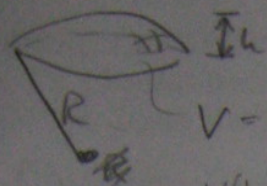


**Uebung Weiche Materia**  
**Blatt 06**  
**Aufgabe 1**  
*Michael Kopp*  
January 27, 2011

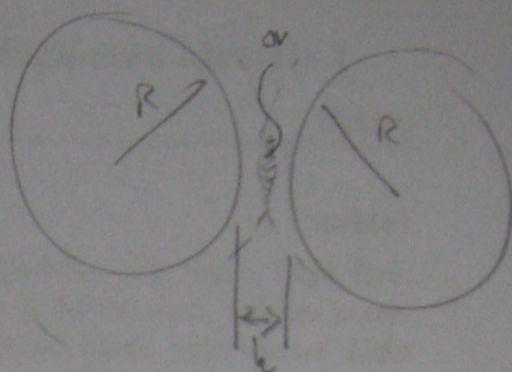
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$$V = \frac{1}{3} \pi h^2 (3R - h)$$

$$K(h) =$$

Weil ⑥



$$(a) \Delta V = 2 \cdot K(r - h/2)$$

$$= \frac{2}{3} \pi (r - \frac{h}{2})^2 (3(R+r) - (r - \frac{h}{2}))$$

$$= \frac{2}{3} \pi (r - \frac{h}{2})^2 (3R + 2r + \frac{h}{2})$$

$$\Delta F = -NkT \ln(1 + \frac{\Delta V}{V})$$

$$\approx -NkT [\frac{\Delta V}{V} - \frac{(\Delta V)^2}{2V^2} + \frac{(\Delta V)^3}{3V^3} - \frac{(\Delta V)^4}{4V^4} + \dots]$$

$$\approx -NkT \frac{\Delta V}{V} = -nkT \cdot \Delta V = \Delta F_{KK}$$



$$(b) \Delta V \xrightarrow{r \rightarrow R} \frac{2}{3} \pi (R - \frac{h}{2})^2 (5R + \frac{h}{2})$$

(c) Für Kugel-Wand:

$$\Delta F = -nkT \frac{1}{3} \pi (2r - h)^2 (3(R+r) - 2r + h)$$

$$= -nkT \frac{2}{3} \pi (r - h/2)^2 (3R + r + h) = \Delta F_{KW}$$

$$\frac{\Delta F_{KW}}{\Delta F_{KK}} = \frac{1}{2} \cdot \frac{3R + 2r + h/2}{3R + r + h} = \frac{1}{2} \left[ 1 + \frac{r - h/2}{3R + r + h} \right]$$

$$(d) \text{ Vgl } \Delta F_{KW} \text{ mit } \Delta F_{KW}^L = -3kT \phi \frac{R}{2r} (1 - \frac{h}{2r})$$

$$\phi = \frac{4}{3} \pi r^3 \cdot n$$

$$= -nkT \pi 2 R^2 (1 - \frac{h}{2r})$$

 $\phi$ : Vol'br. d. G. kg.

$$\text{Abgleichung: } r^2 R (1 - \frac{h}{2r}) \text{ vs } \frac{1}{3} (r - \frac{h}{2})^2 (3R + 2r + \frac{h}{2}) =$$

$$\frac{1}{3} r^2 (1 - \frac{h}{2r})^2 (3R + 2r + \frac{h}{2}) =$$

$$[r^2 R (1 - \frac{h}{2r})] \cdot [1 - \frac{h}{2r} + \frac{2r}{3R} + \frac{h}{6R}]$$