Main parameters (problems).

1. An aqueous solution containing 3.0% w/w of solute is treated by RO. The permeate contains 150 ppm of solute. Determine the retention, R, and the selectivity, α.

2. To enrich air in O_2, gas permeation is fairly used. At the permeate, a 75% of O_2 is observed. Calculate the retention, R, for the N_2 and the selectivity factor, α.

Explain which one of the two parameters seems to be more suitable for each case (1 and 2)?

3. The pure water flux of a membrane with a diameter of 7.5 cm has been determined as a function of the applied pressure. The results obtained are collected in the following table:

ΔP (bar)	5	10	15	20	25
Flux (ml/hr)	103	202	287	386	501

Estimate the water permeability coefficient (hydraulic permeability).

Main parameters (problems).

4. Darcy's equation (1856)

$$Q_w = \frac{k \cdot A_m \cdot \Delta P}{\mu \cdot d}$$

(where Q_w is the volum flowrate, A_m is the membrane surface and k is a characteristic permeability constant for each membrane) is widely used in order to experimentally characterise the permeability of the membranes.

Is there some contradiction between the above equation and the Hagen-Pouseuille's equation?

Main parameters (problems).

5. Demonstrate that the Hagen-Poiseuille's equation results from an energy balance when a fluid passes through the membrane (assume that pores are cylinders and remember the mechanical energy balance).

6. How will the Kozeny-Carman's equation be if we are studying a membrane formed by sintered alumina particles (granulated layer), assuming to be spheres?