}{24{,}5 \frac{\text{dm}^3}{\text{mol}}} = 3{,}11 \text{ mol}$$

$$V(\text{oldat}) = \frac{n(\text{oldott anyag})}{c(\text{oldat})} = \frac{3{,}11 \text{ mol}}{0{,}600 \frac{\text{mol}}{\text{dm}^3}} = \underline{\mathbf{5{,}18 \text{ dm}^3}}.$$

B)

$$n(\text{H}_2\text{S}) = \frac{p \cdot V}{R \cdot T} = \frac{92000 \text{ Pa} \cdot 0{,}096 \text{ m}^3}{8{,}314 \frac{\text{J}}{\text{mol} \cdot \text{K}} \cdot 311 \text{ K}} = 3{,}42 \text{ mol}$$

$$V(\text{oldat}) = \frac{n(\text{oldott anyag})}{c(\text{oldat})} = \frac{3{,}42 \text{ mol}}{1{,}30 \frac{\text{mol}}{\text{dm}^3}} = \underline{\mathbf{2{,}63 \text{ dm}^3}}.$$

C)

$$n(\text{HCl}) = \frac{p \cdot V}{R \cdot T} = \frac{145000 \text{ Pa} \cdot 0{,}063 \text{ m}^3}{8{,}314 \frac{\text{J}}{\text{mol} \cdot \text{K}} \cdot 295 \text{ K}} = 3{,}72 \text{ mol}$$

$$V(\text{oldat}) = \frac{n(\text{oldott anyag})}{c(\text{oldat})} = \frac{3{,}72 \text{ mol}}{1{,}40 \frac{\text{mol}}{\text{dm}^3}} = \underline{\mathbf{2{,}66 \text{ dm}^3}}.$$

197. A)

$$V(\text{oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{400 \text{ g}}{1{,}13 \frac{\text{g}}{\text{cm}^3}} = 353{,}98 \text{ cm}^3 \approx 0{,}354 \text{ dm}^3$$

$$n(\text{oldott anyag}) = c(\text{oldat}) \cdot V(\text{oldat}) = 2{,}16 \frac{\text{mol}}{\text{dm}^3} \cdot 0{,}354 \text{ dm}^3 = 0{,}765 \text{ mol}$$

$$\mathbf{m(\text{H}_2\text{SO}_4)} = n(\text{H}_2\text{SO}_4) \cdot M(\text{H}_2\text{SO}_4) = 0{,}765 \text{ mol} \cdot 98{,}08 \frac{\text{g}}{\text{mol}} = 74{,}99 \text{ g} \approx \underline{\mathbf{75{,}0 \text{ g}}}$$

$$\mathbf{m(\text{víz})} = m(\text{oldat}) - m(\text{oldott anyag}) = 400 \text{ g} - 75{,}0 \text{ g} = \underline{\mathbf{325 \text{ g}}}.$$

B)

$$V(\text{oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{1500 \text{ g}}{1{,}23 \frac{\text{g}}{\text{cm}^3}} = 1219{,}51 \text{ cm}^3 \approx 1{,}22 \text{ dm}^3$$

$$n(\text{oldott anyag}) = c(\text{oldat}) \cdot V(\text{oldat}) = 7{,}32 \frac{\text{mol}}{\text{dm}^3} \cdot 1{,}22 \text{ dm}^3 = 8{,}93 \text{ mol}$$

$m(\mathbf{HNO_3}) = n(HNO_3) \cdot M(HNO_3) = 8{,}93 \text{ mol} \cdot 63{,}02 \frac{\text{g}}{\text{mol}} = 562{,}57 \text{ g} \approx \underline{\mathbf{563 \text{ g}}}$

$m(\mathbf{víz}) = m(\text{oldat}) - m(\text{oldott anyag}) = 1500 \text{ g} - 563 \text{ g} = 937{,}43 \text{ g} \approx \underline{\mathbf{937 \text{ g}}}.$

C)

$V(\text{oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{1700 \text{ g}}{1{,}05 \frac{\text{g}}{\text{cm}^3}} = 1619{,}05 \text{ cm}^3 \approx 1{,}62 \text{ dm}^3$

$n(\text{oldott anyag}) = c(\text{oldat}) \cdot V(\text{oldat}) = 1{,}22 \frac{\text{mol}}{\text{dm}^3} \cdot 1{,}62 \text{ dm}^3 = 1{,}98 \text{ mol}$

$m(\mathbf{Na_2CO_3}) = n(Na_2CO_3) \cdot M(Na_2CO_3) = 1{,}98 \text{ mol} \cdot 105{,}99 \frac{\text{g}}{\text{mol}} = 209{,}36 \text{ g} \approx \underline{\mathbf{209 \text{ g}}}$

$m(\mathbf{víz}) = m(\text{oldat}) - m(\text{oldott anyag}) = 1700 \text{ g} - 209 \text{ g} = 1490{,}64 \text{ g} \approx \underline{\mathbf{1{,}49 \cdot 10^3 \text{ g}}}.$

198. A)

$m(\text{oldat}) = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 0{,}988 \frac{\text{g}}{\text{cm}^3} \cdot 3000 \text{ cm}^3 = 2964 \text{ g} \approx 2{,}96 \cdot 10^3 \text{ g}$

$n(\text{oldott anyag}) = c(\text{oldat}) \cdot V(\text{oldat}) = 1{,}36 \frac{\text{mol}}{\text{dm}^3} \cdot 3{,}00 \text{ dm}^3 = 4{,}08 \text{ mol}$

$m(NH_3) = n(NH_3) \cdot M(NH_3) = 4{,}08 \text{ mol} \cdot 17{,}04 \frac{\text{g}}{\text{mol}} = 69{,}52 \text{ g} \approx 69{,}5 \text{ g}$

$m(\text{víz}) = m(\text{oldat}) - m(\text{oldott anyag}) = 2{,}96 \cdot 10^3 \text{ g} - 69{,}5 \text{ g} = 2894{,}48 \text{ g} \approx 2{,}89 \cdot 10^3 \text{ g}$

$V(\mathbf{NH_3}) = n(NH_3) \cdot V_\text{m}^\text{st} = 4{,}08 \text{ mol} \cdot 24{,}5 \frac{\text{dm}^3}{\text{mol}} = 99{,}96 \text{ dm}^3 \approx \underline{\mathbf{100 \text{ dm}^3}}$

$V(\mathbf{víz}) = \frac{m(\text{víz})}{\varrho(\text{víz})} = \frac{2{,}89 \cdot 10^3 \text{ g}}{1{,}00 \frac{\text{g}}{\text{cm}^3}} = \underline{\mathbf{2{,}89 \cdot 10^3 \text{ cm}^3}}.$

B)

$m(\text{oldat}) = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 1{,}03 \frac{\text{g}}{\text{cm}^3} \cdot 5000 \text{ cm}^3 = 5150 \text{ g} \approx 5{,}15 \cdot 10^3 \text{ g}$

$n(\text{oldott anyag}) = c(\text{oldat}) \cdot V(\text{oldat}) = 1{,}81 \frac{\text{mol}}{\text{dm}^3} \cdot 5{,}00 \text{ dm}^3 = 9{,}05 \text{ mol}$

$m(HCl) = n(HCl) \cdot M(HCl) = 9{,}05 \text{ mol} \cdot 36{,}46 \frac{\text{g}}{\text{mol}} = 329{,}96 \text{ g} \approx 330 \text{ g}$

$m(\text{víz}) = m(\text{oldat}) - m(\text{oldott anyag}) = 5{,}15 \cdot 10^3 \text{ g} - 330 \text{ g} = 4820{,}04 \text{ g} \approx 4{,}82 \cdot 10^3 \text{ g}$

$V(\mathbf{HCl}) = n(HCl) \cdot V_\text{m}^\text{st} = 9{,}05 \text{ mol} \cdot 24{,}5 \frac{\text{dm}^3}{\text{mol}} = 221{,}73 \text{ dm}^3 \approx \underline{\mathbf{222 \text{ dm}^3}}$

$V(\mathbf{víz}) = \frac{m(\text{víz})}{\varrho(\text{víz})} = \frac{4{,}82 \cdot 10^3 \text{ g}}{1{,}00 \frac{\text{g}}{\text{cm}^3}} = \underline{\mathbf{4{,}82 \cdot 10^3 \text{ cm}^3}}.$

C)

$m(\text{oldat}) = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 0{,}978 \frac{\text{g}}{\text{cm}^3} \cdot 1500 \text{ cm}^3 = 1467 \text{ g} \approx 1{,}47 \cdot 10^3 \text{ g}$

$n(\text{oldott anyag}) = c(\text{oldat}) \cdot V(\text{oldat}) = 2{,}73 \frac{\text{mol}}{\text{dm}^3} \cdot 1{,}50 \text{ dm}^3 = 4{,}10 \text{ mol}$

$m(NH_3) = n(NH_3) \cdot M(NH_3) = 4{,}10 \text{ mol} \cdot 17{,}04 \frac{\text{g}}{\text{mol}} = 69{,}78 \text{ g} \approx 69{,}8 \text{ g}$

$m(\text{víz}) = m(\text{oldat}) - m(\text{oldott anyag}) = 1{,}47 \cdot 10^3 \text{ g} - 69{,}8 \text{ g} = 1397{,}22 \text{ g} \approx 1{,}40 \cdot 10^3 \text{ g}$

$V(\mathbf{NH_3}) = n(NH_3) \cdot V_\text{m}^{0\,°C} = 4{,}10 \text{ mol} \cdot 22{,}41 \frac{\text{dm}^3}{\text{mol}} = 91{,}77 \text{ dm}^3 \approx \underline{\mathbf{91{,}8 \text{ dm}^3}}$

$V(\mathbf{víz}) = \frac{m(\text{víz})}{\varrho(\text{víz})} = \frac{1{,}40 \cdot 10^3 \text{ g}}{1{,}00 \frac{\text{g}}{\text{cm}^3}} = \underline{\mathbf{1{,}40 \cdot 10^3 \text{ cm}^3}}.$

199. A)

$c_\text{m}(\mathbf{oldat}) = \frac{m(\text{oldott anyag})}{V(\text{oldat})} = \frac{2{,}50 \text{ g}}{4{,}00 \text{ dm}^3} = \underline{\mathbf{0{,}625 \ \frac{\text{g}}{\text{dm}^3}}}.$

B)

$c_\text{m}(\mathbf{oldat}) = \frac{m(\text{oldott anyag})}{V(\text{oldat})} = \frac{9{,}30 \text{ g}}{0{,}346 \text{ dm}^3} = 26{,}88 \ \frac{\text{g}}{\text{dm}^3} \approx \underline{\mathbf{26{,}9 \ \frac{\text{g}}{\text{dm}^3}}}.$

C)

$c_\text{m}(\mathbf{oldat}) = \frac{m(\text{oldott anyag})}{V(\text{oldat})} = \frac{680000 \text{ g}}{5100 \text{ dm}^3} = 133{,}33 \ \frac{\text{g}}{\text{dm}^3} \approx \underline{\mathbf{133 \ \frac{\text{g}}{\text{dm}^3}}}.$

200. A)

$m(Na_2S) = n(Na_2S) \cdot M(Na_2S) = 0,600 \text{ mol} \cdot 78,04 \frac{g}{mol} = 46,82 \text{ g} \approx 46,8 \text{ g}$

$c_m(\text{oldat}) = \frac{m(\text{oldott anyag})}{V(\text{oldat})} = \frac{46,8 \text{ g}}{0,550 \text{ dm}^3} = \underline{\mathbf{85,1 \ \frac{g}{dm^3}}}.$

B)

$m(AgNO_3) = n(AgNO_3) \cdot M(AgNO_3) = 3,90 \text{ mol} \cdot 169,88 \frac{g}{mol} = 662,53 \text{ g} \approx 663 \text{ g}$

$c_m(\text{oldat}) = \frac{m(\text{oldott anyag})}{V(\text{oldat})} = \frac{663 \text{ g}}{6,75 \text{ dm}^3} = 98,15 \ \frac{g}{dm^3} \approx \underline{\mathbf{98,2 \ \frac{g}{dm^3}}}.$

C)

$m(K_2SO_4) = n(K_2SO_4) \cdot M(K_2SO_4) = 5,15 \text{ mol} \cdot 174,26 \frac{g}{mol} = 897,44 \text{ g} \approx 897 \text{ g}$

$c_m(\text{oldat}) = \frac{m(\text{oldott anyag})}{V(\text{oldat})} = \frac{897 \text{ g}}{4,80 \text{ dm}^3} = 186,97 \ \frac{g}{dm^3} \approx \underline{\mathbf{187 \ \frac{g}{dm^3}}}.$

201. A)

$m(NH_3) = \frac{p \cdot V(NH_3) \cdot M(NH_3)}{R \cdot T} = \frac{202000 \text{ Pa} \cdot 0,0210 \text{ m}^3 \cdot 17,04 \frac{g}{mol}}{8,314 \frac{J}{mol \cdot K} \cdot 293 \text{ K}} = 29,67 \text{ g} \approx 29,7 \text{ g}$

$c_m(\text{oldat}) = \frac{m(\text{oldott anyag})}{V(\text{oldat})} = \frac{29,7 \text{ g}}{0,400 \text{ dm}^3} = 74,18 \ \frac{g}{dm^3} \approx \underline{\mathbf{74,2 \ \frac{g}{dm^3}}}.$

B)

$m(HCl) = \frac{p \cdot V(HCl) \cdot M(HCl)}{R \cdot T} = \frac{105000 \text{ Pa} \cdot 0,00500 \text{ m}^3 \cdot 36,46 \frac{g}{mol}}{8,314 \frac{J}{mol \cdot K} \cdot 301 \text{ K}} = 7,65 \text{ g}$

$c_m(\text{oldat}) = \frac{m(\text{oldott anyag})}{V(\text{oldat})} = \frac{7,65 \text{ g}}{1,00 \text{ dm}^3} = \mathbf{7,65 \ \frac{g}{dm^3}}.$

C)

$m(H_2S) = \frac{p \cdot V(H_2S) \cdot M(H_2S)}{R \cdot T} = \frac{88200 \text{ Pa} \cdot 3,55 \cdot 10^{-4} \text{ m}^3 \cdot 34,08 \frac{g}{mol}}{8,314 \frac{J}{mol \cdot K} \cdot 315 \text{ K}} = 0,407 \text{ g}$

$c_m(\text{oldat}) = \frac{m(\text{oldott anyag})}{V(\text{oldat})} = \frac{0,407 \text{ g}}{2,30 \text{ dm}^3} = \mathbf{0,177 \ \frac{g}{dm^3}}.$

202. A)

$V(\text{oldat}) = \frac{m(\text{oldott anyag})}{c_m(\text{oldat})} = \frac{10,0 \text{ g}}{37,0 \frac{g}{dm^3}} = \underline{\mathbf{0,270 \ dm^3}}.$

B)

$V(\text{oldat}) = \frac{m(\text{oldott anyag})}{c_m(\text{oldat})} = \frac{35,0 \text{ g}}{50,0 \frac{g}{dm^3}} = \underline{\mathbf{0,700 \ dm^3}}.$

C)

$V(\text{oldat}) = \frac{m(\text{oldott anyag})}{c_m(\text{oldat})} = \frac{200 \text{ g}}{25,5 \frac{g}{dm^3}} = \underline{\mathbf{7,84 \ dm^3}}.$

203. A)

$m(CuCl_2) = n(CuCl_2) \cdot M(CuCl_2) = 1,50 \text{ mol} \cdot 134,45 \frac{g}{mol} = 201,68 \text{ g} \approx 202 \text{ g}$

$V(\text{oldat}) = \frac{m(\text{oldott anyag})}{c_m(\text{oldat})} = \frac{202 \text{ g}}{55,0 \frac{g}{dm^3}} = \underline{\mathbf{3,67 \ dm^3}}.$

B)

$m(NaHCO_3) = n(NaHCO_3) \cdot M(NaHCO_3) = 4,59 \text{ mol} \cdot 84,01 \frac{g}{mol} = 385,61 \text{ g} \approx 386 \text{ g}$

$V(\text{oldat}) = \frac{m(\text{oldott anyag})}{c_m(\text{oldat})} = \frac{386 \text{ g}}{25,5 \frac{g}{dm^3}} = 15,12 \text{ dm}^3 \approx \underline{\mathbf{15,1 \ dm^3}}.$

C)

$m(NaBr) = n(NaBr) \cdot M(NaBr) = 1,26 \text{ mol} \cdot 102,89 \frac{g}{mol} = 129,64 \text{ g} \approx 130 \text{ g}$

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$$V(\text{oldat}) = \frac{m(\text{oldott anyag})}{c_{\text{m}}(\text{oldat})} = \frac{130 \text{ g}}{700 \frac{\text{g}}{\text{dm}^3}} = \mathbf{0{,}185 \text{ dm}^3}.$$

204. A)

$$m(\text{NH}_3) = \frac{p \cdot V(\text{NH}_3) \cdot M(\text{NH}_3)}{R \cdot T} = \frac{101325 \text{ Pa} \cdot 0{,}0886 \text{ m}^3 \cdot 17{,}04 \frac{\text{g}}{\text{mol}}}{8{,}314 \frac{\text{J}}{\text{mol·K}} \cdot 273 \text{ K}} = 67{,}38 \text{ g} \approx 67{,}4 \text{ g}$$

$$V(\text{oldat}) = \frac{m(\text{oldott anyag})}{c_{\text{m}}(\text{oldat})} = \frac{67{,}4 \text{ g}}{8{,}00 \frac{\text{g}}{\text{dm}^3}} = \mathbf{8{,}42 \text{ dm}^3}.$$

B)

$$m(\text{H}_2\text{S}) = \frac{p \cdot V(\text{H}_2\text{S}) \cdot M(\text{H}_2\text{S})}{R \cdot T} = \frac{90000 \text{ Pa} \cdot 7{,}77 \cdot 10^{-4} \text{ m}^3 \cdot 34{,}08 \frac{\text{g}}{\text{mol}}}{8{,}314 \frac{\text{J}}{\text{mol·K}} \cdot 303 \text{ K}} = 0{,}946 \text{ g}$$

$$V(\text{oldat}) = \frac{m(\text{oldott anyag})}{c_{\text{m}}(\text{oldat})} = \frac{0{,}946 \text{ g}}{53{,}5 \frac{\text{g}}{\text{dm}^3}} = \mathbf{0{,}0177 \text{ dm}^3}.$$

C)

$$m(\text{HCl}) = \frac{p \cdot V(\text{HCl}) \cdot M(\text{HCl})}{R \cdot T} = \frac{363000 \text{ Pa} \cdot 0{,}0360 \text{ m}^3 \cdot 36{,}46 \frac{\text{g}}{\text{mol}}}{8{,}314 \frac{\text{J}}{\text{mol·K}} \cdot 306 \text{ K}} = 187{,}28 \text{ g} \approx 187 \text{ g}$$

$$V(\text{oldat}) = \frac{m(\text{oldott anyag})}{c_{\text{m}}(\text{oldat})} = \frac{187 \text{ g}}{12{,}8 \frac{\text{g}}{\text{dm}^3}} = 14{,}63 \text{ dm}^3 \approx \mathbf{14{,}6 \text{ dm}^3}.$$

205. A)

$$V(\text{oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{1400 \text{ g}}{1{,}131 \frac{\text{g}}{\text{cm}^3}} = 1237{,}84 \text{ cm}^3 \approx 1{,}238 \text{ dm}^3$$

$$\mathbf{m(\text{oldott anyag})} = c_{\text{m}}(\text{oldat}) \cdot V(\text{oldat}) = 211{,}7 \frac{\text{g}}{\text{dm}^3} \cdot 1{,}238 \text{ dm}^3 = 262{,}05 \text{ g} \approx \mathbf{\underline{262{,}1 \text{ g}}}$$

$$\mathbf{m(\text{víz})} = m(\text{oldat}) - m(\text{oldott anyag}) = 1400 \text{ g} - 262{,}1 \text{ g} = 1137{,}95 \approx \mathbf{\underline{1138 \text{ g}}}.$$

B)

$$V(\text{oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{580 \text{ g}}{1{,}22 \frac{\text{g}}{\text{cm}^3}} = 475{,}41 \text{ cm}^3 \approx 0{,}475 \text{ dm}^3$$

$$\mathbf{m(\text{oldott anyag})} = c_{\text{m}}(\text{oldat}) \cdot V(\text{oldat}) = 461 \frac{\text{g}}{\text{dm}^3} \cdot 0{,}475 \text{ dm}^3 = 219{,}16 \text{ g} \approx \mathbf{\underline{219 \text{ g}}}$$

$$\mathbf{m(\text{víz})} = m(\text{oldat}) - m(\text{oldott anyag}) = 580 \text{ g} - 219 \text{ g} = 360{,}84 \approx \mathbf{\underline{361 \text{ g}}}.$$

C)

$$V(\text{oldat}) = \frac{m(\text{oldat})}{\rho(\text{oldat})} = \frac{900 \text{ g}}{1{,}03 \frac{\text{g}}{\text{cm}^3}} = 873{,}79 \text{ cm}^3 \approx 0{,}874 \text{ dm}^3$$

$$\mathbf{m(\text{oldott anyag})} = c_{\text{m}}(\text{oldat}) \cdot V(\text{oldat}) = 79{,}6 \frac{\text{g}}{\text{dm}^3} \cdot 0{,}874 \text{ dm}^3 = 69{,}55 \text{ g} \approx \mathbf{\underline{69{,}6 \text{ g}}}$$

$$\mathbf{m(\text{víz})} = m(\text{oldat}) - m(\text{oldott anyag}) = 900 \text{ g} - 69{,}6 \text{ g} = 830{,}45 \text{ g} \approx \mathbf{\underline{830 \text{ g}}}.$$

206. A)

$$m(\text{oldat}) = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 0{,}990 \frac{\text{g}}{\text{cm}^3} \cdot 5000 \text{ cm}^3 = 4950 \text{ g} \approx 4{,}95 \cdot 10^3 \text{ g}$$

$$m(\text{oldott anyag}) = c_{\text{m}}(\text{oldat}) \cdot V(\text{oldat}) = 18{,}7 \frac{\text{g}}{\text{dm}^3} \cdot 5{,}00 \text{ dm}^3 = 93{,}5 \text{ g}$$

$$m(\text{víz}) = m(\text{oldat}) - m(\text{oldott anyag}) = 4{,}95 \cdot 10^3 \text{ g} - 93{,}5 \text{ g} = 4856{,}5 \approx 4{,}86 \cdot 10^3 \text{ g}$$

$$n(\text{NH}_3) = \frac{m(\text{NH}_3)}{M(\text{NH}_3)} = \frac{93{,}5 \text{ g}}{17{,}04 \frac{\text{g}}{\text{mol}}} = 5{,}49 \text{ mol}$$

$$\mathbf{V(\text{NH}_3)} = n(\text{NH}_3) \cdot V_{\text{m}}^{\text{st}} = 5{,}49 \text{ mol} \cdot 24{,}5 \frac{\text{dm}^3}{\text{mol}} = 134{,}43 \text{ dm}^3 \approx \mathbf{\underline{134 \text{ dm}^3}}$$

$$\mathbf{V(\text{víz})} = \frac{m(\text{víz})}{\varrho(\text{víz})} = \frac{4{,}86 \cdot 10^3 \text{ g}}{1{,}00 \frac{\text{g}}{\text{cm}^3}} = \mathbf{4{,}86 \cdot 10^3 \text{ cm}^3}.$$

B)

$$m(\text{oldat}) = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 1{,}04 \frac{\text{g}}{\text{cm}^3} \cdot 9200 \text{ cm}^3 = 9568 \text{ g} \approx 9{,}57 \cdot 10^3 \text{ g}$$

$$m(\text{oldott anyag}) = c_{\text{m}}(\text{oldat}) \cdot V(\text{oldat}) = 88{,}3 \frac{\text{g}}{\text{dm}^3} \cdot 9{,}20 \text{ dm}^3 = 812{,}36 \text{ g} \approx 812 \text{ g}$$

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$m(\text{víz}) = m(\text{oldat}) - m(\text{oldott anyag}) = 9,57 \cdot 10^3 \text{ g} - 812 \text{ g} = 8755,64 \approx 8,76 \cdot 10^3 \text{ g}$

$n(\text{HCl}) = \frac{m(\text{HCl})}{M(\text{HCl})} = \frac{812 \text{ g}}{36,46 \frac{\text{g}}{\text{mol}}} = 22,28 \text{ mol} \approx 22,3 \text{ mol}$

$\mathbf{V(\text{HCl})} = n(\text{HCl}) \cdot V_{\text{m}}^{\text{st}} = 22,3 \text{ mol} \cdot 24,5 \frac{\text{dm}^3}{\text{mol}} = 545,88 \text{ dm}^3 \approx \underline{\mathbf{546 \text{ dm}^3}}$

$\mathbf{V(\text{víz})} = \frac{m(\text{víz})}{\varrho(\text{víz})} = \frac{8,76 \cdot 10^3 \text{ g}}{1,00 \frac{\text{g}}{\text{cm}^3}} = \underline{\mathbf{8,76 \cdot 10^3 \text{ cm}^3}}$.

C)

$m(\text{oldat}) = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 0,908 \frac{\text{g}}{\text{cm}^3} \cdot 5250 \text{ cm}^3 = 4767 \text{ g} \approx 4,77 \cdot 10^3 \text{ g}$

$m(\text{oldott anyag}) = c_{\text{m}}(\text{oldat}) \cdot V(\text{oldat}) = 224 \frac{\text{g}}{\text{dm}^3} \cdot 5,25 \text{ dm}^3 = 1176 \text{ g} \approx 1,18 \cdot 10^3 \text{ g}$

$m(\text{víz}) = m(\text{oldat}) - m(\text{oldott anyag}) = 4,77 \cdot 10^3 \text{ g} - 1,18 \cdot 10^3 \text{ g} = 3591 \approx 3,59 \cdot 10^3 \text{ g}$

$n(\text{NH}_3) = \frac{m(\text{NH}_3)}{M(\text{NH}_3)} = \frac{1,18 \cdot 10^3 \text{ g}}{17,04 \frac{\text{g}}{\text{mol}}} = 69,0 \text{ mol}$

$\mathbf{V(\text{NH}_3)} = n(\text{NH}_3) \cdot V_{\text{m}}^{\text{st}} = 69,0 \text{ mol} \cdot 24,5 \frac{\text{dm}^3}{\text{mol}} = 1690,85 \text{ dm}^3 \approx \underline{\mathbf{1,69 \cdot 10^3 \text{ dm}^3}}$

$\mathbf{V(\text{víz})} = \frac{m(\text{víz})}{\varrho(\text{víz})} = \frac{3,59 \cdot 10^3 \text{ g}}{1,00 \frac{\text{g}}{\text{cm}^3}} = \underline{\mathbf{3,59 \cdot 10^3 \text{ cm}^3}}$.

207. A)

Legyen 100 gramm oldat!

$m(\text{oldott anyag}) = \frac{m(\text{oldat}) \cdot w\%}{100} = \frac{100 \text{ g} \cdot 10,1}{100} = 10,1 \text{ g}$

$m(\text{oldószer}) = m(\text{oldat}) - m(\text{oldott anyag}) = 100 \text{ g} - 10,1 \text{ g} = 89,9 \text{ g}$

$n(\text{NaOH}) = \frac{m(\text{NaOH})}{M(\text{NaOH})} = \frac{10,1 \text{ g}}{40,00 \frac{\text{g}}{\text{mol}}} = 0,253 \text{ mol}$

$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{89,9 \text{ g}}{18,02 \frac{\text{g}}{\text{mol}}} = 4,99 \text{ mol}$

$n(\text{oldat}) = n(\text{oldott anyag}) + n(\text{oldószer}) = 0,253 \text{ mol} + 4,99 \text{ mol} = 5,24 \text{ mol}$

$V(\text{oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{100 \text{ g}}{1,11 \frac{\text{g}}{\text{cm}^3}} = 90,1 \text{ cm}^3 \approx 0,0901 \text{ dm}^3$

$\mathbf{x\%} = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{0,253 \text{ mol}}{5,24 \text{ mol}} \cdot 100 = \underline{\mathbf{4,82}}$

$\mathbf{c(\text{oldat})} = \frac{n(\text{oldott anyag})}{V(\text{oldat})} = \frac{0,253 \text{ mol}}{0,0901 \text{ dm}^3} = \underline{\mathbf{2,80 \ \frac{\text{mol}}{\text{dm}^3}}}$

$\mathbf{c_{\text{m}}(\text{oldat})} = \frac{m(\text{oldott anyag})}{V(\text{oldat})} = \frac{10,1 \text{ g}}{0,0901 \text{ dm}^3} = 112,11 \ \frac{\text{g}}{\text{dm}^3} \approx \underline{\mathbf{112 \ \frac{\text{g}}{\text{dm}^3}}}$.

B)

Legyen 100 gramm oldat!

$m(\text{oldott anyag}) = \frac{m(\text{oldat}) \cdot w\%}{100} = \frac{100 \text{ g} \cdot 50,5}{100} = 50,5 \text{ g}$

$m(\text{oldószer}) = m(\text{oldat}) - m(\text{oldott anyag}) = 100 \text{ g} - 50,5 \text{ g} = 49,5 \text{ g}$

$n(\text{H}_2\text{SO}_4) = \frac{m(\text{H}_2\text{SO}_4)}{M(\text{H}_2\text{SO}_4)} = \frac{50,5 \text{ g}}{98,08 \frac{\text{g}}{\text{mol}}} = 0,515 \text{ mol}$

$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{49,5 \text{ g}}{18,02 \frac{\text{g}}{\text{mol}}} = 2,75 \text{ mol}$

$n(\text{oldat}) = n(\text{oldott anyag}) + n(\text{oldószer}) = 0,515 \text{ mol} + 2,75 \text{ mol} = 3,26 \text{ mol}$

$V(\text{oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{100 \text{ g}}{1,40 \frac{\text{g}}{\text{cm}^3}} = 71,43 \text{ cm}^3 \approx 0,0714 \text{ dm}^3$

$\mathbf{x\%} = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{0,515 \text{ mol}}{3,26 \text{ mol}} \cdot 100 = 15,79 \approx \underline{\mathbf{15,8}}$

$\mathbf{c(\text{oldat})} = \frac{n(\text{oldott anyag})}{V(\text{oldat})} = \frac{0,515 \text{ mol}}{0,0714 \text{ dm}^3} = \underline{\mathbf{7,21 \ \frac{\text{mol}}{\text{dm}^3}}}$

$c_m(\text{oldat}) = \frac{m(\text{oldott anyag})}{V(\text{oldat})} = \frac{50,5 \text{ g}}{0,0714 \text{ dm}^3} = \underline{\mathbf{707 \ \frac{g}{dm^3}}}$.

C)

Legyen 100 gramm oldat!

$m(\text{oldott anyag}) = \frac{m(\text{oldat}) \cdot w\%}{100} = \frac{100 \text{ g} \cdot 39,01}{100} = 39,01 \text{ g}$

$m(\text{oldószer}) = m(\text{oldat}) - m(\text{oldott anyag}) = 100 \text{ g} - 39,01 \text{ g} = 60,99 \text{ g}$

$n(\text{KOH}) = \frac{m(\text{KOH})}{M(\text{KOH})} = \frac{39,01 \text{ g}}{56,11 \frac{g}{mol}} = 0,6952 \text{ mol}$

$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{60,99 \text{ g}}{18,02 \frac{g}{mol}} = 3,385 \text{ mol}$

$n(\text{oldat}) = n(\text{oldott anyag}) + n(\text{oldószer}) = 0,6952 \text{ mol} + 3,385 \text{ mol} = 4,080 \text{ mol}$

$V(\text{oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{100 \text{ g}}{1,385 \frac{g}{cm^3}} = 72,20 \text{ cm}^3 \approx 0,07220 \text{ dm}^3$

$x\% = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{0,6952 \text{ mol}}{4,080 \text{ mol}} \cdot 100 = \underline{\mathbf{17,04}}$

$c(\text{oldat}) = \frac{n(\text{oldott anyag})}{V(\text{oldat})} = \frac{0,6952 \text{ mol}}{0,07220 \text{ dm}^3} = \underline{\mathbf{9,629 \ \frac{mol}{dm^3}}}$

$c_m(\text{oldat}) = \frac{m(\text{oldott anyag})}{V(\text{oldat})} = \frac{39,01 \text{ g}}{0,07220 \text{ dm}^3} = 540,30 \ \frac{g}{dm^3} \approx \underline{\mathbf{540,3 \ \frac{g}{dm^3}}}$.

208. A)

Legyen 100 mol oldat!

$n(\text{oldott anyag}) = \frac{n(\text{oldat}) \cdot x\%}{100} = \frac{100 \text{ mol} \cdot 0,450}{100} = 0,450 \text{ mol}$

$n(\text{oldószer}) = n(\text{oldat}) - n(\text{oldott anyag}) = 100 \text{ mol} - 0,450 \text{ mol} = 99,55 \text{ mol} \approx 99,6 \text{ mol}$

$m(\text{HNO}_3) = n(\text{HNO}_3) \cdot M(\text{HNO}_3) = 0,450 \text{ mol} \cdot 63,02 \frac{g}{mol} = 28,36 \text{ g} \approx 28,4 \text{ g}$

$m(\text{H}_2\text{O}) = n(\text{H}_2\text{O}) \cdot M(\text{H}_2\text{O}) = 99,6 \text{ mol} \cdot 18,02 \frac{g}{mol} = 1793,89 \text{ g} \approx 1,79 \cdot 10^3 \text{ g}$

$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 28,4 \text{ g} + 1,79 \cdot 10^3 \text{ g} = 1822,25 \text{ g} \approx 1,82 \cdot 10^3 \text{ g}$

$V(\text{oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{1,82 \cdot 10^3 \text{ g}}{1,05 \frac{g}{cm^3}} = 1735,48 \text{ cm}^3 \approx 1,74 \text{ dm}^3$

$w\% = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{28,4 \text{ g}}{1,82 \cdot 10^3 \text{ g}} \cdot 100 = \underline{\mathbf{1,56}}$

$c(\text{oldat}) = \frac{n(\text{oldott anyag})}{V(\text{oldat})} = \frac{0,450 \text{ mol}}{1,74 \text{ dm}^3} = \underline{\mathbf{0,259 \ \frac{mol}{dm^3}}}$

$c_m(\text{oldat}) = \frac{m(\text{oldott anyag})}{V(\text{oldat})} = \frac{28,4 \text{ g}}{1,74 \text{ dm}^3} = 16,34 \ \frac{g}{dm^3} \approx \underline{\mathbf{16,3 \ \frac{g}{dm^3}}}$.

B)

Legyen 100 mol oldat!

$n(\text{oldott anyag}) = \frac{n(\text{oldat}) \cdot x\%}{100} = \frac{100 \text{ mol} \cdot 23,1}{100} = 23,1 \text{ mol}$

$n(\text{oldószer}) = n(\text{oldat}) - n(\text{oldott anyag}) = 100 \text{ mol} - 23,1 \text{ mol} = 76,9 \text{ mol}$

$m(\text{NaNO}_3) = n(\text{NaNO}_3) \cdot M(\text{NaNO}_3) = 23,1 \text{ mol} \cdot 85,00 \frac{g}{mol} = 1963,5 \text{ g} \approx 1,96 \cdot 10^3 \text{ g}$

$m(\text{H}_2\text{O}) = n(\text{H}_2\text{O}) \cdot M(\text{H}_2\text{O}) = 76,9 \text{ mol} \cdot 18,02 \frac{g}{mol} = 1385,74 \text{ g} \approx 1,39 \cdot 10^3 \text{ g}$

$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 1,96 \cdot 10^3 \text{ g} + 1,39 \cdot 10^3 \text{ g} =$

$m(\text{oldat}) = 3349,24 \text{ g} \approx 3,35 \cdot 10^3 \text{ g}$

$V(\text{oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{3,35 \cdot 10^3 \text{ g}}{1,13 \frac{g}{cm^3}} = 2963,93 \text{ cm}^3 \approx 2,96 \text{ dm}^3$

$w\% = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{1,96 \cdot 10^3 \text{ g}}{3,35 \cdot 10^3 \text{ g}} \cdot 100 = 58,63 \approx \underline{\mathbf{58,6}}$

$c(\text{oldat}) = \frac{n(\text{oldott anyag})}{V(\text{oldat})} = \frac{23,1 \text{ mol}}{2,96 \text{ dm}^3} = \underline{\mathbf{7,79 \ \frac{mol}{dm^3}}}$

$$c_{\mathrm{m}}(\text{oldat}) = \frac{m(\text{oldott anyag})}{V(\text{oldat})} = \frac{1,96 \cdot 10^3 \text{ g}}{2,96 \text{ dm}^3} = 662,47 \ \frac{\text{g}}{\text{dm}^3} \approx \mathbf{662} \ \frac{\mathbf{g}}{\mathbf{dm^3}}.$$

C)

A feladat szövege helyesen: „A 0,0659 x%-os…".

Legyen 100 mol oldat!

$$n(\text{oldott anyag}) = \frac{n(\text{oldat}) \cdot x\%}{100} = \frac{100 \text{ mol} \cdot 0,0659}{100} = 0,0659 \text{ mol}$$

$$n(\text{oldószer}) = n(\text{oldat}) - n(\text{oldott anyag}) = 100 \text{ mol} - 0,0659 \text{ mol} = 99,93 \text{ mol} \approx 99,9 \text{ mol}$$

$$m(\text{KCl}) = n(\text{KCl}) \cdot M(\text{KCl}) = 0,0659 \text{ mol} \cdot 74,55 \ \frac{\text{g}}{\text{mol}} = 4,91 \text{ g}$$

$$m(\text{H}_2\text{O}) = n(\text{H}_2\text{O}) \cdot M(\text{H}_2\text{O}) = 99,9 \text{ mol} \cdot 18,02 \ \frac{\text{g}}{\text{mol}} = 1800,81 \text{ g} \approx 1,80 \cdot 10^3 \text{ g}$$

$$m(\text{oldat}) = m(\text{oldott anyag}) + m(\text{oldószer}) = 4,91 \text{ g} + 1,80 \cdot 10^3 \text{ g} = 1805,73 \text{ g} \approx 1,81 \cdot 10^3 \text{ g}$$

$$V(\text{oldat}) = \frac{m(\text{oldat})}{\varrho(\text{oldat})} = \frac{1,81 \cdot 10^3 \text{ g}}{1,002 \ \frac{\text{g}}{\text{cm}^3}} = 1802,12 \text{ cm}^3 \approx 1,80 \text{ dm}^3$$

$$w\% = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{4,91 \text{ g}}{1,81 \cdot 10^3 \text{ g}} \cdot 100 = \mathbf{\underline{0,272}}$$

$$c(\text{oldat}) = \frac{n(\text{oldott anyag})}{V(\text{oldat})} = \frac{0,0659 \text{ mol}}{1,80 \text{ dm}^3} = \mathbf{\underline{0,0366}} \ \frac{\mathbf{mol}}{\mathbf{dm^3}}$$

$$c_{\mathrm{m}}(\text{oldat}) = \frac{m(\text{oldott anyag})}{V(\text{oldat})} = \frac{4,91 \text{ g}}{1,80 \text{ dm}^3} = \mathbf{\underline{2,72}} \ \frac{\mathbf{g}}{\mathbf{dm^3}}.$$

209. **A)**

Legyen 100 cm³ oldat!

$$V(\text{oldott anyag}) = \frac{V(\text{oldat}) \cdot \varphi\%}{100} = \frac{100 \text{ cm}^3 \cdot 96,0}{100} = 96,0 \text{ cm}^3$$

$$m(\text{oldat}) = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 0,804 \ \frac{\text{g}}{\text{cm}^3} \cdot 100 \text{ cm}^3 = 80,4 \text{ g}$$

$$m(\text{oldott anyag}) = \varrho(\text{oldott anyag}) \cdot V(\text{oldott anyag}) = 0,789 \ \frac{\text{g}}{\text{cm}^3} \cdot 96,0 \text{ cm}^3 =$$

$$m(\text{oldott anyag}) = 75,74 \text{ g} \approx 75,7 \text{ g}$$

$$m(\text{oldószer}) = m(\text{oldat}) - m(\text{oldott anyag}) = 80,4 \text{ g} - 75,7 \text{ g} = 4,66 \text{ g}$$

$$n(\text{C}_2\text{H}_6\text{O}) = \frac{m(\text{C}_2\text{H}_6\text{O})}{M(\text{C}_2\text{H}_6\text{O})} = \frac{75,7 \text{ g}}{46,08 \ \frac{\text{g}}{\text{mol}}} = 1,64 \text{ mol}$$

$$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{4,66 \text{ g}}{18,02 \ \frac{\text{g}}{\text{mol}}} = 0,258 \text{ mol}$$

$$n(\text{oldat}) = n(\text{oldott anyag}) + n(\text{oldószer}) = 1,64 \text{ mol} + 0,258 \text{ mol} = 1,90 \text{ mol}$$

$$w\% = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{75,7 \text{ g}}{80,4 \text{ g}} \cdot 100 = \mathbf{\underline{94,2}}$$

$$x\% = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{1,64 \text{ mol}}{1,90 \text{ mol}} \cdot 100 = \mathbf{\underline{86,4}}$$

$$c(\text{oldat}) = \frac{n(\text{oldott anyag})}{V(\text{oldat})} = \frac{1,64 \text{ mol}}{0,100 \text{ dm}^3} = \mathbf{\underline{16,4}} \ \frac{\mathbf{mol}}{\mathbf{dm^3}}$$

$$c_{\mathrm{m}}(\text{oldat}) = \frac{m(\text{oldott anyag})}{V(\text{oldat})} = \frac{75,7 \text{ g}}{0,100 \text{ dm}^3} = 757,44 \ \frac{\text{g}}{\text{dm}^3} \approx \mathbf{\underline{757}} \ \frac{\mathbf{g}}{\mathbf{dm^3}}.$$

B)

Legyen 100 cm³ oldat!

$$V(\text{oldott anyag}) = \frac{V(\text{oldat}) \cdot \varphi\%}{100} = \frac{100 \text{ cm}^3 \cdot 70,0}{100} = 70,0 \text{ cm}^3$$

$$m(\text{oldat}) = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 0,880 \ \frac{\text{g}}{\text{cm}^3} \cdot 100 \text{ cm}^3 = 88,0 \text{ g}$$

$$m(\text{oldott anyag}) = \varrho(\text{oldott anyag}) \cdot V(\text{oldott anyag}) = 0,789 \ \frac{\text{g}}{\text{cm}^3} \cdot 70,0 \text{ cm}^3 =$$

$$m(\text{oldott anyag}) = 55,23 \text{ g} \approx 55,2 \text{ g}$$

$$m(\text{oldószer}) = m(\text{oldat}) - m(\text{oldott anyag}) = 88,0 \text{ g} - 55,2 \text{ g} = 32,77 \text{ g} \approx 32,8 \text{ g}$$

$$n(C_2H_6O) = \frac{m(C_2H_6O)}{M(C_2H_6O)} = \frac{55{,}2 \text{ g}}{46{,}08 \frac{\text{g}}{\text{mol}}} = 1{,}20 \text{ mol}$$

$$n(H_2O) = \frac{m(H_2O)}{M(H_2O)} = \frac{32{,}8 \text{ g}}{18{,}02 \frac{\text{g}}{\text{mol}}} = 1{,}82 \text{ mol}$$

$n(\text{oldat}) = n(\text{oldott anyag}) + n(\text{oldószer}) = 1{,}20 \text{ mol} + 1{,}82 \text{ mol} = 3{,}02 \text{ mol}$

$$\mathbf{w\%} = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{55{,}2 \text{ g}}{88{,}0 \text{ g}} \cdot 100 = 62{,}76 \approx \underline{\mathbf{62{,}8}}$$

$$\mathbf{x\%} = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{1{,}20 \text{ mol}}{3{,}02 \text{ mol}} \cdot 100 = 39{,}73 \approx \underline{\mathbf{39{,}7}}$$

$$\mathbf{c}(\text{oldat}) = \frac{n(\text{oldott anyag})}{V(\text{oldat})} = \frac{1{,}20 \text{ mol}}{0{,}100 \text{ dm}^3} = \underline{\mathbf{12{,}0 \; \frac{mol}{dm^3}}}$$

$$\mathbf{c_m}(\text{oldat}) = \frac{m(\text{oldott anyag})}{V(\text{oldat})} = \frac{55{,}2 \text{ g}}{0{,}100 \text{ dm}^3} = 552{,}3 \; \frac{\text{g}}{\text{dm}^3} \approx \underline{\mathbf{552 \; \frac{g}{dm^3}}}.$$

C)

Legyen 100 cm^3 oldat!

$$V(\text{oldott anyag}) = \frac{V(\text{oldat}) \cdot \varphi\%}{100} = \frac{100 \text{ cm}^3 \cdot 12{,}72}{100} = 12{,}72 \text{ cm}^3$$

$$m(\text{oldat}) = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 1{,}145 \; \frac{\text{g}}{\text{cm}^3} \cdot 100 \text{ cm}^3 = 114{,}5 \text{ g}$$

$$m(\text{oldott anyag}) = \varrho(\text{oldott anyag}) \cdot V(\text{oldott anyag}) = 1{,}830 \; \frac{\text{g}}{\text{cm}^3} \cdot 12{,}72 \text{ cm}^3 =$$

$m(\text{oldott anyag}) = 23{,}28 \text{ g}$

$m(\text{oldószer}) = m(\text{oldat}) - m(\text{oldott anyag}) = 114{,}5 \text{ g} - 23{,}28 \text{ g} = 91{,}22 \text{ g}$

$$n(H_2SO_4) = \frac{m(H_2SO_4)}{M(H_2SO_4)} = \frac{23{,}28 \text{ g}}{98{,}08 \frac{\text{g}}{\text{mol}}} = 0{,}2373 \text{ mol}$$

$$n(H_2O) = \frac{m(H_2O)}{M(H_2O)} = \frac{91{,}22 \text{ g}}{18{,}02 \frac{\text{g}}{\text{mol}}} = 5{,}062 \text{ mol}$$

$n(\text{oldat}) = n(\text{oldott anyag}) + n(\text{oldószer}) = 0{,}2373 \text{ mol} + 5{,}062 \text{ mol} = 5{,}300 \text{ mol}$

$$\mathbf{w\%} = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{23{,}28 \text{ g}}{114{,}5 \text{ g}} \cdot 100 = \underline{\mathbf{20{,}33}}$$

$$\mathbf{x\%} = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{0{,}2373 \text{ mol}}{5{,}300 \text{ mol}} \cdot 100 = \underline{\mathbf{4{,}478}}$$

$$\mathbf{c}(\text{oldat}) = \frac{n(\text{oldott anyag})}{V(\text{oldat})} = \frac{0{,}2373 \text{ mol}}{0{,}100 \text{ dm}^3} = \underline{\mathbf{2{,}373 \; \frac{mol}{dm^3}}}$$

$$\mathbf{c_m}(\text{oldat}) = \frac{m(\text{oldott anyag})}{V(\text{oldat})} = \frac{23{,}28 \text{ g}}{0{,}100 \text{ dm}^3} = 232{,}78 \; \frac{\text{g}}{\text{dm}^3} \approx \underline{\mathbf{232{,}8 \; \frac{g}{dm^3}}}.$$

210. **A)**

Legyen 1,00 dm^3 oldat!

$$n(\text{oldott anyag}) = c(\text{oldat}) \cdot V(\text{oldat}) = 3{,}07 \; \frac{\text{mol}}{\text{dm}^3} \cdot 1{,}00 \text{ dm}^3 = 3{,}07 \text{ mol}$$

$$m(\text{oldat}) = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 1{,}10 \; \frac{\text{g}}{\text{cm}^3} \cdot 1000 \text{ cm}^3 = 1100 \text{ g} \approx 1{,}10 \cdot 10^3 \text{ g}$$

$$m(HNO_3) = n(HNO_3) \cdot M(HNO_3) = 3{,}07 \text{ mol} \cdot 63{,}02 \; \frac{\text{g}}{\text{mol}} = 193{,}47 \text{ g} \approx 193 \text{ g}$$

$m(\text{oldószer}) = m(\text{oldat}) - m(\text{oldott anyag}) = 1{,}10 \cdot 10^3 \text{ g} - 193 \text{ g} = 906{,}53 \text{ g} \approx 907 \text{ g}$

$$n(H_2O) = \frac{m(H_2O)}{M(H_2O)} = \frac{907 \text{ g}}{18{,}02 \frac{\text{g}}{\text{mol}}} = 50{,}3 \text{ mol}$$

$n(\text{oldat}) = n(\text{oldott anyag}) + n(\text{oldószer}) = 3{,}07 \text{ mol} + 50{,}3 \text{ mol} = 53{,}38 \text{ mol} \approx 53{,}4 \text{ mol}$

$$\mathbf{w\%} = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{193 \text{ g}}{1{,}10 \cdot 10^3 \text{ g}} \cdot 100 = 17{,}59 \approx \underline{\mathbf{17{,}6}}$$

$$\mathbf{x\%} = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{3{,}07 \text{ mol}}{53{,}4 \text{ mol}} \cdot 100 = \underline{\mathbf{5{,}75}}$$

$$\mathbf{c_m}(\text{oldat}) = \frac{m(\text{oldott anyag})}{V(\text{oldat})} = \frac{193 \text{ g}}{1{,}00 \text{ dm}^3} = 193{,}47 \; \frac{\text{g}}{\text{dm}^3} \approx \underline{\mathbf{193 \; \frac{g}{dm^3}}}.$$

B)

Legyen 1,00 dm^3 oldat!

$n(\text{oldott anyag}) = c(\text{oldat}) \cdot V(\text{oldat}) = 2{,}51 \, \frac{\text{mol}}{\text{dm}^3} \cdot 1{,}00 \, \text{dm}^3 = 2{,}51 \, \text{mol}$

$m(\text{oldat}) = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 1{,}15 \, \frac{\text{g}}{\text{cm}^3} \cdot 1000 \, \text{cm}^3 = 1150 \, \text{g} \approx 1{,}15 \cdot 10^3 \, \text{g}$

$m(\text{H}_2\text{SO}_4) = n(\text{H}_2\text{SO}_4) \cdot M(\text{H}_2\text{SO}_4) = 2{,}51 \, \text{mol} \cdot 98{,}08 \, \frac{\text{g}}{\text{mol}} = 246{,}18 \, \text{g} \approx 246 \, \text{g}$

$m(\text{oldószer}) = m(\text{oldat}) - m(\text{oldott anyag}) = 1{,}15 \cdot 10^3 \, \text{g} - 246 \, \text{g} = 903{,}82 \, \text{g} \approx 904 \, \text{g}$

$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{904 \, \text{g}}{18{,}02 \, \frac{\text{g}}{\text{mol}}} = 50{,}16 \, \text{mol} \approx 50{,}2 \, \text{mol}$

$n(\text{oldat}) = n(\text{oldott anyag}) + n(\text{oldószer}) = 2{,}51 \, \text{mol} + 50{,}2 \, \text{mol} = 52{,}67 \, \text{mol} \approx 52{,}7 \, \text{mol}$

$\boldsymbol{w\%} = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{246 \, \text{g}}{1{,}15 \cdot 10^3 \, \text{g}} \cdot 100 = 21{,}41 \approx \underline{\boldsymbol{21{,}4}}$

$\boldsymbol{x\%} = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{2{,}51 \, \text{mol}}{52{,}7 \, \text{mol}} \cdot 100 = \underline{\boldsymbol{4{,}77}}$

$\boldsymbol{c_m}(\textbf{oldat}) = \frac{m(\text{oldott anyag})}{V(\text{oldat})} = \frac{246 \, \text{g}}{1{,}00 \, \text{dm}^3} = 246{,}18 \, \frac{\text{g}}{\text{dm}^3} \approx \underline{\boldsymbol{246 \, \frac{\textbf{g}}{\textbf{dm}^3}}}.$

C)

Legyen 1,00 dm^3 oldat!

$n(\text{oldott anyag}) = c(\text{oldat}) \cdot V(\text{oldat}) = 0{,}264 \, \frac{\text{mol}}{\text{dm}^3} \cdot 1{,}00 \, \text{dm}^3 = 0{,}264 \, \text{mol}$

$m(\text{oldat}) = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 1{,}01 \, \frac{\text{g}}{\text{cm}^3} \cdot 1000 \, \text{cm}^3 = 1010 \, \text{g} \approx 1{,}01 \cdot 10^3 \, \text{g}$

$m(\text{NaOH}) = n(\text{NaOH}) \cdot M(\text{NaOH}) = 0{,}264 \, \text{mol} \cdot 40{,}00 \, \frac{\text{g}}{\text{mol}} = 10{,}56 \, \text{g} \approx 10{,}6 \, \text{g}$

$m(\text{oldószer}) = m(\text{oldat}) - m(\text{oldott anyag}) = 1{,}01 \cdot 10^3 \, \text{g} - 10{,}6 \, \text{g} = 999{,}44 \, \text{g} \approx 999 \, \text{g}$

$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{999 \, \text{g}}{18{,}02 \, \frac{\text{g}}{\text{mol}}} = 55{,}46 \, \text{mol} \approx 55{,}5 \, \text{mol}$

$n(\text{oldat}) = n(\text{oldott anyag}) + n(\text{oldószer}) = 0{,}264 \, \text{mol} + 55{,}5 \, \text{mol} = 55{,}71 \, \text{mol} \approx 55{,}7 \, \text{mol}$

$\boldsymbol{w\%} = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{10{,}6 \, \text{g}}{1{,}01 \cdot 10^3 \, \text{g}} \cdot 100 = \underline{\boldsymbol{1{,}05}}$

$\boldsymbol{x\%} = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{0{,}264 \, \text{mol}}{55{,}7 \, \text{mol}} \cdot 100 = \underline{\boldsymbol{0{,}474}}$

$\boldsymbol{c_m}(\textbf{oldat}) = \frac{m(\text{oldott anyag})}{V(\text{oldat})} = \frac{10{,}6 \, \text{g}}{1{,}00 \, \text{dm}^3} = 10{,}56 \, \frac{\text{g}}{\text{dm}^3} \approx \underline{\boldsymbol{10{,}6 \, \frac{\textbf{g}}{\textbf{dm}^3}}}.$

211. A)

Legyen 1,000 dm^3 oldat!

$m(\text{oldott anyag}) = c_m(\text{oldat}) \cdot V(\text{oldat}) = 374{,}5 \, \frac{\text{g}}{\text{dm}^3} \cdot 1{,}000 \, \text{dm}^3 = 374{,}5 \, \text{g}$

$m(\text{oldat}) = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 1{,}190 \, \frac{\text{g}}{\text{cm}^3} \cdot 1000 \, \text{cm}^3 = 1190 \, \text{g}$

$m(\text{oldószer}) = m(\text{oldat}) - m(\text{oldott anyag}) = 1190 \, \text{g} - 374{,}5 \, \text{g} = 815{,}5 \, \text{g}$

$n(\text{HNO}_3) = \frac{m(\text{HNO}_3)}{M(\text{HNO}_3)} = \frac{374{,}5 \, \text{g}}{63{,}02 \, \frac{\text{g}}{\text{mol}}} = 5{,}943 \, \text{mol}$

$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{815{,}5 \, \text{g}}{18{,}02 \, \frac{\text{g}}{\text{mol}}} = 45{,}26 \, \text{mol}$

$n(\text{oldat}) = n(\text{oldott anyag}) + n(\text{oldószer}) = 5{,}943 \, \text{mol} + 45{,}26 \, \text{mol} = 51{,}20 \, \text{mol}$

$\boldsymbol{w\%} = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{374{,}5 \, \text{g}}{1190 \, \text{g}} \cdot 100 = \underline{\boldsymbol{31{,}47}}$

$\boldsymbol{x\%} = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{5{,}943 \, \text{mol}}{51{,}20 \, \text{mol}} \cdot 100 = \underline{\boldsymbol{11{,}61}}$

$\boldsymbol{c}(\textbf{oldat}) = \frac{n(\text{oldott anyag})}{V(\text{oldat})} = \frac{5{,}943 \, \text{mol}}{1{,}000 \, \text{dm}^3} = \underline{\boldsymbol{5{,}943 \, \frac{\textbf{mol}}{\textbf{dm}^3}}}.$

B)

Legyen 1,000 dm^3 oldat!

$m(\text{oldott anyag}) = c_m(\text{oldat}) \cdot V(\text{oldat}) = 280{,}2 \, \frac{\text{g}}{\text{dm}^3} \cdot 1{,}000 \, \text{dm}^3 = 280{,}2 \, \text{g}$

$m(\text{oldat}) = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 1{,}170 \frac{\text{g}}{\text{cm}^3} \cdot 1000 \text{ cm}^3 = 1170 \text{ g}$

$m(\text{oldószer}) = m(\text{oldat}) - m(\text{oldott anyag}) = 1170 \text{ g} - 280{,}2 \text{ g} = 889{,}8 \text{ g}$

$n(\text{H}_2\text{SO}_4) = \frac{m(\text{H}_2\text{SO}_4)}{M(\text{H}_2\text{SO}_4)} = \frac{280{,}2 \text{ g}}{98{,}08 \frac{\text{g}}{\text{mol}}} = 2{,}857 \text{ mol}$

$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{889{,}8 \text{ g}}{18{,}02 \frac{\text{g}}{\text{mol}}} = 49{,}38 \text{ mol}$

$n(\text{oldat}) = n(\text{oldott anyag}) + n(\text{oldószer}) = 2{,}857 \text{ mol} + 49{,}38 \text{ mol} = 52{,}24 \text{ mol}$

$\boldsymbol{w\%} = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{280{,}2 \text{ g}}{1170 \text{ g}} \cdot 100 = \underline{\mathbf{23{,}95}}$

$\boldsymbol{x\%} = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{2{,}857 \text{ mol}}{52{,}24 \text{ mol}} \cdot 100 = \underline{\mathbf{5{,}469}}$

$\boldsymbol{c}(\textbf{oldat}) = \frac{n(\text{oldott anyag})}{V(\text{oldat})} = \frac{2{,}857 \text{ mol}}{1{,}000 \text{ dm}^3} = \underline{\mathbf{2{,}857 \frac{mol}{dm^3}}}.$

C)

Legyen 1,000 dm³ oldat!

$m(\text{oldott anyag}) = c_m(\text{oldat}) \cdot V(\text{oldat}) = 401{,}6 \frac{\text{g}}{\text{dm}^3} \cdot 1{,}000 \text{ dm}^3 = 401{,}6 \text{ g}$

$m(\text{oldat}) = \varrho(\text{oldat}) \cdot V(\text{oldat}) = 1{,}330 \frac{\text{g}}{\text{cm}^3} \cdot 1000 \text{ cm}^3 = 1330 \text{ g}$

$m(\text{oldószer}) = m(\text{oldat}) - m(\text{oldott anyag}) = 1330 \text{ g} - 401{,}6 \text{ g} = 928{,}4 \text{ g}$

$n(\text{NaOH}) = \frac{m(\text{NaOH})}{M(\text{NaOH})} = \frac{401{,}6 \text{ g}}{40{,}00 \frac{\text{g}}{\text{mol}}} = 10{,}04 \text{ mol}$

$n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = \frac{928{,}4 \text{ g}}{18{,}02 \frac{\text{g}}{\text{mol}}} = 51{,}52 \text{ mol}$

$n(\text{oldat}) = n(\text{oldott anyag}) + n(\text{oldószer}) = 10{,}04 \text{ mol} + 51{,}52 \text{ mol} = 61{,}56 \text{ mol}$

$\boldsymbol{w\%} = \frac{m(\text{oldott anyag})}{m(\text{oldat})} \cdot 100 = \frac{401{,}6 \text{ g}}{1330 \text{ g}} \cdot 100 = \underline{\mathbf{30{,}20}}$

$\boldsymbol{x\%} = \frac{n(\text{oldott anyag})}{n(\text{oldat})} \cdot 100 = \frac{10{,}04 \text{ mol}}{61{,}56 \text{ mol}} \cdot 100 = \underline{\mathbf{16{,}31}}$

$\boldsymbol{c}(\textbf{oldat}) = \frac{n(\text{oldott anyag})}{V(\text{oldat})} = \frac{10{,}04 \text{ mol}}{1{,}000 \text{ dm}^3} = \underline{\mathbf{10{,}04 \frac{mol}{dm^3}}}.$

212. A)

$n(\text{He}) = \frac{V(\text{He})}{V_m^{st}} = \frac{12{,}0 \text{ dm}^3}{24{,}5 \frac{\text{dm}^3}{\text{mol}}} = 0{,}490 \text{ mol}$

$n(\text{H}_2) = \frac{V(\text{H}_2)}{V_m^{0\,°C}} = \frac{34{,}0 \text{ dm}^3}{22{,}41 \frac{\text{dm}^3}{\text{mol}}} = 1{,}52 \text{ mol}$

$n(\text{elegy}) = n(\text{He}) + n(\text{H}_2) = 0{,}490 \text{ mol} + 1{,}52 \text{ mol} = 2{,}01 \text{ mol}$

$m(\text{He}) = n(\text{He}) \cdot M(\text{He}) = 0{,}490 \text{ mol} \cdot 4{,}00 \frac{\text{g}}{\text{mol}} = 1{,}96 \text{ g}$

$m(\text{H}_2) = n(\text{H}_2) \cdot M(\text{H}_2) = 1{,}52 \text{ mol} \cdot 2{,}02 \frac{\text{g}}{\text{mol}} = 3{,}06 \text{ g}$

$m(\text{elegy}) = m(\text{He}) + m(\text{H}_2) = 1{,}96 \text{ g} + 3{,}06 \text{ g} = 5{,}02 \text{ g}$

$\boldsymbol{w\%(\text{He})} = \frac{m(\text{He})}{m(\text{elegy})} \cdot 100 = \frac{1{,}96 \text{ g}}{5{,}02 \text{ g}} \cdot 100 = \underline{\mathbf{39{,}0}}$

$\boldsymbol{w\%(\text{H}_2)} = \frac{m(\text{H}_2)}{m(\text{elegy})} \cdot 100 = \frac{3{,}06 \text{ g}}{5{,}02 \text{ g}} \cdot 100 = \underline{\mathbf{61{,}0}}$

$\boldsymbol{x\%(\text{He})} = \frac{n(\text{He})}{n(\text{elegy})} \cdot 100 = \frac{0{,}490 \text{ mol}}{2{,}01 \text{ mol}} \cdot 100 = \underline{\mathbf{24{,}4}} = \varphi\%(\text{He})$

$\boldsymbol{x\%(\text{H}_2)} = \frac{n(\text{H}_2)}{n(\text{elegy})} \cdot 100 = \frac{1{,}52 \text{ mol}}{2{,}01 \text{ mol}} \cdot 100 = \underline{\mathbf{75{,}6}} = \varphi\%(\text{H}_2)$

$\boldsymbol{\bar{M}(\text{elegy})} = \frac{m(\text{elegy})}{n(\text{elegy})} = \frac{5{,}02 \text{ g}}{2{,}01 \text{ mol}} = \underline{\mathbf{2{,}50 \frac{g}{mol}}}.$

B)

$$n(\text{Ar}) = \frac{p \cdot V}{R \cdot T} = \frac{121000 \text{ Pa} \cdot 0{,}370 \text{ m}^3}{8{,}314 \frac{\text{J}}{\text{mol} \cdot \text{K}} \cdot 291 \text{ K}} = 18{,}5 \text{ mol}$$

$$n(\text{O}_2) = \frac{p \cdot V}{R \cdot T} = \frac{222000 \text{ Pa} \cdot 0{,}125 \text{ m}^3}{8{,}314 \frac{\text{J}}{\text{mol} \cdot \text{K}} \cdot 363 \text{ K}} = 9{,}19 \text{ mol}$$

$$n(\text{elegy}) = n(\text{Ar}) + n(\text{O}_2) = 18{,}5 \text{ mol} + 9{,}19 \text{ mol} = 27{,}7 \text{ mol}$$

$$m(\text{Ar}) = n(\text{Ar}) \cdot M(\text{Ar}) = 18{,}5 \text{ mol} \cdot 39{,}95 \frac{\text{g}}{\text{mol}} = 739{,}27 \text{ g} \approx 739 \text{ g}$$

$$m(\text{O}_2) = n(\text{O}_2) \cdot M(\text{O}_2) = 9{,}19 \text{ mol} \cdot 32{,}00 \frac{\text{g}}{\text{mol}} = 294{,}24 \text{ g} \approx 294 \text{ g}$$

$$m(\text{elegy}) = m(\text{Ar}) + m(\text{O}_2) = 739 \text{ g} + 294 \text{ g} = 1033{,}50 \text{ g} \approx 1{,}03 \cdot 10^3 \text{ g}$$

$$\mathbf{\textit{w}\%(\text{Ar})} = \frac{m(\text{Ar})}{m(\text{elegy})} \cdot 100 = \frac{739 \text{ g}}{1{,}03 \cdot 10^3 \text{ g}} \cdot 100 = \underline{\mathbf{71{,}5}}$$

$$\mathbf{\textit{w}\%(\text{O}_2)} = \frac{m(\text{O}_2)}{m(\text{elegy})} \cdot 100 = \frac{294 \text{ g}}{1{,}03 \cdot 10^3 \text{ g}} \cdot 100 = \underline{\mathbf{28{,}5}}$$

$$\mathbf{\textit{x}\%(\text{Ar})} = \frac{n(\text{Ar})}{n(\text{elegy})} \cdot 100 = \frac{18{,}5 \text{ mol}}{27{,}7 \text{ mol}} \cdot 100 = \underline{\mathbf{66{,}8}} = \boldsymbol{\varphi}\%(\text{Ar})$$

$$\mathbf{\textit{x}\%(\text{O}_2)} = \frac{n(\text{O}_2)}{n(\text{elegy})} \cdot 100 = \frac{9{,}19 \text{ mol}}{27{,}7 \text{ mol}} \cdot 100 = \underline{\mathbf{33{,}2}} = \boldsymbol{\varphi}\%(\text{O}_2)$$

$$\bar{\mathbf{M}}(\mathbf{elegy}) = \frac{m(\text{elegy})}{n(\text{elegy})} = \frac{1{,}03 \cdot 10^3 \text{ g}}{27{,}7 \text{ mol}} = \underline{\mathbf{37{,}3} \ \frac{\mathbf{g}}{\mathbf{mol}}}.$$

C)

$$n(\text{NO}) = \frac{p \cdot V}{R \cdot T} = \frac{357000 \text{ Pa} \cdot 15{,}0 \text{ m}^3}{8{,}314 \frac{\text{J}}{\text{mol} \cdot \text{K}} \cdot 316{,}5 \text{ K}} = 2{,}04 \cdot 10^3 \text{ mol}$$

$$n(\text{Xe}) = \frac{p \cdot V}{R \cdot T} = \frac{168000 \text{ Pa} \cdot 0{,}896 \text{ m}^3}{8{,}314 \frac{\text{J}}{\text{mol} \cdot \text{K}} \cdot 428 \text{ K}} = 42{,}3 \text{ mol}$$

$$n(\text{elegy}) = n(\text{NO}) + n(\text{Xe}) = 2{,}04 \cdot 10^3 \text{ mol} + 42{,}3 \text{ mol} = 2{,}08 \cdot 10^3 \text{ mol}$$

$$m(\text{NO}) = n(\text{NO}) \cdot M(\text{NO}) = 2{,}04 \cdot 10^3 \text{ mol} \cdot 30{,}01 \frac{\text{g}}{\text{mol}} = 6{,}11 \cdot 10^4 \text{ g}$$

$$m(\text{Xe}) = n(\text{Xe}) \cdot M(\text{Xe}) = 42{,}3 \text{ mol} \cdot 131{,}29 \frac{\text{g}}{\text{mol}} = 5{,}55 \cdot 10^3 \text{ g}$$

$$m(\text{elegy}) = m(\text{NO}) + m(\text{Xe}) = 6{,}11 \cdot 10^4 \text{ g} + 5{,}55 \cdot 10^3 \text{ g} = 6{,}66 \cdot 10^4 \text{ g}$$

$$\mathbf{\textit{w}\%(\text{NO})} = \frac{m(\text{NO})}{m(\text{elegy})} \cdot 100 = \frac{6{,}11 \cdot 10^4 \text{ g}}{6{,}66 \cdot 10^4 \text{ g}} \cdot 100 = \underline{\mathbf{91{,}7}}$$

$$\mathbf{\textit{w}\%(\text{Xe})} = \frac{m(\text{Xe})}{m(\text{elegy})} \cdot 100 = \frac{5{,}55 \cdot 10^3 \text{ g}}{6{,}66 \cdot 10^4 \text{ g}} \cdot 100 = \underline{\mathbf{8{,}34}}$$

$$\mathbf{\textit{x}\%(\text{NO})} = \frac{n(\text{NO})}{n(\text{elegy})} \cdot 100 = \frac{2{,}04 \cdot 10^3 \text{ mol}}{2{,}08 \cdot 10^3 \text{ mol}} \cdot 100 = \underline{\mathbf{98{,}0}} = \boldsymbol{\varphi}\%(\text{NO})$$

$$\mathbf{\textit{x}\%(\text{Xe})} = \frac{n(\text{Xe})}{n(\text{elegy})} \cdot 100 = \frac{42{,}3 \text{ mol}}{2{,}08 \cdot 10^3 \text{ mol}} \cdot 100 = \underline{\mathbf{2{,}04}} = \boldsymbol{\varphi}\%(\text{Xe})$$

$$\bar{\mathbf{M}}(\mathbf{elegy}) = \frac{m(\text{elegy})}{n(\text{elegy})} = \frac{6{,}66 \cdot 10^4 \text{ g}}{2{,}08 \cdot 10^3 \text{ mol}} = \underline{\mathbf{32{,}1} \ \frac{\mathbf{g}}{\mathbf{mol}}}.$$

213. **A)**

$$m(\text{elegy}) = m(\text{CO}) + m(\text{CO}_2) = 3{,}61 \cdot 10^3 \text{ g} + 947 \text{ g} = 4557 \text{ g} \approx 4{,}56 \cdot 10^3 \text{ g}$$

$$n(\text{CO}) = \frac{m(\text{CO})}{M(\text{CO})} = \frac{3{,}61 \cdot 10^3 \text{ g}}{28{,}01 \frac{\text{g}}{\text{mol}}} = 128{,}88 \text{ mol} \approx 129 \text{ mol}$$

$$n(\text{CO}_2) = \frac{m(\text{CO}_2)}{M(\text{CO}_2)} = \frac{947 \text{ g}}{44{,}01 \frac{\text{g}}{\text{mol}}} = 21{,}52 \text{ mol} \approx 21{,}5 \text{ mol}$$

$$n(\text{elegy}) = n(\text{CO}) + n(\text{CO}_2) = 129 \text{ mol} + 21{,}5 \text{ mol} = 150{,}40 \text{ mol} \approx 150 \text{ mol}$$

$$\mathbf{\textit{w}\%(\text{CO})} = \frac{m(\text{CO})}{m(\text{elegy})} \cdot 100 = \frac{3{,}61 \cdot 10^3 \text{ g}}{4{,}56 \cdot 10^3 \text{ g}} \cdot 100 = \underline{\mathbf{79{,}2}}$$

$$\mathbf{\textit{w}\%(\text{CO}_2)} = \frac{m(\text{CO}_2)}{m(\text{elegy})} \cdot 100 = \frac{947 \text{ g}}{4{,}56 \cdot 10^3 \text{ g}} \cdot 100 = \underline{\mathbf{20{,}8}}$$

$x\%(CO) = \frac{n(CO)}{n(\text{elegy})} \cdot 100 = \frac{129 \text{ mol}}{150 \text{ mol}} \cdot 100 = \underline{\mathbf{85,7}} = \varphi\%(CO)$

$x\%(CO_2) = \frac{n(CO_2)}{n(\text{elegy})} \cdot 100 = \frac{21,5 \text{ mol}}{150 \text{ mol}} \cdot 100 = \underline{\mathbf{14,3}} = \varphi\%(CO_2)$

$\bar{M}(\text{elegy}) = \frac{m(\text{elegy})}{n(\text{elegy})} = \frac{4,56 \cdot 10^3 \text{ g}}{150 \text{ mol}} = \underline{\mathbf{30,3}} \frac{\mathbf{g}}{\mathbf{mol}}.$

B)

$m(\text{elegy}) = m(NH_3) + m(CH_4) = 421 \text{ g} + 769 \text{ g} = 1190 \text{ g} \approx 1,19 \cdot 10^3 \text{ g}$

$n(NH_3) = \frac{m(NH_3)}{M(NH_3)} = \frac{421 \text{ g}}{17,04 \frac{g}{mol}} = 24,71 \text{ mol} \approx 24,7 \text{ mol}$

$n(CH_4) = \frac{m(CH_4)}{M(CH_4)} = \frac{769 \text{ g}}{16,05 \frac{g}{mol}} = 47,91 \text{ mol} \approx 47,9 \text{ mol}$

$n(\text{elegy}) = n(NH_3) + n(CH_4) = 24,7 \text{ mol} + 47,9 \text{ mol} = 72,62 \text{ mol} \approx 72,6 \text{ mol}$

$w\%(NH_3) = \frac{m(NH_3)}{m(\text{elegy})} \cdot 100 = \frac{421 \text{ g}}{1,19 \cdot 10^3 \text{ g}} \cdot 100 = \underline{\mathbf{35,4}}$

$w\%(CH_4) = \frac{m(CH_4)}{m(\text{elegy})} \cdot 100 = \frac{769 \text{ g}}{1,19 \cdot 10^3 \text{ g}} \cdot 100 = \underline{\mathbf{64,6}}$

$x\%(NH_3) = \frac{n(NH_3)}{n(\text{elegy})} \cdot 100 = \frac{24,7 \text{ mol}}{72,6 \text{ mol}} \cdot 100 = \underline{\mathbf{34,0}} = \varphi\%(NH_3)$

$x\%(CH_4) = \frac{n(CH_4)}{n(\text{elegy})} \cdot 100 = \frac{47,9 \text{ mol}}{72,6 \text{ mol}} \cdot 100 = \underline{\mathbf{66,0}} = \varphi\%(CH_4)$

$\bar{M}(\text{elegy}) = \frac{m(\text{elegy})}{n(\text{elegy})} = \frac{1,19 \cdot 10^3 \text{ g}}{72,6 \text{ mol}} = \underline{\mathbf{16,4}} \frac{\mathbf{g}}{\mathbf{mol}}.$

C)

$m(\text{elegy}) = m(SO_2) + m(Kr) = 120 \text{ g} + 564 \text{ g} = 684 \text{ g}$

$n(SO_2) = \frac{m(SO_2)}{M(SO_2)} = \frac{120 \text{ g}}{64,06 \frac{g}{mol}} = 1,87 \text{ mol}$

$n(Kr) = \frac{m(Kr)}{M(Kr)} = \frac{564 \text{ g}}{83,80 \frac{g}{mol}} = 6,73 \text{ mol}$

$n(\text{elegy}) = n(SO_2) + n(Kr) = 1,87 \text{ mol} + 6,73 \text{ mol} = 8,60 \text{ mol}$

$w\%(SO_2) = \frac{m(SO_2)}{m(\text{elegy})} \cdot 100 = \frac{120 \text{ g}}{684 \text{ g}} \cdot 100 = \underline{\mathbf{17,5}}$

$w\%(Kr) = \frac{m(Kr)}{m(\text{elegy})} \cdot 100 = \frac{564 \text{ g}}{684 \text{ g}} \cdot 100 = \underline{\mathbf{82,5}}$

$x\%(SO_2) = \frac{n(SO_2)}{n(\text{elegy})} \cdot 100 = \frac{1,87 \text{ mol}}{8,60 \text{ mol}} \cdot 100 = \underline{\mathbf{21,8}} = \varphi\%(SO_2)$

$x\%(Kr) = \frac{n(Kr)}{n(\text{elegy})} \cdot 100 = \frac{6,73 \text{ mol}}{8,60 \text{ mol}} \cdot 100 = \underline{\mathbf{78,2}} = \varphi\%(Kr)$

$\bar{M}(\text{elegy}) = \frac{m(\text{elegy})}{n(\text{elegy})} = \frac{684 \text{ g}}{8,60 \text{ mol}} = \underline{\mathbf{79,5}} \frac{\mathbf{g}}{\mathbf{mol}}.$

214. A)

$\bar{M}(\text{elegy}) = \varrho_{\text{rel}} \cdot M(O_2) = 0,750 \cdot 32,00 \frac{g}{mol} = \underline{\mathbf{24,0}} \frac{\mathbf{g}}{\mathbf{mol}}$

Legyen 1,00 mol, vagyis 24,0 g gázelegy! Ebben a mol N_2 és $(1 - a)$ mol CH_4 van.

$m(N_2) = n(N_2) \cdot M(N_2) = a \text{ mol} \cdot 28,02 \frac{g}{mol} = 28,02a \text{ g}$

$m(CH_4) = n(CH_4) \cdot M(CH_4) = (1 - a) \text{ mol} \cdot 16,05 \frac{g}{mol} = (16,05 - 16,05a) \text{ g}$

Ezek segítségével felírható:

$28,02a + (16,05 - 16,05a) = 24,0$

amelyből $\qquad a = n(N_2) = 0,664 \text{ mol } N_2,$

$\qquad\qquad (1 - a) = n(CH_4) = 0,336 \text{ mol } CH_4$

$m(N_2) = 28,02a \text{ g} = 18,6 \text{ g}$

$m(CH_4) = (16,05 - 16,05a) \text{ g} = 5,39 \text{ g}$

$w\%(\mathbf{N_2}) = \frac{m(N_2)}{m(\text{elegy})} \cdot 100 = \frac{18,6\ g}{24,0\ g} \cdot 100 = \underline{\mathbf{77,5}}$

$w\%(\mathbf{CH_4}) = \frac{m(CH_4)}{m(\text{elegy})} \cdot 100 = \frac{5,39\ g}{24,0\ g} \cdot 100 = \underline{\mathbf{22,5}}$

$x\%(\mathbf{N_2}) = \frac{n(N_2)}{n(\text{elegy})} \cdot 100 = \frac{0,664\ mol}{1,00\ mol} \cdot 100 = \underline{\mathbf{66,4}} = \varphi\%(N_2)$

$x\%(\mathbf{CH_4}) = \frac{n(CH_4)}{n(\text{elegy})} \cdot 100 = \frac{0,336\ mol}{1,00\ mol} \cdot 100 = \underline{\mathbf{33,6}} = \varphi\%(CH_4).$

B)

$\overline{M}(\mathbf{elegy}) = \varrho_{\text{rel}} \cdot M(H_2) = 18,0 \cdot 2,02\ \frac{g}{mol} = 36,36\ \frac{g}{mol} \approx \underline{\mathbf{36,4\ \frac{g}{mol}}}$

Legyen 1,00 mol, vagyis 36,4 g gázelegy! Ebben a mol O_2 és $(1 - a)$ mol Ar van.

$m(O_2) = n(O_2) \cdot M(O_2) = a\ mol \cdot 32,00\ \frac{g}{mol} = 32,00a\ g$

$m(Ar) = n(Ar) \cdot M(Ar) = (1 - a)\ mol \cdot 39,95\ \frac{g}{mol} = (39,95 - 39,95a)\ g$

Ezek segítségével felírható:

$32,00a + (39,95 - 39,95a) = 36,4$

amelyből $\qquad a = n(O_2) = 0,452$ mol O_2,

$\qquad\qquad\quad (1 - a) = n(Ar) = 0,548$ mol Ar

$m(O_2) = 32,00a\ g = 14,5\ g$

$m(Ar) = (39,95 - 39,95a)\ g = 21,9\ g$

$w\%(\mathbf{O_2}) = \frac{m(O_2)}{m(\text{elegy})} \cdot 100 = \frac{14,5\ g}{36,4\ g} \cdot 100 = \underline{\mathbf{39,8}}$

$w\%(\mathbf{Ar}) = \frac{m(Ar)}{m(\text{elegy})} \cdot 100 = \frac{21,9\ g}{36,4\ g} \cdot 100 = \underline{\mathbf{60,2}}$

$x\%(\mathbf{O_2}) = \frac{n(O_2)}{n(\text{elegy})} \cdot 100 = \frac{0,452\ mol}{1,00\ mol} \cdot 100 = \underline{\mathbf{45,2}} = \varphi\%(O_2)$

$x\%(\mathbf{Ar}) = \frac{n(Ar)}{n(\text{elegy})} \cdot 100 = \frac{0,548\ mol}{1,00\ mol} \cdot 100 = \underline{\mathbf{54,8}} = \varphi\%(Ar).$

C)

$\overline{M}(\mathbf{elegy}) = \varrho_{\text{rel}} \cdot M(CH_4) = 3,55 \cdot 16,05\ \frac{g}{mol} = 56,98\ \frac{g}{mol} \approx \underline{\mathbf{57,0\ \frac{g}{mol}}}$

Legyen 1,00 mol, vagyis 57,0 g gázelegy! Ebben a mol SO_2 és $(1 - a)$ mol CO_2 van.

$m(SO_2) = n(SO_2) \cdot M(SO_2) = a\ mol \cdot 64,06\ \frac{g}{mol} = 64,06a\ g$

$m(CO_2) = n(CO_2) \cdot M(CO_2) = (1 - a)\ mol \cdot 44,01\ \frac{g}{mol} = (44,01 - 44,01a)\ g$

Ezek segítségével felírható:

$64,06a + (44,01 - 44,01a) = 57,0$

amelyből $\qquad a = n(SO_2) = 0,647$ mol SO_2,

$\qquad\qquad\quad (1 - a) = n(CO_2) = 0,353$ mol CO_2

$m(SO_2) = 64,06a\ g = 41,4\ g$

$m(CO_2) = (44,01 - 44,01a)\ g = 15,5\ g$

$w\%(\mathbf{SO_2}) = \frac{m(SO_2)}{m(\text{elegy})} \cdot 100 = \frac{41,4\ g}{57,0\ g} \cdot 100 = \underline{\mathbf{72,7}}$

$w\%(\mathbf{CO_2}) = \frac{m(CO_2)}{m(\text{elegy})} \cdot 100 = \frac{15,5\ g}{57,0\ g} \cdot 100 = \underline{\mathbf{27,3}}$

$x\%(\mathbf{SO_2}) = \frac{n(SO_2)}{n(\text{elegy})} \cdot 100 = \frac{0,647\ mol}{1,00\ mol} \cdot 100 = \underline{\mathbf{64,7}} = \varphi\%(SO_2)$

$x\%(\mathbf{CO_2}) = \frac{n(CO_2)}{n(\text{elegy})} \cdot 100 = \frac{0,353\ mol}{1,00\ mol} \cdot 100 = \underline{\mathbf{35,3}} = \varphi\%(CO_2).$

215. A)

$\overline{M}(\mathbf{elegy}) = \frac{m(\text{elegy}) \cdot V_m^{0\,°C}}{V(\text{elegy})} = \frac{10,0\ g \cdot 22,41\ \frac{dm^3}{mol}}{6,50\ dm^3} = 34,48\ \frac{g}{mol} \approx \underline{\mathbf{34,5\ \frac{g}{mol}}}$

Legyen 1,00 mol, vagyis 34,5 g gázelegy! Ebben a mol CO_2 és $(1-a)$ mol N_2 van.

$m(CO_2) = n(CO_2) \cdot M(CO_2) = a$ mol $\cdot\ 44,01\ \frac{g}{mol} = 44,01a$ g

$m(N_2) = n(N_2) \cdot M(N_2) = (1-a)$ mol $\cdot\ 28,02\ \frac{g}{mol} = (28,02 - 28,02a)$ g

Ezek segítségével felírható:

$44,01a + (28,02 - 28,02a) = 34,5$

amelyből $\qquad a = n(CO_2) = 0,404$ mol CO_2,

$\qquad\qquad (1-a) = n(N_2) = 0,596$ mol N_2

$m(CO_2) = 44,01a$ g $= 17,8$ g

$m(N_2) = (28,02 - 28,02a)$ g $= 16,7$ g

$w\%(CO_2) = \frac{m(CO_2)}{m(\text{elegy})} \cdot 100 = \frac{17,8\ g}{34,5\ g} \cdot 100 = \underline{\textbf{51,6}}$

$w\%(N_2) = \frac{m(N_2)}{m(\text{elegy})} \cdot 100 = \frac{16,7\ g}{34,5\ g} \cdot 100 = \underline{\textbf{48,4}}$

$x\%(CO_2) = \frac{n(CO_2)}{n(\text{elegy})} \cdot 100 = \frac{0,404\ mol}{1,00\ mol} \cdot 100 = \underline{\textbf{40,4}} = \varphi\%(CO_2)$

$x\%(N_2) = \frac{n(N_2)}{n(\text{elegy})} \cdot 100 = \frac{0,596\ mol}{1,00\ mol} \cdot 100 = \underline{\textbf{59,6}} = \varphi\%(N_2).$

B)

$\bar{M}(\textbf{elegy}) = \frac{m(\text{elegy}) \cdot V_m^{st}}{V(\text{elegy})} = \frac{68,5\ g\ \cdot\ 24,5\ \frac{dm^3}{mol}}{140\ dm^3} = 11,99\ \frac{g}{mol} \approx \underline{\textbf{12,0}\ \frac{\textbf{g}}{\textbf{mol}}}$

Legyen 1,00 mol, vagyis 12,0 g gázelegy! Ebben a mol He és $(1-a)$ mol NO van.

$m(He) = n(He) \cdot M(He) = a$ mol $\cdot\ 4,00\ \frac{g}{mol} = 4,00a$ g

$m(NO) = n(NO) \cdot M(NO) = (1-a)$ mol $\cdot\ 30,01\ \frac{g}{mol} = (30,01 - 30,01a)$ g

Ezek segítségével felírható:

$4,00a + (30,01 - 30,01a) = 12,0$

amelyből $\qquad a = n(He) = 0,693$ mol He,

$\qquad\qquad (1-a) = n(NO) = 0,307$ mol NO

$m(He) = 4,00a$ g $= 2,77$ g

$m(NO) = (30,01 - 30,01a)$ g $= 9,21$ g

$w\%(He) = \frac{m(He)}{m(\text{elegy})} \cdot 100 = \frac{2,77\ g}{12,0\ g} \cdot 100 = \underline{\textbf{23,1}}$

$w\%(NO) = \frac{m(NO)}{m(\text{elegy})} \cdot 100 = \frac{9,21\ g}{12,0\ g} \cdot 100 = \underline{\textbf{76,9}}$

$x\%(He) = \frac{n(He)}{n(\text{elegy})} \cdot 100 = \frac{0,693\ mol}{1,00\ mol} \cdot 100 = \underline{\textbf{69,3}} = \varphi\%(He)$

$x\%(NO) = \frac{n(NO)}{n(\text{elegy})} \cdot 100 = \frac{0,307\ mol}{1,00\ mol} \cdot 100 = \underline{\textbf{30,7}} = \varphi\%(NO).$

C)

$\bar{M}(\textbf{elegy}) = \frac{m(\text{elegy}) \cdot V_m^{st}}{V(\text{elegy})} = \frac{214\ g\ \cdot\ 24,5\ \frac{dm^3}{mol}}{524\ dm^3} = \underline{\textbf{10,0}\ \frac{\textbf{g}}{\textbf{mol}}}$

Legyen 1,00 mol, vagyis 10,0 g gázelegy! Ebben a mol CH_4 és $(1-a)$ mol H_2 van.

$m(CH_4) = n(CH_4) \cdot M(CH_4) = a$ mol $\cdot\ 16,05\ \frac{g}{mol} = 16,05a$ g

$m(H_2) = n(H_2) \cdot M(H_2) = (1-a)$ mol $\cdot\ 2,02\ \frac{g}{mol} = (2,02 - 2,02a)$ g

Ezek segítségével felírható:

$16,05a + (2,02 - 2,02a) = 10,0$

amelyből $\qquad a = n(CH_4) = 0,569$ mol CH_4,

$\qquad\qquad (1-a) = n(H_2) = 0,431$ mol H_2

$m(CH_4) = 16,05a$ g $= 9,13$ g

$m(H_2) = (2,02 - 2,02a)$ g $= 0,871$ g

$w\%(\mathbf{CH_4}) = \dfrac{m(CH_4)}{m(\text{elegy})} \cdot 100 = \dfrac{9,13 \text{ g}}{10,0 \text{ g}} \cdot 100 = \underline{\mathbf{91,3}}$

$w\%(\mathbf{H_2}) = \dfrac{m(H_2)}{m(\text{elegy})} \cdot 100 = \dfrac{0,871 \text{ g}}{10,0 \text{ g}} \cdot 100 = \underline{\mathbf{8,70}}$

$x\%(\mathbf{CH_4}) = \dfrac{n(CH_4)}{n(\text{elegy})} \cdot 100 = \dfrac{0,569 \text{ mol}}{1,00 \text{ mol}} \cdot 100 = \underline{\mathbf{56,9}} = \boldsymbol{\varphi}\%(\mathbf{CH_4})$

$x\%(\mathbf{H_2}) = \dfrac{n(H_2)}{n(\text{elegy})} \cdot 100 = \dfrac{0,431 \text{ mol}}{1,00 \text{ mol}} \cdot 100 = \underline{\mathbf{43,1}} = \boldsymbol{\varphi}\%(\mathbf{H_2}).$