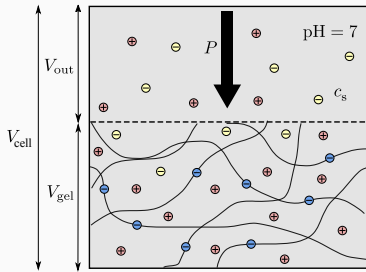


# Mean field thory.



**Figure 1:** The hydrogel in equilibrium with a bath of aqueous solution

- Free energy of a hydrogel chain

$$F = F_{conf} + F_{int} + F_{ion}$$

- Conformational entropy

$$F_{conf} = \frac{3}{2} \frac{R^2/(b^2 N) - 1}{1 - R^2/(b^2 N^2)} - \frac{3}{2} \ln \left( \frac{R^2}{b^2 N} \right)$$

- Steric interactions

$$F_{int} = \frac{N}{c_p} \left[ (1 - c_p) \ln (1 - c_p) - \chi c_p^2 \right]$$

$$F_{ion} = \frac{N}{c_p} \sum_i \left( c_i^{in} \ln \frac{c_i^{in}}{c_i^{out}} + c_i^{out} - c_i^{in} \right)$$