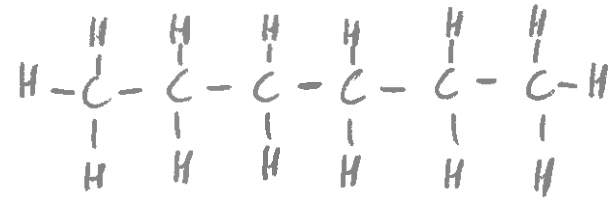
4.4.1

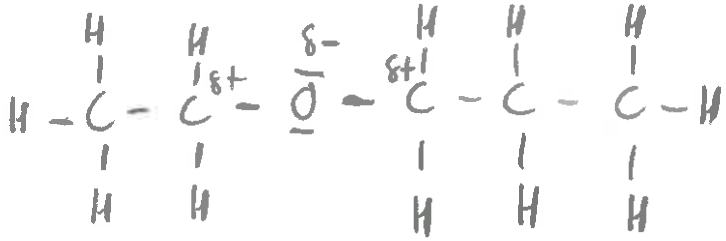
a)

2. n-Hexan, $K_p = 68{,}7\,°C$, $M = 86{,}18\,g/mol$



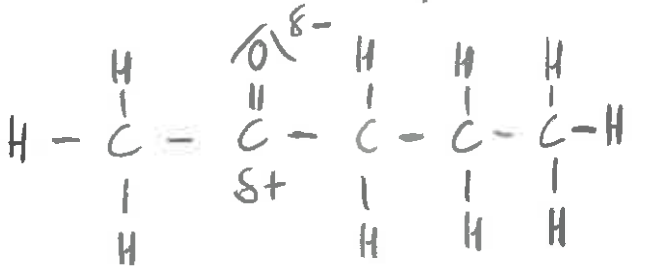
nur Dispersionskräfte

1. Ethylpropylether, $K_p = 63{,}6\,°C$, $M = 88{,}15\,g/mol$



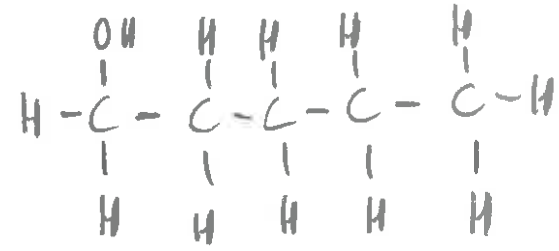
schwache Dipol-Dipol-Wechselwirkungen

3. 2-Pentanon, $K_p = 102\,°C$, $M = 86{,}14\,g/mol$



stärkere Dipol-Dipol-Wechselwirkungen

4. 1-Pentanol, $K_p = 137{,}3\,°C$, $M = 88{,}15\,g/mol$

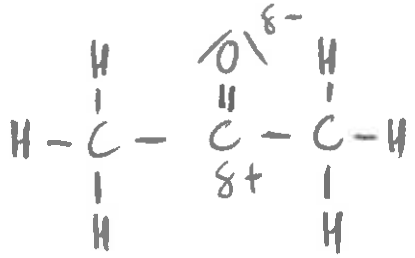


Ausbildung von Wasserstoffbrücken!

4.4.1

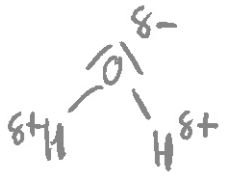
b)

1. 2-Propanon, Kp. = 56,2 °C, M = 58,03 g/mol
(Aceton)



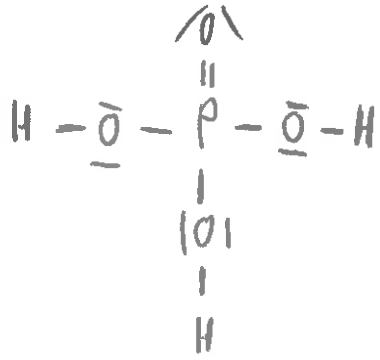
Dipol-Dipol-Wechselwirkungen

2. Wasser, Kp. = 100 °C, M = 18,01 g/mol



Ausbildung von starken Wasserstoffbrücken

3. Phosphorsäure, Mp. = 42,35 °C, M = 98,0 g/mol



bildet starke Wasserstoffbrückenbindungen aus (3 OH-Gruppen!)
Ziemlich viskose Flüssigkeit

4.4.1 in Tabellenform an die Tafel schreiben

c) 1. Benzol, Kp. = 80,1 °C, M = 78,1 g/mol

nur Dispersionskräfte

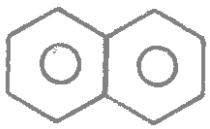
2. Toluol, Kp. = 110,8 °C, M = 92,15 g/mol

nur Dispersionskräfte

3. p-Xylol, Kp. = 138,4 °C, M = 106,17 g/mol

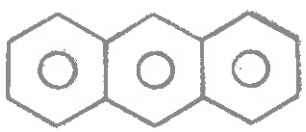
nur Dispersionskräfte

4. Naphthalin, Kp. = 218 °C, M = 128,19 g/mol



nur Dispersionskräfte

5. Anthracen, Kp. = 340°C, M = 178,24 g/mol



nur Dispersionskräfte

4.4.2

Gesucht: $V(\text{Dampf})$

Gegeben:

$V(\text{Flüssig}) = 1\,l$

$\rho(\text{Äther}) = 0{,}713\,g/ml$

$t = 50\,°C$

$T = 323{,}15\,K$

$p = 1{,}013\,bar$

$R = 0{,}08314\,bar\,l/mol\,K$

$M(\text{Äther}) = 74{,}12\,g/mol$

$$p \cdot V = n \cdot R \cdot T$$

$$V = \frac{n \cdot R \cdot T}{p}$$

Zunächst Berechnung von n:

$$\rho = \frac{m}{V} \Rightarrow m = \rho \cdot V, \quad m = 0{,}713\,g/ml \cdot 1000\,ml$$

$$m = 713\,g$$

$$n = \frac{m}{M}$$

$$n = \frac{713\,g}{74{,}12\,g/mol} = 9{,}62\,mol$$

$$V(\text{Dampf}) = \frac{9{,}62\,mol \cdot 0{,}08314\,bar\,l \cdot 323{,}15\,K}{1{,}013\,bar \quad mol\,K}$$

$$V(\text{Dampf}) = 255{,}14\,l$$

4.4.3

Gesucht: $K_{p_{133,3\,mbar}}$

Gegeben:

$K_{p_{1013,25\,mbar}}$ (Benzol) = 80,1 °C

$\Delta H_{verd.} = 33,5\ kJ/mol$

$R = 8,314\ J/mol\,K$

$$\log p = -\frac{\Delta H_{verd.}}{2,303 \cdot R \cdot T} + C$$

$$\log 1013,25 = -\frac{33,5\ kJ/mol}{2,303 \cdot 8,314\ J/molK \cdot 353,25\ K} + C$$

$$3,01 = -4,95 + C$$

$$\underline{c = 7,96}$$

$$\log p\,[mbar] = \frac{-33,5\ kJ/mol}{2,303 \cdot 8,314\ J/molK \cdot T} + 7,96$$

$$\log 133,3\,mbar = \frac{-33500\ J/mol}{2,303 \cdot 8,314\ J/molK \cdot T} + 7,96$$

$$2,12 = -\frac{1749,61\,[K]}{T} + 7,96$$

$$-5,84 = -\frac{1749,61\,[K]}{T}$$

$$T = 299,6\ K$$

$$\underline{\underline{t = 26,4\ °C}}$$

4.4.4

Gesucht: $\Delta H_{verd.}$

Gegeben: Nitrobenzol

$p(85°C) = 1{,}38\ hPa$

$p(115°C) = 5{,}17\ hPa$

$R = 8{,}314\ J/mol\,K$

$$\log p = -\frac{\Delta H_{verd.}}{2{,}303 \cdot R \cdot T} + C$$

$$\log 1{,}38\ hPa = -\frac{\Delta H_{verd.}}{2{,}303 \cdot 0{,}00831\ hJ/mol\,K \cdot 358{,}15\ K} + C$$

$$\log 5{,}17\ hPa = -\frac{\Delta H_{verd.}}{2{,}303 \cdot 0{,}00831\ hJ/mol\,K \cdot 388{,}15\ K} + C$$

$$0{,}1399 = -\frac{\Delta H_{verd.}}{6{,}8543\ hJ/mol} + C$$

$$0{,}7135 = -\frac{\Delta H_{verd.}}{7{,}4284\ hJ/mol} + C$$

$$0{,}1399 + \frac{\Delta H_{verd.}}{6{,}8543\ hJ/mol} = 0{,}7135 + \frac{\Delta H_{verd.}}{7{,}4284\ hJ/mol}$$

$$\Delta H_{verd.}\left(\frac{1}{6{,}8543\ hJ/mol} - \frac{1}{7{,}4284\ hJ/mol}\right) = 0{,}5736$$

$$\Delta H_{verd.}\,(0{,}1459\ mol/hJ - 0{,}1346\ mol/hJ) = 0{,}5736$$

$$\Delta H_{verd.} = \frac{0{,}5736}{0{,}0113\ mol/hJ}$$

$$\underline{\Delta H_{verd.} = 50{,}76\ hJ/mol}$$