

Reverse osmosis technology

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Solution:

First we calculate the required pressure using the van't Hoff Equation:

$$\Pi = cRT = (1.1 M) \left(0.08206 \frac{Latm}{molK} \right) (298 K)$$

$$\Pi = cRT = 26.9 atm$$

Then we calculate the pressure-volume product for 1 liter.

$$\Pi V = 26.9 L - atm \left(101.325 \frac{J}{Latm} \right) = 2725 Joules$$

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In case you do not know, there is a simple trick for remembering the conversion from L-atm to Joules. You may know (and you can always look up even on a test) that there are two values of the ideal gas constant, R. These are:

$$R = 8.31 \frac{J}{molK} = 0.08206 \frac{Latm}{molK}$$

Their ratio gives the needed conversion factor:

$$101.325 \frac{J}{Latm} = \frac{8.31 \frac{J}{molK}}{0.08206 \frac{Latm}{molK}}$$