Problem 14-01 Pressure difference on curved phase boundary - Laplace-Young equation

Calculate the pressure inside the drop of a liquid of density with radius of 6 μm floating in the air (temperature 35 °C, pressure 102.1 kPa). The liquid density is 0.93 g cm^{-3} and surface tension 42 mN m^{-1}.

[$p^{(\ell)}$ = 116.1 kPa]

Solution:

$p^{(g)}$ = 102.1 kPa
γ = 42 mN m^{-1} = 0.042 N m^{-1},
r = 6 μm = 6·10^{-6} m

$$p^{(\ell)} - p^{(g)} = \frac{2\gamma}{r} = \frac{2 \cdot 0.042}{6 \cdot 10^{-6}} = 14000 \text{ Pa} = 14 \text{ kPa}$$

$$p^{(\ell)} = 102.1 + 14 = 116.1 \text{ kPa}$$